



Flood Risk Assessment

'The Paddock' & 'Battery Storage Plot'
Chalcroft Business Park, Burnetts Lane, West End
Southampton SO30 2PA

Client

FIP West End Limited

La Rue des Pres

St Saviour

Jersey

JE1 3UP

Ref: 12746

Date: October 2023

Consulting Engineers

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Issue	Issue date	Compiled	Checked
Preliminary Issue	31 October 2023	JP	MR
2 nd Preliminary Issue	08 November 2023	JP	MR
First Issue	10 November 2023	JP	MR
Revised to latest scheme	5 March 2023	CM	MR

1 Introduction

- 1.1 This report has been prepared for FIP West End Limited in relation to two separate land parcels and corresponding planning applications, namely 'The Paddock' & 'Battery Storage plot' within Chalcroft Business Park, Burnetts Lane, West End, Southampton SO30 2PA.
- 1.2 No responsibility is accepted to any third party for all or part of this study in connection with this or any other development.
- 1.3 GTA Civils & Transport Ltd. was appointed by the client to provide a Flood Risk Assessment (FRA), as required by the Environment Agency and Eastleigh Borough Council, in order to achieve Planning Approval at said property.
- 1.4 This report will take the form of a formal Flood Risk Assessment in accordance with the 2023 National Planning Policy Framework (NPPF) and the 2022 Planning Practice Guidance (PPG).
- 1.5 Reference has been made to the local Preliminary Flood Risk Assessment and Local Flood Risk Management Strategy, together with the Strategic Flood Risk Assessment published by the Partnership for Urban South Hampshire (PUSH).
- 1.6 Limitations of this report: this report examines flood risk only. It does not consider potential contamination, biodiversity or other environmental/ecological issues.

2 Existing Site & Current Flood Conditions

- 2.1 The 2 application sites, within the area administered by Eastleigh Borough Council (EBC), comprise two land parcels within the Chalcroft Business Park, located northeast of Southampton, between the villages of West End and Horton Heath. 'The Paddock,' a vacant agricultural field (measuring approximately 1.8ha) is situated near the Business park's entrance to the east. The proposed 'Battery Storage plot' (approximately 0.4ha), located to the west of the Business Park, is predominantly hardstanding ground for industrial storage with grass at its peripheries.
- 2.2 The Business Park is bounded by fields with a railway line passing along the southwest boundary; see the site location plan and aerial view in Appendix A.
- 2.3 Hydrology: The River Itchen flows north-south, passing the Business Park approximately 1.8km to the west before depositing into the English Channel at Southampton. A ditch watercourse flows south-north along the Business Park's western boundary before turning west to converge with the River Itchen. Drainage watercourses are located approximately 10m to the west and 30m metres north of the 'Battery Storage Plot.'
- 2.4 Topography: A topographic survey (see Appendix C) shows ambient levels at the 'Battery Storage Plot' peak at the centre of this area (20.04m AOD) and taper off towards its peripheries, the lowest level measuring 18.37m AOD on the western boundary. 'The Paddock' slopes from east to west, with ambient levels ranging between 26.99m AOD on the east boundary and 22.30m AOD on the northwest boundary.
- 2.5 Geology: the BGS online map shows the solid geology is dominated by the Wittering Formation (sand, silt and clay), with no superficial drift deposits recorded.
- 2.6 Soakage testing was carried out by Ashdown Site Investigations on the 20th December 2023 in two locations, TP01 and TP01A. See results in Appendix F. Both pits failed to drain and negligible or no drop in water level was recorded over 90 minutes. Therefore, the site is not considered to be suitable for infiltration.
- 2.7 A drainage survey has been undertaken of the complete Business Park. The drainage strategy for this proposal utilises these networks. Southern Water has confirmed that there are no public assets in this vicinity.

- 2.8 A land contamination assessment has been carried out, which states that further assessment of soil quality and leachability will be needed where soakaways (or other infiltration features) are being proposed. This is due to its former use as a Royal Naval victualling yard.
- 2.9 The Paddock's greenfield runoff rate has been calculated – limited to the contributing area of 0.97ha, to determine the discharge rate into the watercourse. This calculation sheet is shown in Appendix E. The Qbar rate is 5l/s. The offsite flow rate will be limited to this, to comply with the PPG.

3 Flood Risk Assessment and Groundwater

- 3.1 Fluvial flooding: the Environment Agency Flood Map in Appendix B shows both parcels lie within Flood Zone 1 (FZ1 – Low Risk). Sites within Flood Zone 1 are susceptible to less than a 1 in 1000 chance (<0.1%) of river or coastal flooding each year.
- 3.2 Tidal flooding: does not pose a risk due to a combination of the site's distance from the coast and tidally influenced rivers.
- 3.3 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 Surface Water Flood Depth Map in a 'Low Risk Scenario' (see Appendix B) shows the 'Battery Storage Plot' to the NW is clear from this risk. Although there is some shallow flooding in the extreme event in the Paddock, this originates within this area – so the precipitation will be intercepted by (flow into) the SuDS network. It can be discounted as a risk, therefore. There is no risk of flooding from off site on to either parcel.
- 3.4 Sewer flooding: occurs due to limited capacity or blockage in the sewer system causing backing up of storm water and effluent. The PUSH Strategic Flood Risk Assessment (SFRA) map shows this site is removed from the nearest Southern Water 'observed flooding' incident – refer to the map in Appendix B.
- 3.5 Groundwater flooding: occurs when water levels in the ground rise above the surface. The SFRA does not show any registered historical groundwater flooding incidents at the site. The interactive map shows the wider area (soil type) possesses 'moderate bedrock permeability'. The nearest Groundwater Source Protection Zone is well removed from this area – see the map in Appendix B.
- 3.6 The EA's mapping for Groundwater Vulnerability (GWV) Zones and Groundwater Source Protection (GWSP) Zones show both land parcels overlie a 'Medium' GWV Zone. This corresponds to the PUSH SFRA map – as set out in section 3.5 above,
- 3.7 Artificial sources: flooding from reservoirs, canals and docks. The EA's reservoir flooding map shows neither land parcel is liable to flood if a reservoir were to fail – see Appendix B. There are no reservoirs in the vicinity of the site.
- 3.8 The EA's historical flood map in Appendix B shows that neither parcel has been affected by flooding.
- 3.9 Conclusion: the 2 parcel's flood risk profile is **Low**: both are removed from all sources of flooding.

4 Proposed Development, Mitigation & The Sequential Test

- 4.1 The Paddock development is an *"outline application development of up to 3,410m² of commercial floorspace (Use Classes E(g)(ii), E(g)(iii) and B8) to include farm shop (Use Class E(a)) of up to 325m², parking and yard areas (including accessible spaces), landscape buffers and acoustic mitigation)".* The Battery Storage Area comprises *"establishment of Battery Energy Storage System compound and associated infrastructure on existing hardstanding to support energy management at Chalcroft Business Park."* The proposed site plans are shown in Appendix D.
- 4.2 As summarised in section 3.9 above, the flood risk profile is Low. No mitigation measures are needed or proposed.
- 4.3 Vulnerability and the Sequential Test: the Sequential and Exception Tests are policy mechanisms created to discourage 'vulnerable use' developments in FZ2 and FZ3. This process 'steers' higher vulnerability uses to sites in lower flood-risk zones (eg FZ1.) The vulnerability classification of any new development should be considered. All vulnerabilities are 'appropriate development' in FZ1 – **Low Risk**.

5 Surface & Foul Water Drainage – The Paddock

- 5.1 The SuDS Hierarchy (infiltration, watercourses, public sewers, private sewers) was applied. Infiltration has been ruled out following soakage testing - refer to section 2.6 above.
- 5.2 All surface water from roofs and hardstandings - will be routed to the watercourse at the restricted rate of 5l/s (in the critical 1% + 45% CC event), this being the Qbar rate – refer to section 2.9 above and Appendix E. As this is an outline planning application, there is flexibility on the layout - and SuDS solution following BRE 365 testing.
- 5.3 The SuDS management train has been set up with the water flowing via the porous pavings to 2 attenuation ponds in the NW corner. The SuDS network has been designed, which shows the nodes with storage (PN refs 3.00, 1.007, 4.000, 5.000 and 4.005 – refer to the drainage calculations in Appendix E). The volume in the critical 100 years + 45% climate change event will be contained within the paved areas and ponds – there is no flooding.
- 5.4 All hardstandings will be of porous pavings. The sub-base will comprise clean granular fill (stone), with 30% voids ratio. This volume will act as an infiltration blanket. Cleansing/Water Quality: the filtration characteristics of granular fill are excellent. The combination of this with the UV action on the 2 balancing ponds provides sufficient mitigation to offset the pollution indices for an industrial development.
- 5.5 Exceedance: the exceedance flows are shown on the drainage strategy layout in Appendix D. The flow is generally northwest to the watercourse.
- 5.6 Maintenance of the SuDS system will be the overall responsibility of the Applicant. The ongoing maintenance regime will be contracted out to a Property Maintenance company. Regular inspections of the ponds and porous pavings shall be made in line with industry standards.
- 5.7 Proposed foul system: It is proposed to route the foul effluent to the Business Park's sewerage network to the NW of the Paddock. This now incorporates reed bed filtration following the successful implementation of a scheme to replace the original Ministry of Defence site treatment works.

6 Surface & Foul Water Drainage – Battery Storage Area

- 6.1 The battery storage area comprises a row of battery containers, DNO/customer substations, Transformer/Inverter and storage area. These units will be placed on concrete bases that will sit on the hardstanding area. These are all – effectively – outbuildings that have no positive drainage.
- 6.2 All precipitation will therefore run off to the sides of the hardstanding – just as it does currently. No change is deemed to be required, therefore – as there will be no adverse impact on downstream properties.
- 6.3 This development will not increase the flood risk of this site or neighbouring properties – and so complies fully with the 2021 National Planning Practice Guidance and 2022 National Planning Policy Framework.

- End of Report -

Appendix A

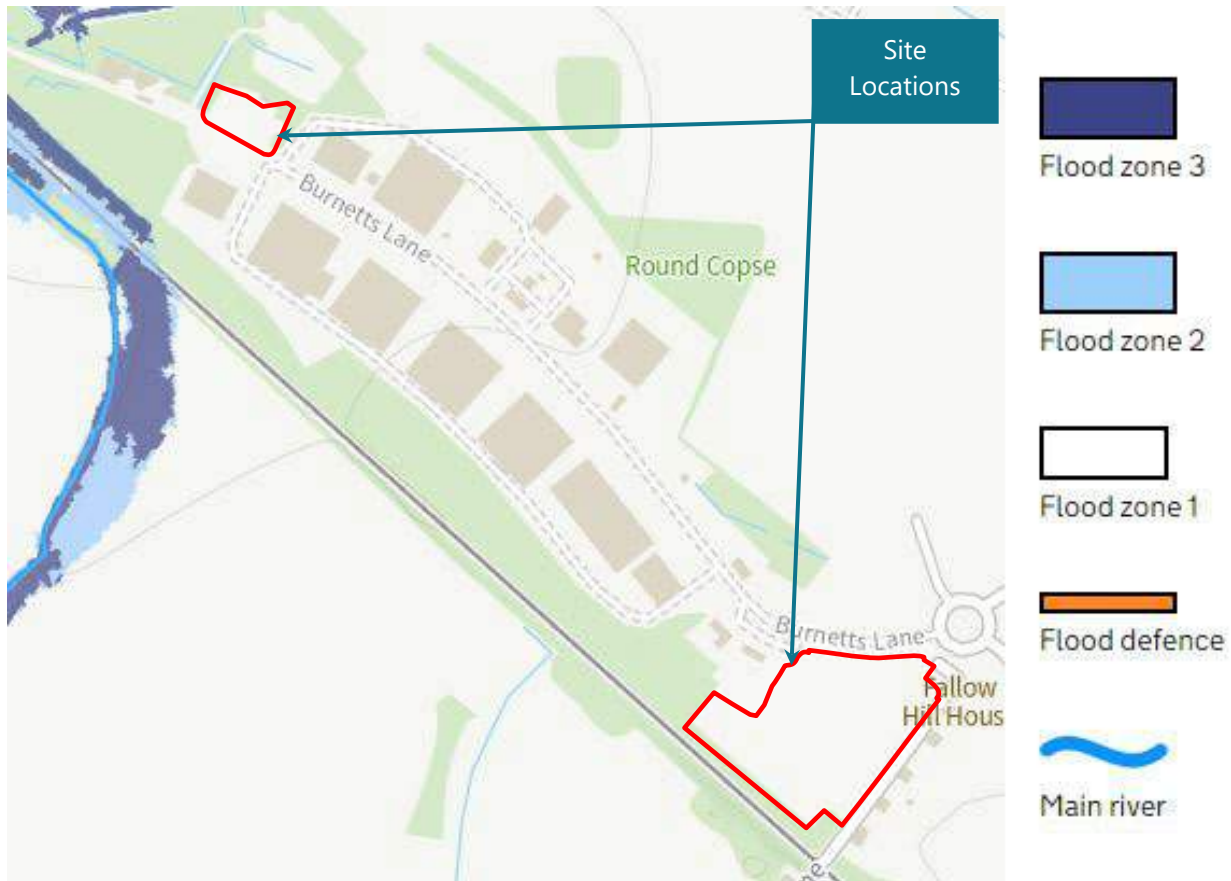
Site Location Map & Aerial View





Appendix B

Environment Agency & SFRA Flood Maps

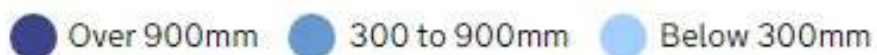


EA's Online Flood Map for Planning (Rivers and Seas)

Both land parcels are located in fluvial Flood Zone 1

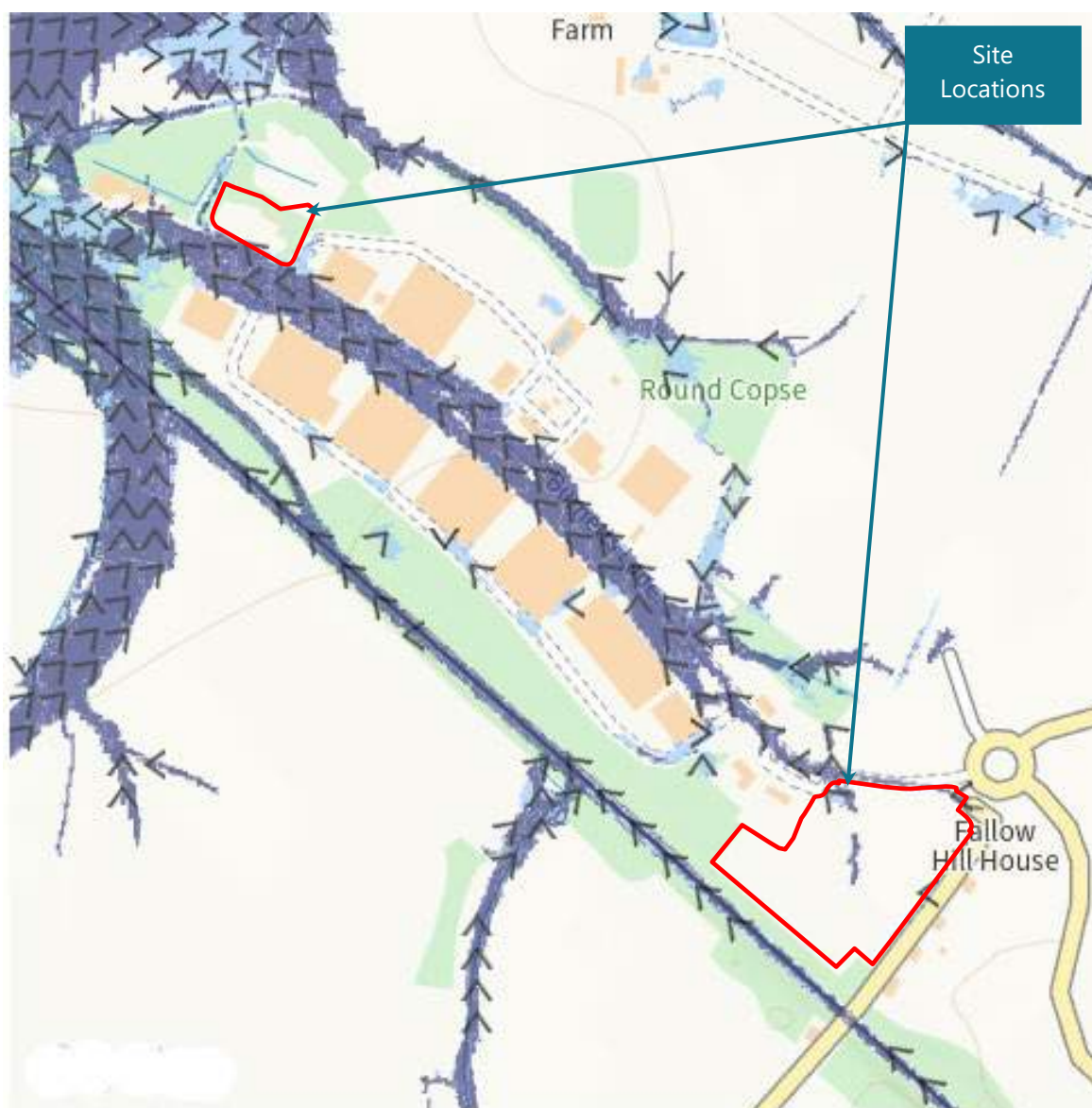


Surface water flood risk: water depth in a low risk scenario
 Flood depth (millimetres)



EA's Online Surface Water Flood Depth Map in a 'Low Risk Scenario'
(1 in 1000 years storm event)

While the majority of 'The Paddock' parcel is clear from this risk, the north of the plot and an isolated area in the centre are liable to flood below 300mm. The land parcel to the NW is clear from this risk



Surface water flood risk: water velocity in a low risk scenario
Flood velocity (metres/second)

● Over 0.25 m/s ● Less than 0.25 m/s ↗ Direction of water flow

EA's Online Surface Water Flood Velocity Map in a 'Low Risk Scenario'
(1 in 1000 years storm event)

This small pattern originates within the site – and so will be intercepted/routed into the SuDS network

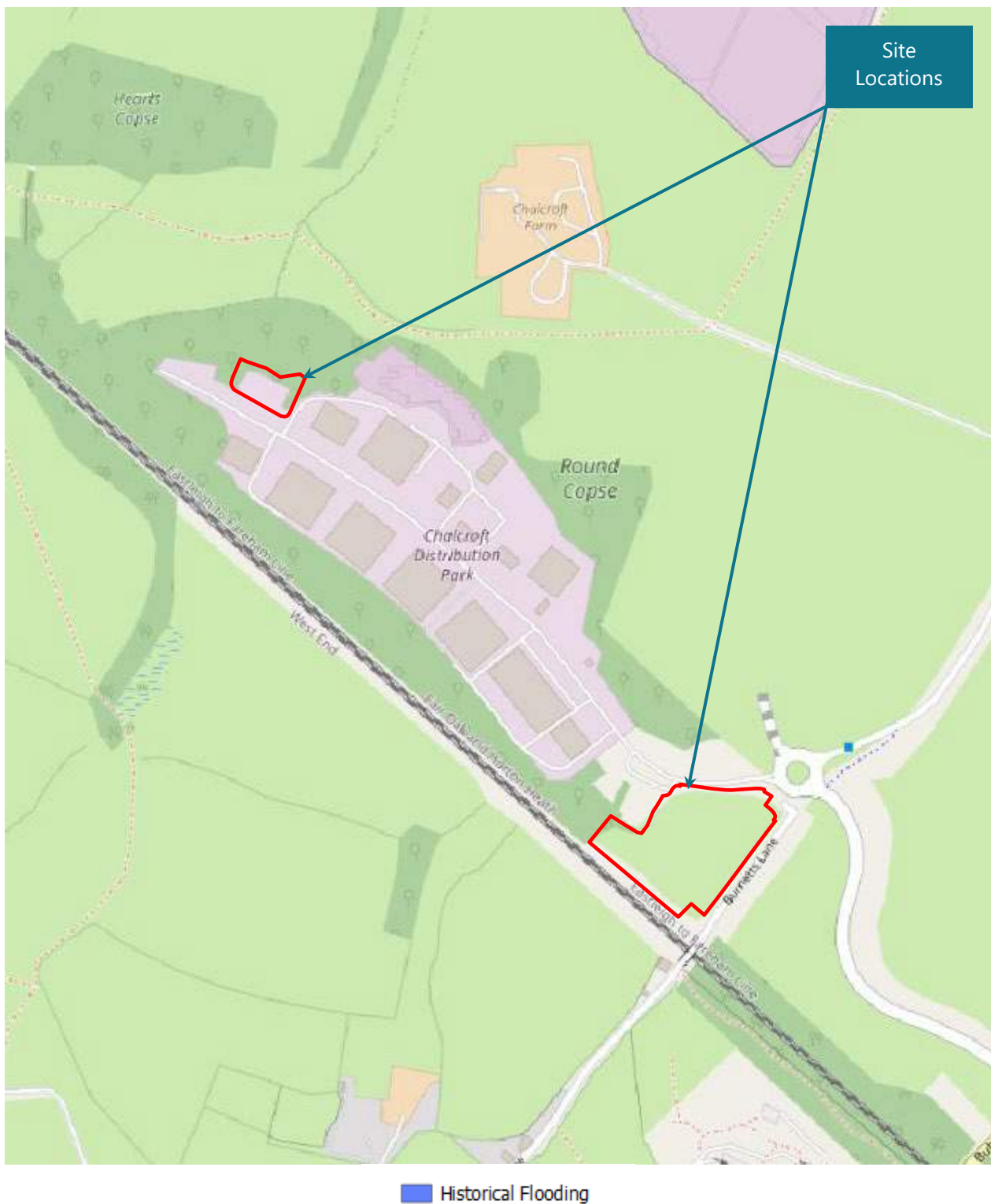


Maximum extent of flooding from reservoirs:

● when river levels are normal ● when there is also flooding from rivers

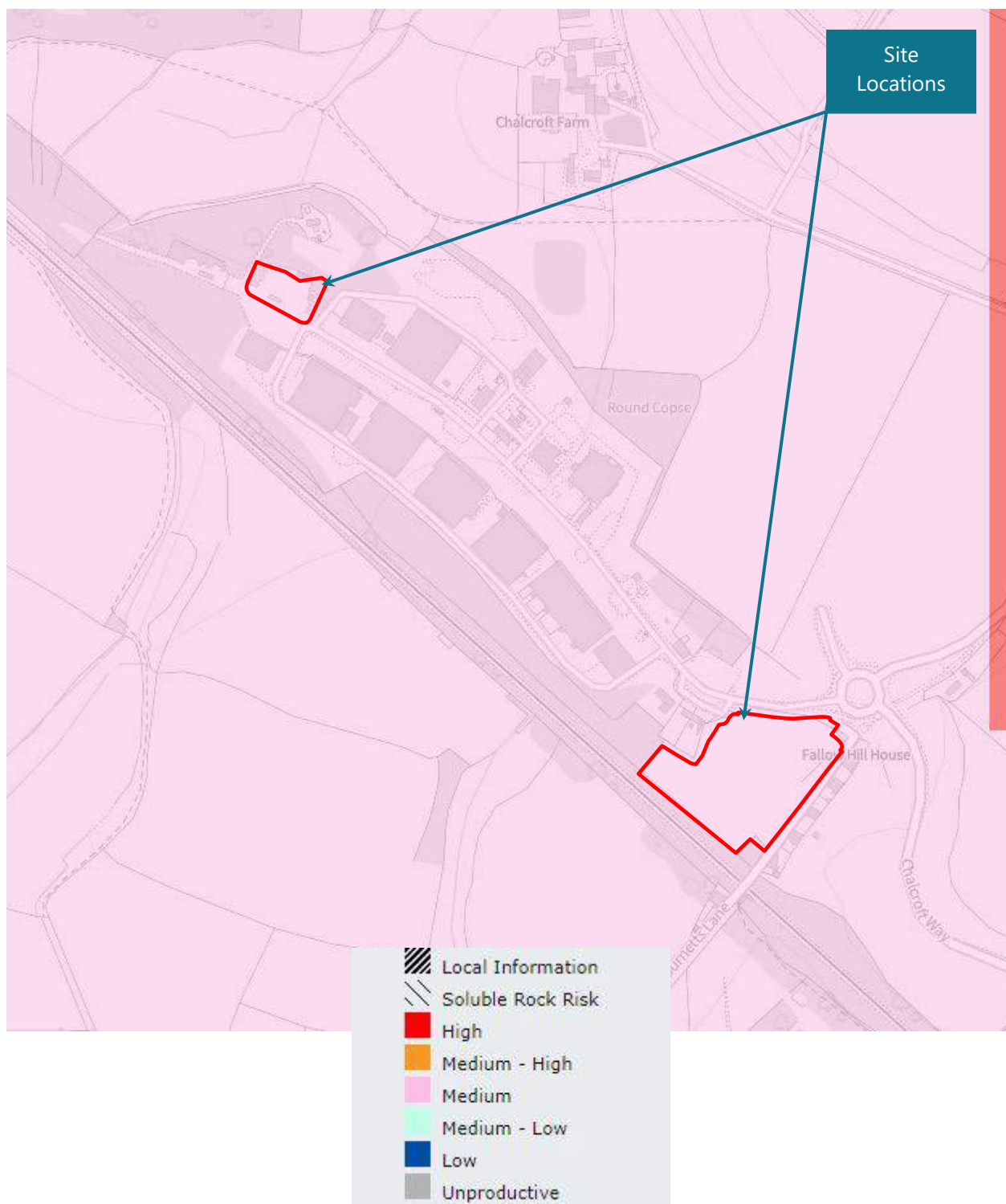
EA's Online Risk of Flooding from Reservoirs' Map

Neither land parcel is liable to flood from this source



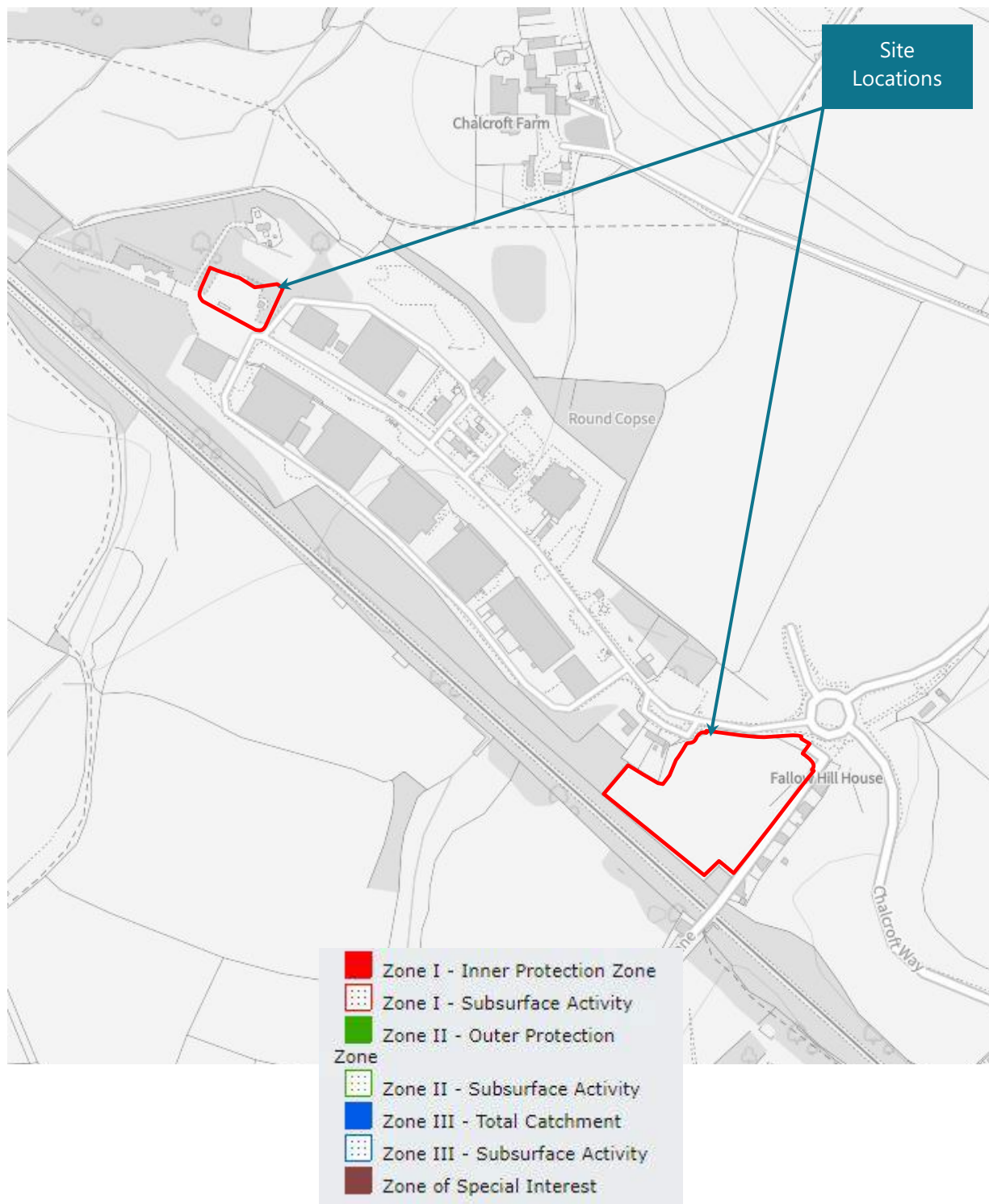
Environment Agency's Online Historic Flood Map

Neither land parcel has been affected by flooding



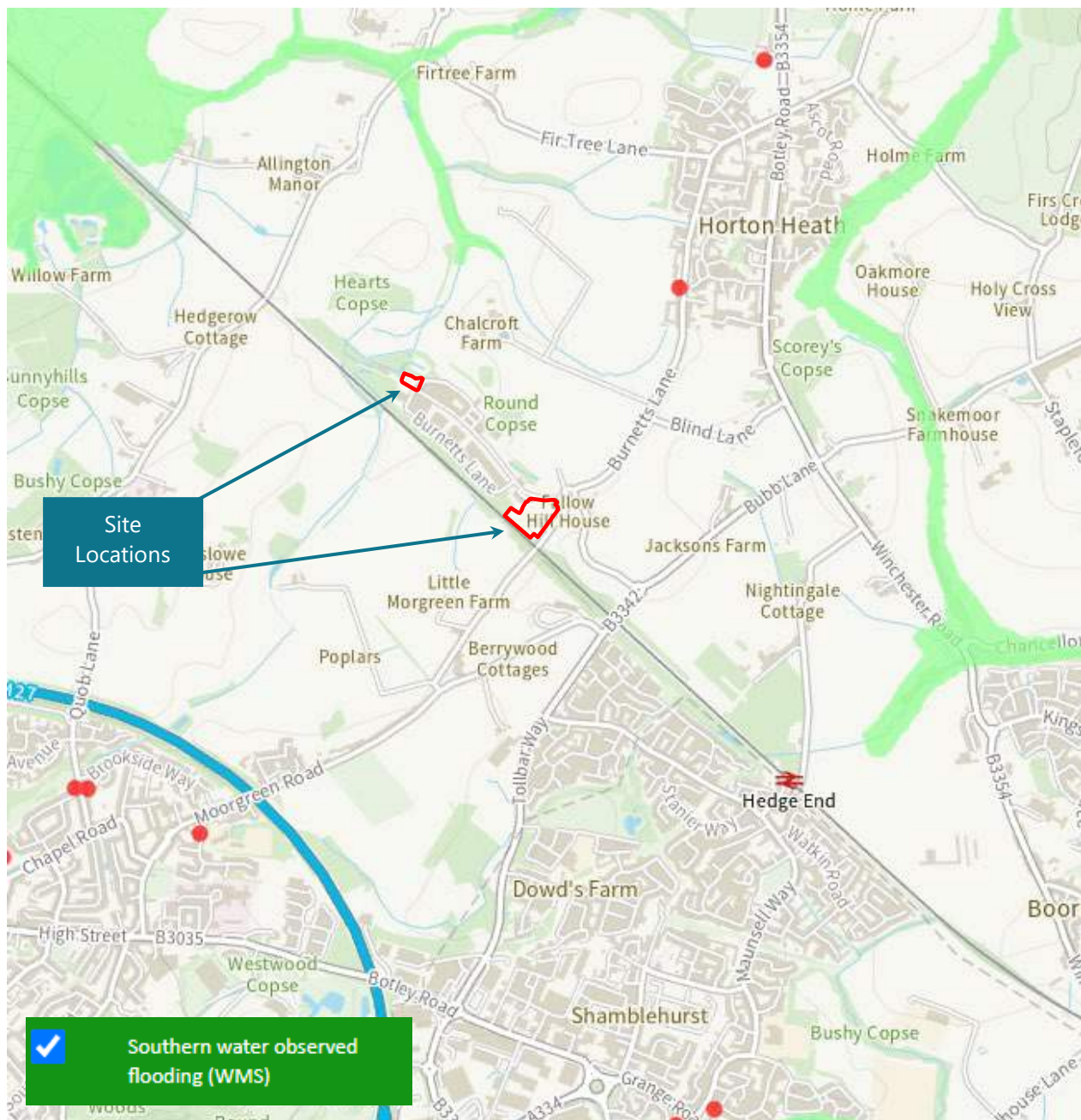
Environment Agency's Groundwater Vulnerability Zone Map

Both land parcels overlie a 'Medium' Groundwater Vulnerability Zone



Environment Agency's Online Groundwater Source Protection Zones Map

Both land parcels lie outside of all recorded Groundwater Protection Zones

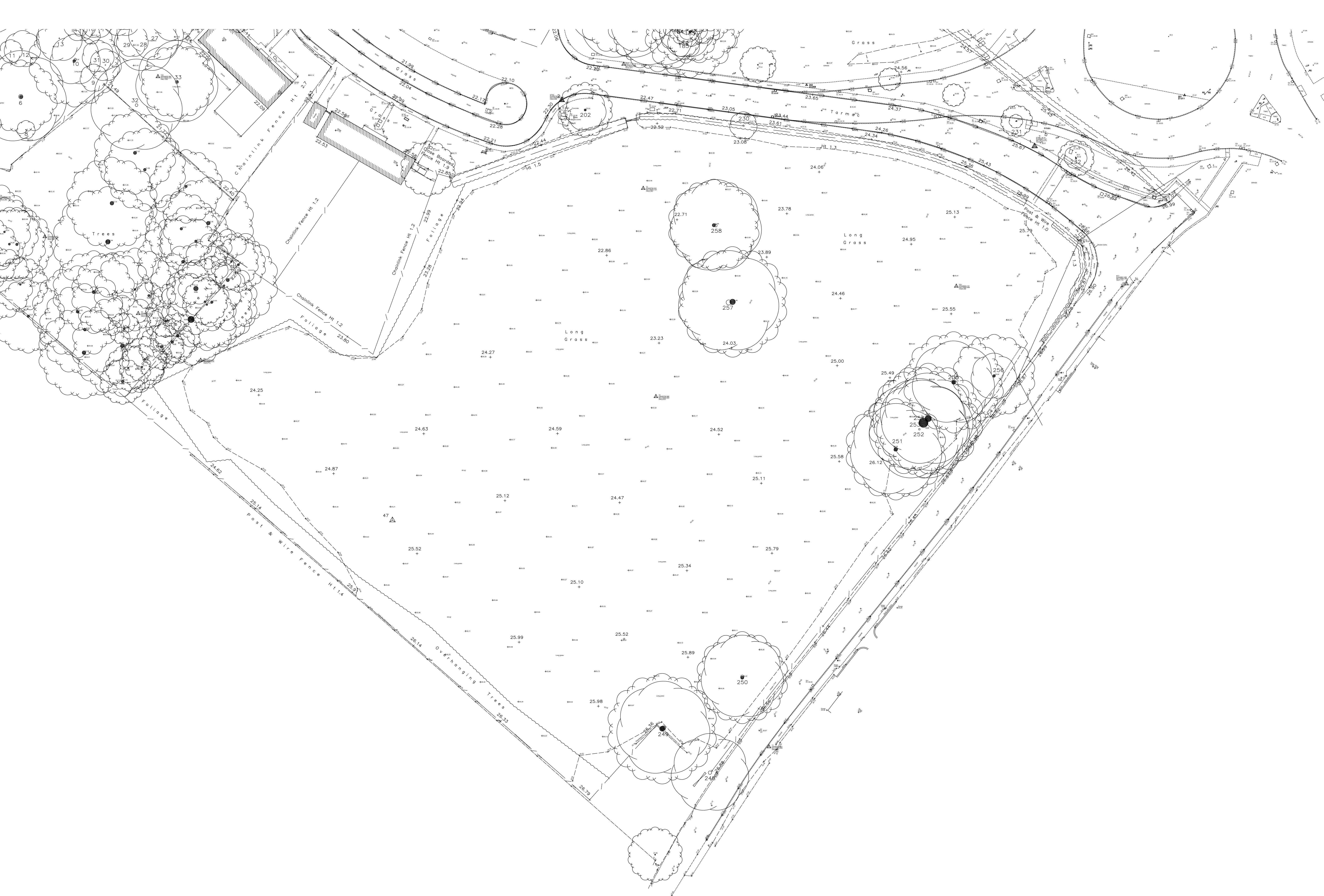


Extract from the PUSH Strategic Flood Risk Assessment map

Both parcels are removed from the nearest observed incident – over 1km away to the northeast

Appendix C

Topographic Survey





Appendix D

Proposed Scheme Drawings including Drainage Strategy Layout



Notes

This drawing is © Boyle & Summers and may not be reproduced, copied or altered in any way without written authority.

Other than for the purposes of planning, do not scale these drawings. Use written dimensions only. All dimensions to be checked on site prior to commencement of work.

Ordnance Survey Data

The Ordnance Survey data used in this drawing is © Crown Copyright. All rights reserved. Licence no. 100022432.

Site and plot boundaries are shown indicatively only and subject to confirmation.

Area Schedule

New business starter and move-on units:
Gross plot area: 1.8ha / 4.45ac
Gross External Area (building footprints): 3,410sqm. / 36,705sqft.
Site coverage / plot ratio: approximately 19%
Gross Internal Area (building footprints): 3,125sqm. / 33,637sqft.
Allowance for mezzanine offices circa 5% of GIA: 140sqm. / 1,507sqft. (excluding farm shop)
Building height (to haunch): 6-8m (excluding farm shop)
Use Class: E(a),(g)(ii), (iii) and B8
Car parking: 86no. spaces (including 9no. accessible)

Detailed area breakdown by building: Gross Internal Areas
Farm Shop 325sqm. / 3,498sqft.
A 170sqm. / 1,830sqft.
B 292sqm. / 3,143sqft.
C 166sqm. / 1,787sqft.
D 1,171sqm. / 12,504sqft.
E 280sqm. / 3,014sqft.
F 406sqm. / 4,370sqft.
G 315sqm. / 3,391sqft.

Legend

- Approximate site area - 1.8ha
- Client ownership boundary
- Indicative acoustic fence
- Proposed open green space - trees & landscaping
- Proposed SINC landscape buffer (20m depth)
- Proposed building
- Carriageway
- Proposed footway
- Proposed parking
- Proposed yard

Rev A 21-02-24 Redesign of layout to retain two existing oak trees. Area schedule updated accordingly ER TB

Proposed Site Coloured

CBP - BSL - ZZ - XX - DR - A - 1501 - PL - A October 2023
22093: Paddock Development 1:500 @ A1
Chalcroft Business Park Drawn ER
Client: FIPWEL Checked TB

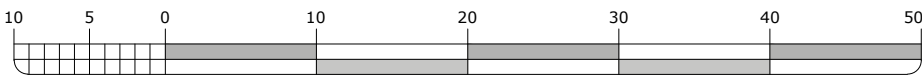
Suite E, Ferry House
Canute Road
Southampton
Hampshire
SO14 3FJ

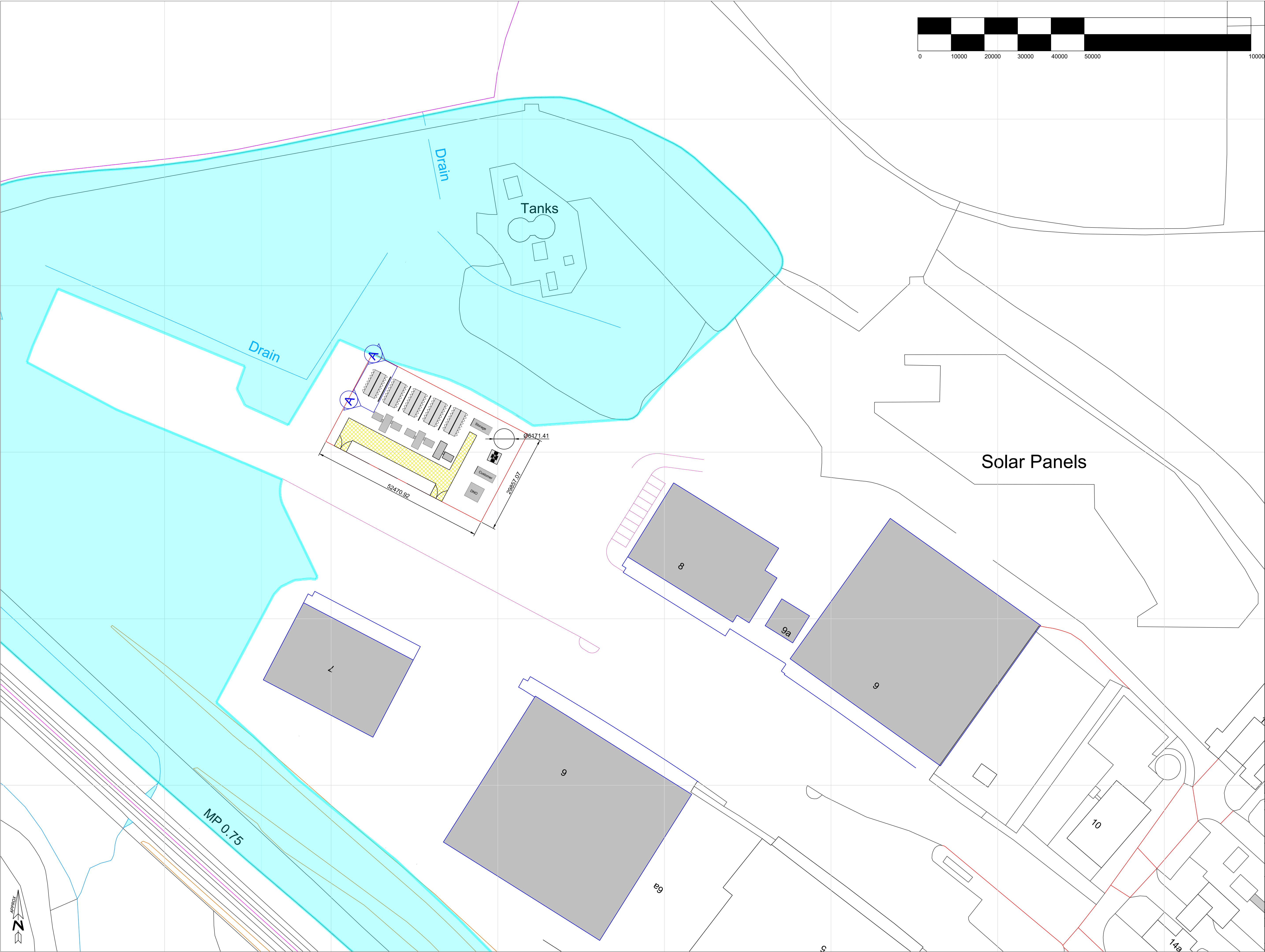
023 8063 1432
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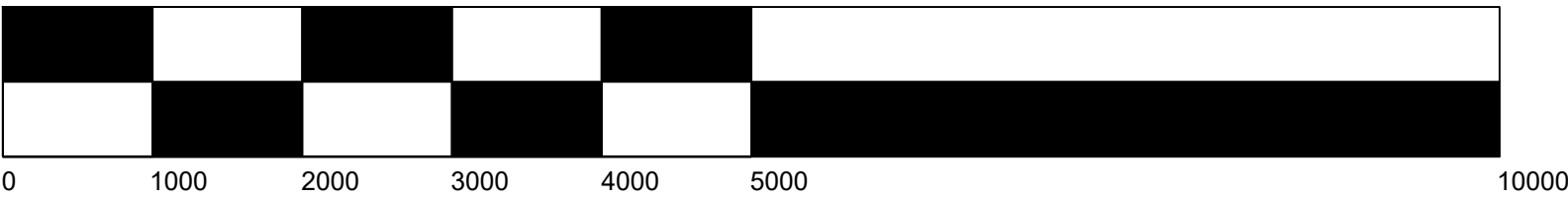
PLANNING





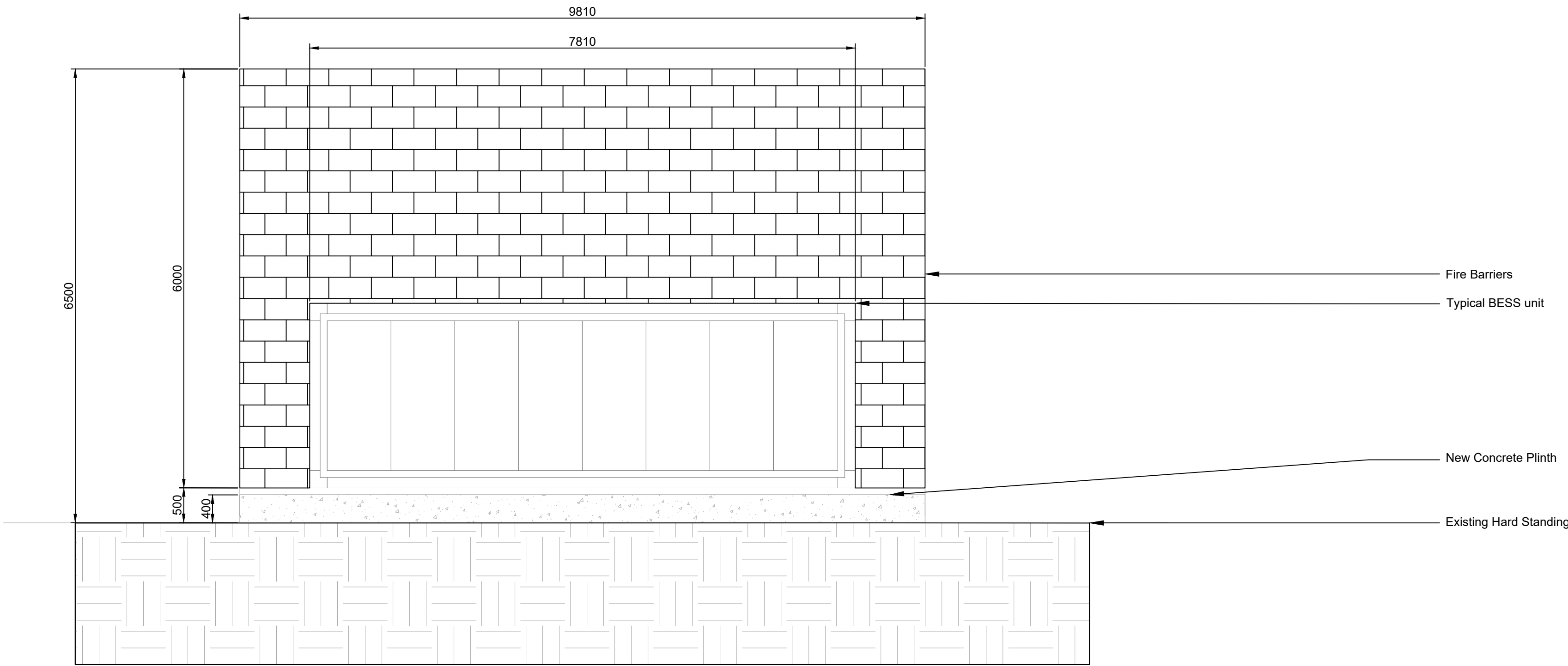
- Security Palisade Fencing with Barbed Wire
- Access Way
- Battery Container
- Customer Substation
- Storage
- DNO Substation
- Transformer/Inverter
- Fire Barriers

Description		Site Plan
D	Revision	17/10/23
	Date	
Chalcroft Brunetts Ln Southampton SO30 2PA		
Pre-app statement BESS		
Project Number:		1073.004
Date:		17/10/23
Drawn by:		FD [Checked by: KC
Chalcroft Site Plan		
Scale:		1:500 Page size: A1

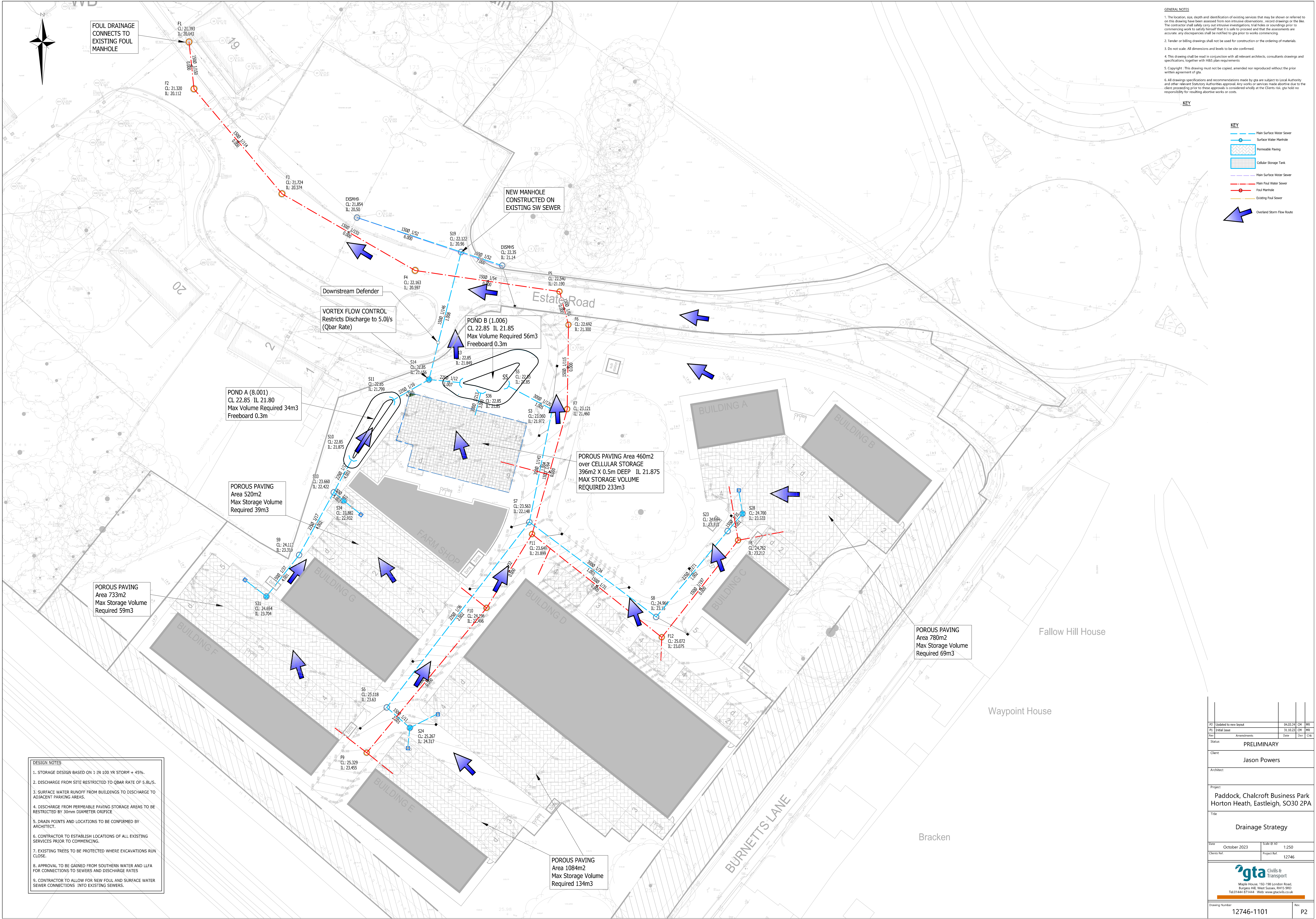


NOTES

Section AA refers to the drawing "Site Plan", and depicts a typical elevation view of a BESS system.



Description		Elevation A
E	Revision	17/10/23
	Date	
		
Chalcroft Brunetts Ln Southampton SO30 2PA		
Pre-app statement BESS		
Project Number:		1073.004
Date:		17/10/23
Drawn by:		FD [Checked by: KC
Foundation Site Plan		
Scale:		1:50 Page size: A1



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 HBS 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 their approval is considered wholly at the Client's risk. gta hold no responsibility for resulting abortive works or costs.

KEY

KEY

- Main Surface Water Sewer
- Surface Water Manhole
- Permeable Paving
- Cellular Storage Tank
- Main Surface Water Sewer
- Main Foul Water Sewer
- Foul Manhole
- Existing Foul Sewer
- Overland Storm Flow Route

DESIGN NOTES

1. STORAGE DESIGN BASED ON 1 IN 100 YR STORM + 45%.
2. DISCHARGE FROM SITE RESTRICTED TO QBAR RATE OF 5.8L/S.
3. SURFACE WATER RUNOFF FROM BUILDINGS TO DISCHARGE TO ADJACENT PARKING AREAS.
4. DISCHARGE FROM PERMEABLE PAVING STORAGE AREAS TO BE RESTRICTED BY 30mm DIAMETER ORIFICE
5. DRAIN POINTS AND LOCATIONS TO BE CONFIRMED BY ARCHITECT.
6. CONTRACTOR TO ESTABLISH LOCATIONS OF ALL EXISTING SERVICES PRIOR TO COMMENCING.
7. EXISTING TREES TO BE PROTECTED WHERE EXCAVATIONS RUN CLOSE.
8. APPROVAL TO BE GAINED FROM SOUTHERN WATER AND LLFA FOR CONNECTIONS TO SEWERS AND DISCHARGE RATES
9. CONTRACTOR TO ALLOW FOR NEW FOUL AND SURFACE WATER SEWER CONNECTIONS INTO EXISTING SEWERS.

Appendix E

MicroDrainage Calculation Sheets

GTA Civils Ltd		Page 1
Gloucester House 66a Church Walk Burgess Hill, BN43 6LB		
Date 03/03/2024 07:48 File	Designed by cmoore Checked by	
XP Solutions		
		Source Control 2020.1.3

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.970	Urban	0.000
SAAR (mm)	800	Region Number	Region 7

Results l/s

QBAR Rural	5.0
QBAR Urban	5.0
Q100 years	15.9
Q1 year	4.2
Q30 years	11.3
Q100 years	15.9

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GTA Civils Ltd		Page 0
Gloucester House 66a Church Walk Burgess Hill RH15 9AS	Chalcroft Business Park Storm Network	
Date 01/03/2024 File 12746 STORM NETWORK.mdx	Designed by CM Checked by MR	
Micro Drainage	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Surface Network 1

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	4.806	0.317	15.2	0.144	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	4.982	0.143	34.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	24.401	0.090	271.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	34.546	1.002	34.5	0.180	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	5.048	0.083	60.7	0.224	5.00	0.0	0.600	o	150	Pipe/Conduit	
2.001	6.737	0.612	11.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.002	51.050	1.407	36.3	0.052	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	25.031	0.176	142.5	0.020	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	11.649	0.097	120.1	0.019	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.006	8.118	0.001	8117.8	0.015	0.00	0.0	0.600	o	675	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.03	23.850	0.144	0.0	0.0	0.0	2.60	45.9	19.4
1.001	50.00	5.08	23.533	0.144	0.0	0.0	0.0	1.71	30.3	19.4
1.002	50.00	5.59	23.315	0.144	0.0	0.0	0.0	0.79	31.4	19.4
1.003	50.00	5.81	23.150	0.323	0.0	0.0	0.0	2.69	189.9	43.8
2.000	50.00	5.07	24.400	0.224	0.0	0.0	0.0	1.29	22.8«	30.3
2.001	50.00	5.10	24.317	0.224	0.0	0.0	0.0	3.05	54.0	30.3
2.002	50.00	5.49	23.630	0.276	0.0	0.0	0.0	2.18	86.6	37.4
1.004	50.00	6.13	22.148	0.620	0.0	0.0	0.0	1.31	92.9	83.9
1.005	50.00	6.26	21.972	0.638	0.0	0.0	0.0	1.43	101.3	86.4
1.006	50.00	6.74	21.850	0.654	0.0	0.0	0.0	0.28	100.6	88.5

Chalcroft Business Park
Storm Network

Designed by CM
Checked by MR



Network 2020.1.3

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section	Type	Auto Design
3.000	5.330	0.025	213.2	0.097	5.00	0.0	0.600	o	300	Pipe/Conduit		🚰
3.001	3.339	-0.074	-45.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit		🚰
1.007	8.564	0.693	12.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit		🚰
4.000	5.559	0.196	28.3	0.120	5.00	0.0	0.600	o	150	Pipe/Conduit		🚰
4.001	11.532	0.310	37.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit		🚰
4.002	15.625	0.897	17.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit		🚰
5.000	4.486	0.368	12.2	0.091	5.00	0.0	0.600	o	150	Pipe/Conduit		🚰
5.001	2.837	0.435	6.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit		🚰

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
3.000	50.00	5.08	21.875	0.097	0.0	0.0	0.0	1.07	75.8	13.1
3.001	50.00	5.46	21.850	0.097	0.0	0.0	0.0	0.15	10.5	13.1
1.007	50.00	6.78	21.849	0.750	0.0	0.0	0.0	3.74	148.8	101.6
4.000	50.00	5.05	23.900	0.120	0.0	0.0	0.0	1.90	33.6	16.2
4.001	50.00	5.16	23.704	0.120	0.0	0.0	0.0	1.65	29.2	16.2
4.002	50.00	5.25	23.319	0.120	0.0	0.0	0.0	3.15	125.2	16.2
5.000	50.00	5.03	23.300	0.091	0.0	0.0	0.0	2.90	51.3	12.3
5.001	50.00	5.04	22.932	0.091	0.0	0.0	0.0	3.97	70.2	12.3

Chalcroft Business Park
Storm Network

Designed by CM
Checked by MR



Network 2020.1.3

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section	Type	Auto Design
4.003	9.540	0.547	17.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit		
4.004	13.282	0.076	174.8	0.009	0.00	0.0	0.600	o	225	Pipe/Conduit		
4.005	10.295	0.643	16.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit		
1.008	28.700	0.196	146.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit		
6.000	23.958	-0.460	-52.1	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit		
7.000	9.430	0.180	52.4	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit		

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
4.003	50.00	5.30	22.422	0.211	0.0	0.0	0.0	3.15	125.2	28.5
4.004	50.00	5.52	21.875	0.219	0.0	0.0	0.0	0.99	39.2	29.7
4.005	50.00	5.57	21.799	0.219	0.0	0.0	0.0	3.29	130.7	29.7
1.008	50.00	7.36	21.156	0.970	0.0	0.0	0.0	0.83	14.6	131.3
6.000	50.00	9.31	20.500	0.000	0.0	0.0	0.0	0.09	1.6	0.0
7.000	50.00	5.11	21.140	0.000	0.0	0.0	0.0	1.39	24.6	0.0

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Online Controls for Surface Network 1

Orifice Manhole: S28, DS/PN: 1.001, Volume (m³): 1.7

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 23.533

Orifice Manhole: S24, DS/PN: 2.001, Volume (m³): 1.4

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 24.317

Orifice Manhole: S31, DS/PN: 4.001, Volume (m³): 1.4

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 23.704

Orifice Manhole: S34, DS/PN: 5.001, Volume (m³): 1.4

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 22.932

Hydro-Brake® Optimum Manhole: S14, DS/PN: 1.008, Volume (m³): 3.1

Unit Reference	MD-SHE-0099-5000-1450-5000	Sump Available	Yes
Design Head (m)	1.450	Diameter (mm)	99
Design Flow (l/s)	5.0	Invert Level (m)	21.156
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.450	5.0	Kick-Flo®	0.882	4.0
Flush-Flo™	0.432	5.0	Mean Flow over Head Range	-	4.4

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

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Hydro-Brake® Optimum Manhole: S14, DS/PN: 1.008, Volume (m³): 3.1

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.2	0.600	4.9	1.600	5.2	2.600	6.6	5.000	8.9	7.500	10.8
0.200	4.5	0.800	4.4	1.800	5.5	3.000	7.0	5.500	9.3	8.000	11.2
0.300	4.9	1.000	4.2	2.000	5.8	3.500	7.5	6.000	9.7	8.500	11.5
0.400	5.0	1.200	4.6	2.200	6.1	4.000	8.0	6.500	10.1	9.000	11.8
0.500	5.0	1.400	4.9	2.400	6.3	4.500	8.5	7.000	10.5	9.500	12.1

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Storage Structures for Surface Network 1

Porous Car Park Manhole: S29, DS/PN: 1.000

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	23.900	Depression Storage (mm)	5
Max Percolation (l/s)	216.7	Width (m)	26.0	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	30.0	Membrane Depth (mm)	0

Porous Car Park Manhole: S30, DS/PN: 2.000

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	24.400	Depression Storage (mm)	5
Max Percolation (l/s)	300.0	Width (m)	30.0	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	36.0	Membrane Depth (mm)	0

Complex Manhole: S37, DS/PN: 3.000

Cellular Storage

Invert Level (m)	21.875	Infiltration Coefficient Side (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Base (m/hr)	0.00000	Safety Factor	2.0		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	396.0	396.0	0.500	396.0	435.8	0.600	0.0	435.8

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	22.375	Depression Storage (mm)	5
Max Percolation (l/s)	127.8	Width (m)	20.0	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	23.0	Membrane Depth (mm)	0

Tank or Pond Manhole: S13, DS/PN: 1.007

Invert Level (m) 21.850

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	31.3	0.200	49.5	0.400	70.5	0.600	94.0	0.800	120.0	1.000	148.2
0.100	40.0	0.300	59.7	0.500	81.9	0.700	106.7	0.900	133.9		

Porous Car Park Manhole: S32, DS/PN: 4.000

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	23.900	Depression Storage (mm)	5
Max Percolation (l/s)	202.8	Width (m)	10.0	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	73.0	Membrane Depth (mm)	0

Porous Car Park Manhole: S35, DS/PN: 5.000

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	23.300	Depression Storage (mm)	5
Max Percolation (l/s)	144.4	Width (m)	10.0	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	52.0	Membrane Depth (mm)	0

Tank or Pond Manhole: S11, DS/PN: 4.005

Invert Level (m) 21.800

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	14.6	0.200	26.7	0.400	39.7	0.600	53.7	0.800	68.5	1.000	84.3
0.100	20.5	0.300	33.1	0.500	46.6	0.700	61.0	0.900	76.3	1.050	88.3

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 5 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 0.750
Site Location GB 439758 114798 SU 39758 14798 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep 2.5 Second Increment (Extended) Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 45

										Water	Surcharged	Flooded				Half Drain	Pipe		
US/MH							US/CL	Level	Depth	Volume	Flow /	Overflow	Infil.	Maximum	Time	Flow			
PN	Name	Event					(m)	(m)	(m)	(m³)	Cap.	(l/s)	Flow (l/s)	Vol (m³)	(mins)	(l/s)	Status		
1.000	S29	240 minute	2 year	Winter	I+0%	24.677	23.957	-0.043	0.000	0.06			0.0	13.385	138	2.1	OK		
1.001	S28	240 minute	2 year	Winter	I+0%	24.700	23.954	0.271	0.000	0.05				0.655		1.2	SURCHARGED		
1.002	S23	240 minute	2 year	Winter	I+0%	24.684	23.344	-0.196	0.000	0.04				0.035		1.2	OK		
1.003	S8	15 minute	2 year	Winter	I+0%	24.964	23.225	-0.225	0.000	0.14				0.105		24.6	OK		
2.000	S30	960 minute	2 year	Winter	I+0%	25.318	24.512	-0.038	0.000	0.04			0.0	36.320	585	0.8	OK		
2.001	S24	960 minute	2 year	Winter	I+0%	25.267	24.510	0.043	0.000	0.02				0.328		0.8	SURCHARGED		
2.002	S6	15 minute	2 year	Winter	I+0%	25.118	23.675	-0.180	0.000	0.09				0.057		7.1	OK		
1.004	S7	15 minute	2 year	Winter	I+0%	23.563	22.283	-0.165	0.000	0.42				0.264		34.5	OK		
1.005	S3	15 minute	2 year	Winter	I+0%	23.060	22.117	-0.155	0.000	0.47				0.551		36.8	OK		

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap.	Overflow (l/s)	Infil. Flow (l/s)	Maximum Vol (m ³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.006	S5	30 minute 2 year Winter I+0%	22.850	22.066	-0.459	0.000	0.15			0.693		33.2	OK
3.000	S37	480 minute 2 year Winter I+0%	22.992	22.026	-0.149	0.000	0.05		0.0	57.090		2.3	OK
3.001	S36	120 minute 2 year Winter I+0%	22.850	22.046	-0.104	0.000	0.01			0.373		0.7	OK
1.007	S13	120 minute 2 year Winter I+0%	22.850	22.065	-0.009	0.000	0.08			9.548		9.1	OK
4.000	S32	360 minute 2 year Winter I+0%	24.598	23.959	-0.091	0.000	0.04		0.0	12.999	185	1.2	OK
4.001	S31	360 minute 2 year Winter I+0%	24.654	23.957	0.103	0.000	0.03			0.415		0.9	SURCHARGED
4.002	S9	360 minute 2 year Winter I+0%	24.112	23.328	-0.216	0.000	0.01			0.006		0.9	OK
5.000	S35	240 minute 2 year Winter I+0%	23.912	23.346	-0.104	0.000	0.05		0.0	7.244	92	1.9	OK
5.001	S34	240 minute 2 year Winter I+0%	23.882	23.344	0.262	0.000	0.03			0.631		1.2	SURCHARGED
4.003	S33	240 minute 2 year Winter I+0%	23.660	22.444	-0.203	0.000	0.02			0.026		2.1	OK
4.004	S10	120 minute 2 year Winter I+0%	22.850	22.070	-0.030	0.000	0.07			0.264		2.4	OK
4.005	S11	120 minute 2 year Winter I+0%	22.850	22.066	0.042	0.000	0.07			6.719		7.9	SURCHARGED
1.008	S14	60 minute 2 year Winter I+0%	22.850	22.173	0.867	0.000	0.35			2.091		4.9	SURCHARGED
6.000	EXSMH9	15 minute 2 year Summer I+0%	21.854	20.500	-0.150	0.000	0.00			0.000		0.0	OK
7.000	EXSMH5	15 minute 2 year Summer I+0%	22.350	21.140	-0.150	0.000	0.00			0.000		0.0	OK

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

Areal Reduction Factor	1.000	Manhole Headloss Coeff (Global)	0.500	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Foul Sewage per hectare (l/s)	0.000	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Additional Flow - % of Total Flow	0.000	Flow per Person per Day (l/per/day)	0.000

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	5	Number of Storage Structures	7	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model					FEH	Data Type	Point	
FEH Rainfall Version					2013	Cv (Summer)	0.750	
Site Location	GB	439758	114798	SU	39758	14798	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep 2.5 Second Increment (Extended)		Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 45

WARNING: Half Drain Time has not been calculated as the structure is too full.

										Water Surcharged Flooded				Half Drain	Pipe			
PN	US/MH							US/CL	Level	Depth	Volume	Flow / Overflow	Infil.	Maximum	Time	Flow		
	Name	Event					(m)	(m)	(m)	(m³)	Cap.	(l/s)	Flow (l/s)	(l/s)	Vol (m³)	(mins)	(l/s)	Status
1.000	S29	240	minute	30	year	Winter	I+0%	24.677	24.037	0.037	0.000	0.06		0.0	32.357	229	1.9	SURCHARGED
1.001	S28	240	minute	30	year	Winter	I+0%	24.700	24.035	0.351	0.000	0.06			0.772		1.3	SURCHARGED
1.002	S23	240	minute	30	year	Winter	I+0%	24.684	23.346	-0.194	0.000	0.05			0.037		1.3	OK
1.003	S8	15	minute	30	year	Winter	I+0%	24.964	23.277	-0.173	0.000	0.38			0.246		65.6	OK
2.000	S30	480	minute	30	year	Winter	I+0%	25.318	24.609	0.059	0.000	0.05		0.0	68.148		1.0	SURCHARGED
2.001	S24	480	minute	30	year	Winter	I+0%	25.267	24.607	0.141	0.000	0.02			0.474		1.0	SURCHARGED
2.002	S6	15	minute	30	year	Winter	I+0%	25.118	23.703	-0.152	0.000	0.23			0.098		19.0	OK

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Infil. Flow (l/s)	Maximum Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.004	S7	15 minute 30 year Winter I+0%	23.563	22.505	0.057	0.000	1.05			1.208		86.9	SURCHARGED
1.005	S3	15 minute 30 year Winter I+0%	23.060	22.308	0.036	0.000	1.18			1.932		92.4	SURCHARGED
1.006	S5	30 minute 30 year Winter I+0%	22.850	22.234	-0.291	0.000	0.33			1.357		74.2	OK
3.000	S37	960 minute 30 year Winter I+0%	22.992	22.201	0.026	0.000	0.05		0.0	123.266	583	2.8	SURCHARGED
3.001	S36	960 minute 30 year Winter I+0%	22.850	22.203	0.053	0.000	0.05			0.671		2.7	SURCHARGED
1.007	S13	30 minute 30 year Winter I+0%	22.850	22.230	0.156	0.000	0.25			20.473		29.0	SURCHARGED
4.000	S32	240 minute 30 year Winter I+0%	24.598	24.031	-0.019	0.000	0.05		0.0	28.798		1.4	OK
4.001	S31	240 minute 30 year Winter I+0%	24.654	24.028	0.175	0.000	0.04			0.531		1.0	SURCHARGED
4.002	S9	240 minute 30 year Winter I+0%	24.112	23.329	-0.215	0.000	0.01			0.007		1.0	OK
5.000	S35	120 minute 30 year Winter I+0%	23.912	23.418	-0.032	0.000	0.07		0.0	18.596		2.7	OK
5.001	S34	120 minute 30 year Winter I+0%	23.882	23.416	0.334	0.000	0.03			0.739		1.3	SURCHARGED
4.003	S33	120 minute 30 year Winter I+0%	23.660	22.445	-0.202	0.000	0.02			0.028		2.3	OK
4.004	S10	60 minute 30 year Winter I+0%	22.850	22.232	0.132	0.000	0.09			0.541		3.0	SURCHARGED
4.005	S11	60 minute 30 year Winter I+0%	22.850	22.227	0.203	0.000	0.06			12.759		6.2	SURCHARGED
1.008	S14	960 minute 30 year Winter I+0%	22.850	22.340	1.034	0.000	0.35			2.330		5.0	SURCHARGED
6.000	EXSMH9	15 minute 30 year Summer I+0%	21.854	20.500	-0.150	0.000	0.00			0.000		0.0	OK
7.000	EXSMH5	15 minute 30 year Summer I+0%	22.350	21.140	-0.150	0.000	0.00			0.000		0.0	OK

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 5 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 0.750
Site Location GB 439758 114798 SU 39758 14798 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep 2.5 Second Increment (Extended) Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 45

WARNING: Half Drain Time has not been calculated as the structure is too full.

										Water	Surcharged	Flooded				Half Drain	Pipe
US/MH						US/CL	Level	Depth	Volume	Flow /	Overflow	Infil.	Maximum	Time	Flow		
PN	Name	Event	(m)	(m)	(m)	(m³)	Cap.	(l/s)	Flow (l/s)	Vol (m³)	(mins)	(l/s)	Status				
1.000	S29	240 minute 100 year Winter I+45%	24.677	24.194	0.194	0.000	0.08		0.0	69.166		2.8	SURCHARGED				
1.001	S28	240 minute 100 year Winter I+45%	24.700	24.191	0.507	0.000	0.06			0.995		1.5	SURCHARGED				
1.002	S23	15 minute 100 year Winter I+45%	24.684	23.497	-0.043	0.000	0.10			0.271		2.9	OK				
1.003	S8	15 minute 100 year Winter I+45%	24.964	23.502	0.052	0.000	0.63			1.336		109.4	SURCHARGED				
2.000	S30	960 minute 100 year Winter I+45%	25.318	24.813	0.263	0.000	0.07		0.0	134.465		1.3	SURCHARGED				
2.001	S24	960 minute 100 year Winter I+45%	25.267	24.811	0.344	0.000	0.03			0.765		1.3	SURCHARGED				
2.002	S6	15 minute 100 year Winter I+45%	25.118	23.731	-0.124	0.000	0.42			0.138		34.6	OK				
©1982–2020 Innovyze																	

GTA Civils Ltd		Page 12
Gloucester House 66a Church Walk Burgess Hill RH15 9AS	Chalcroft Business Park Storm Network	
Date 01/03/2024 File 12746 STORM NETWORK.mdx	Designed by CM Checked by MR	
Micro Drainage	Network 2020.1.3	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Event	Water Surcharged Flooded				Flow / Cap.	Overflow (l/s)	Infil. Flow (l/s)	Maximum Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
			US/CL (m)	Level (m)	Depth (m)	Volume (m³)							
1.004	S7	15 minute 100 year Winter I+45%	23.563	23.172	0.724	0.000	1.70			4.652		141.5	SURCHARGED
1.005	S3	15 minute 100 year Winter I+45%	23.060	22.675	0.403	0.000	1.93			2.902		150.3	SURCHARGED
1.006	S5	1440 minute 100 year Winter I+45%	22.850	22.614	0.089	0.000	0.05			2.059		10.1	FLOOD RISK
3.000	S37	1440 minute 100 year Winter I+45%	22.992	22.613	0.438	0.000	0.06		0.0	234.550	1241	3.2	SURCHARGED
3.001	S36	1440 minute 100 year Winter I+45%	22.850	22.614	0.464	0.000	0.06			1.145		3.1	FLOOD RISK
1.007	S13	1440 minute 100 year Winter I+45%	22.850	22.614	0.540	0.000	0.04			57.301		5.2	FLOOD RISK
4.000	S32	360 minute 100 year Winter I+45%	24.598	24.170	0.120	0.000	0.05		0.0	59.526		1.3	SURCHARGED
4.001	S31	360 minute 100 year Winter I+45%	24.654	24.167	0.314	0.000	0.05			0.731		1.3	SURCHARGED
4.002	S9	360 minute 100 year Winter I+45%	24.112	23.331	-0.213	0.000	0.01			0.010		1.3	OK
5.000	S35	240 minute 100 year Winter I+45%	23.912	23.549	0.099	0.000	0.05		0.0	39.244		1.9	SURCHARGED
5.001	S34	240 minute 100 year Winter I+45%	23.882	23.547	0.464	0.000	0.04			0.928		1.5	SURCHARGED
4.003	S33	1440 minute 100 year Winter I+45%	23.660	22.620	-0.028	0.000	0.02			0.331		2.5	OK
4.004	S10	1440 minute 100 year Winter I+45%	22.850	22.617	0.517	0.000	0.08			1.159		2.6	FLOOD RISK
4.005	S11	1440 minute 100 year Winter I+45%	22.850	22.614	0.590	0.000	0.04			34.567		3.8	FLOOD RISK
1.008	S14	1440 minute 100 year Winter I+45%	22.850	22.714	1.408	0.000	0.36			2.865		5.0	FLOOD RISK
6.000	EXSMH9	15 minute 100 year Summer I+45%	21.854	20.500	-0.150	0.000	0.00			0.000		0.0	OK
7.000	EXSMH5	15 minute 100 year Summer I+45%	22.350	21.140	-0.150	0.000	0.00			0.000		0.0	OK

Appendix F

Soakaway Testing



**Paddock
Chalcroft Business Park
Horton Heath
Eastleigh
Hampshire**

Brief In Situ Infiltration Test Report

Report Beneficiary:

Fip West End Limited
La Rue Des Pres
St Saviour
Jersey
JE1 3UP

Project Reference: P16407

Report Reference: R16032

Document Control			
Issue No.	Status	Issue Date	Notes
1	Final	3 rd January 2024	
Report Section		Prepared By	Approved By
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2.	SITE WORKS	2
3.	GROUND CONDITIONS	3
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FIGURES AND APPENDICIES

Figure 1 Site Location Plan
Figure 2 Site Plan
Proposed Drainage Layout
Explanatory Notes
Exploratory Hole Records
Trial Pit In Situ Infiltration Test Results

1. INTRODUCTION

Ashdown Site Investigation Ltd was requested to undertake in situ infiltration testing at a site located at Paddock, Chalcroft Business Park, Horton Heath, Eastleigh, Hampshire, to assist others with the drainage design.

The specific objectives of the works were to:

- a) Investigate the shallow ground and groundwater conditions at a single specified test location; and
- b) Undertake in situ infiltration testing and provide the results to assist others in undertaking the drainage design.

The scope of the works covered by this report, and the terms and conditions under which they were undertaken, were set out within the offer letter Q13514Rev1, dated 7th December 2023. The instruction to proceed was received on behalf of the client.

2. SITE WORKS

Whilst only a single trial pit (designated TP01) was scheduled to be dug using a mechanical excavator for in situ infiltration testing, during excavation of the trial pit at the preferred test location, the pit quickly filled with water from near surface water seepages and surface run-off. A second test pit, denoted TP01A, was therefore attempted a short distance from the first, which recorded significantly less water seepage.

The intrusive work was carried out on 20th December 2023. The exploratory hole locations are shown on Figure 2.

Falling head in situ infiltration testing was carried out in trial pit TP01A in general accordance with the test methodology given by BRE guidance¹, other than the pit was filled only once, rather than the three times suggested by the digest, due to the slow drainage rate of the soils and water ingress.

¹ Section 3.2.3 of Building Research Establishment (BRE) Digest 365, 2016.

3. GROUND CONDITIONS

3.1 Stratigraphy

Both trial pits were excavated through a surface cover of topsoil some 250mm to 300mm in thickness.

Underlying the topsoil, slightly gravelly sandy clay soils were recorded which persisted to the full depth of the investigation. No coarse grained layers were observed within the full depth of the trial pits.

These undisturbed deposits are considered to represent the Wittering Formation indicated to underlie the site on British Geological Survey maps.

3.2 Stability

Both trial pits remained stable during their excavation, although trial pit TP01A did collapse during the in situ infiltration testing after a period of 90 minutes.

3.3 Groundwater Conditions

Significant ingress of water through seepages and surface run off was observed within trial pit TP01. The ingress of water filled the pit to ground level, despite numerous attempts to bail the water out using the bucket of the excavator.

Trial pit TP01A recorded only slight water seepages on completion of the pit.

4. STORMWATER INFILTRATION SYSTEMS

In-situ infiltration testing² was carried out in trial pit TP01A. From the test results calculations were made to determine the infiltration rate that could be expected for infiltration systems constructed into the underlying Wittering Formation soils.

During the test performed the water level within the test pit did not fall and as such calculation of a soil infiltration rate in accordance with the BRE digest was not possible. After a period of 90 minutes the pit sides collapsed into the pit which caused the water level to rise. The water level was monitored for a further 1 hour, again without any fall.

The infiltration testing is summarised in the following table.

Table 1. Summary of infiltration testing

Exploratory Hole	Test Response Zone Depth (m)		Stratum	Infiltration Rate (f) (m/sec)
	Top	Bottom		
TP01A	0.90	1.80	Wittering Formation	Negligible – water level rose 30mm in 90 minutes
TP01A*	0.65*	1.80	Wittering Formation	Negligible – no fall in water level recorded within 60 minutes

Notes: *TP01A collapsed after 90 minutes of soakage testing which caused water level to rise.

The results from the infiltration tests should be provided to engineers responsible for the design of the drainage system.

Attention is drawn to the negligible infiltration recorded as well as the significant ingress of water observed within trial pit TP01 and the seepages also noted within TP01A, indicating that a high groundwater table likely exists beneath the site, which may restrict storage within any soakaways systems.

Ashdown Site Investigation Ltd.

² Conducted in general accordance with the requirements of BRE 365, Soakaway Design.

FIGURES AND APPENDICIES

Figure 1 Site Location Plan

Figure 2 Site Plan

Proposed Drainage Layout

Explanatory Notes

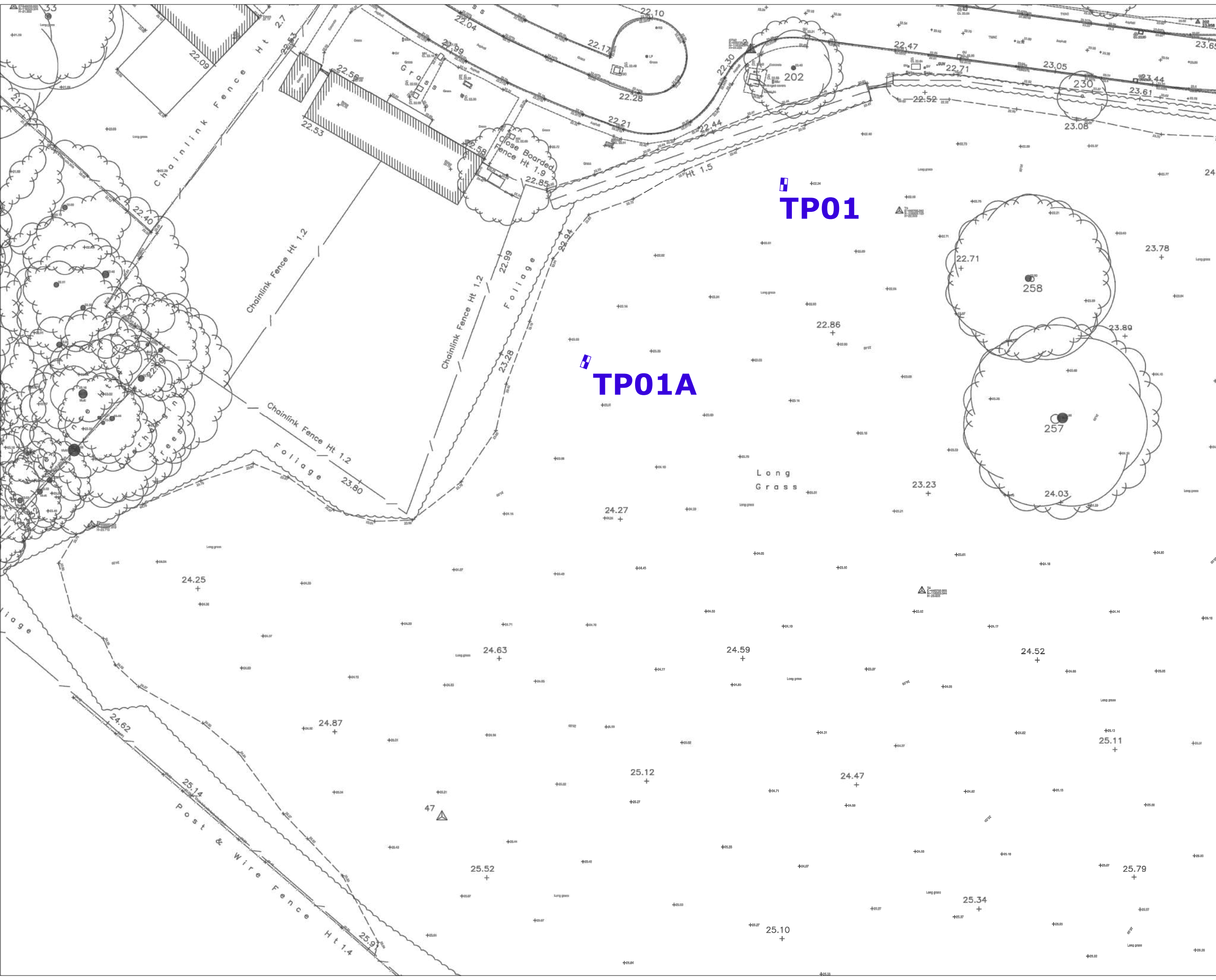
Exploratory Hole Records

Trial Pit In Situ Infiltration Test Results



© OpenStreetMap contributors, CC BY-SA

Site Location Plan	Site Name	Figure No.	Project Reference
	Paddock, Chalcroft Business Park, Horton Heath, Eastleigh, Hampshire	1	P16407



TP01

TP01A

ASHDOWN SITE INVESTIGATION

L · I · M · I · T · E · D

Unit 3
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Ditchling
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BN6 8SG
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contact@ashdownsi.co.uk

Site:

Paddock
Chalcroft Business Park
Horton Heath
Eastleigh
Hampshire

Project Ref:

P16407

Figure No.

2

Drawing Title

Site Plan

Scale

NTS

Explanatory Notes

Symbols and abbreviations on Exploratory Hole Records

Samples

- U 'Undisturbed' Sample: - 100mm diameter by 450mm long. The number of blows to drive in the sampling tube is shown after the test index letter in the SPT column.
- Pi Piston Sample: 'Undisturbed' sample 100mm diameter by 600mm long.
- D Disturbed Sample
- R Root Sample
- B Bulk Disturbed Sample
- W Water Sample
- ES Environmental Suite (on older records may be referenced J T)

In Situ Testing

- S Standard penetration test (SPT): Using the split spoon sampler.
- C Standard Penetration Test (SPT): Using a solid cone instead of the sampler – conducted usually in coarse grained soils or weak rocks.
- V Shear Vane Test: Undrained shear strength (cohesion) (kN/m²) shown within the Vane/Pen Test and N Value column.
- H Hand penetrometer Test: Undrained shear strength (cohesion) (kN/m²) shown within the Vane/Pen Test and N Value column.
- P Perth Penetrometer Test: Number of blows for 300mm penetration shown under Vane/Pen Test and N Value column.

Excavation Method

- CP Cable Percussion Borehole
- RC Rotary Cored Borehole
- WLS Dynamic Sampler Borehole using windowless sampler tubes
- WS Dynamic Sampler Borehole using window sampler tubes
- TP Trial Pit excavated using mechanic excavator
- HDP Trial Pit excavated using hand tools

Soil Description

Description and classification of soils has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of soil, Part 1 Identification and description (BS EN ISO 14688-1) and Part 2 Principles of classification (BS EN 14688-2) as well as the BS5930 code of Practice for Ground Investigations.

Rock Description

Description and classification of rocks has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of rock, Part 1 Identification and classification (BS EN ISO 14689-1) as well as the BS5930 code of Practice for Ground Investigations. TCR – Total Core Recovery, SCR – Solid Core Recovery, RQD – Rock Quality Designation, NI – Non Intact, If – indicative fracture spacing (min/ave/max), FI – Fracture Index.

Chalk Description

Chalk description is based on BS EN ISO 14688, BS EN ISO 14689 and BS5930. The classification of chalk generally follows the guidance offered by the Construction Industry Research and Information Association (CIRIA) C574, 'Engineering in Chalk'. This is based on assessment of chalk density, discontinuity and aperture spacing, and the proportion of intact chalk to silt of chalk.

In Situ Strength Testing

Standard penetration testing (SPT) carried out in accordance with BS EN ISO 22476-3:2005.

Continuous dynamic probe testing conducted using a super heavy DPSH-B (As defined by BS EN ISO 22476-2:2005) probing geometry. The DPSH-B configuration is similar to that of the standard penetration test (SPT); the main differences being that the tip comprises a 90° cone, the driving rods are lighter than those used for SPT testing and the blow counts are recorded over 100mm increments rather than 300mm, as is the case for the SPT.

Perth penetrometer tests carried out in accordance with Australian Standard AS 1289:6.3.3-1997, Method of Testing Soils for Engineering Purposes; no equivalent European or British Standard having been published to date.

Undrained shear strength determinations made in-situ using a Geonor hand shear vane or a hand penetrometer.

Testing to determine the in-situ California Bearing Ratio (CBR) of soils conducted at shallow depths using a hand-held Transport Research Laboratory (TRL) cone penetrometer.

ASHDOWN SITE INVESTIGATION

L · I · M · I · T · E · D

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Site Name: Paddock, Chalcroft Business Park, Horton Heath, Eastleigh, Hampshire

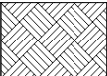
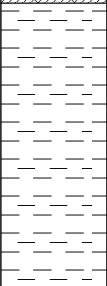
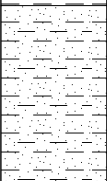
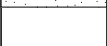
Job Number: P16407

Start Date: 20/12/2023

End Date: 20/12/2023

Trial Pit Number: TP01

Sheet 1 of 1

Samples and In Situ Testing				Legend	Depth/ Reduced Level	Stratum Description
Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result			
					0.00	Topsoil.
					0.25	Orange brown mottled grey slightly gravelly slightly sandy CLAY. Gravel is subangular to subrounded fine to medium flint. (Wittering Formation)
					1.20	Grey brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to medium flint. (Wittering Formation)
					1.80	End of trial pit at 1.80m

Remarks Groundwater: Groundwater seepages recorded within pit between 0.10m and 0.30m, together with surface run off. Pit filled to 0.20m with water ingress. Bailed out with excavator bucket but water level rose again. Stability: Trial pit stable during excavation. Notes: Soakage test not undertaken due to ingress of water. Relocated to TP01A.	Excavation Method: TP
	Pit Length: 1.20m
	Pit Width: 0.40m
	Made By: JN

ASHDOWN SITE INVESTIGATION L · I · M · I · T · E · D E-mail: contact@ashdownsi.co.uk Web: www.ashdownsi.co.uk Tel: 01273 483119	Site Name: Paddock, Chalcroft Business Park, Horton Heath, Eastleigh, Hampshire					
	Job Number: P16407					
	Start Date: 20/12/2023			Trial Pit Number: TP01A		
	End Date: 20/12/2023					
Sheet 1 of 1						
Samples and In Situ Testing						
Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Legend	Depth/ Reduced Level	Stratum Description
					0.00	Topsoil.
D	0.50				0.30	Orange brown mottled grey slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to medium flint. (Wittering Formation)
D	1.00					
D	1.80				1.80	End of trial pit at 1.80m
Remarks						
Groundwater: Groundwater recorded at base of trial pit on completion, prior to start of soakage testing. Stability: Trial pit stable on completion, prior to start of soakage testing. Pit partially collapsed during soakage test. Notes: n/a					Excavation Method: TP	
					Pit Length: 1.53m	
					Pit Width: 0.40m	
					Made By: JN	

Infiltration Test Results

Test Position TP01A
 Test No. 1
 Project No. P16407
 Project Name Paddock, Chalcroft Business Park, Horton Heath, Eastleigh, Hampshire

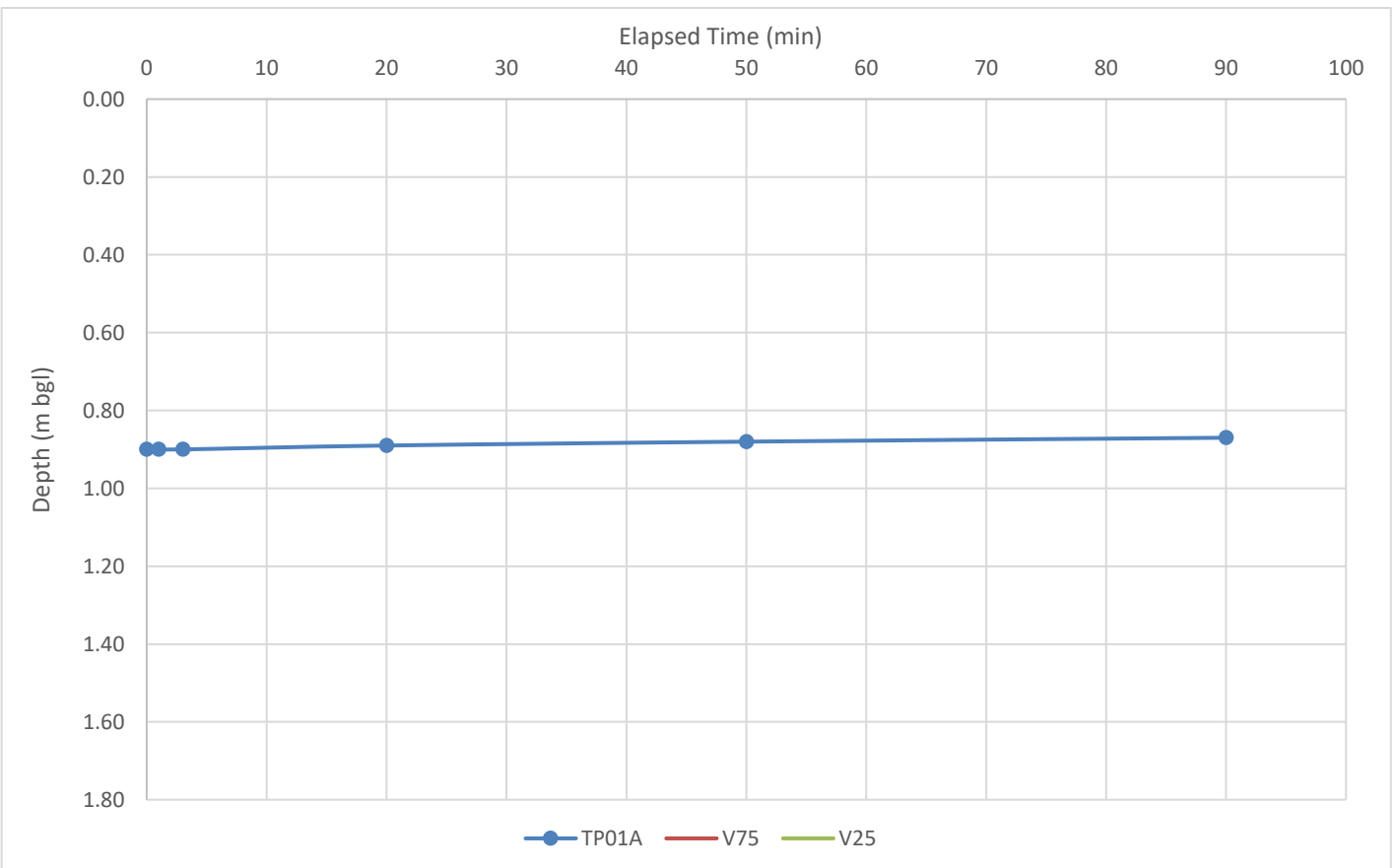
Width of Pit 0.40 m W
 Length of Pit 1.53 m L
 Depth of Pit 1.80 m D
 Pit type Open

Volume of water introduced into pit 0.549 m³
 Initial head of water 0.90 m h_o
 Water level at start of test 0.90 m
 Water level at end of test 0.87 m
 Volume of water discharged from pit n/a m³
 Duration of test 90 min
 Average soaked surface area 4.13 m²
 Time for water level to fall to 75% of initial head Not reached min t_{p75}
 Time for water level to fall to 25% of initial head Not reached min t_{p25}
 Depth to water at 75% of initial head Not reached m d₇₅
 Depth to water at 25% of initial head Not reached m d₂₅
 Time for the water level to fall from 75% to 25% of initial head Not reached min t_{p75-25}
 Effective storage volume of water in the soakage trial pit between 75% and 25% of initial head Not reached m³ V_{p75-25}
 Internal surface area of the soakage trial pit up to 50% of initial head and including the base area 2.34 m² a_{s50}

Infiltration rate

Negligible m/sec f

Calculation method: Water Level rose 30mm during 90 minute test period.



Infiltration Test Results

Test Position TP01A
 Test No. 1A - After pit collapsed causing water level to rise.
 Project No. P16407
 Project Name Paddock, Chalcroft Business Park, Horton Heath, Eastleigh, Hampshire

Width of Pit	0.40 m	W
Length of Pit	1.53 m	L
Depth of Pit	1.80 m	D
Pit type	Open	

Volume of water introduced into pit	0.702 m ³	
Initial head of water	1.15 m	h _o
Water level at start of test	0.65 m	
Water level at end of test	0.65 m	
Volume of water discharged from pit	0.000 m ³	
Duration of test	60 min	
Average soaked surface area	5.04 m ²	
Time for water level to fall to 75% of initial head	Not reached min	t _{p75}
Time for water level to fall to 25% of initial head	Not reached min	t _{p25}
Depth to water at 75% of initial head	Not reached m	d ₇₅
Depth to water at 25% of initial head	Not reached m	d ₂₅
Time for the water level to fall from 75% to 25% of initial head	Not reached min	t _{p75-25}
Effective storage volume of water in the soakage trial pit between 75% and 25% of initial head	Not reached m ³	V _{p75-25}
Internal surface area of the soakage trial pit up to 50% of initial head and including the base area	2.82 m ²	a _{s50}

Infiltration rate **Negligible m/sec f**
 Calculation method: Water level rose to 0.65m below ground level after pit collapsed after 90 minutes. Water level monitored for a further 60 minutes with no fall in water level recorded.

