Flood Risk Assessment

Land South of Kings Head PH, Lower Horsebridge, Hailsham BN27 4DH

Client

Abtec Limited
c/o Decimus Ltd
1 Lonsdale Gardens
Tunbridge Wells
Kent TN1 1NU
Ref: 10273
Date: November 2019

Consulting Engineers

GTA Civils Ltd
Gloucester House
66a Church Walk
Burgess Hill
West Sussex RH15 9AS

Tel: 01444 871444

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Schedule of Appendices

Issue	Issue date	Compiled	Checked
Preliminary Issue	27 November 2019	JP	MR
First Issue	28 November 2019	JP	MR
Second Issue	1 May 2020	PH	MR

1 Introduction

1.1 This report has been prepared for Abtec Limited in relation to the proposed development at land to the south of Kings Head Public House, Lower Horsebridge, Hailsham BN27 4DH; 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 GTA Civils and Transport was appointed by its client to provide a Flood Risk Assessment (FRA) to support the planning application for 10 dwelling units at the subject site.

1.3 This report will take the form of a formal Flood Risk Assessment in accordance with the 2019 National Planning Policy Framework (NPPF) and the current Planning Practice Guidance (PPG). Reference has been made of the Strategic Flood Risk Assessment published by Wealden District Council (WDC).

1.4 This FRA (First Issue, November 2019) accompanied the planning submission to WDC (application ref: WD/2017/2419/MAJ). Comments were received from East Sussex County Council (ESCC) in its role as the Lead Local Flood Authority (LLFA), a statutory consultee. This FRA has now been updated to address the LLFA comments as follows:

- Revision to proposed outfall location to allay downstream flood risk concerns.
- Remove private driveways from the proposed permeable paving storage cell.
- Mitigation for risk of groundwater affecting the permeable paving storage cell.

2 Existing Site and Current Flood Conditions

2.1 The application site is a vacant greenfield plot situated on the west side of – and is accessed from – the A271 highway in Lower Horsebridge. This area is administered by Wealden District Council (WDC). Refer to Appendix A for location plans and an aerial view.

2.2 A Topographical Survey of the site is contained in Appendix B. The site has a gentle east to west gradient with levels ranging between 18.5m AOD and 18.05m AOD. The average gradient is approximately 1 in 75.

2.3 Hydrology: The site lies approximately 170m to the north of the River Cuckmere, which flows south and then westwards around the site. An unnamed brook flows southwest, some 90m at its closest to the SE corner. Both of these watercourses are shown on the first site location map in Appendix A. The site is served by a ditch that runs along the south boundary.

2.4 Geology: The British Geological Society (BGS) online geological map shows the bedrock is Weald Clay; a drift stratum of River Terrace Deposits (sand and gravel) overlies this.

2.5 2 BRE Digest 365 tests were undertaken at different parts of the site. The report is shown in Appendix D. The water level *rose*, not *fell* – the measurements started once water was encountered at 1.5m bgl. The conclusion by the geotechnical engineer (author of the report) was that soakage is not viable on this site.

2.6 The WDC drainage engineer advised that the site's proximity to the Cuckmere would throw sufficient doubt on infiltration methods being viable. This was stated without prior knowledge of the soakage testing.

2.7 Southern Water's sewer records for this area are shown in Appendix B. There is no public surface water sewer in this part of Lower Horsebridge.

2.8 The sewer records show a 300mm diameter foul sewer passing through the northeast corner of the site. (This will have to be diverted). As the invert level of the downstream sewer manhole (ref 8304) is 12.43m AOD, well over 4m below the site's lowest level, any flow into it will be under gravity.

2.9 The existing greenfield runoff rate (Q_{BAR}) for this small site is 0.7l/s. This is less than the practical minimum limit of vortex restriction devices. See Appendix G for the calculation sheet.

2.10 According to the Environment Agency's Rivers and Seas Flood Map (see Appendix C), the vast majority of the site lies in Flood Zone 1 (Low Risk). Sites in FZ1 are defined in Table 1 of the National

Planning Policy Framework's (NPPF) as being susceptible to flooding with an annual probability (AEP) of >0.1% (less often than once every 1000 years on average). There is a very narrow strip along the south half of the east boundary in Flood Zone 2 (FZ2). Inland sites in FZ2 are liable to flood with an annual expectation of between 0.1% and 1% (between once every 1000 years and 100 years on average).

2.11 An excerpt from the EA's modelled data-pack shows the 2D nodes at the SE corner of the site – see Appendix C. The greater of the 2 flood depths in the extreme storm is 0.29m. As this flood pattern is limited to the hedge along the boundary, this is of little concern.

2.12 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 Map for the Low Risk scenario (1000 years) is shown in Appendix C. The site is removed from this risk.

2.13 Artificial sources: flooding from reservoirs, canals and docks. The EA's Reservoirs Flood Map in Appendix C shows that the site is removed from this source of flooding. There are no docks or canals in this area.

2.14 Historic records: the EA's online map in Appendix C shows that this site is removed from the nearest area of recorded flooding by the EA.

2.15 WDC's Strategic Flood Risk Assessment (SFRA) does not show any evidence of historical flood incidents on or near to the site.

2.16 In conclusion – the flood risk profile of this site is – effectively - Low. The small area in FZ2 near to the SE corner is in amenity space – effectively within the confines of the site boundary hedge.

2.17 Site visits and surveys carried out in February 2020 confirmed that the ditch downstream of the site boundary is waterlogged due to poor management. A 450mm diameter highway drain runs north to south along the land boundary with the recreation ground to the west. The outfall of this drain into the ditch occurs around 30m south of the application site, but was observed to be submerged in February 2020.

2.18 The land between the site and the Cuckmere River is open fields. There are no buildings or property affected by this localised flooding issue, neither does it impact upon the proposed development. However, it is a consideration for the proposed surface water discharge from the development.

3 Proposed Development & SuDS Drainage Strategy

3.1 The proposed development is to demolish all the existing building stock and erect 10 new dwellings. Appendix E shows the scheme drawings.

3.2 The Sequential Test: the majority of the site lies in fluvial FZ1 with only a very small proportion in FZ2. Although this scheme should have to pass the Sequential Test, strictly speaking, it is clear that there is no problem with the development being safe, ie the scheme passes the second part of the Exception Test.

3.3 The flood risk profile of the site is Low, as concluded in section 2.13 above. The small area liable to flood in the extreme storm is limited to water compatible use.

3.4 Surface water drainage: The SuDS hierarchy was applied. Due to the artesian pressure causing a rise in water level during the first 30 minutes in each of the 2 soakage tests it was concluded that infiltration is not viable here. A drainage strategy has been drawn up for the development with an off-site surface water discharge.

3.5 The existing off-site runoff route is via the ditch which runs west along the southern boundary of the site. At the south-west corner the ditch peters out and flow spreads southwards overland and then into the downstream ditch. The LLFA raised concern that re-use of this route for development runoff will exacerbate the existing localised flooding downstream and potentially compromise the Highway drainage assets due to erosion.

3.6 Following discussions with the LLFA and East Sussex Highways (ESH) regarding this problem, it has been agreed in principle that development runoff should be discharged into the existing 450mm highway drain. A copy of email correspondence from the ESH engineer is included in Appendix F.

3.7 The proposed connection is illustrated on the proposed drainage strategy layout in Appendix E. The detail of the proposed connection is to be agreed at the next stage. Any repairs, remediation or improvements required for the highway drainage system to accommodate the development discharge will also be identified at the next stage along with a plan for implementation, including remedial maintenance of the downstream ditch. Provisionally the physical works will be carried out by ESH and funded by the developer. It is suggested that this information be covered by a suitably worded condition.

3.8 The proposed development discharge rate is 2 l/s. This is a practical minimum flow rate for small catchments balancing the risk of blockage associated with small orifice diameters. Although the greenfield Q_{BAR} rate is 0.7 l/s, the greenfield 1:100 year rate is 2.4 l/s (see Appendix G). Therefore,

the proposed maximum rate of 2 l/s still provide a betterment during extreme storm events. A vortex flow control device will be installed in the chamber at the south-west of the development area.

3.9 Attenuation storage volume will be provided within the permeable pavement cell comprising the communal road areas. Private driveways have been removed from this storage cell as requested by the LLFA officer. The pavement construction will be 0.68m overall (cover level 18.280m AOD, invert level 17.600m AOD), providing 90m³ of storage capacity. The sub-base material will provide filter out pollutant to protect water quality downstream. The layout of the permeable paving is shown in Appendix E.

3.10 The soakaway tests were each excavated to 1.5m below ground level (bgl) and water ingress occurred in each test pit due to sub-artesian pressure. Assuming 1.5m bgl as the water table depth equates to a level of 16.8m AOD at TP1 and 16.5m AOD at TP2.

3.11 Indicative site sections are included in Appendix E which show the development area's existing ground levels are higher than the surrounding land in all directions. This makes it very unlikely that groundwater could rise sufficiently to affect the proposed permeable paving cell which has an invert of 17.600m AOD. Nonetheless, a simple network of land drainage beneath the liner of the paving sub-base is included in the design. The land drainage system will outfall to the boundary ditch as shown in Appendix E. This proposal will relieve groundwater pressure below the development and this may also help to water the ditch once site runoff is diverted from it.

3.12 The drainage strategy layout is included in Appendix E. MicroDrainage calculations are included in Appendix G to demonstrate that the proposed strategy will accommodate storm water in the critical '1 in 100 year plus 40% climate change' events, thereby complying with the NPPF.

3.13 A SuDS Management and Maintenance Plan has been prepared – see Appendix H of this report. An access route for maintaining the control manhole/catchpit has been incorporated into the design.

3.14 Conclusion: this development will not increase the flood risk either on this site or to neighbouring properties - and so complies with the 2019 NPPF and current PPG.

- End of Report -

Appendix A

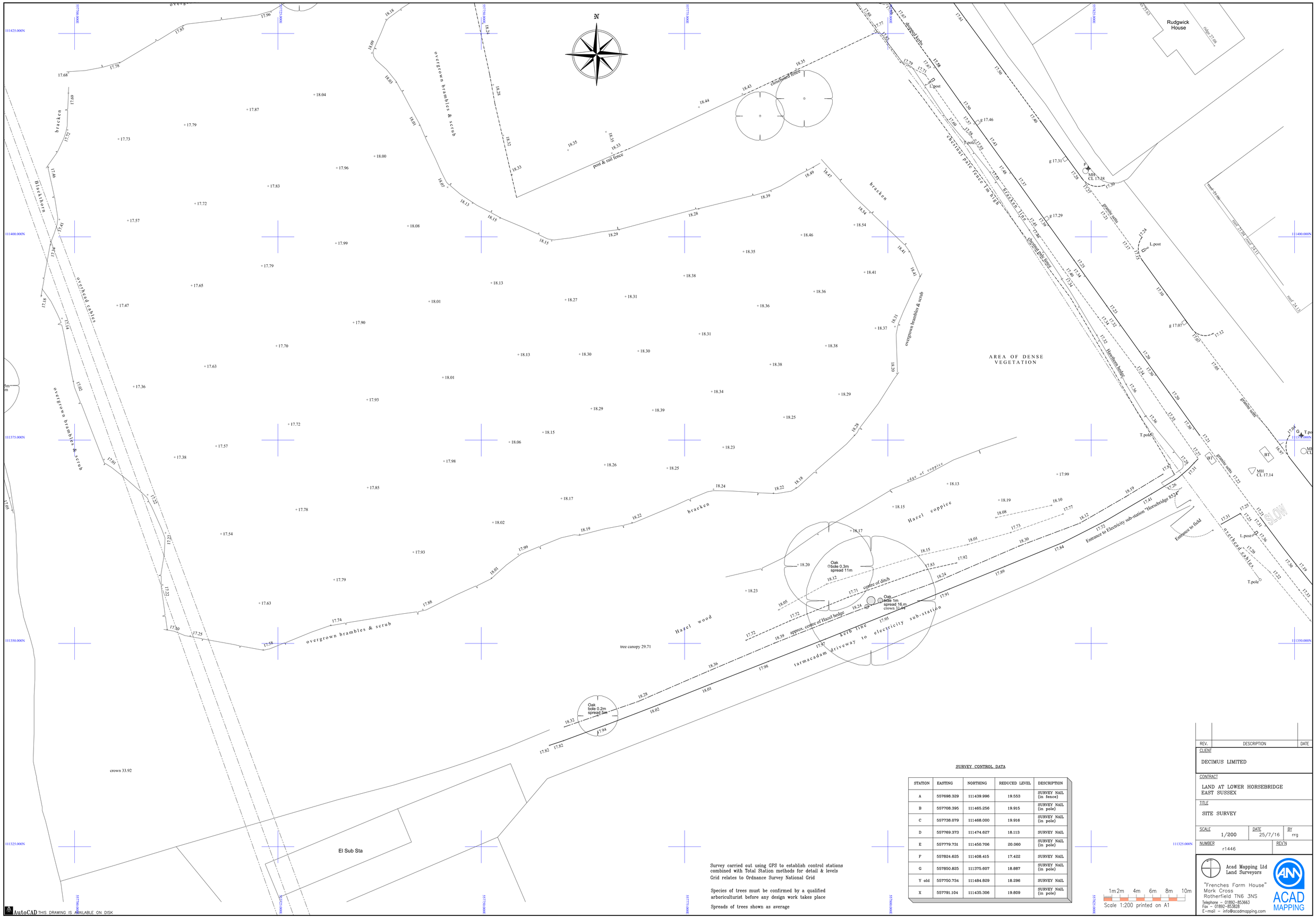
Site Location Maps & Aerial Photo


Ivy Dene
Acorns
St Annes Cottage
Willow Cottage
Birch Lodge
Kallsa
Heathers
Meadow View
Monteray
1a
B 2104
PO
Olive House
Charnies
Hope Cott
Old Sweet Shop
Cottage
Christdon
Tawny House
White House
Little Manor
Rudgwick House
The King's Head (PH)
Proposed access bellmouth
Cobwebs
El Sub Sta


Site
Location

Appendix B

Topographical Survey & Sewer Records



STATION	EASTING	NORTHING	REDUCED LEVEL	DESCRIPTION
A	557698.329	111439.996	19.553	SURVEY NAIL (in fence)
B	557708.395	111465.256	19.915	SURVEY NAIL (in pole)
C	557738.079	111468.000	19.916	SURVEY NAIL (in pole)
D	557769.373	111474.627	18.113	SURVEY NAIL
E	557779.731	111450.706	20.060	SURVEY NAIL (in pole)
F	557824.625	111408.415	17.422	SURVEY NAIL
G	557850.825	111375.607	18.887	SURVEY NAIL (in pole)
Y old	557750.734	111484.829	18.296	SURVEY NAIL
X	557791.104	111435.306	19.809	SURVEY NAIL (in pole)

SURVEY CONTROL DATA

Survey carried out using GPS to establish control stations combined with Total Station methods for detail & levels
Grid relates to Ordnance Survey National Grid

Species of trees must be confirmed by a qualified arboriculturist before any design work takes place

Spreads of trees shown as average

1m 2m 4m 6m 8m 10m
Scale 1:200 printed on A1

REV.	DESCRIPTION	DATE

CLIENT
DECIMUS LIMITED

CONTRACT
LAND AT LOWER HORSEBRIDGE
EAST SUSSEX

TITLE
SITE SURVEY

SCALE	DATE	BY
1/200	25/7/16	rrg

NUMBER	REV'N
r1446	

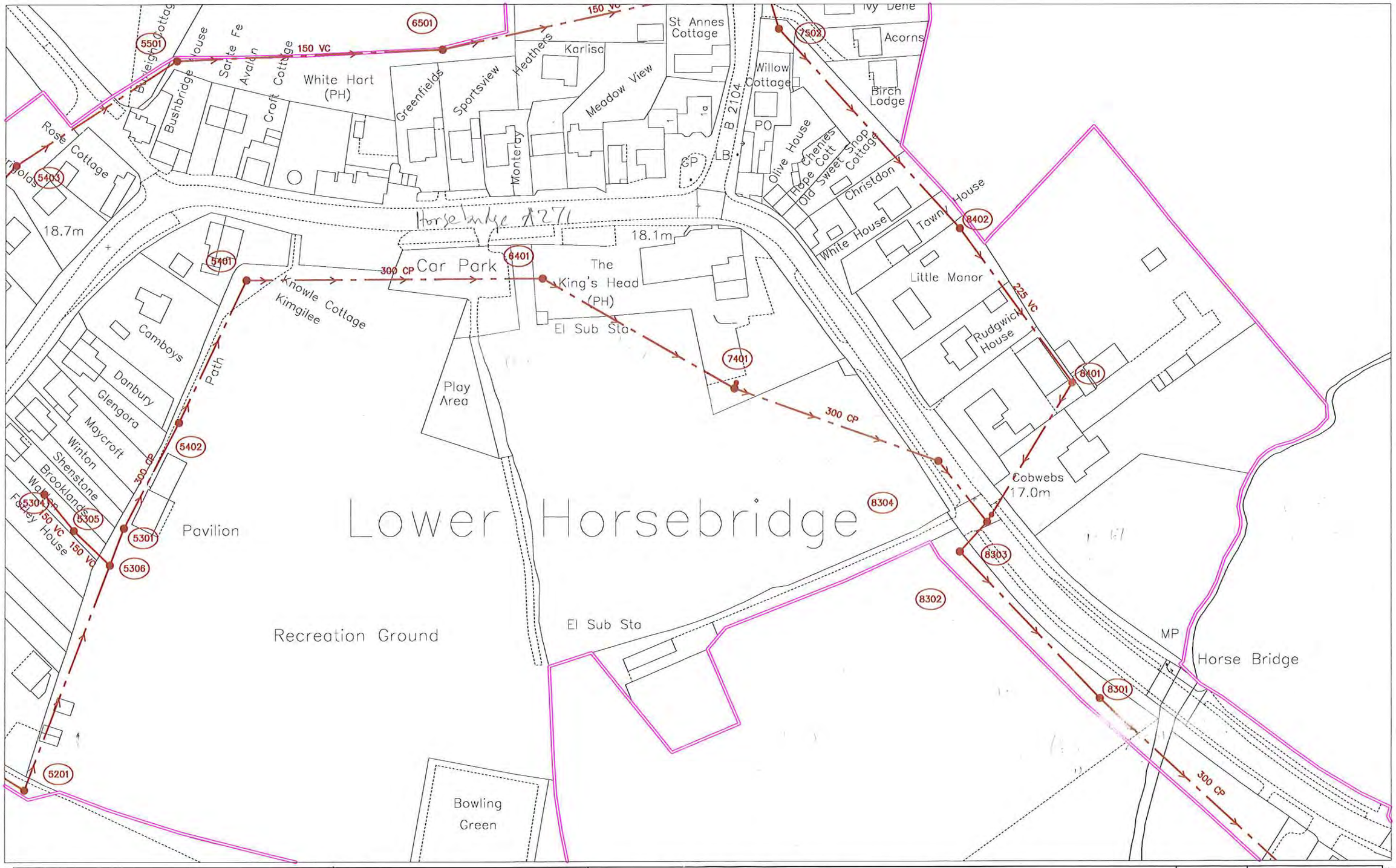
Acad Mapping Ltd
Land Surveyors
"Frenches Farm House"
Mark Cross
Rotherfield TN6 3NS
Telephone - 01892-853663
Fax - 01892-853828
E-mail - info@acadmapping.com

ACAD MAPPING

AutoCAD THIS DRAWING IS AVAILABLE ON DISK

SEWER RECORDS PAGE 1 OF 2

111543



111255

O.S. REF. TQ5711SE	Drawn by: kumaria	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 determnined on site. WARNING: BAC pipes are constructed of Bonded Asbestos Cement WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement	N
	Scale: 1:1250		Southern Water
Title: 219643_Land at Lower Horsebrid	Date: 19/07/2016	Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530.	

557513 557985

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape
5201X	17.05	14.15	UNK	UNK	CIRC
5301X	17.92	13.72	300	CP	CIRC
5304X			150	VC	CIRC
5305X			150	VC	CIRC
5306X			UNK	UNK	CIRC
5401X	18.3	13.3	300	CP	CIRC
5402X	18.19	13.58	300	CP	CIRC
5403X			UNK	UNK	CIRC
5501X	19.14	16.78	150	VC	CIRC
6401X	17.92	12.92	UNK	UNK	CIRC
6501X	18.38	16.18	150	VC	CIRC
7401X	18.18	12.65	300	CP	CIRC
7502X			UNK	UNK	CIRC
8301X	15.93		300	CP	CIRC
8302X	17.37	12.32	UNK	UNK	CIRC
8303X	16.97	12.28	300	CP	CIRC
8304X	17.04	12.43	300	CP	CIRC
8401X			UNK	UNK	CIRC
8402X	18.4	15.15	225	VC	CIRC

Node	Cover	Invert	Size	Material	Shape

Node	Cover	Invert	Size	Material	Shape

Node	Cover	Invert	Size	Material	Shape

Node	Cover	Invert	Size	Material	Shape

LINE STYLES / COLOURS

- Brown — Foul
- Foul Syphon Sewer
- Foul Vacuum Main
- Foul Rising Main
- Red — Combined
- Combined Syphon Sewer
- Combined Rising Main
- Lateral Drain
- Orange — Building Over Agreement Area
- Dark Blue — Treated Effluent
- Purple — Sludge
- Sewer Catchment
- Section 104 Area
- Light Blue — Surface Water
- Surface Water Rising Main
- Yellow — Private
- Green — Access Shaft
- Decommissioned

MATERIALS

AK	Alkathene
BAC	Bonded Asbestos Cement
BRC	Brick (Common)
BRE	Brick (Engineering)
CC	Concrete Box Culvert
CI	Cast Iron
CO	Concrete (In-Situ)
CP	Concrete (Pre-Cast)
CSB	Concrete Segments (bolted)
CSU	Concrete Segments (unbolted)
DI	Ductile Iron
GRC	Glass Reinforced Concrete
GRP	Glass Reinforced Plastic
MAC	Masonry in regular Courses
MAR	Masonry in random Courses
PE	Polyethylene
PF	Pitch Fibre
PP	Polypropylene
PVC	Polyvinyl Chloride
RPM	Reinforced Plastic Matrix
SI	Spun Iron
ST	Steel
VC	Vitrified Clay
XXX	Other
ZZZ	Unknown

LEGEND - SEWERS

- Manhole (SW)
- Manhole (F&C)
- Lamp hole (SW)
- Lamp hole (F&C)
- Pumping Station (SW)
- Pumping Station (F&C)
- Side entry manhole (SW)
- Side entry Manhole (F&C)
- Blind shaft (SW)
- Blind shaft (F&C)
- Ejector station (SW)
- Ejector station (F&C)
- Watertight door (SW)
- Watertight door (F&C)
- Flushing ch. Mine (SW)
- Flushing ch. Mine (F&C)
- Flushing ch. No-e (SW)
- Flushing ch. No-e (F&C)
- Demarcation Chamber
- Washout (SW)
- Washout (F&C)
- Rodding Eye (SW)
- Rodding Eye (F&C)
- Gauging point (SW)
- Gauging point (F&C)
- Intercept chamber (SW)
- Intercept chamber (F&C)
- Storm Tank (SW)
- Storm Tank (F&C)
- Vortex chamber (SW)
- Vortex chamber (F&C)
- Label ellipse
- Dummy/S24 manhole
- Outfall
- Penstock chamber
- Dambcards
- Storm Overflow
- Backdrop manhole
- Other (s)
- Other
- Change in sewer (s)
- Change in sewer
- Reflux valve
- Flap valve
- Cascade
- Anode
- Valve
- Closed Valve
- Air Valve
- Hatch box (SW)
- Hatch box (F&C)
- Direction arrow
- Emptying valve
- Catchpit
- Soakaway
- Inlet
- Balancing Pond
- Wastewater treatment works
- Marine treatment works
- Outfall headworks
- Vent
- Vent column
- Tidal storage tank
- Blank end
- Head of Public Sewer
- Micro Pumping Station

SHAPES (S)

A	Arched	R	Rectangular
B	Barrel	S	Square
C	Circular	T	Trapezoidal
E	Egg	U	U Shape
H	Horseshoe	X	Other

NODE REFERENCING SYSTEM

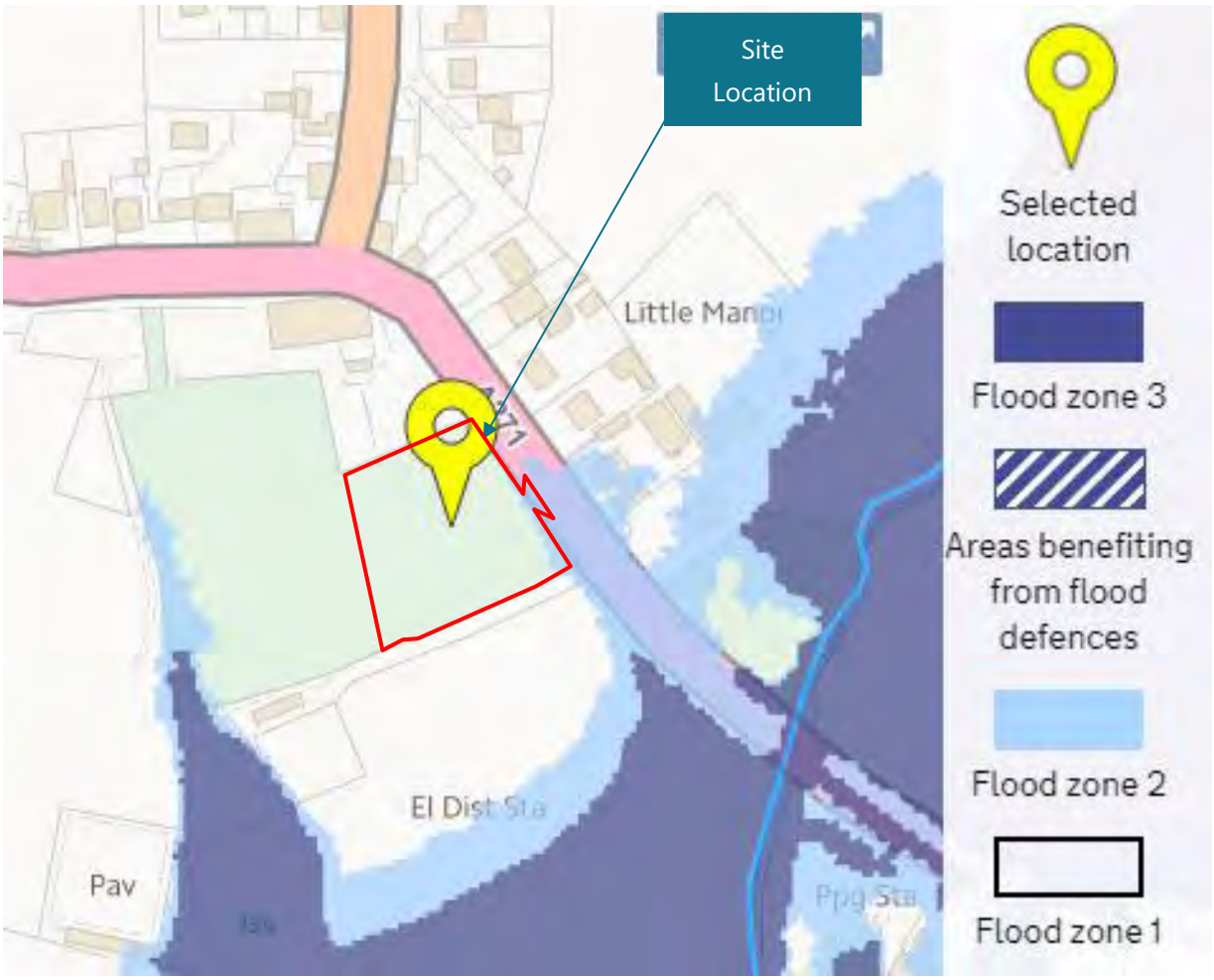
- 1st digit: hundred metre easting identifier
- 2nd digit: hundred metre northing identifier
- 3rd digit: sewer type identifier
  - 0-4 = Foul/Combined
  - 5-9 = Surface Water
- 4th digit: next sequential node

Drawn by:	kumaria
Title:	219643_Land at Lower Horsebrid
Date:	19/07/2016

Southern Water

Appendix C

Environment Agency Flood Maps



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

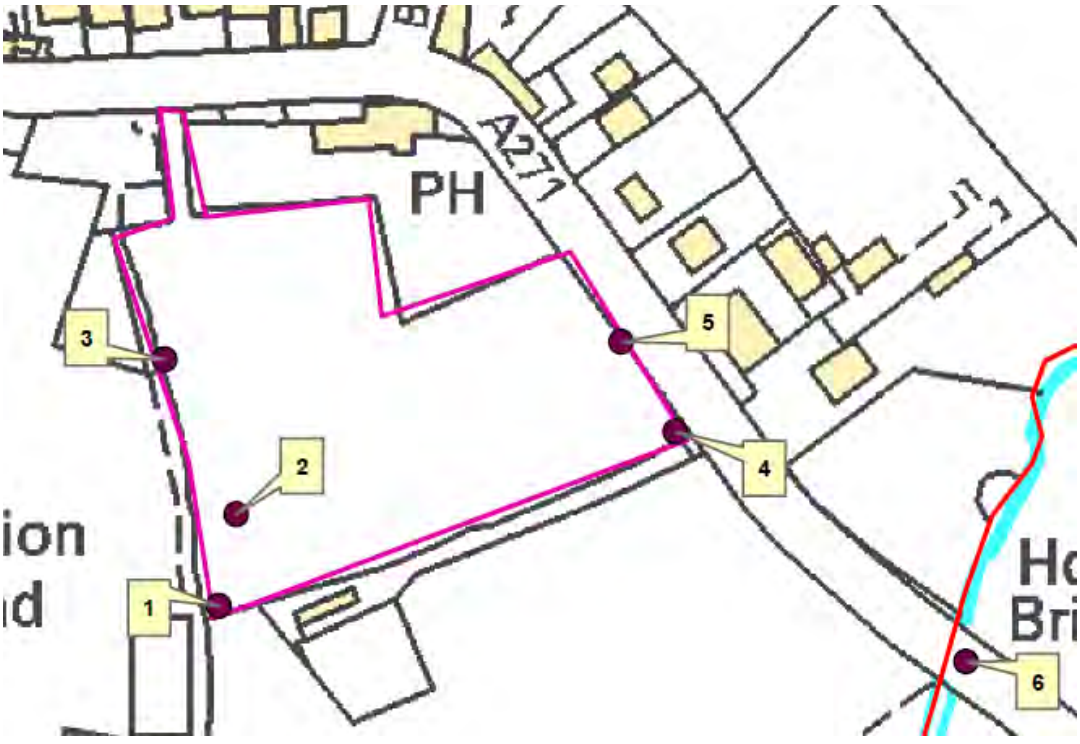
The majority of the site lies in fluvial Flood Zone 1 with a narrow strip along the east boundary in Flood Zone 2

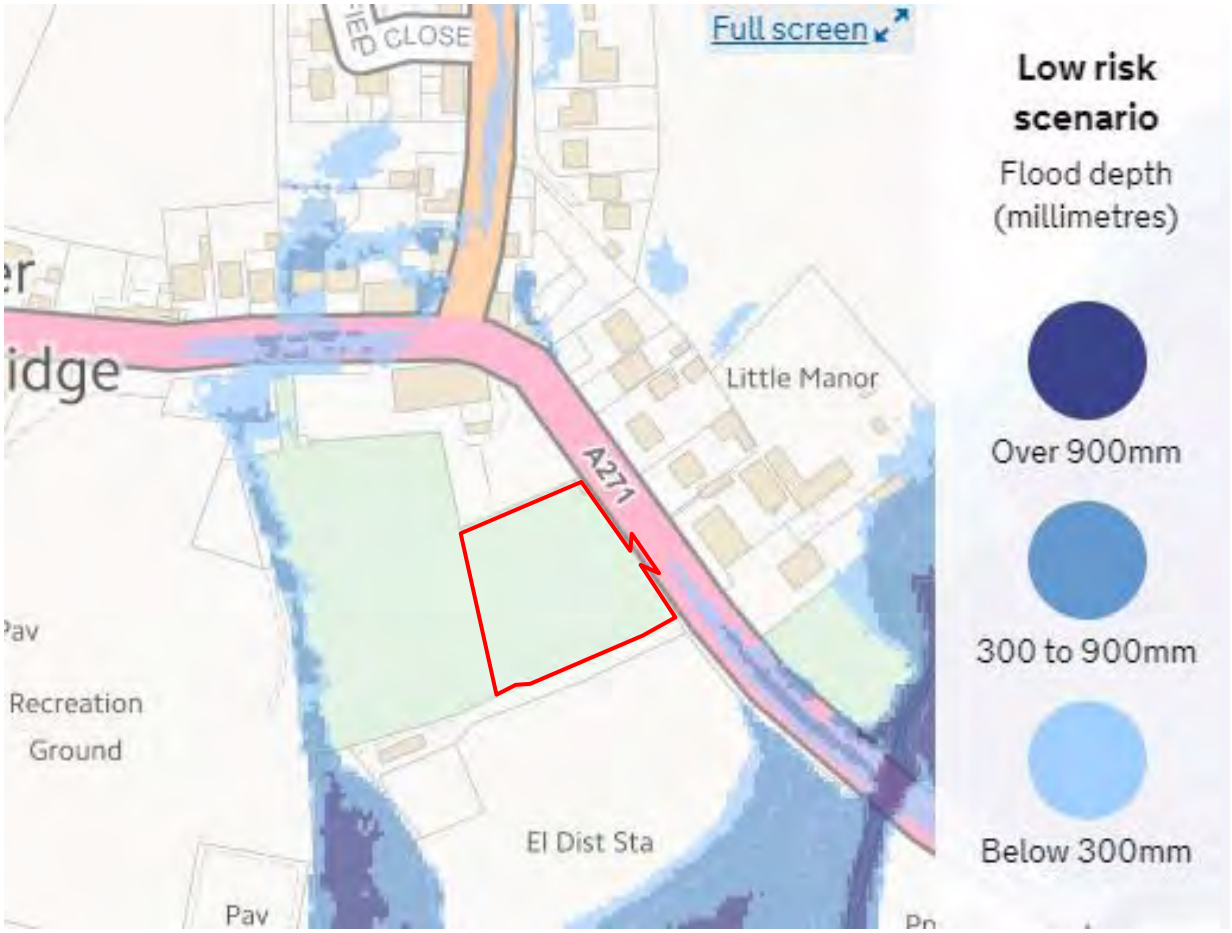
Table 1: Water Levels: Fluvial Undefended (see Levels Node Map for location of Nodes)

	NGR		Modelled Flood Levels in Metres	
			Undefended Annual Exceedance Probability	
Node Reference	Eastings	Northings	1%	0.1%
C0347_MN	557381	110962	16.93	18.36
C0354_MN	557496	111027	16.15	16.87
C0355_MN	557562	111031	14.87	15.57
C0358_MN	557639	111055	16.45	17.12
C0359_MN	557647	111119	15.48	16.13
C0368_MN	557832	111148	15.27	15.81
C0374_MN	557905	111295	16.21	16.71
C0376_MN	557923	111347	16.38	16.89
C0383_MN	557990	111255	15.81	16.26
C0389_MN	558037	111495	17.14	17.62
C0395_MN	558136	111377	16.96	17.47
C0398_MN	558152	111444	17.12	17.6
C0545_MN	557882	111170	16.2	16.7

Table 2: Water Depth: Fluvial Undefended (See Depths Node Map for location of Nodes)

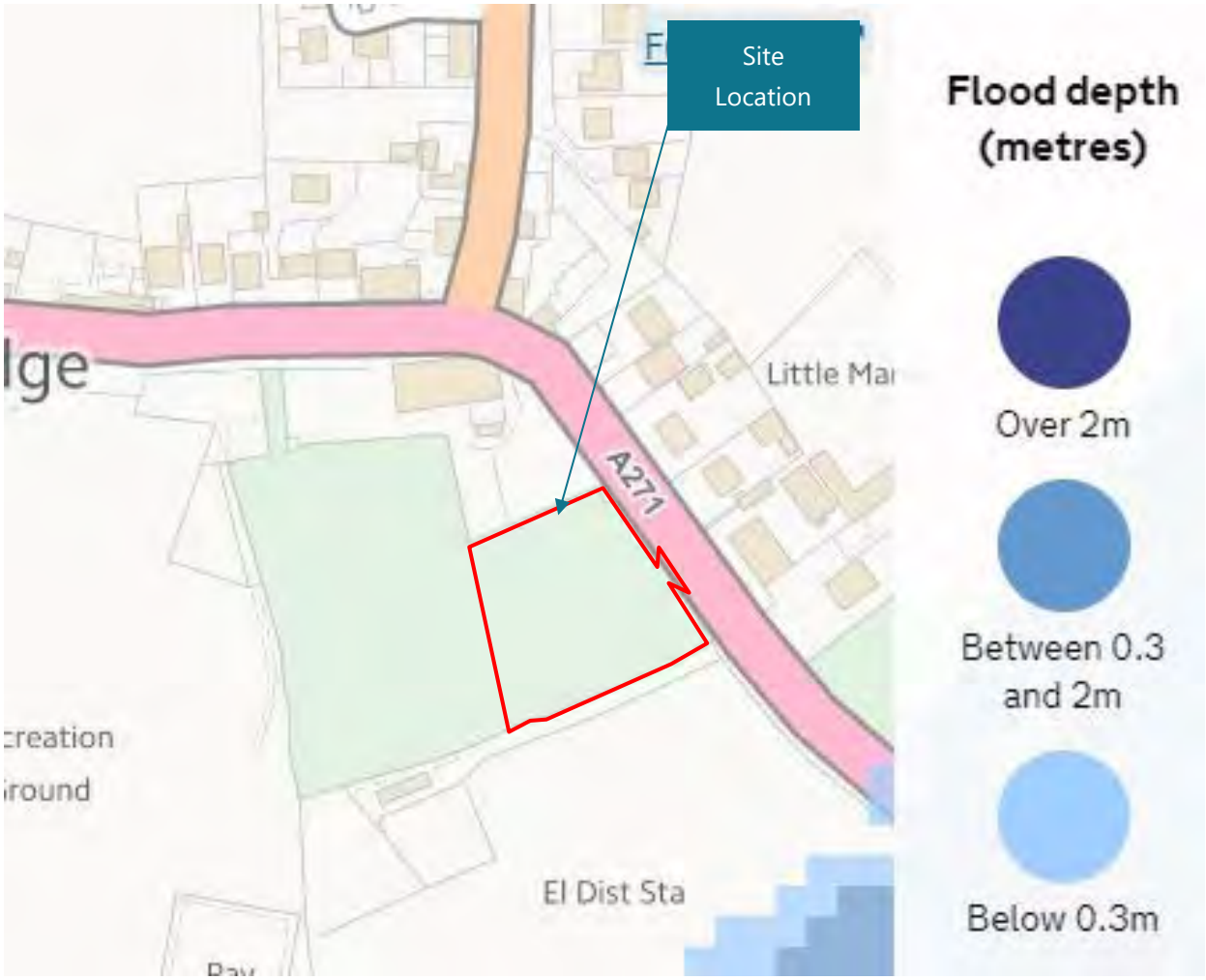
	NGR		Modelled Flood Depth in Metres	
			Undefended Annual Exceedance Probability	
Node Reference	Eastings	Northings	1%	0.1%
1	557701	111324	0.39	0.98
2	557706	111350	N/A	0.27
3	557686	111394	N/A	0.08
4	557831	111374	N/A	0.29
5	557816	111400	N/A	0.12
6	557914	111308	2.40	2.91





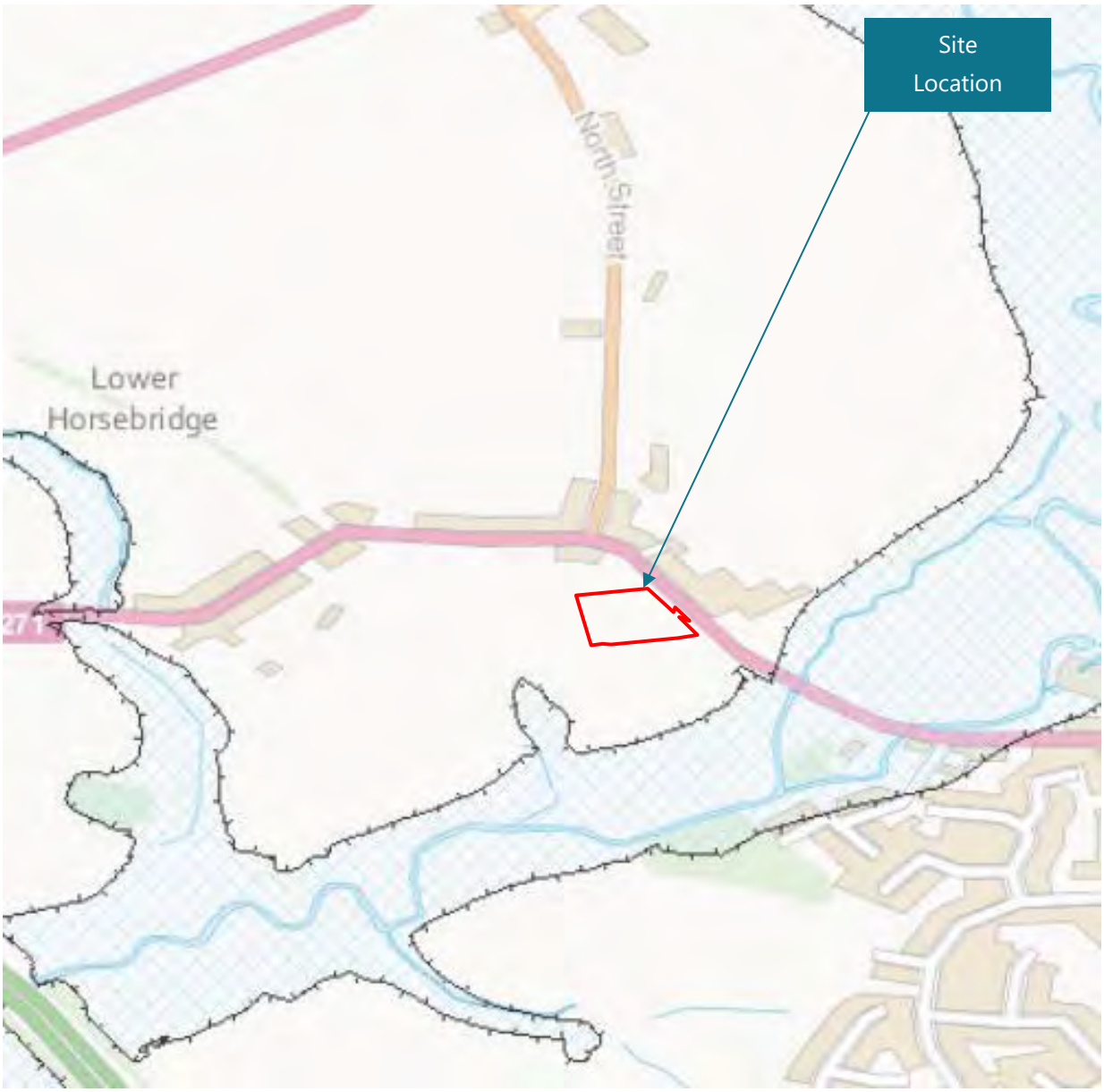
EA's Online Surface Water Flood Depth Map in the 'Low Risk Scenario'
(1 in 1000 years storm event)

The site is clear of flooding in this extreme storm scenario



EA's Online 'Risk of Flooding from Reservoirs' Map

The site is removed from this source of flood risk

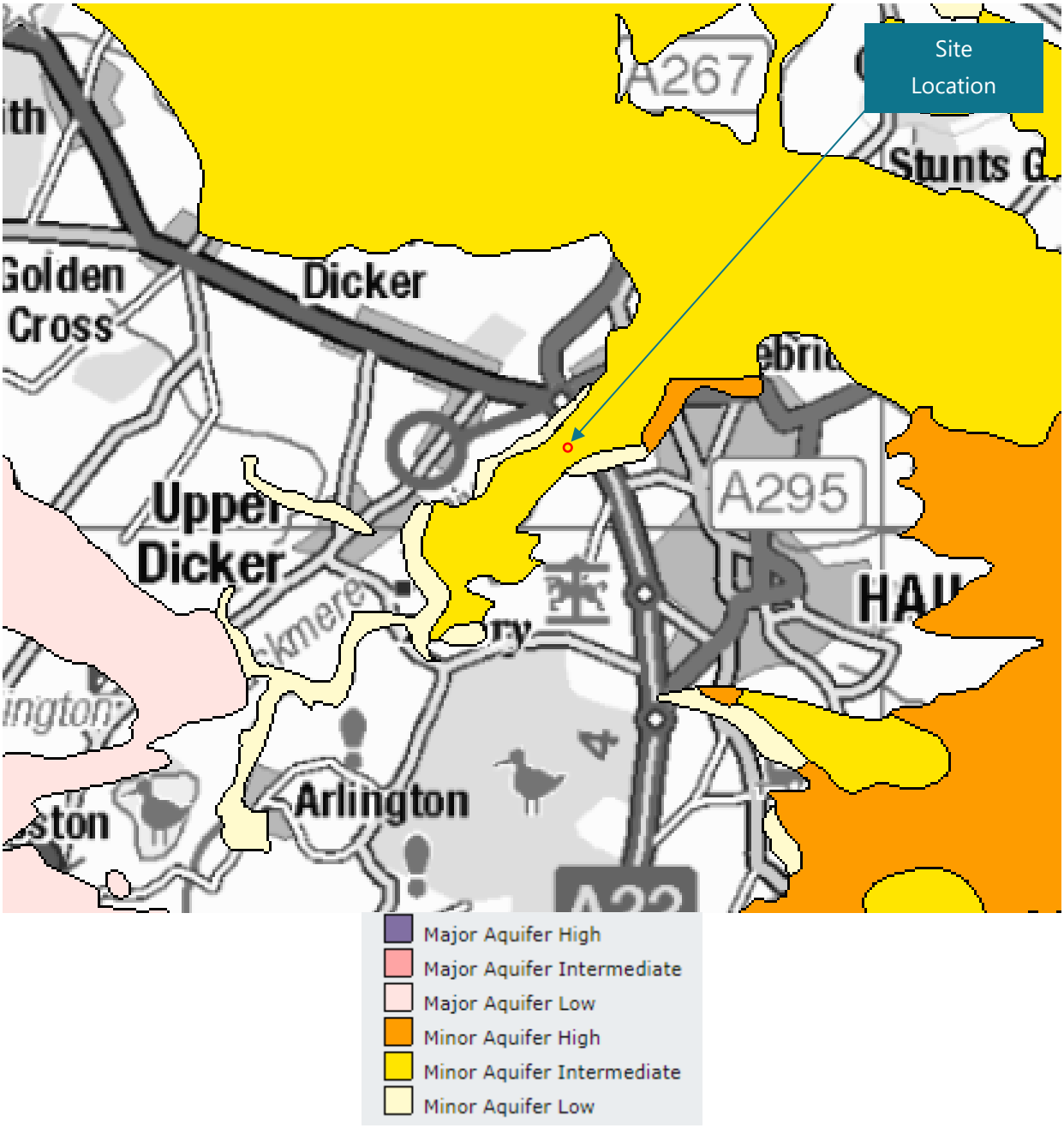


Historic Flood Map

Historic Flood Map

EA's Historic Flood Map

This site is removed from the nearest affected area



EA's Groundwater Vulnerability Map

This site overlies a 'Minor Aquifer Intermediate'

EA's Source Protection Zones Map

The site is removed from all Source Protection Zones

Appendix D

Soakaway Tests

Our Ref: YE7694

15th November 2019

For the attention of GTA Civils and Transport,

Ref: Land at Kings Head Public House, Lower Horsebridge, Hailsham, BN27 4DH

We thank you for your request to undertake permeability testing at the above mentioned site and take pleasure in enclosing the results of this work. The investigation was undertaken on the 11th November 2019 in accordance with your instruction to proceed. This letter describes the work undertaken, presents the data obtained and discusses the results of the tests.

Geology

An examination of the available British Geological Survey data of the area for the site has been examined and indicates that the site has superficial drift deposits composed of the River Terrace Deposits (sand and gravel), and bedrock deposits recorded as the Weald Clay Formation (mudstone).

Fieldworks

The programme of this investigation included the excavation of two trial pits. The locations of the soakaway tests were selected by the client.

During this work, the soils encountered were logged in general accordance with BS 5930: 1990, as amended in 2007, and full descriptions are given on the borehole records, which are also appended to this letter.

Soakaway Tests

During the soakaway tests the water failed to achieve a fall from 75% to 25% of the effective depth of the storage volume in TP01 and TP02. The results obtained from the soakaway tests are summarised below:

Table 1: *Soakaway Test Results*

WS	Soakage Area Dimensions (m)	Depth (m)	Soil Description (Base of TP)	Infiltration Rate (m/sec)	Drainage Characteristics
TP01 test1	1.20 x 0.60	1.50	Soft orange and mottled grey sandy CLAY. Sand is medium to coarse.	N/A	Practically Impermeable
TP02 test1	1.30 x 0.60	1.50	Soft orange and mottled grey sandy CLAY. Sand is medium to coarse.	N/A	Practically Impermeable

Discussion

The soils encountered beneath the site were found to be predominantly CLAY. Groundwater was encountered at depths of approximately 1.50mbgl, which was under sub-artesian pressure, rising to 1.20mbgl. Given the data from the test, it is considered that soakaways are not suitable for this site.

References

Building Research Establishment (BRE) Digest 365, *Soakaway Design*, September 1991.

British Standards Institution (1999) BS5930: *Code of practice for site investigations*, B.S.I., London.

British Standards Institution (2007), Amendment No 1, BS5930: *Code of practice for site investigations*, B.S.I., London.

We trust that this information is of interest and should you have any other requirements do not hesitate to contact us.

For and on behalf of

*Your*Environment

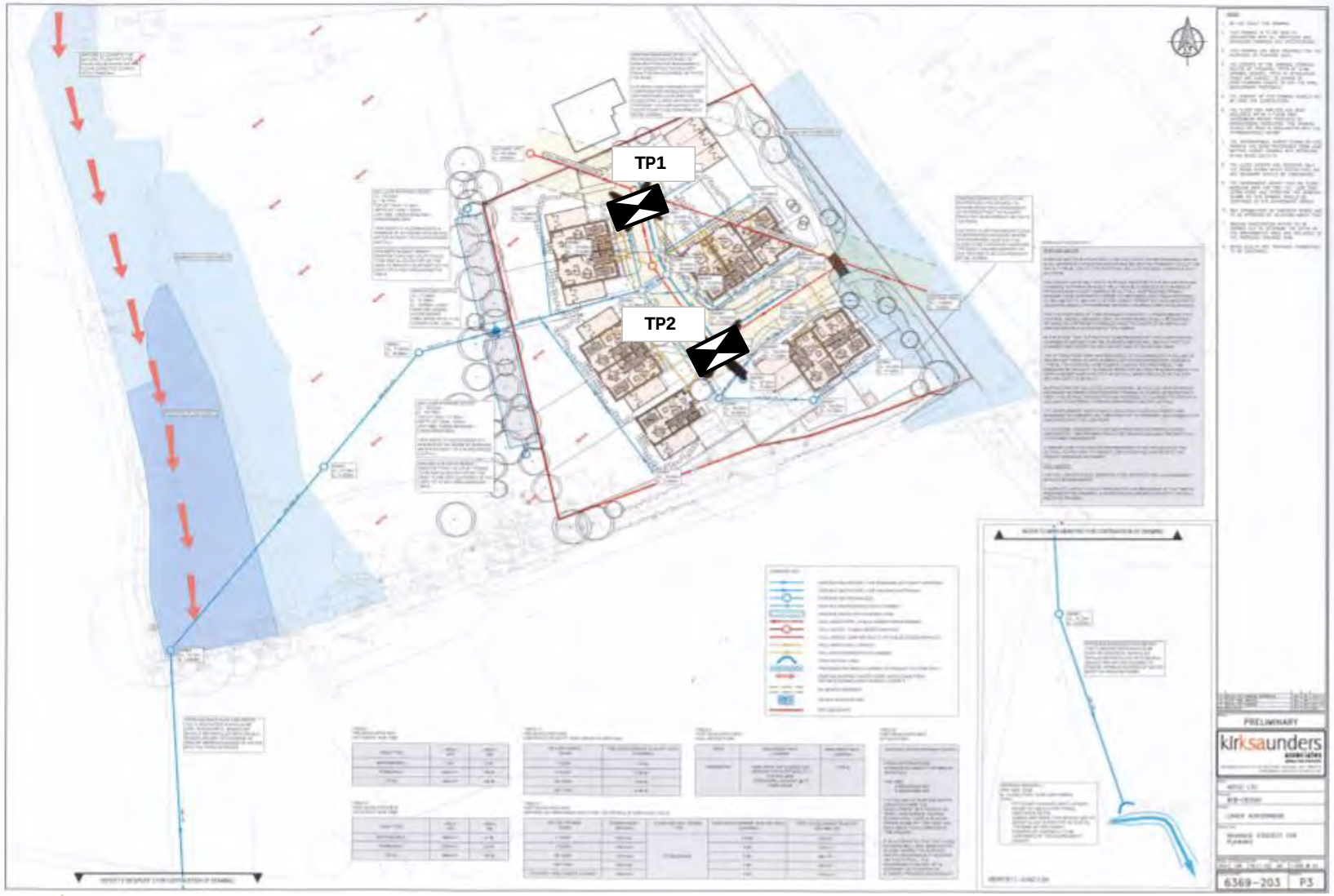
Yours Faithfully,

Nick Hammond

Enc.

Appendix A: Site Investigation Plan
Appendix B: Trial Pit Logs
Appendix C: Soakaway Test Results
Appendix D: Photographs

APPENDIX A: Site Investigation Plan



YourEnvironment

Ground Investigation Location Plan - Not to Scale

YourEnvironment Chilgrove Business Centre, Chilgrove, Nr Chichester, PO18 9HU Tel: 01243 787150 Email: info@yourenvironment.org	**Site Name:** **Land at Kings Head PH**	**Client:** **GTA Civils and Transport**	**Date:** **Nov-19**	**Job No:** **YE7694**

APPENDIX B: Trial Pit Logs

TP01

YourGeotechnical

Trial Pit Log

TrialPit No
TP01
Sheet 1 of 1

Project Name: Kings Head PH.	Project No. YE7694	Co-ords: - Level:	Date 11/11/2019
Location: Hailsham, BN27 4DH.		Dimensions (m): 1.20 × 0.60 Depth 1.50	Scale 1:25
Client: GTA Civils and Transport.			Logged NH

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Loose light brown SAND. Sand is fine to medium.
				0.30			Soft orange sandy CLAY. Sand is medium to coarse.
				1.10			Soft orange and mottled grey sandy CLAY. Sand is medium to coarse.
				1.50			End of Pit at 1.50m

Remarks: Ingress of water.

Stability:

AGS

TP02

YourGeotechnical

Trial Pit Log

TrialPit No
TP02
Sheet 1 of 1

Project Name: Kings Head PH.	Project No. YE7694	Co-ords: - Level:	Date 11/11/2019
Location: Hailsham, BN27 4DH.		Dimensions (m): Depth 1.50 — 1.30 × 0.60	Scale 1:25
Client: GTA Civils and Transport.			Logged NH

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Loose light brown SAND. Sand is fine to medium.
				0.45			Soft orange sandy CLAY. Sand is medium to coarse.
				1.20			Soft orange and mottled grey sandy CLAY. Sand is medium to coarse.
				1.50			End of Pit at 1.50m

Remarks: Ingress of water.

Stability:

AGS

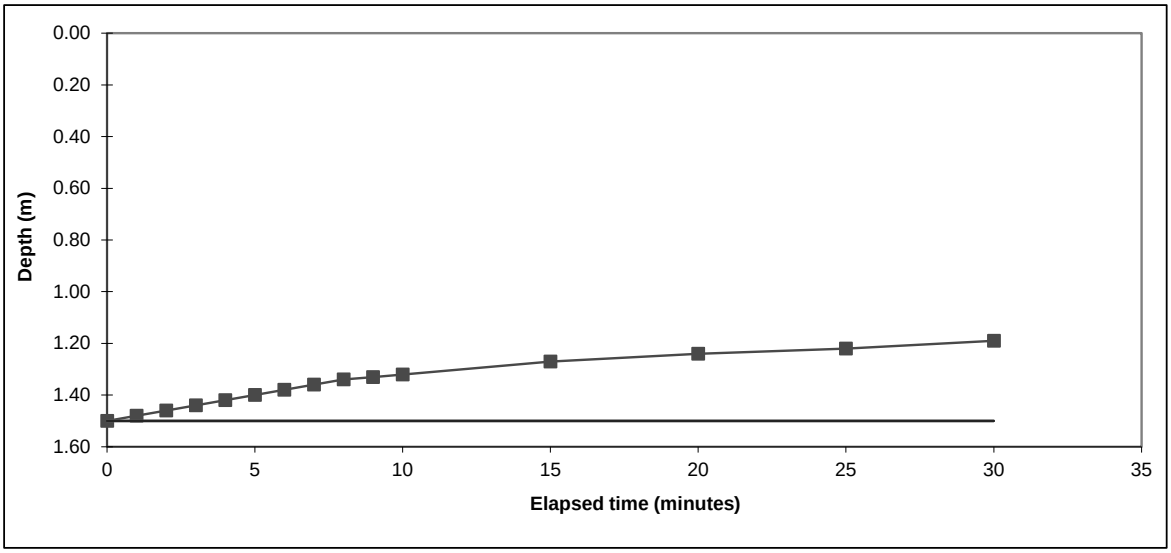
APPENDIX B: Soakaway Test Results

Your Environment

Soakaway Test

Trial Pit No:	TP1	Test No:	1	Date:	11/11/2019
Length (m):	1.200		Datum Height:	0.00	m agl
Width (m):	0.60		Granular infill:	None	
Depth (m):	1.50		Porosity of infill:	1	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	1.500	30	1.190
1	1.480		
2	1.460		
3	1.440		
4	1.420		
5	1.400		
6	1.380		
7	1.360		
8	1.340		
9	1.330		
10	1.320		
15	1.270		
20	1.240		
25	1.220		



Start water depth for analysis (mbgl)	1.50		
75% effective depth (mbgl):	1.50	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.50		
25% effective depth (mbgl):	1.50	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	1.50		
Volume outflow between 75% and 25% effective depth (m^3):			
Mean surface area of outflow (m^2):		0.72	
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	**Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.**

Remarks Results processed following BRE 365 (2007).

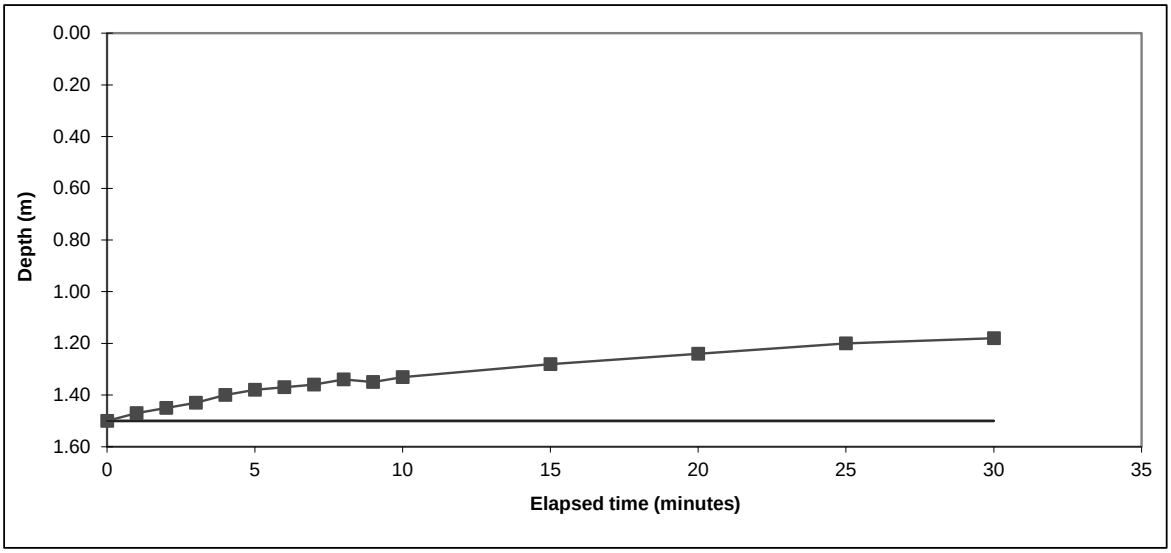
Client:	GTA Civils and Transport	**TP1**
Site:	Land at Kings Head PH	

Your Environment

Soakaway Test

Trial Pit No:	TP2	Test No:	1	Date:	11/11/2019
Length (m):	1.300		Datum Height:	0.00	m agl
Width (m):	0.60		Granular infill:	None	
Depth (m):	1.50		Porosity of infill:	1	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	1.500	30	1.180
1	1.470		
2	1.450		
3	1.430		
4	1.400		
5	1.380		
6	1.370		
7	1.360		
8	1.340		
9	1.350		
10	1.330		
15	1.280		
20	1.240		
25	1.200		



Start water depth for analysis (mbgl)	1.50		
75% effective depth (mbgl):	1.50	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.50		
25% effective depth (mbgl):	1.50	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	1.50		
Volume outflow between 75% and 25% effective depth (m^3):			
Mean surface area of outflow (m^2):		0.78	
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	**Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.**

Remarks Results processed following BRE 365 (2007).

Client:	GTA Civils and Transport	**TP2**
Site:	Land at Kings Head PH	

Appendix E

Proposed Scheme Drawings

SPECIFICATION NOTES

All drainage shall be constructed and commissioned in accordance with BS EN 295 & BS EN752, 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 ST3)

The use of short radius or 90º bends for changes in direction is not permitted, only long or medium radius 45º bends shall be used. All junctions shall be 45º.

All drains shall have granular bed and surround as class 'S' bedding, unless noted otherwise.

All drainage works shall commence from the upstream 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.

ABBREVIATIONS

D307.0	DETAIL NUMBER - SEE DRAINAGE DETAIL SHEET
FD	FOUL DRAIN
SWD	SURFACE WATER DRAIN
FWS	ADOPTABLE FOUL WATER SEWER
SWS	ADOPTABLE SURFACE WATER SEWER
MH	MANHOLE
IC	INSPECTION CHAMBER
SA	SOAKAWAY
FIC	450mm DIA. FOUL INSPECTION CHAMBER - D202.6
SIC	450mm DIA. SURFACE WATER INSPECTION CHAMBER - D202.6
FAC	300mm DIA. FOUL ACCESS CHAMBER - D202.18
SAC	300mm DIA. SURFACE WATER ACCESS CHAMBER - D202.18
CI	CAST IRON
VC	VITRIFIED CLAY
CONC	CONCRETE
PVC-U	POLYVINYL CHLORIDE - UNPLASTICISED
G	SMALL GULLY - D209.0
YG	YARD GULLY - D209.2
RG	ROAD GULLY - D208.1
CPG	CAR PARK GULLY - D208.2
DP	BELOW GROUND DRAIN POINT
SVP	SOIL VENT PIPE DROP
SS	STUB STACK OR DIRECT DRAIN CONNECTION
RP	EXTERNAL RODDING POINT - D213.1
DT	SURFACE WATER DISTRIBUTION TANK
FFL	FINISHED FLOOR LEVEL
SSL	STRUCTURAL SLAB LEVEL
GL	GROUND LEVEL
CL	COVER LEVEL
IL	INVERT LEVEL
SL	SUMP LEVEL
BL	BASE LEVEL
HL	HIGH LEVEL
BD	BACKDROP
CBS	CONCRETE BED & SURROUND
CLASS S	GRANULAR BED & SURROUND
CLASS B	GRANULAR BED

DESIGN NOTES

1. STORAGE DESIGN BASED ON 1 IN 100 YR STORM + 40%.

2. DRAIN POINTS AND LOCATIONS TO BE CONFIRMED BY ARCHITECT.

3. CONTRACTOR TO ESTABLISH LOCATIONS OF ALL EXISTING SERVICES PRIOR TO COMMENCING.

4. EXISTING TREES TO BE PROTECTED WHERE EXCAVATIONS RUN CLOSE.

5. APPROVAL TO BE GAINED FROM SOUTHERN WATER FOR SEWER DIVERSION AND NEW SEWER CONNECTIONS.

KEY

- SURFACE WATER STORAGE: PERMEABLE SURFACING WITH CLEAN STONE SUB-BASE
- Existing Foul water drain
- Proposed Private foul water drain
- Proposed Private surface water drain
- SAC — Surface Water Access Chamber
- SIC — Surface Water Inspection Chamber
- FAC — Foul Water Access Chamber
- FIC — Surface Water Inspection Chamber
- DT — Permavoid Distribution tank
- SVP
- Rodding point
- Proposed land drain for groundwater relief

Rev	Amendments	Date	Dsn	Chk
P04	Updated to LLFA comments	30.04.20	PH	MR
P03	Tank removed	25.11.19	TPL	MR
P02	Updated for planning	19.11.19	TPL	MR
P01	INITIAL ISSUE	31.10.19	TPL	MR

Status: PRELIMINARY

Client: DECIMUS

Architect: BDB DESIGN

Project: LAND AT LOWER HORSEBRIDGE HAILSHAM

Title: DRAINAGE STRATEGY

Date: OCT 2019 | Scale @ A0: 1:200

Clients Ref. | Project Ref.: 10273

gta Civils & Transport
Gloucester House, 66a Church Walk,
Burgess Hill, West Sussex, RH15 9AS
Tel.01444 871444 Web: www.gtacivils.co.uk

Drawing Number: 10273/1101 | Rev.: P04

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.

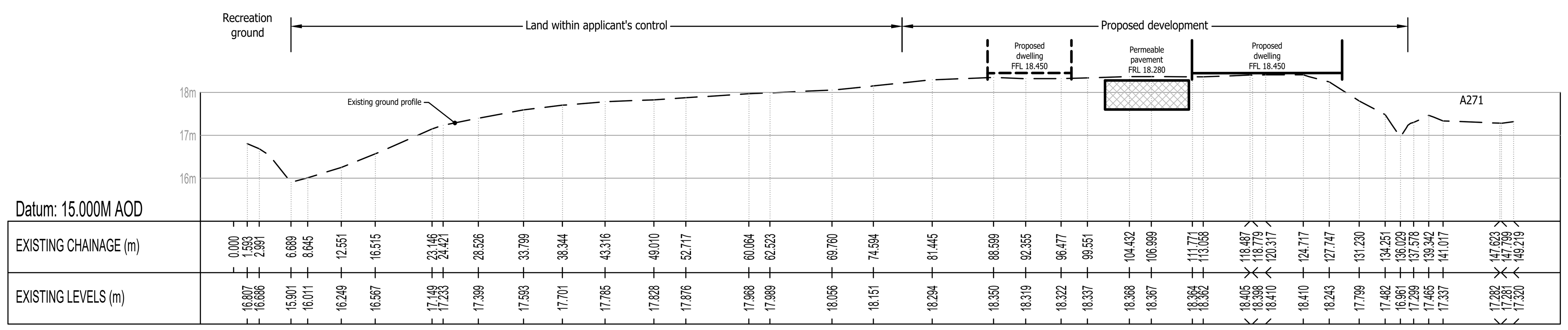
3. Do not scale. All dimensions and levels to be site confirmed.

4. This drawing shall be read in conjunction with all relevant architects, consultants drawings and specifications, together with H&S plan requirements.

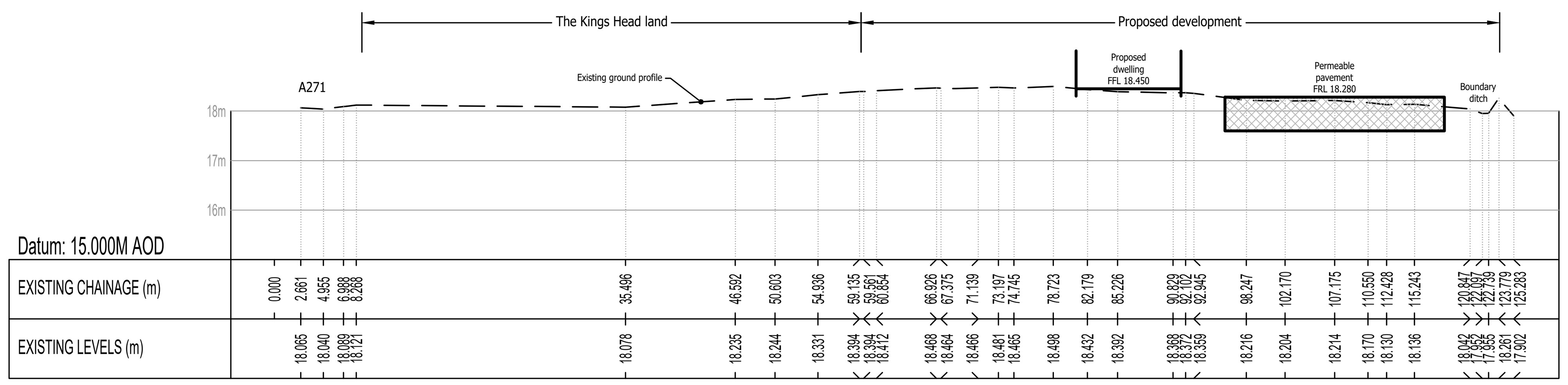
5. Copyright : This drawing must not be copied, amended nor reproduced without the prior written agreement of gta.

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.

PLAN
1:500



SECTION A-A
Horiz. 1:500; Vert. 1:100



SECTION B-B
Horiz. 1:500; Vert. 1:100

Rev	Amendments	Date	Dsn	Chk
P01	INITIAL ISSUE	30.04.20	PH	MR

Status: PRELIMINARY

Client: DECIMUS

Architect: BDB DESIGN

Project: LAND AT LOWER HORSEBRIDGE HAILSHAM

Title: SITE SECTIONS

Date: APRIL 2020

Scale @ A1: AS SHOWN

Clients Ref.:

Project Ref.: 10273

gta Civils & Transport

Gloucester House, 66a Church Walk,
Burgess Hill, West Sussex, RH15 9AS
Tel.01444 871444 Web: www.gtacivils.co.uk

Drawing Number: 10273/1102

Rev.: P01

Appendix F

East Sussex Highways Correspondence

From: Roger Archer-Reeves [redacted]
Sent: 07 April 2020 10:29
To: Phil Hurst [redacted]
Cc: Sonia Holman [redacted]
Subject: : RE: Case 447829 - Request to discharge into Highway Drainage - Lower Horsebridge, Hailsham

Phil

Further to our two conversations regarding the above development I have spoken with colleagues and consider the most pragmatic way forward as below: -

Connecting into the highway system is the best option available.

I appreciate some investigation has been done but I would want to see some proof of the integrity of the system, ideally by CCTV.

The agreement for a connection to be subject to the following: -

- Discharge rate into the highway system be as low as possible, we discussed 2 litres/ second;
- A CCTV survey showing the condition of the highway drainage system;
- The developer pays for any improvements or rehabilitation required for the system from point of connection to outfall into the Cuckmere

I believe there may be a need for some attenuation built into the system prior to the point of connection.

Naturally happy to discuss further.

Regards

Roger

Appendix G

Micro Drainage Calculation Sheets

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.146	Urban	0.000
SAAR (mm)	800	Region Number	Region 7

Results l/s

QBAR Rural	0.7
QBAR Urban	0.7
Q100 years	2.4
Q1 year	0.6
Q30 years	1.7
Q100 years	2.4

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	20.000	Volumetric Runoff Coeff.	0.750	Min Design Depth for Optimisation (m)	1.200
Ratio R	0.392	PIMP (%)	100	Min Vel for Auto Design only (m/s)	1.00
Maximum Rainfall (mm/hr)	50	Add Flow / Climate Change (%)	0	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.200		

Designed with Level Soffits

Network Design Table for Storm

« - 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	9.509	0.063	150.9	0.170	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	4.071	0.030	135.7	0.000	0.00	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)
1.000	50.00	5.19	17.600	0.170	0.0	0.0	0.0	0.82	14.4«	23.0
1.001	50.00	5.27	17.530	0.170	0.0	0.0	0.0	0.86	15.2«	23.0

Network Design Table for Storm

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
1.002	14.707	0.100	147.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	34.166	0.975	35.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	33.971	0.950	35.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.005	4.049	0.050	81.0	0.000	0.00	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)
1.002	50.00	5.57	17.500	0.170	0.0	0.0	0.0	0.83	14.6«	23.0
1.003	50.00	5.90	17.400	0.170	0.0	0.0	0.0	1.71	30.1	23.0
1.004	50.00	6.24	16.425	0.170	0.0	0.0	0.0	1.69	29.8	23.0
1.005	50.00	6.30	15.450	0.170	0.0	0.0	0.0	1.12	19.8«	23.0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.005		16.300	15.400	15.400	0	0

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 4, DS/PN: 1.003, Volume (m³): 6.4

Unit Reference	MD-SHE-0069-2000-0850-2000	Sump Available	Yes
Design Head (m)	0.850	Diameter (mm)	69
Design Flow (l/s)	2.0	Invert Level (m)	17.400
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	100
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)	0.850	2.0	Kick-Flo®	0.535	1.6
Flush-Flo™	0.257	2.0	Mean Flow over Head Range	-	1.8

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.7	0.600	1.7	1.600	2.7	2.600	3.3	5.000	4.5	7.500	5.5
0.200	2.0	0.800	1.9	1.800	2.8	3.000	3.6	5.500	4.7	8.000	5.7
0.300	2.0	1.000	2.2	2.000	3.0	3.500	3.8	6.000	4.9	8.500	5.8
0.400	1.9	1.200	2.3	2.200	3.1	4.000	4.1	6.500	5.1	9.000	6.0
0.500	1.7	1.400	2.5	2.400	3.2	4.500	4.3	7.000	5.3	9.500	6.1

Storage Structures for Storm

Porous Car Park Manhole: 2, 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)	17.600	Depression Storage (mm)	5
Max Percolation (l/s)	125.6	Width (m)	10.0	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	45.2	Membrane Depth (mm)	0

Summary of Critical Results by Maximum Level (Rank 1) for Storm

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 1 Number of Storage Structures 1 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 557744 111522 TQ 57744 11522	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm) 300.0 DTS Status OFF Inertia Status ON
Analysis Timestep Fine DVD Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years)	100
Climate Change (%)	40

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
1.000	2	360 minute 100 year Winter I+40%	18.300	18.254	0.504	0.000	0.25	89.410	79.802	3.2	FLOOD RISK
1.001	2	360 minute 100 year Winter I+40%	18.300	18.247	0.567	0.000	0.28	0.952	79.135	3.0	FLOOD RISK
1.002	2	360 minute 100 year Winter I+40%	18.300	18.244	0.594	0.000	0.22	0.886	78.487	2.9	FLOOD RISK
1.003	4	360 minute 100 year Winter I+40%	18.250	18.235	0.685	0.000	0.07	6.280	74.046	2.0	FLOOD RISK
1.004	4	960 minute 100 year Winter I+40%	17.700	16.451	-0.124	0.000	0.07	0.027	166.812	2.0	OK
1.005	4	960 minute 100 year Winter I+40%	16.300	15.487	-0.113	0.000	0.14	0.040	166.810	2.0	OK

Appendix H

SuDS Maintenance Plan

Maintenance Responsibilities

To ensure ongoing compliance with the requirements of the maintenance schedule, an Estate Management Company will be set up by the Applicant (site owner) to administer the site wide infrastructure including all the drainage items listed in this Plan.

It is the overarching responsibility of the **site owner** to ensure the Drainage Infrastructure is maintained in accordance with this Maintenance Plan.

Contamination or Dilution of Spillage

The Environment Agency would prefer all spillages on any highway 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 the highway it is important that the Environment Agency are 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 design of the drainage on this site, a number of measures have been put in place to prevent any pollution entering the groundwater such as Green roofs and permeable paving. The permeable paving sub-base is lined with a geotextile fabric.

In the event of a spillage on site it is the responsibility of the Management 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.

Environment Agency – Emergency Contact Number

In the event of a spillage the Environment Agency should be contacted to notify the event and seek advice. The Environment Agency's Incident Hotline is **0800 80 70 60** (Freephone 24hrs).

Permeable Paved Areas

Regular inspection and maintenance are important for the effective operation of porous paved areas.

The surfaces should be kept clear of debris and/or cleaned as necessary.

Damaged surfaces should be repaired as soon as possible. Please contact the contractor who installed the surfacing.

Areas subject to snow, ice and frost can be treated using Rock Salt; however, this may be harmful to plants and can damage surrounding metal or concrete surfaces. Excessive snow should be shovelled away using a plastic snow shovel, taking care not to damage the surfacing. Do not use a wire brush ice remover.

Permeable paving maintenance and monitoring requirements are described in the following table:

Schedule	Action	Frequency
Regular Maintenance	Brushing and vacuuming.	Three times per year at end of winter, mid-summer, after autumn leaf fall, or as required based on specific observations
Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As required
Remedial Actions	Remedial work to any depressions, rutting and cracked or broken blocks or deformations in the permeable paving (if applicable) considered detrimental to the structural performance.	As required

	Rehabilitation of surface and upper structure.	As required
Monitoring	Initial Inspection Inspect for evidence of poor operation and / or weed growth. Inspect silt accumulation rates and establish appropriate brushing techniques	Monthly for 3 months after installation. 3 monthly & 48hrs. after large storms. Annually.

Drains, Manholes, Gullies, Silt Catchpits

Regular inspection/maintenance is required to ensure the effective long-term operation of private drains, manholes, gullies & silt pits.

Check hydrobrake orifice is clear and retention tank door is closed. Check function of retention tank door and oil if necessary.

Operation and maintenance requirements for drains, gullies and silt pits 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. Debris removal from gullies & silt pits, channel drains (where may cause risks to performance). Lift and inspect receiving manholes to check for any blockages. **Particular attention should be given to the control manhole containing the flow control device.**	6 Monthly intervals Weekly Six-monthly

Remedial Actions	Repair any damaged gully gratings or manhole covers. Replace / fix any loose channel drain covers.	As required 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

Inspection of manholes and removal of silt from silt catchpits should be undertaken by a specialist contractor.

gtaCivils
Consulting Engineers