



FRA & Drainage Statement

Westholme Clinic, 10 Clive Avenue

Goring-by-Sea, BN12 4SG

Client

Westholme Clinic Ltd

Westholme Clinic

10 Clive Avenue

Worthing

BN12 4SG

Ref: 11926

Date: March 2026

Consulting Engineers

GTA Civils & Transport Limited

Maple House

192-198 London Road

Burgess Hill

West Sussex

RH15 9RD

Tel: [REDACTED]

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Issue	Issue date	Compiled	Checked
Draft Issue	02.03.2026	JP	FV / MR
First Issue	17.03.2026	JP	FV / MR
Second Issue	04.08.2026	JP	FV / MR

1 Introduction

- 1.1 GTA Civils and Transport Ltd. was appointed by the Client to provide a FRA & Drainage Statement in relation to the proposed development at Westholme Clinic, 10 Clive Avenue, Goring-by-Sea, BN12 4SG (hereafter referred to as the "Site"). No responsibility is accepted to any third party for all or part of this study in connection with this or any other development.
- 1.2 The Proposed Development is to extend this Health Clinic.
- 1.3 The objective of this Statement is to support the Client's application for Full Planning Permission – by demonstrating that both drainage networks shall comply fully with local and national drainage policies. Planning permission was granted in 2022 for a similar – larger scheme.
- 1.4 This statement has been prepared in accordance with, the National Planning Policy Framework (NPPF) (2025). It follows on from the Foul & Surface Water Drainage Statement prepared by GTA Civils, dated April 2022. This was a post-planning statement that assisted with the discharge of 3 drainage conditions.
- 1.5 The second version of this statement has been prepared following comments from the LPA/ LLFA. The EA's flood mapping has been updated recently and so the surface water flood risk has been assessed – refer to Appendix G and sections 2.7-2.9 below.

2 Existing Site

- 2.1 The application site, measuring approximately 0.4 hectares, comprises a nursing home complex with external storerooms and sheds in the setting of landscaped private gardens. It lies within the area administered by Worthing Borough Council (WBC). Appendix A shows a site location map and an aerial view.
- 2.2 Topography: a topographic survey is shown in Appendix B. The south of the site where the extension is proposed is flat with levels ranging between 10.24m AOD and 10.00m AOD.
- 2.3 Geology: the BGS online geological map shows this area is dominated by New Pit Chalk Formation. River Terrace Deposits (sand, silt and clay) superficial deposits overlie the chalk bedrock.
- 2.4 Soakage Tests: soakage tests were undertaken in trial pit TP01 in accordance with BRE365. The testing was carried out over 3 days. The lowest rate of the 3 was calculated at $1.53 \times 10^{-6} \text{m/s}$. The Site Investigation report is shown in Appendix C.
- 2.5 A groundwater monitoring programme was undertaken between 23/12/21 and 31/03/22 at DS01 and DS03. No water was encountered over this period at the 2 bore locations (one at 2.8m bgl and the second at 2.9m bgl). A site plan showing all the test and borehole locations is shown in Appendix C.
- 2.6 Public Sewers: Southern Water's sewer records (in Appendix B) show a 225mmØ foul sewer flowing north- south under Clive Avenue, close to the site's west boundary. A second 300mmØ surface water sewer flows south along Clive Avenue. The closest public foul sewer measures 600mmØ, flowing east-west under Barrington Road, to the north of the site. Two other foul sewers (measuring 750mmØ and 150mmØ) flow along this stretch of Barrington Road.
- 2.7 Flood Risk: The EA's online fluvial, and reservoir flood maps have been studied. The flood risk from these sources is Low.
- 2.8 Surface water flooding: this can occur when excess rainwater does not infiltrate into the ground, or is not intercepted by urban drainage systems, and instead flows across the surface. The EA's Online Surface Water Flood Map (all depths, 1 in 100yrs, 2061-2125 scenario) is shown in Appendix G.
- 2.9 Although there are flood patterns within the site, these are small and localised – associated with localised depression in the LIDAR data. There are no overland flow routes crossing the site. All such volume shall be intercepted by the proposed development's surface water drainage network. It is concluded that the flood risk profile of this site is LOW.

3 Proposed Sustainable Surface Water Drainage Design & Conclusion

- 3.1 The proposed development is to create an extension to the Clinic.
- 3.2 The SuDS hierarchy (infiltration, watercourses, public sewers, private sewers) has been applied here.
- 3.3 A drainage strategy layout has been prepared – refer to Appendix D. This shows all pipe diameters, manhole sizes, cover levels and invert levels.
- 3.4 The surface water from the extension's roof will be routed into a newly formed trench soakaway. This soakaway has been sized to store the critical 1 in 100-year event + 45% climate change event.
- 3.5 The Flow Calculation sheets in Appendix E show that 16.7m³ is needed while the soakaway's actual design volume is 18.0m³. Flow uses FEH22 hydrology and Cv values are set to 1.0. No surface flooding is showing.
- 3.6 Maintenance: The Applicant (clinic) shall be responsible for the ongoing maintenance of the drainage components, i.e. pipes, manholes and trench soakaway. A management company shall be appointed to undertake the necessary maintenance work. A SuDS Management and Maintenance Plan is shown in Appendix F. This sets out how the various components will be inspected and maintained – in line with Industry Standards as per CIRIA's SuDS Manual C753.
- 3.7 Water quality / Treatment: The proposed SuDS strategy includes appropriate runoff treatment measures in the form of permeable paving to protect and improve the quality of the aquifer. This can be demonstrated using the Simple Index Approach described in CIRIA C753 (the SuDS Manual). The roofs are classified as 'very low' pollution hazard level. This is mitigated by the proposed soakaway.

Table 11: Runoff Treatment - Simple Index Approach

		TSS	Metals	Hydrocarbons
Pollution hazard indices	Roof – Very Low	0.2	0.2	0.05
SuDS mitigation indices	Infiltration Trench	0.4	0.4	0.4

- 3.8 Exceedance flows: in the event of system failure or for events in excess of the design event, it is expected that exceedance flows will be westwards to a local low point.
- 3.9 It is proposed to discharge the development's foul water into the existing public foul sewer via the existing outfall manhole approximately halfway up the west boundary. The foul drainage strategy is shown in the layout drawing in Appendix D.
- 3.10 Permission to discharge into the sewer – by means of an application under Section 106 of the Water Industry Act 1991 – will be sought from Southern Water in due course.

3.11 Conclusion: With the proposed measures in place, it is concluded that this development complies with the current local and national drainage policies.

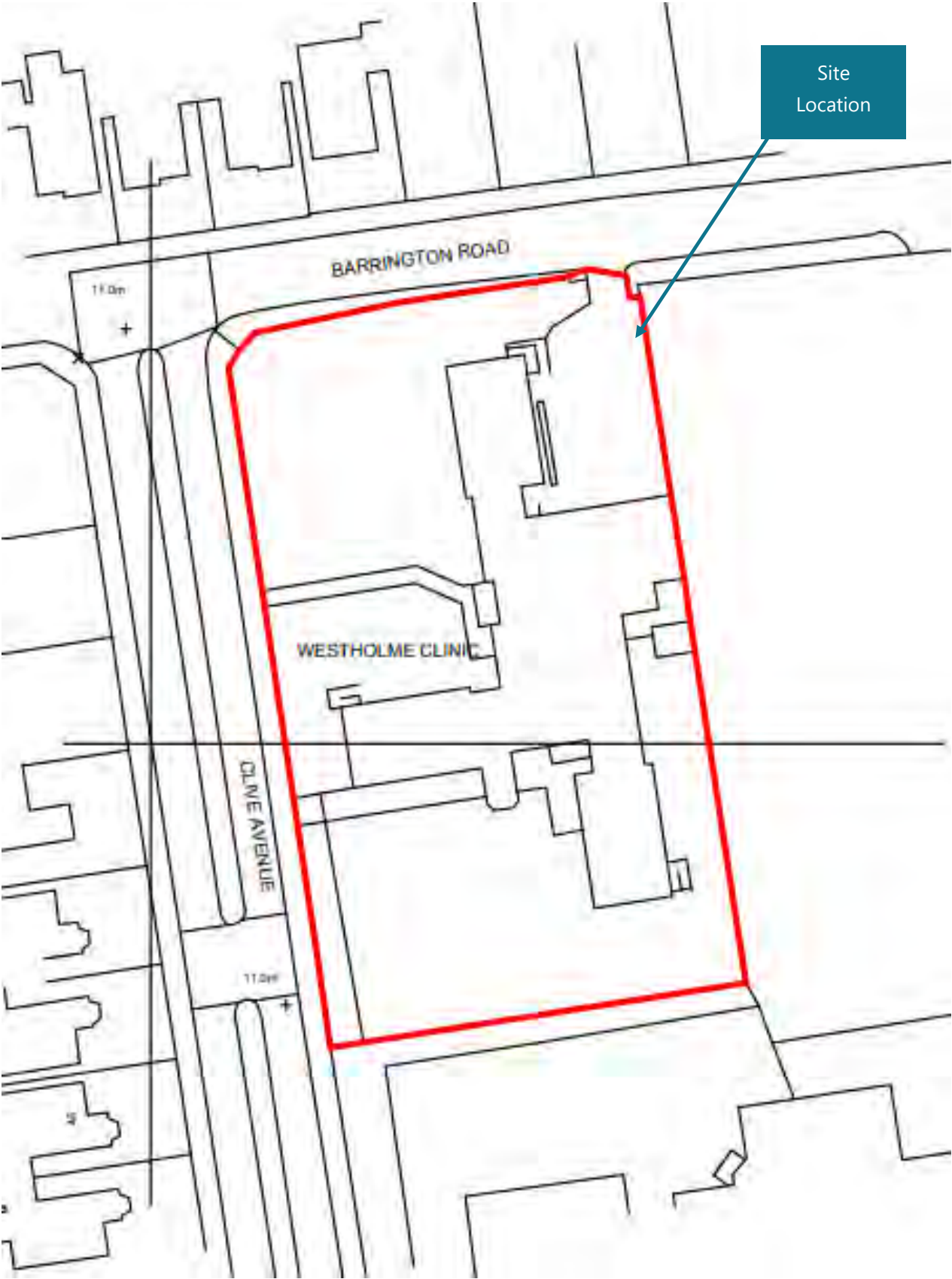
- End of Report -

Appendix A

Location Maps

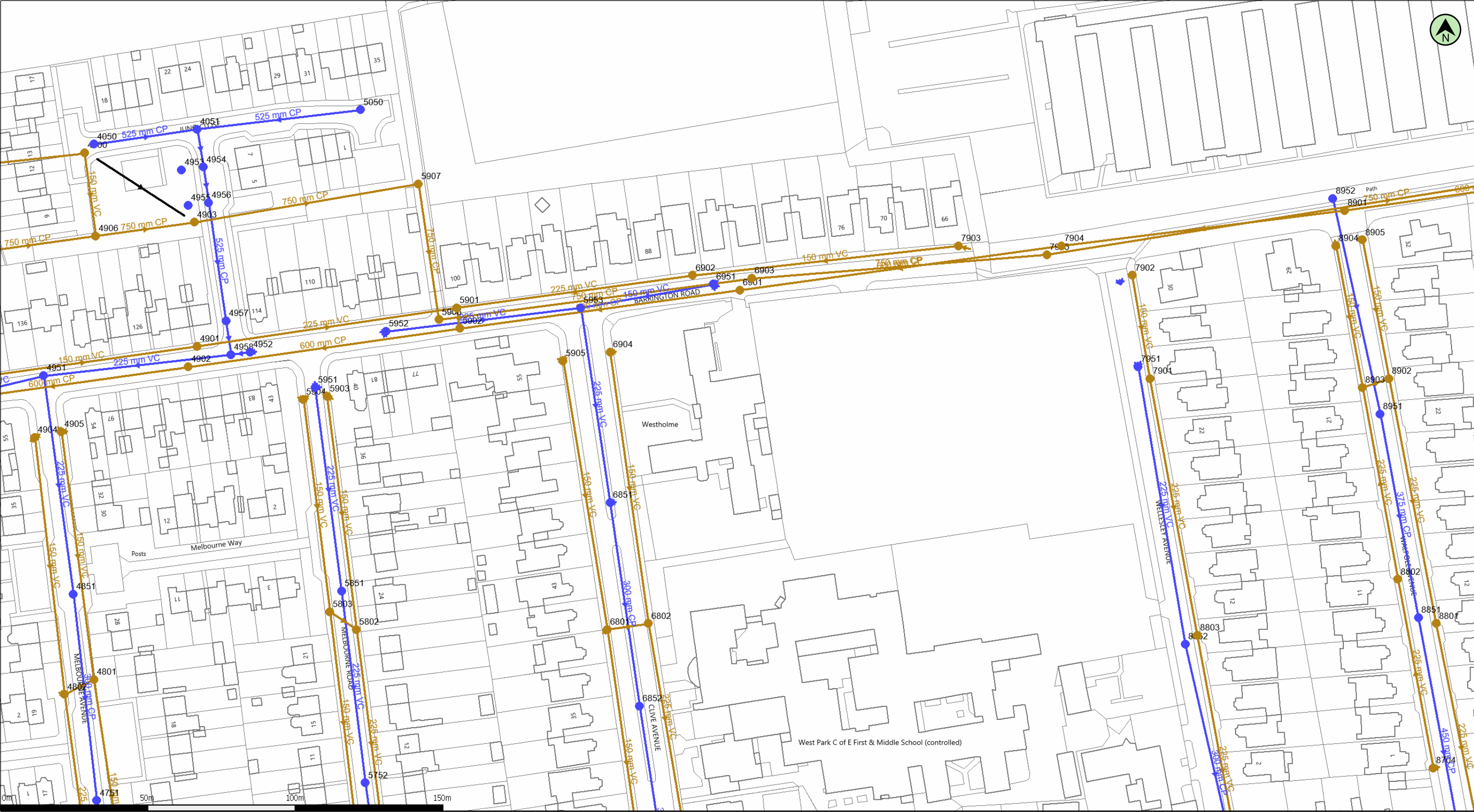






Appendix B

Topographic Survey & Sewer Records



(c) Crown copyright and database rights 2022 Ordnance Survey 100031673 Date: 05/04/22 Scale: 1:1250 Map Centre: 511652,102918 Data updated: 21/03/22 Our Ref: 823895 - 1 Wastewater Plan A3

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. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2022 Ordnance Survey 100031673. This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

cfagan@gtacivils.co.uk
11926 / MR



Appendix C

BRE365 Soil Soakage Test Report

BY EMAIL ONLY

16th May 2022

Our Ref: LS6198

Fuller Associates
10-11 The Parade
Willowhayne Crescent
East Preston
West Sussex
BN16 1NS



Unit 10, 19 Albert Drive, Burgess Hill,
West Sussex, RH15 9TN

t: 0345 604 6494 / 01444 882 084

w: www.landscience.co.uk

e: info@landscience.co.uk

Dear Sirs,

RE: WESTHOLME CLINIC, WORTHING, BN12 4SG -INFILTRATION TESTING

Land Science were instructed to carryout soakage testing at the above site between the 9th and 12th May 2022. The location of the test is shown on the plan attached along with the trial pit logs and infiltration calculations.

Scope of work

The soakage testing was carried out in accordance with the BRE365 methodology. A single long narrow trial hole (TP101) was excavated. Three repeat tests were to be carried out over a period of four days on site. The trial hole was not gravel-filled and remained stable during the testing.

Ground Conditions

The ground conditions were expected to comprise Topsoil over River Terrace Deposits, which was confirmed in the trial pit. No water strikes were recorded in any of the position. The conditions encountered are summarised below:

Strata	Base depth	Description
Made Ground	0.40m	Dark brown, gravelly, slightly sandy, slightly clayey SILT. Gravels are fine to coarse, subangular to subrounded flint, brick and concrete fragments with occasional brick cobbles.
River Terrace Deposits	1.20m+	Brown, slightly sandy, gravelly CLAY.

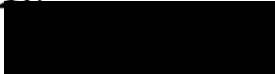
Test Results

The three soakage tests undertaken in recorded infiltration rates ranging from between 1.53×10^{-6} m/s and 3.18×10^{-6} m/s.

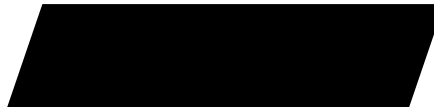
We trust the above fulfils the investigation brief, but please get in touch if you have any questions or further requirements.

Kind regards

For and on Behalf of Land Science

JAKE TRANGMAR B.Sc. (Hons)
Project Environmental Scientist



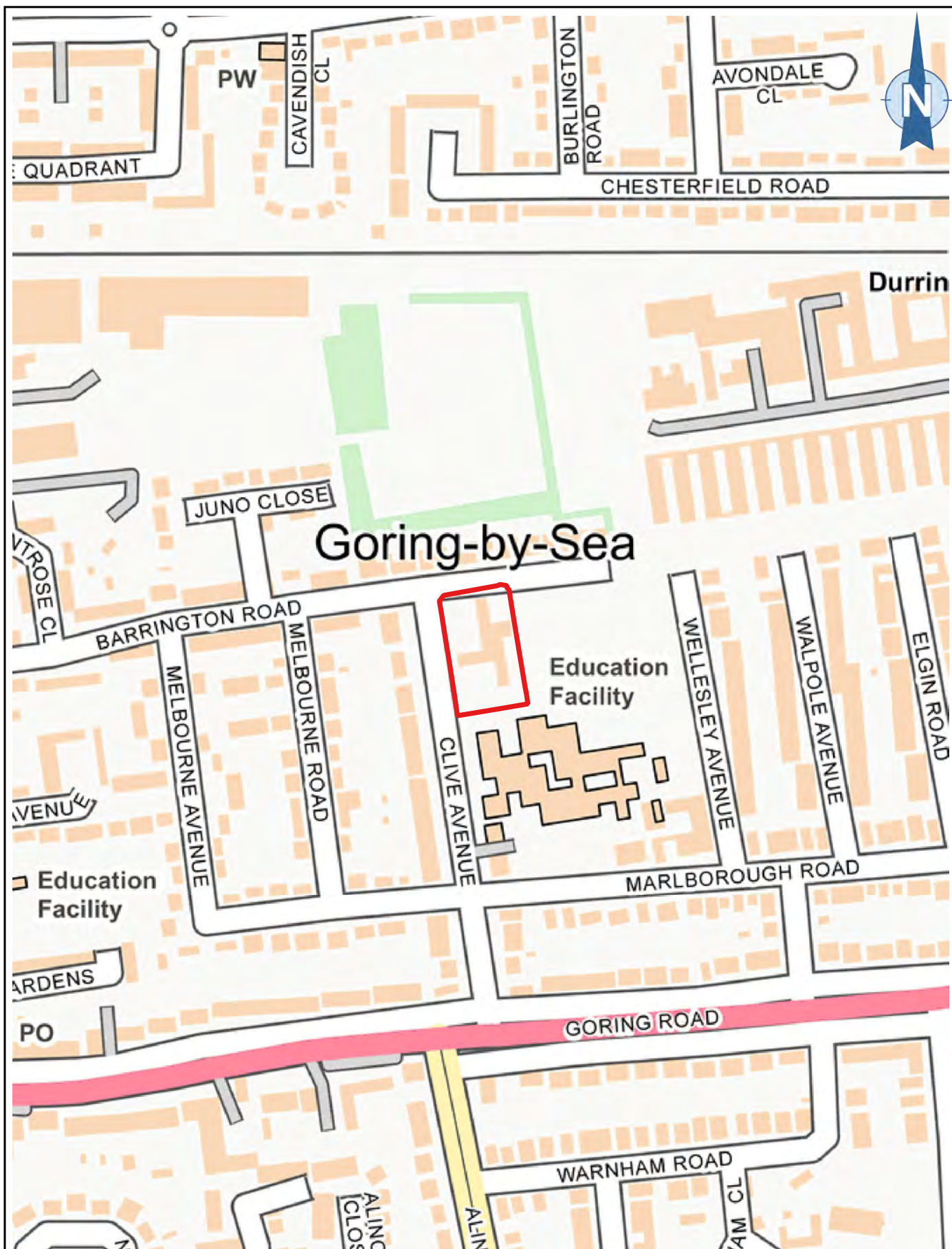
ELLIOT TOMS CEnv M.Sc., B.Sc. (Hons), F.G.S., MEnvSci
Managing Director

Enclosed

Figures

Trial Pit Logs

Infiltration Data



			Title: Site Location	Reference: LS6198
			Project: Westholme Clinic, Worthing, BN12 4SG	Figure: 1
			Client: Westholme Clinic Ltd.	Date: 16/05/2022
			Prepared by: JT	Checked by: ET
			Version: 01	Sheet: 1 of 1



Legend

-  Site Plan
-  TP101 (05/2022)
-  DS Locations (03/2022)
-  Trial Pit (03/2022)

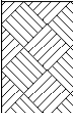
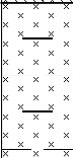
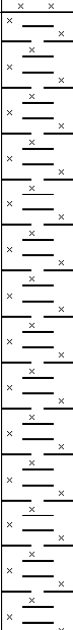


Title: Exploratory Hole Location Plan			Reference: LS6198
Project: Westholme Clinic, Worthing, BN12 4SG			Figure: 2
Client: Westholme Clinic Ltd.			Date: 16/05/2022
Prepared by: JT	Checked by: ET	Version: 01	Sheet: 1 of 1



	Title: Proposed Development Layout			Reference: LS6198
	Project: Westholme Clinic, Worthing, BN12 4SG			Figure: 3
	Client: Westholme Clinic Ltd.			Date: 16/05/2022
	Prepared by: JT	Checked by: ET	Version: 01	Sheet: 1 of 1

Machine : Machine Excavated Method : Trial Pit		Dimensions 1.20 x 0.30 x 5.00	Ground Level (mOD)	Client Fuller Associates	Job Number LS6198
		Location	Dates 01/05/2022	Engineer Land Science	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	Grass over dark brown sandy SILT with abundant rootlets. Sand is fine to medium. (TOPSOIL)		
					0.15	Dark brown clayey SILT. (RIVER TERRACE DEPOSITS)		
					(0.22)			
					0.37	Light brown slightly silty CLAY. (RIVER TERRACE DEPOSITS)		
					(0.83)			
					1.20	Complete at 1.20m		

Plan					Remarks		
.	.	.	.	.	GROUNDWATER: No groundwater encountered. STABILITY: No instability encountered. BACKFILL: With arisings. NOTES: Trial Pit Dimentions : 1.20m (D) x 0.30m(W) x 5.00m(L)		
.	.	.	.	.			
.	.	.	.	.			
.	.	.	.	.			
.	.	.	.	.			
.	.	.	.	.			
					Scale (approx)	Logged By	Figure No.
					1:10	JT	LS6198.TP01

Site : Westholme Clinic, Worthing, BN12 4SG

Client : Fuller Associates

Engineer: Land Science

Job Number
LS6198

Sheet
1 / 1

Location	Date	Level	Location
TP101	01/05/2022		

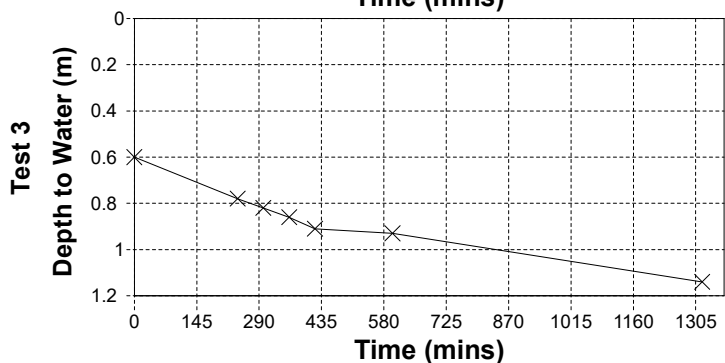
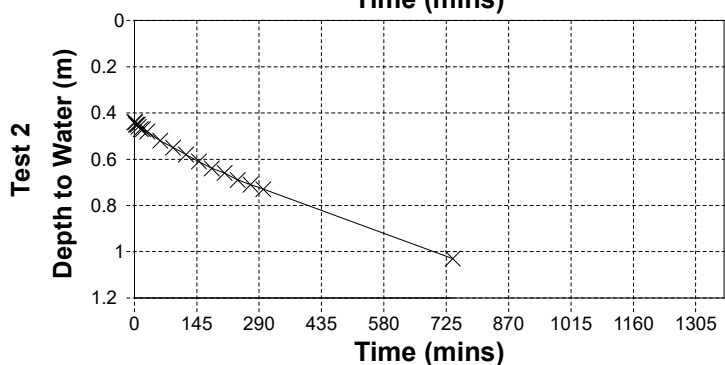
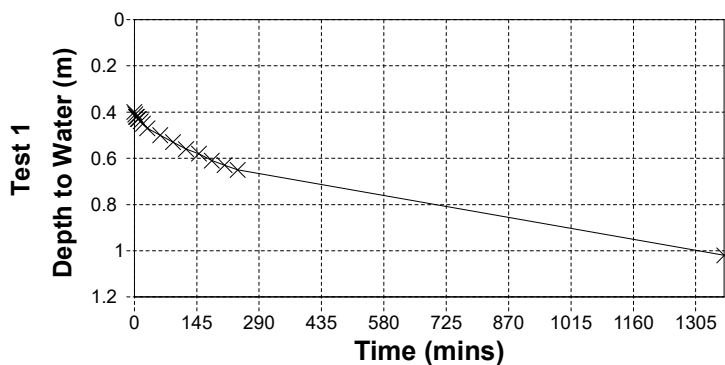
Pit Width (m)	0.30
Pit Depth (m)	1.20
Pit Length (m)	5.00

Soil type at test level
Groundwater
Drain discharge depth
Sidewall stability
Stone filled or open pit

	1	2	3
Effective depth (m)	0.80	0.76	0.60
Volume outflowing between 75% & 25% (m3)	0.60	0.57	0.45
Mean surface area through which outflow occurs (m2)	5.74	5.53	4.68
Time for outflow between 75% & 25% (min)	1139.86	540.67	811.43
SOIL INFILTRATION RATE (ms-1), f	1.53E-6	3.18E-6	1.97E-6

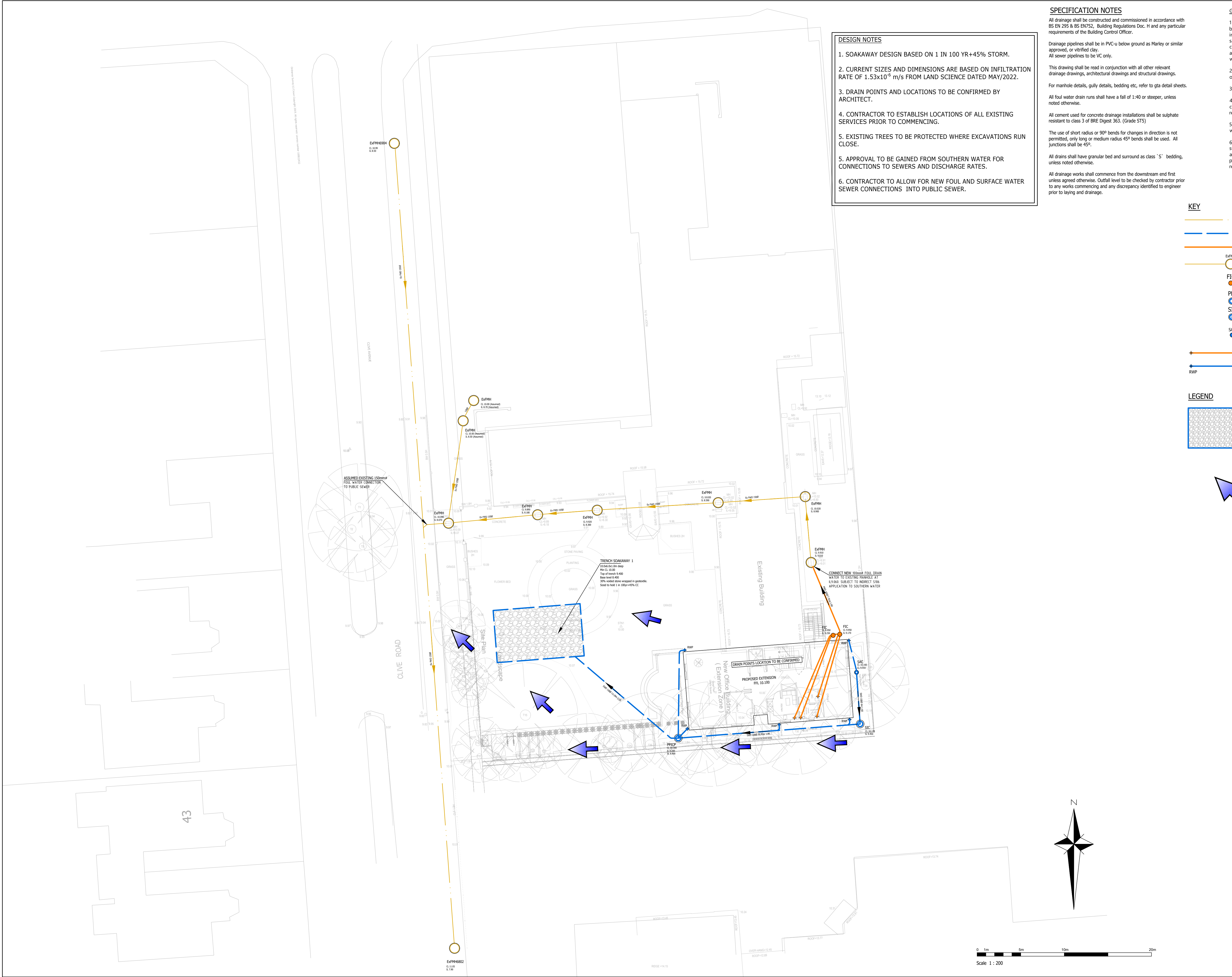
Remarks

Elapsed time (mins)	Depth to Water Test 1	Depth to Water Test 2	Depth to Water Test 3
0	0.40	0.44	0.60
2	0.41	0.44	
4	0.42	0.45	
6	0.42	0.45	
8	0.43	0.45	
10	0.43	0.46	
15	0.44	0.47	
20	0.45	0.47	
30	0.47	0.48	
60	0.50	0.52	
90	0.53	0.55	
120	0.56	0.58	
150	0.58	0.61	
180	0.61	0.64	
210	0.63	0.66	
240	0.65	0.69	0.78
270		0.71	
300		0.73	0.82
360			0.86
420			0.91
600			0.93
740		1.03	
1320			1.14
1371	1.02		



Appendix D

Proposed Drainage Strategy Layout



- DESIGN NOTES**
1. SOAKAWAY DESIGN BASED ON 1 IN 100 YR+45% STORM.
 2. CURRENT SIZES AND DIMENSIONS ARE BASED ON INFILTRATION RATE OF 1.53x10⁻⁶ m/s FROM LAND SCIENCE DATED MAY/2022.
 3. DRAIN POINTS AND LOCATIONS TO BE CONFIRMED BY ARCHITECT.
 4. CONTRACTOR TO ESTABLISH LOCATIONS OF ALL EXISTING SERVICES PRIOR TO COMMENCING.
 5. EXISTING TREES TO BE PROTECTED WHERE EXCAVATIONS RUN CLOSE.
 5. APPROVAL TO BE GAINED FROM SOUTHERN WATER FOR CONNECTIONS TO SEWERS AND DISCHARGE RATES.
 6. CONTRACTOR TO ALLOW FOR NEW FOUL AND SURFACE WATER SEWER CONNECTIONS INTO PUBLIC SEWER.

- SPECIFICATION NOTES**
- All drainage shall be constructed and commissioned in accordance with BS EN 295 & BS EN/52, Building Regulations Doc. H and any particular requirements of the Building Control Officer.
- Drainage pipelines shall be in PVC-u below ground as Marley or similar approved, or vitrified clay.
- All sewer pipelines to be VC only.
- This drawing shall be read in conjunction with all other relevant drainage drawings, architectural drawings and structural drawings.
- For manhole details, gully details, bedding etc, refer to gta detail sheets.
- All foul water drain runs shall have a fall of 1:40 or steeper, unless noted otherwise.
- All cement used for concrete drainage installations shall be sulphate resistant to class 3 of BRE Digest 363. (Grade ST5)
- The use of short radius or 90° bends for changes in direction is not permitted, only long or medium radius 45° bends shall be used. All junctions shall be 45°.
- All drains shall have granular bed and surround as class 'S' bedding, unless noted otherwise.
- All drainage works shall commence from the downstream end first unless agreed otherwise. Outfall level to be checked by contractor prior to any works commencing and any discrepancy identified to engineer prior to laying and drainage.
- GENERAL NOTES**
1. The location, size, depth and identification of existing services that may be shown or referred to on this drawing have been assessed from non intrusive observations, record drawings or the like. The contractor shall safely carry out intrusive investigations, trial holes or soundings prior to commencing work to satisfy himself that it is safe to proceed and that the assessments are accurate. Any discrepancies shall be notified to gta prior to works commencing.
 2. Tender or billing drawings shall not be used for construction or the ordering of materials.
 3. Do not scale. All dimensions and levels to be site confirmed.
 4. This drawing shall be read in conjunction with all relevant architects, consultants drawings and specifications, together with H&S plan requirements.
 5. Copyright : This drawing must not be copied, amended nor reproduced without the prior written agreement of gta.
 6. All drawings specifications and recommendations made by gta are subject to Local Authority and other relevant Statutory Authorities approval. Any works or services made abortive due to the client proceeding prior to these approvals is considered wholly at the Clients risk. gta hold no responsibility for resulting abortive works or costs.

KEY

- Existing foul water drain
- Private surface water drain
- Private foul drain
- ExFHH
- FIC
- PPICP
- SIC
- SAC
- Foul drain point D307.0
- SW Drain point for RWP D203.5

LEGEND

- Trench Soakaway
- Exceedance Flow Arrow

P2	Drainage updated to latest layout		02/03/26	AE FW
P1	INITIAL ISSUE		17/05/22	AE MR
Rev	Amendments		Date	Dsn Chk
Status				
PRELIMINARY				
Client				
WESTHOLME CLINIC LTD				
Architect				
Project				
WESTHOLME CLINIC GORING BY SEA				
Title				
SITE DRAINAGE STRATEGY				
Date		Scale @ A1		
FEBURARY 2026		1 : 200		
Clients Ref.		Project Ref.		
		11926		
 Civils & Transport Maple House, 192-198 London Road, Burgess Hill, West Sussex, RH15 9RD Tel 01444 871444 Web: www.gtacivils.co.uk				
Drawing Number				Rev.
11926/1101				P2

Appendix E

Drainage Calculations

Design Settings

Rainfall Methodology	FEH-22	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	1.000		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
SAC	0.003	5.00	10.163	300	28.473	-3.789	0.613	9.550
SIC	0.011	5.00	10.170	450	28.895	-9.713	0.720	9.450
PPCP	0.003	5.00	10.188	450	8.032	-11.334	0.988	9.200
SOAKAWAY			10.051	450	-3.815	-2.063	1.651	8.400
Dummy			10.029	50	-3.904	-0.783	0.589	9.440

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	SAC	SIC	5.939	0.600	9.550	9.450	0.100	59.4	100	5.10	50.0
1.001	SIC	PPCP	20.925	0.600	9.450	9.200	0.250	83.7	100	5.51	50.0
1.002	PPCP	SOAKAWAY	15.044	0.600	9.200	8.400	0.800	18.8	100	5.65	50.0
1.003	SOAKAWAY	Dummy	1.283	0.600	9.450	9.440	0.010	128.3	100	5.69	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.001	7.9	0.6	0.513	0.620	0.003	0.0	19	0.595
1.001	0.841	6.6	2.6	0.620	0.888	0.014	0.0	43	0.789
1.002	1.789	14.1	3.1	0.888	1.551	0.017	0.0	32	1.430
1.003	0.677	5.3	3.1	0.501	0.489	0.017	0.0	54	0.700

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	2880	Check Discharge Rate(s)	x
Rainfall Events	Singular	Analysis Speed	Normal	Additional Storage (m ³ /ha)	0.0	Check Discharge Volume	x
Summer CV	1.000	Skip Steady State	x	Starting Level (m)			

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

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

Node SOAKAWAY Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00551	Porosity	0.30	Pit Width (m)	6.000	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.00551	Invert Level (m)	8.400	Pit Length (m)	10.000	Number Required	1
Safety Factor	2.0	Time to half empty (mins)	1380	Depth (m)			

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SAC	10	9.581	0.031	1.7	0.0022	0.0000	OK
15 minute summer	SIC	11	9.577	0.127	7.0	0.0201	0.0000	SURCHARGED
15 minute summer	PPCP	10	9.254	0.054	7.9	0.0086	0.0000	OK
960 minute winter	SOAKAWAY	915	8.882	0.482	0.5	8.7573	0.0000	OK
15 minute summer	Dummy	1	9.440	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SAC	1.000	SIC	1.7	0.330	0.213	0.0295	
15 minute summer	SIC	1.001	PPCP	6.5	1.064	0.981	0.1270	
15 minute summer	PPCP	1.002	SOAKAWAY	8.0	1.777	0.568	0.0911	
960 minute winter	SOAKAWAY	1.003	Dummy	0.0	0.000	0.000	0.0000	0.0
960 minute winter	SOAKAWAY	Infiltration		0.1				

Design Settings

Rainfall Methodology	FEH-22	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	1.000		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
SAC	0.003	5.00	10.163	300	28.473	-3.789	0.613	9.550
SIC	0.011	5.00	10.170	450	28.895	-9.713	0.720	9.450
PPCP	0.003	5.00	10.188	450	8.032	-11.334	0.988	9.200
SOAKAWAY			10.051	450	-3.815	-2.063	1.651	8.400
Dummy			10.029	50	-3.904	-0.783	0.589	9.440

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	SAC	SIC	5.939	0.600	9.550	9.450	0.100	59.4	100	5.10	50.0
1.001	SIC	PPCP	20.925	0.600	9.450	9.200	0.250	83.7	100	5.51	50.0
1.002	PPCP	SOAKAWAY	15.044	0.600	9.200	8.400	0.800	18.8	100	5.65	50.0
1.003	SOAKAWAY	Dummy	1.283	0.600	9.450	9.440	0.010	128.3	100	5.69	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.001	7.9	0.6	0.513	0.620	0.003	0.0	19	0.595
1.001	0.841	6.6	2.6	0.620	0.888	0.014	0.0	43	0.789
1.002	1.789	14.1	3.1	0.888	1.551	0.017	0.0	32	1.430
1.003	0.677	5.3	3.1	0.501	0.489	0.017	0.0	54	0.700

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	2880	Check Discharge Rate(s)	x
Rainfall Events	Singular	Analysis Speed	Normal	Additional Storage (m ³ /ha)	0.0	Check Discharge Volume	x
Summer CV	1.000	Skip Steady State	x	Starting Level (m)			

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

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

Node SOAKAWAY Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00551	Porosity	0.30	Pit Width (m)	6.000	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.00551	Invert Level (m)	8.400	Pit Length (m)	10.000	Number Required	1
Safety Factor	2.0	Time to half empty (mins)	2320	Depth (m)			

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SAC	11	9.569	0.019	0.6	0.0013	0.0000	OK
15 minute summer	SIC	10	9.496	0.046	2.6	0.0073	0.0000	OK
15 minute summer	PPCP	9	9.234	0.034	3.1	0.0053	0.0000	OK
480 minute winter	SOAKAWAY	400	8.604	0.204	0.5	3.7066	0.0000	OK
15 minute summer	Dummy	1	9.440	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SAC	1.000	SIC	0.6	0.276	0.076	0.0134	
15 minute summer	SIC	1.001	PPCP	2.6	0.903	0.387	0.0606	
15 minute summer	PPCP	1.002	SOAKAWAY	3.1	1.697	0.221	0.0469	
480 minute winter	SOAKAWAY	1.003	Dummy	0.0	0.000	0.000	0.0000	0.0
480 minute winter	SOAKAWAY	Infiltration		0.1				

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SAC	10	9.581	0.031	1.7	0.0022	0.0000	OK
15 minute summer	SIC	11	9.577	0.127	7.0	0.0201	0.0000	SURCHARGED
15 minute summer	PPCP	10	9.254	0.054	7.9	0.0086	0.0000	OK
960 minute winter	SOAKAWAY	915	8.882	0.482	0.5	8.7573	0.0000	OK
15 minute summer	Dummy	1	9.440	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SAC	1.000	SIC	1.7	0.330	0.213	0.0295	
15 minute summer	SIC	1.001	PPCP	6.5	1.064	0.981	0.1270	
15 minute summer	PPCP	1.002	SOAKAWAY	8.0	1.777	0.568	0.0911	
960 minute winter	SOAKAWAY	1.003	Dummy	0.0	0.000	0.000	0.0000	0.0
960 minute winter	SOAKAWAY	Infiltration		0.1				

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.52%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SAC	12	9.971	0.421	3.1	0.0299	0.0000	FLOOD RISK
15 minute summer	SIC	12	9.958	0.508	10.8	0.0807	0.0000	FLOOD RISK
480 minute winter	PPCP	472	9.318	0.118	1.6	0.0187	0.0000	SURCHARGED
480 minute winter	SOAKAWAY	472	9.318	0.918	1.6	16.6667	0.0000	OK
15 minute summer	Dummy	1	9.440	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SAC	1.000	SIC	3.2	0.415	0.413	0.0465	
15 minute summer	SIC	1.001	PPCP	10.0	1.316	1.507	0.1480	
480 minute winter	PPCP	1.002	SOAKAWAY	1.6	0.903	0.114	0.1177	
480 minute winter	SOAKAWAY	1.003	Dummy	0.0	0.000	0.000	0.0000	0.0
480 minute winter	SOAKAWAY	Infiltration		0.1				

Appendix F

SuDS Management and Maintenance Plan

1. Introduction

Responsibility for the maintenance of the drainage system will be apportioned as follows:

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

- porous paving.
- control manholes / flow restrictors
- the associated manholes and piped systems.

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

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

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

Important safety information is set out in the next section.

2. Health and Safety

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

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

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

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

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

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

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

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

3. Management of Spillage

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

Prompt action following a spillage can prevent or reduce its effects, whilst inappropriate action may cause or worsen the pollution effects.

In the event of a spillage on a road/paved area, it is the responsibility of the Property Maintenance company's staff to clear up any spillage before it enters the drainage system. The primary method of dealing with any spillage of hydrocarbons should be to use sand to soak up the leak and prevent any hydrocarbons entering the drainage system. Once sand has been contaminated it should not be washed into the drainage system but disposed of by a Licensed Contractor.

4. Schedule A – Sewers, Manholes, Gullies, Channel Drains

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

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

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

Ongoing maintenance responsibility for all public sewers is by Southern Water. All other gullies and drainage are private and are to be maintained by the Estate Management Company within conveyed land.

Operation and maintenance requirements for all sewers, manholes, gullies and channel drains are described in the following table:

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

Where appropriate refer to specialist drainage manufacturer's information/maintenance

requirements.

In all instances, inspection and cleaning should be carried out only by a specialist contractor and in accordance with the guidelines given in 'Safe Working in Sewers and at Sewage Works' published by National Joint Health and Safety Committee for the Water Services. Further information on safety is set out in Section 2.

5. Schedule B – Infiltration Trench

Inspection Frequency and Maintenance Requirements: as per table below.

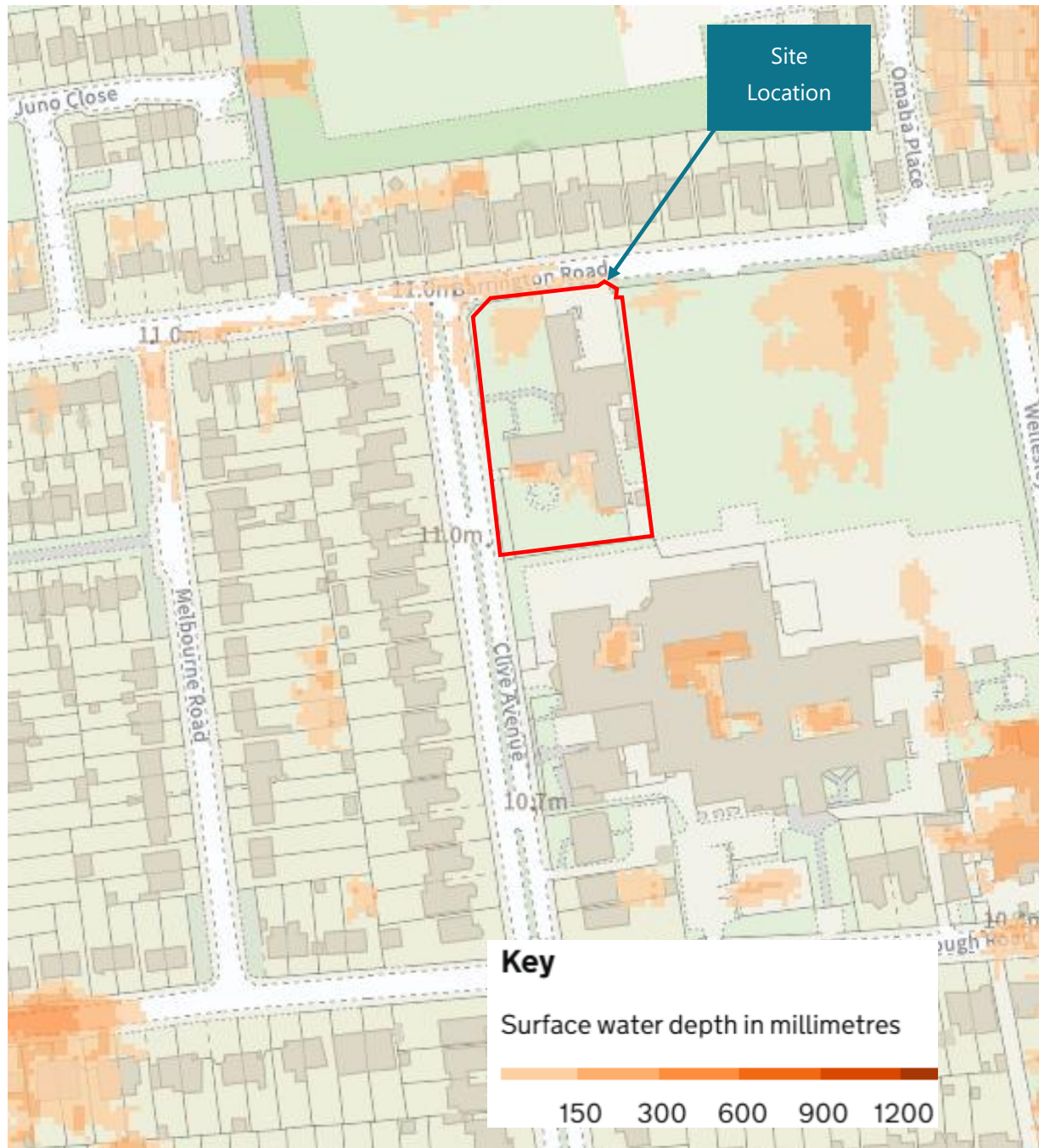
Schedule	Action	Frequency
Regular Maintenance	Litter and debris removal from trench surface, access chambers and pre-treatment devices	Monthly (or as required)
	Removal and washing of exposed stones on the trench surface	Annual (bi-annual the first year) or when silt build up is evident
	Trimming of any roots that may be causing blockages	Annual (semi-annual the first year).
	Remove weeds on the trench surface	Monthly (1 st 6 months, then as required)
Occasional Maintenance	Removal of sediment from silt trap	Six monthly
	Remove tree roots or trees that grow close to the trench	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace filter media	Five yearly
Remedial Actions	Rehabilitate infiltration or filtration surfaces	As required
	Replace geotextiles and clean and replace filter media, if clogging occurs.	As required
	Excavate trench walls to expose clean soils if infiltration performance reduces to unacceptable levels	As required
	Inspect inlets, outlets and inspection points for blockages, clogging, standing water and structural damage	Monthly

Monitoring	Inspect pre-treatment systems, inlets, trench surfaces and perforated pipework for silt accumulation. Establish appropriate silt removal frequencies	Half-yearly
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Safety information is set out in Section 2.

Appendix G

Environment Agency Surface Water Flood Map



Environment Agency Surface Water Flood Map (All Depths 100yrs 2061-2125)

There are small, localised flood patterns that originate in this site – but no overland flow routes



Civil Engineering - Transport Planning - Flood Risk

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