FLOOD RISK ASSESSMENT

GBH WHELER WILL TRUST

HAM ROAD, FAVERSHAM, KENT.

MAY 2016

CS/11311

Contents

APPENDICES

1 EXECUTIVE SUMMARY

1.1 Overview

1.1.1 The outline planning proposals comprise of a residential development of up to 30 dwellings on a 1.1 hectare green field site at Ham Road, Faversham, Kent.

1.1.2 The site specific flood risk assessment determined that the potential development site in question is located in Flood Zone 1; low risk of flooding from rivers or other sources of flooding.

1.1.3 The development is located entirely within Flood Zone 1 and as such is considered to satisfy the sequential test. Planning Practice Guidance Table 1, "Flood Zones", determines all classes of land development are appropriate in Flood Zone 1.

1.1.4 Planning Practice Guidance Table 2, "Flood Risk Vulnerability Classification", states that buildings used for dwellings are classified as "more vulnerable".

1.1.5 Planning Practice Guidance Table 3, "Flood Risk Vulnerability and Flood Zone Compatibility", confirms that all forms of development situated in Flood Zone 1 are appropriate and an exception test is not required.

1.1.6 A Sustainable Urban Drainage System (SUDs) will be provided to deal with the surface water generated from the development to ensure that flood risk is not increased elsewhere.

1.1.7 This site specific flood risk assessment also determines that the development site is at low risk of flooding from other sources.

2 INTRODUCTION

2.1 General

2.1.1 DHA Environment has been commissioned by GBH Wheler Will Trust to provide a Flood Risk Assessment/Drainage Statement showing the possible impact of flooding on a proposed development of up to 30 residential dwellings Ham Road, Faversham, Kent. This report forms part of an outline planning application for the site. It should be recognised that the proposals in question are entirely indicative at this stage and are likely to be subject to change at the detailed design stage.

2.2 Scope and Objectives

2.2.1 This FRA has been carried out in accordance with the National Planning Policy Framework (NPPF). The NPPF requires that a FRA is prepared for all developments that exceed one hectare in size located in Flood Zone 1. The FRA should include the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off.

2.2.2 Given the site is in excess of 10 units it is considered to be major development as set out in Article 2(1) of the Town and Country Planning (Development Management Procedure) (England) Order 2010 and as such this report has been prepared to outline foul and surface drainage for the site. This report covers the following issues:

- A summary of the existing development and drainage;
- Summary of the proposed development;
- Site Specific Flood Risk Assessment;
- Principles for the proposed foul and surface water drainage.

2.2.3 The findings, recommendations and conclusions of this report are based on information obtained from a variety of external sources which are understood to be reputable. DHA Environment cannot guarantee the reliability of any data from third parties and no liability can be accepted for any erroneous information or the conclusions drawn from it.

3 EXISTING DEVELOPMENT

3.1 Site Location

3.1.1 The existing site is located at Ham Road, Faversham, Kent and is centred on grid reference 601323, 162226. An aerial photograph of the site and surrounding area is shown on Figure 3-1 below. The site is indicated by the red line.

Figure 3-1 – Site Location (courtesy Google maps)

3.2 Existing Site

3.2.1 A topographical survey for the site is shown on drawings SDS 204810.01, SDS 204810.02, SDS 204810.03 and SDS 204810.04 contained in **Appendix 1**. The site generally falls from a high point of 8.21m AOD in the Southern corner to a low point of 5.15m AOD in the Northern corner. From the Northern corner of the site levels generally fall away to the North East. Ham Lane to the North is elevated from the site at a level of between 8.38m AOD and 8.0m AOD.

3.2.2 The development can be seen to have the following boundary conditions:

- North - Ham Road.

- South/West - Residential development.
- East - Green fields.

3.3 Existing Drainage Regime and Surface Water Runoff

3.3.1 Based on the existing topography, the surface water can be seen to drain overland from the South to the North.

3.3.2 The proposed contributing areas plan can be seen on drawing 11311-D-01 contained in **Appendix 2.** Table 1 below shows the total site area for the catchment and the proposed area that will contribute to surface water runoff.

Catchment Reference	Total Catchment area (Hectares)	Total contributing area (Hectares)
Total	1.1	0.499

Table 3-1 – Summary of Catchment Areas

3.3.3 The existing peak discharge rates from the catchment has been calculated by using the Flood Studies Report ICP (SUDS) method based on the total contributing areas shown in Table 3-1 above. The calculations can also be seen in **Appendix 2** and have been summarised as follows:-

Return Period	Qbar (l/s)	1 in 1 year	1 in 30 years	1 in100 years
Total	**2.3**	1.9	5.1	7.2

Table 3-2 - Summary of green field runoff rates

3.4 Existing Public Sewers

3.4.1 Southern Water asset plans are shown in **Appendix 3** and indicate the location of any public foul, combined and surface water sewers in the area. These records do not indicate any private drainage that may be present.

3.4.2 In October 2011 the ownership of any private sewer serving more than one property was automatically transferred to the Water Authority, although many of these sewers are yet to be recorded on the asset plans. Known existing drainage can be summarised as follows.

Surface Water

3.4.3 Southern Water asset plans show there to be no public surface water sewers within the development site its self.

3.4.4 The nearest surface water sewer is located in Broomfield Road and drains away to the South.

Foul Water

3.4.5 Southern Water asset plans show there to be no public surface water sewers within the development site itself.

3.4.6 A network of foul water sewers can be seen to serve the existing residential development to the south east of the site on Springhead Road, Larksfield Road and Fostall Road. These sewers all drain away to the south east.

3.4.7 To the West of the site, pumping station 220P pumps foul water from the North via a rising main into a 150mm sewer on Broomfield Road. From here the sewer drains away to the South East.

Combined Sewer

3.4.8 Southern Water asset plans show there to be no combined sewers within the development site itself or the surrounding area.

3.5 Suitability for Infiltration SUDs

3.5.1 A report from the British Geology Survey has been obtained to assess the properties of the sub surface and the suitability for the installation of infiltration SUDs on the site. This assesses constraints such as geology, ground stability and groundwater quality protection. A copy of the report is contained in **Appendix 4** and can be summarised as follows.

Geology

3.5.2 The report summarised that the site is located over the Thanet Formation, comprising of sand, silt and clay. Superficial head deposits comprising of clay and silt are found to overly the bedrock.

Ground Instability

3.5.3 The report summarised that ground instability problems are probably present and increased infiltration may result in ground instability. These have been identified to be due to collapsible ground.

Groundwater

3.5.4 Information published by the Environment Agency shows the site to lay outside any source protection zones. Groundwater is likely to be less than 3m below the ground surface for at least part of the year.

Permeability

3.5.5 The bedrock deposits permeability is likely to be spatially variable, with infiltration rates expected to vary between low and high. Superficial deposits are likely to be poorly draining with low to very low infiltration rates.

Summary

3.5.6 Based on the above, the report concluded that the site has opportunities for bespoke infiltration SUDs although the design may be influenced by the ground conditions. This is due to the constraints such as the shallow groundwater, ground instability and the clay superficial deposits that exhibits low infiltration rates.

4 SITE SPECIFIC FLOOD RISK ASSESSMENT

4.1 Proposed Development

4.1.1 The proposed residential development consists of the erection of up to 30 residential dwellings with associated parking and landscaping on a 1.1 hectare green field site at Ham Road, Faversham, Kent. The purpose of this Flood Risk Assessment is to demonstrate the acceptability of development on this site in relation to flooding. The proposed indicative master plan is shown within **Appendix 5**.

4.2 Flood Risk Zones

4.2.1 The National Planning Policy Framework provides guidance on assessing flood risk and seeks to guide development away from areas at risk of flooding from all sources. Planning Practice Guidance defines a number of Flood Zones based on the probability of flooding and provides guidance on the most appropriate form of development within each zone. The flood risk can be summarised as follows:

Flood Zone	Annual probability in any year	
	River Flooding	Sea Flooding
Zone 1 : Low probability	Less than 1:1000 (<0.1%)	Less than 1:1000 (<0.1%)
Zone 2: Medium probability	Between 1:1000 and 1 in 100 (0.1% -1%)	Between 1:1000 and 1 in 200 (0.1% - 0.5%)
Zone 3a : High probability	Greater than 1:100 (>1%)	Greater than 1:200 (>0.5%)
Zone 3b: functional Floodplain	Greater than 1 in 20 (>5%)	N/A

Table 4-1 – NPPF Guidance

4.2.2 Reference has been made to the Environment Agency product 4 report (Ref KSL 2600 TT) that can be seen in **Appendix 6**. The flood risk map contained in this report indicates that the proposed development is situated within Flood Zone 1. This Flood Zone comprises of land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%) in any year. The product 4 report also provides flood level information for various return periods for both current and future epochs for various nodes around the site area.

4.2.3 **Table 4-2** below is an extract from the product 4 report that details the modelled flood levels for node 4 which is the closest to the site.

	Defended flood levels (m AOD)		
Node	2012	2070	2115
4	0	0	5.51

Table 4-2 – Summary of defended flood levels for a 1 in 200 year event at node 4

4.2.4 This data shows there to be no flooding for the 1 in 200 year events in 2012 and 2070 although flooding to a level of 5.51m AOD will occur in 2115.

4.2.5 The defended flood level of 5.51m AOD that was seen at node 4 has been extrapolated onto the site topographical survey to indicate a more accurate estimation of the extent of flooding. This can be seen on drawing 11311-D-02 seen in **Appendix 8**.

4.2.6 The proposed access in the northern corner of the site will be raised to a level of 8.03m AOD to tie in with Ham Road with embankments on either side of the road. These embankments contain the flood to a small area in the northern corner of the site and the flooding therefore does not reach any of the development on the proposed site.

4.2.7 Even though the extrapolated flood levels indicate that flooding will not reach housing in the proposed development, the ground floor levels will be located a minimum of 300mm above the 5.51m AOD flood level (5.81m AOD) and any sleeping accommodation will be at least 600mm above this level (6.11m AOD).

4.2.8 The National Planning Policy Framework (paragraph 100), requires that a risk based Sequential Test should be applied at all stages of planning with the aim of steering new development to areas at the lowest probability of flooding (Zone 1).

4.2.9 The proposed development is located entirely within Flood Zone 1 and as such it is considered to satisfy the Sequential Test.

4.2.10 Planning Practice Guidance Table 2, "Flood Risk Vulnerability Classification", states that buildings used for dwellings are classified as "more vulnerable".

4.2.11 Planning Practice Guidance Table 3, "Flood Risk Vulnerability and Flood Zone Compatibility", confirms that 'more vulnerable' developments situated in Flood Zone 1 are appropriate and an exception test is not required for this development.

4.3 Strategic Flood Risk Assessment

4.3.1 Reference has been made to the Strategic Flood Risk Assessment (SFRA) produced by Halcrow in October 2009. The map contained in **Appendix 7** does not indicate any significant risk from rivers, sewers, groundwater and surface water.

River and Tidal Flooding

4.3.2 The nearest surface water feature is a lake approximately 120m to the North East of the site and Faversham Creek approximately 500m to the South East of the site. Environment Agency maps show the site to be located within Flood Zone 1 and remote from the sea, and as such the risk of flooding from this source can be viewed as low risk.

Flooding from Sewer

4.3.3 Sewer flooding can occur due to the limited capacity of the sewer system causing backing up, blockages along the system, or due to high water levels at the sewer outlet.

There are no records in the SFRA of flooding from sewers and as such the risk of flooding from sewers can be viewed as low.

Flooding from Artificial Sources

4.3.4 There are no artificial sources in the area and as such the risk from this source can be viewed as low.

Flooding from Groundwater

4.3.5 There are no records in the SFRA regarding ground water flooding in the vicinity of the site and as such the risk from this source can be viewed as low.

Surface Water Flooding

4.3.6 Surface water generated by the proposed development will be dealt with on site via a Sustainable Urban Drainage System. As such, there is low risk in causing off-site flooding as a result of the development and can therefore be viewed as low risk.

Flood Risk summary

Sources	High	Medium	Low	
River and Tidal Flooding			X	Site located within Flood Zone 1, at low risk from tidal and fluvial flooding
Flooding from Sewer			X	No recorded instances of surface water or sewer flooding in site area.
Flooding from Ground Water			X	No recorded instances of ground water flooding in site area.
Flooding from artificial sources			X	None in the area.
Surface Water Flooding			X	SUDs scheme to be implemented to restrict flows to existing rates.

Table 4-3 – Summary of potential Flooding Sources

5 MANAGEMENT OF SURFACE WATER ON THE DEVELOPMENT

5.1 Proposed Development

5.1.1 The proposed residential development consists of the provision of up to 30 dwellings on a 1.1 hectare green field site of which approximately 0.50 hectares will consist of impermeable areas such as roofs, roads and parking areas.

5.2 Aims

5.2.1 Sustainable Urban Drainage (SUDs) techniques will be used to deal with the surface water generated by the development. This will replicate the existing drainage regime by dealing with the surface water at source, as not to increase the risk of downstream flooding. The SUDs scheme has the following aims:

- To reduce the water demand arising from the development;
- To minimise the surface water runoff from the site;
- To mitigate the loss of water to ground waters through urban runoff;
- To incorporate infiltration systems where practicable;
- To prevent contamination to water course and ground water.

5.3 Proposed Drainage Strategy

5.3.1 The principles of the proposed surface water drainage are shown on drawing 11311-D-02 contained in **Appendix 8**. Sustainable Urban Drainage (SUDs) techniques will be used to deal with the surface water drainage generated by the development. This will replicate the existing drainage regime by dealing with the surface water at source, so as not to increase the risk of downstream flooding.

5.3.2 As indicated in the report from the British Geology Survey, the use of infiltration SUDs on the site is unlikely to be suitable to due to the shallow depth of the water table and the presence of the poorly draining Thanet formation.

5.3.3 It is proposed to drain the site via a system of gravity sewers draining into an above ground attenuation basin located on the North East corner of the site. From the attenuation basin, water will be discharged via a Hydro-brake flow control into a ditch at the green field runoff rate. The trench will drain to the North East alongside Ham Road for approximately 125m, before draining to the North West across Ham Road and into a lake in the adjacent development.

5.3.4 If required, an alternative surface water outfall can be provided by extending the watercourse described above approximately 600m to the north and connecting to an

existing water course to the North of Ham Road. This is all within the ownership of the applicant.

5.3.5 The attenuation pond has been modelled using Windes and flows and have been attenuated to the green field runoff rate of 2.3l/s. This provides an attenuation volume of 510m^3. The attenuation tank has been designed to accommodate all return periods up to and including the 1 in 100 year rainfall event with a 30% allowance for climate change. Calculations are shown in **Appendix 8**.

5.3.6 The gravity drainage system will contain pollution control features such as trapped outlets on both rainwater pipes and highway gullies along with catchpit manholes to trap any sediment. The design of the attenuation basins will also incorporate sediment traps to provide a further treatment stage before discharging to the proposed watercourse. The proposed water course will be planted with reed beds to provide additional treatment before discharging into the existing water body to safeguard the water quality in the Swale SPA.

6 FOUL DRAINAGE

6.1 Proposed Foul Drainage

6.1.1 It is proposed that the foul water from the development is collected in a system of gravity sewers discharging into an onsite foul water pumping station. Foul flows are to be pumped via a rising main into manhole 3004 located to the south of the site on Broomfield Road.

6.1.2 A peak foul water flow of 1.39 l/s has been calculated for a development of 30 units based on the daily flow rate of 4000 litres given in Sewers for Adoption 7th Edition.

6.1.3 The results of the capacity check are shown in **Appendix 9**. This indicates that there is adequate capacity in the existing network to accommodate the foul flow generated from the proposed development.

6.1.4 No remedial work would be required to accommodate the proposed development because the additional flow into manhole 3004 will not cause additional surcharge or flooding to the existing system.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1.1 The planning application site has an overall area of 1.1 hectares, 0.5 hectares of which will be developed with up to 30 residential units with associated roads and hardstanding.

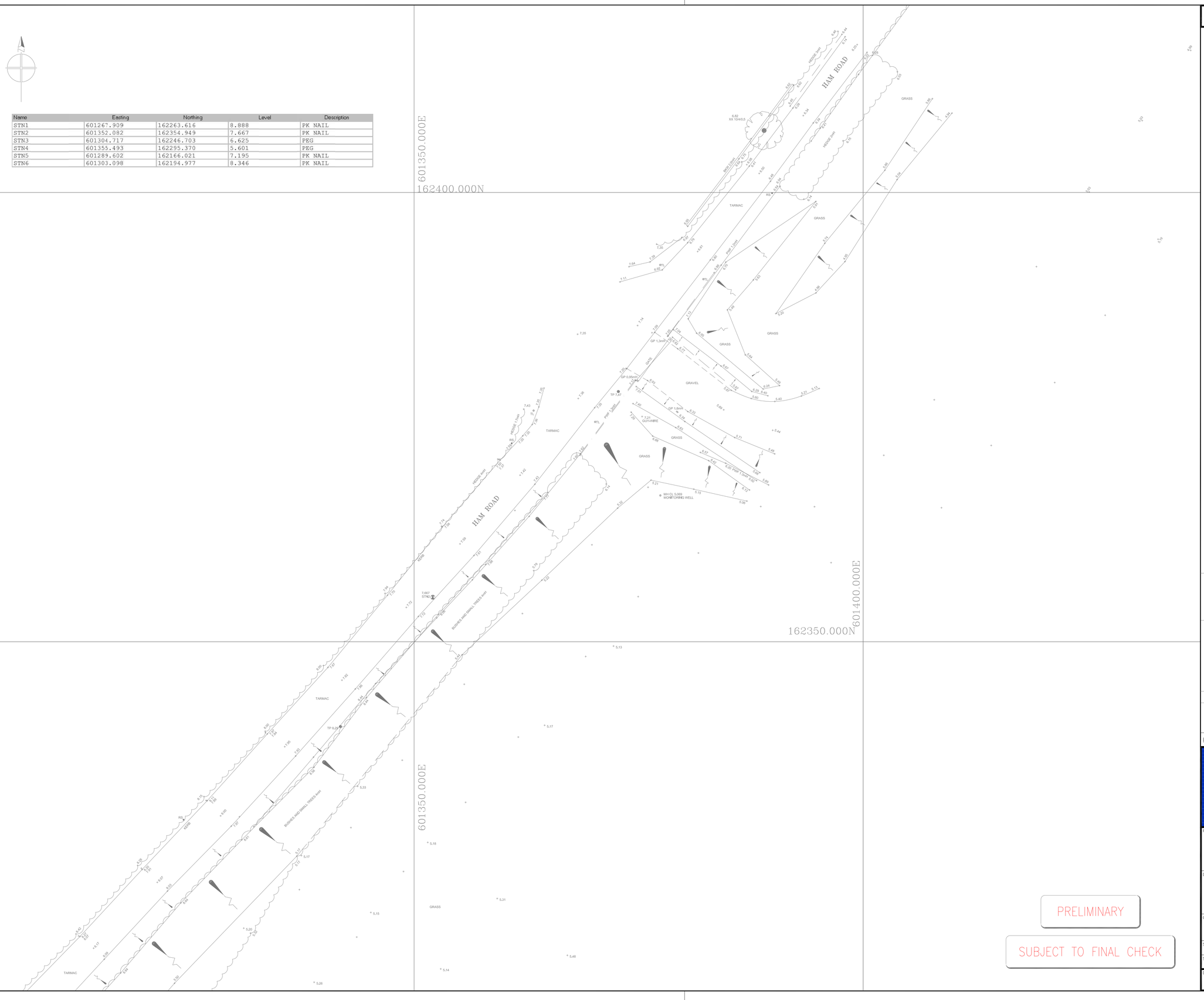
7.1.2 The Flood Risk Assessment confirms that the development is located in Flood Zone 1 which is defined as having a low risk of flooding from rivers and sea.

7.1.3 The flood risk assessment also demonstrates that there is a low risk of flooding due to other sources.

7.1.4 A Sustainable Urban Drainage System (SUDS) will be provided to deal with the surface water generated from the development to ensure that flood risk is not increased elsewhere.

APPENDIX 1.0 – EXISTING TOPOGRAPHICAL SURVEY

Name	Easting	Northing	Level	Description
STN1	601267.909	162263.616	8.888	PK NAIL
STN2	601352.082	162354.949	7.667	PK NAIL
STN3	601304.717	162246.703	6.625	PEG
STN4	601355.493	162295.370	5.601	PEG
STN5	601289.602	162166.021	7.195	PK NAIL
STN6	601303.098	162194.977	8.346	PK NAIL



PRELIMINARY

SUBJECT TO FINAL CHECK

Drawing No. SDS 204810.01 | Revision

SURVEY LEGEND

GENERAL

AR	ASSUMED ROUTE	LB	LETTER BOX
AV	AIR VALVE	LH	LAMP HOLE
		LP	LAMP POST
BB	BOLISHA BEACON		
BD	BACKDROP	MH	MANHOLE
Bdy	BOUNDARY	MK	MARKER POST
BH	BOREHOLE	MS	MILE STONE
BL	BED LEVEL		
BO	BOLLARD	NB	NOTICE BOARD
BS	BUS STOP	NP	NAME-PLATE
BKW	BRICK WALL		
		OH	OVERHEAD
CATV	CABLE TELEVISION	OSBM	ORDNANCE SURVEY BENCH MARK
CB	CABLE RISER		
CG	CATTLE GRID	PE	PENSTOCK
CH	CHANNEL LEVEL	PI	PIPE
CL	COVER LEVEL	PM	PARKING METER
Conc	CONCRETE	PO	POST
Corr	CORRUGATED		
CP	COPING LEVEL	RB	RUBBISH BIN
CPS	CONC. PAVING SLABS	RE	RODDING EYE
CR	CROWN LEVEL	RS	ROAD SIGN
CUL	CULVERT	RTW	RETAINING WALL
		RWP	RAIN WATER PIPE
DK	DROP KERB		
DP	DOWN PIPE	SA	SAPLING
		S/Away	SOAKAWAY
EB	ELECTRICITY BOX	SC	STOP COCK
EC	ELECTRICITY CABLE	SL	SOFFIT LEVEL
ElecMH	ELECTRICITY MANHOLE	SVP	SOIL VENT PIPE
EP	ELECTRICITY POLE	SP	SIGN POST
EPy	ELECTRICITY PYLON	STN	SURVEY STATION
ER	EARTHING ROD	SW	SURFACE WATER
FH	FIRE HYDRANT	T B	TREE BOLE
FL	FLOOR LEVEL	TBM	TEMPORY BENCH MARK
FM	FLOW METER	TCB	TELEPHONE CALL BOX
FB	FLOWER BED	TH	THRESHOLD
FW	FOUL WATER	TL	TRAFFIC LIGHT
		TMH	TELEPHONE MANHOLE
GL	GROUND LEVEL	TOW	TOP OF WALL
GP	GATE POST	TP	TELEGRAPH POLE
GU	GULLY	TS	TREE STUMP
GV	GAS VALVE		
		U/G	UNDERGROUND
H	HIGH	UTL	UNABLE TO LOCATE
HO	HOLE	UTR	UNABLE TO RAISE
HW	HEADWALL		
		VA	VALVE
IC	INSPECTION COVER	VP	VENT PIPE
IL	INVERT LEVEL		
		W	WIDE
JB	JUNCTION BOX	WL	WATER LEVEL
		WM	WATER METER
KIG	KERB INLET GULLY	WO	WASH OUT
KL	KEEP LEFT ROAD SIGN	WP	WOODEN POST
		WV	WATER VALVE

FENCE TYPES

BWF	BARBED WIRE FENCE	IWF	INTERWOVEN FENCE
CBF	CLOSE BOARDED FENCE	LLF	LARCH LAP FENCE
CLF	CHAINLINK FENCE	PAL	PALISADE FENCE
CPF	CHESTNUT PALING FENCE	PRF	POST & RAIL FENCE
CWF	CHICKEN WIRE FENCE	PWF	POST & WIRE FENCE
IRF	IRON RAILING FENCE	TR	TRELLIS

TREE TYPES

AA	ACACIA	EM	ELM	PE	PINE
AH	ASH	FR	FIR	PO	POLLAROID
AL	ALDER	HB	HORNBEAM	PR	POPLAR
AN	ASPEN	HC	HORSE CHESTNUT	RW	REDWOOD
AP	APPLE	HN	HAWTHORN	SB	SILVER BIRCH
BH	BEECH	HY	HOLLY	SC	SWEET CHESTNUT
BR	BIRCH	LA	LARCH	SU	SPRUCE
CE	CHERRY	LE	LIME	SY	SYCAMORE
CO	CONIFER	LN	LONDON PLANE	WB	WHITEBEAM
CR	CEDAR	ME	MAPLE	WT	WALNUT
CY	CYPRESS	OK	OAK	WW	WILLOW
DD	DEAD	OR	ORNAMENTAL	YW	YEW
ED	ELDER			XX	UNKNOWN

TYPE HEIGHT/SPREAD/DIAM.
CO 5/4/0.3

BUILDING SURVEY

1435 FLOOR TO CEILING HEIGHT

985 FLOOR TO UNDERSIDE OF BEAM OR DOOR HEAD

F-C 1235 / C-H 985 FLOOR TO CILL HEIGHT / CILL TO HEAD HEIGHT

RADIATOR

FIRE ALARM / EXTINGUISHER

SP SPRINKLER

LG LIGHTING

OLG

Light STRIP LIGHT

POWER SOCKET

LEVELLING NOTES

ALL LEVELS ARE BASED ON ORDNANCE SURVEY DATUM OBTAINED FROM ACTIVE GPS NETWORK "OS NET"

GRID IS BASED ON OS DATUM, OBTAINED FROM ACTIVE GPS NETWORK "OS NET"

ALL KERB LEVELS ARE TAKEN IN CHANNEL.

A SCALE FACTOR OF 1.000000 HAS BEEN APPLIED TO THIS DRAWING

Rev.	Date	Description	By

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Drawing title: TOPOGRAPHICAL LAND SURVEY

Client: DHA

Scales	Drawn by	Sheet size
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P.W.	X.X.X.		JAN 2016

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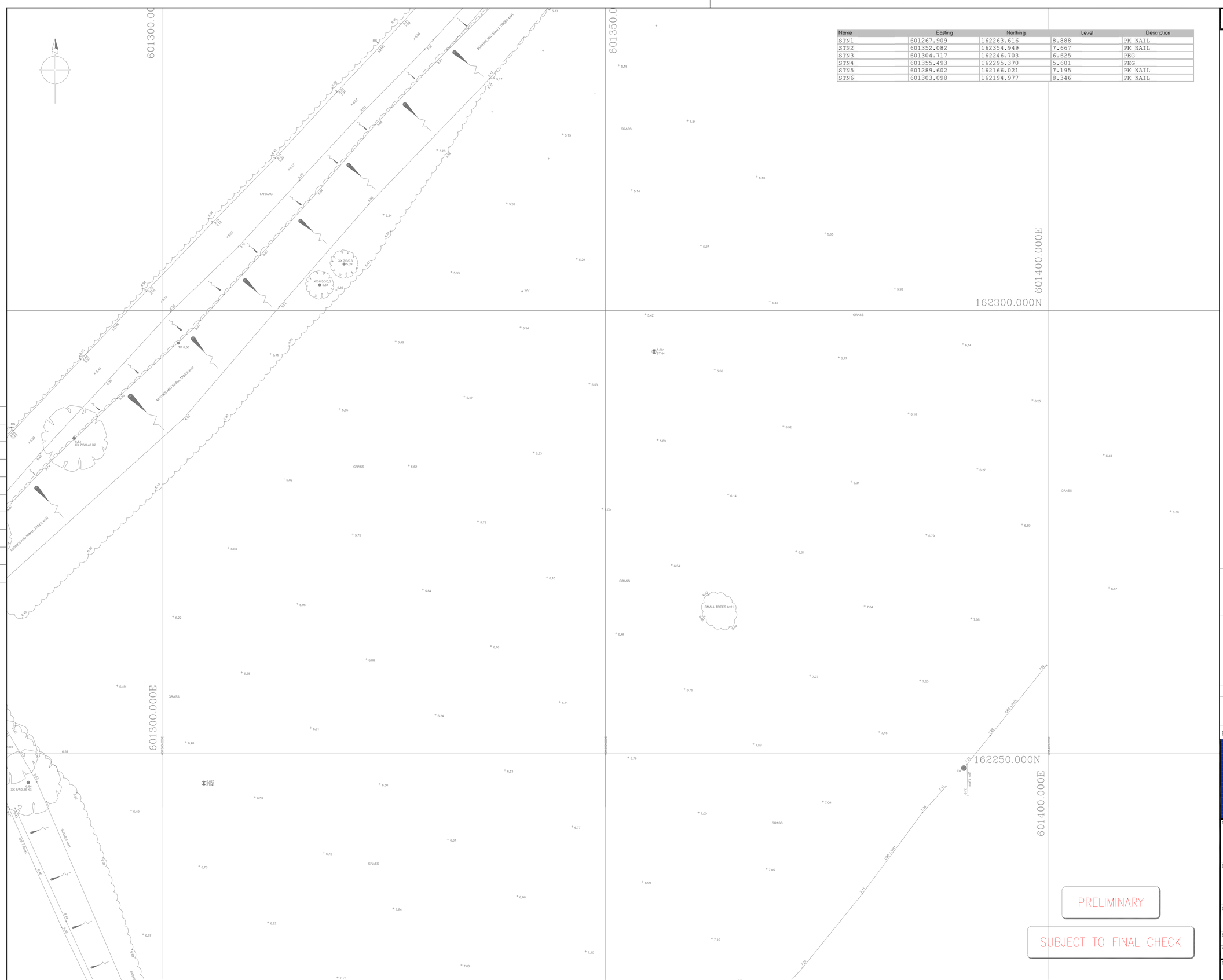

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STN6	601303.098	162194.977	8.346	PK NAIL

Drawing No. SDS 204810.02 | Revision

SURVEY LEGEND

GENERAL

AR	ASSUMED ROUTE	LB	LETTER BOX
AV	AIR VALVE	LH	LAMP HOLE
		LP	LAMP POST
BB	BOLISHA BEACON		
BD	BACKDROP	MH	MANHOLE
Bdy	BOUNDARY	MK	MARKER POST
BH	BOREHOLE	MS	MILE STONE
BL	BED LEVEL		
BO	BOLLARD	NB	NOTICE BOARD
BS	BUS STOP	NP	NAME-PLATE
BKW	BRICK WALL		
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Conc	CONCRETE	PO	POST
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GV	GAS VALVE		
		U/G	UNDERGROUND
H	HIGH	UTL	UNABLE TO LOCATE
HO	HOLE	UTR	UNABLE TO RAISE
HW	HEADWALL		
		VA	VALVE
IC	INSPECTION COVER	VP	VENT PIPE
IL	INVERT LEVEL		
		W	WIDE
JB	JUNCTION BOX	WL	WATER LEVEL
		WM	WATER METER
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KL	KEEP LEFT ROAD SIGN	WP	WOODEN POST
		WV	WATER VALVE

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CBF	CLOSE BOARDED FENCE	LLF	LARCH LAP FENCE
CLF	CHAINLINK FENCE	PAL	PALISADE FENCE
CPF	CHESTNUT PALING FENCE	PRF	POST & RAIL FENCE
CWF	CHICKEN WIRE FENCE	PWF	POST & WIRE FENCE
IRF	IRON RAILING FENCE	TR	TRELLIS

TREE TYPES

AA	ACACIA	EM	ELM	PE	PINE
AH	ASH	FR	FIR	PO	POLLARDED
AL	ALDER	HB	HORNBEAM	PR	POPLAR
AN	ASPEN	HC	HORSE CHESTNUT	RW	REDWOOD
AP	APPLE	HN	HAWTHORN	SB	SILVER BIRCH
BH	BEECH	HY	HOLLY	SC	SWEET CHESTNUT
BR	BIRCH	LA	LARCH	SU	SPRUCE
CE	CHERRY	LE	LIME	SY	SYCAMORE
CO	CONIFER	LN	LONDON PLANE	WB	WHITEBEAM
CR	CEDAR	ME	MAPLE	WT	WALNUT
CY	CYPRESS	OK	OAK	WW	WILLOW
DD	DEAD	OR	ORNAMENTAL	YW	YEW
ED	ELDER			XX	UNKNOWN

TYPE HEIGHT/SPREAD/DIAM.
CO 5/4/0.3

BUILDING SURVEY

1235	FLOOR TO CEILING HEIGHT	SP	SPRINKLER
985	FLOOR TO UNDERSIDE OF BEAM OR DOOR HEAD	LG	LIGHTING
F-E 1235 C-H 985	FLOOR TO CILL HEIGHT CILL TO HEAD HEIGHT	LG	
RAD	RADIATOR	Light	STRIP LIGHT
F	FIRE ALARM / EXTINGUISHER		POWER SOCKET

LEVELLING NOTES

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GRID IS BASED ON OS DATUM, OBTAINED FROM ACTIVE GPS NETWORK "OS NET"

ALL KERB LEVELS ARE TAKEN IN CHANNEL.

A SCALE FACTOR OF 1.000000 HAS BEEN APPLIED TO THIS DRAWING

Rev.	Date	Description	By

PRELIMINARY

SUBJECT TO FINAL CHECK

SURVEY DESIGN SERVICES and ASSOC. LTD.
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TOPOGRAPHICAL LAND SURVEYS
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CCTV SURVEYS.
www.surveydesignservices.co.uk

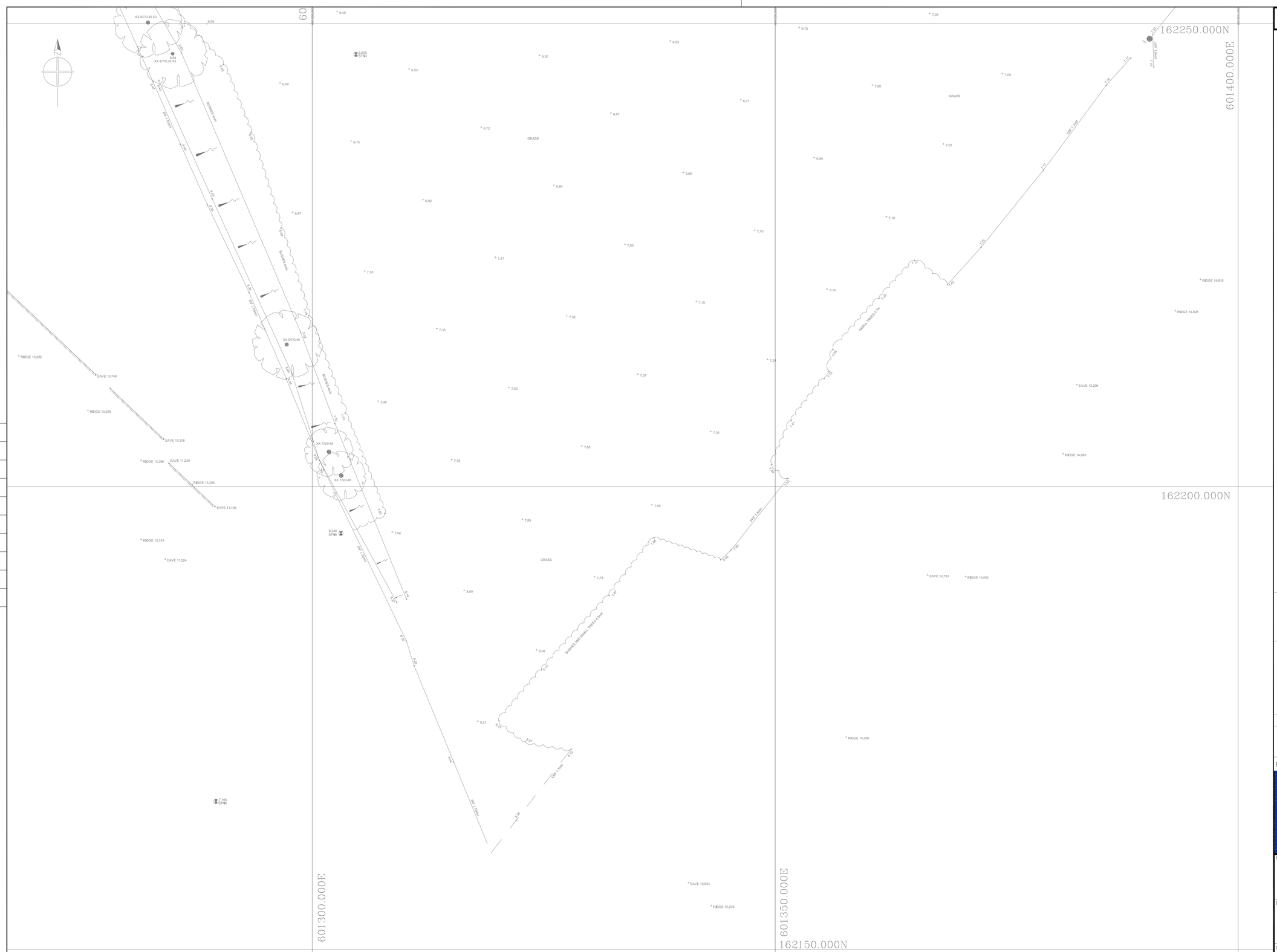
Project title
HAM ROAD FAVERSHAM

Drawing title
TOPOGRAPHICAL LAND SURVEY

Client
DHA

Scales	Drawn by	Sheet size
1:200	P.W.	A1
Surveyed by	**Checked by**	**Approved by**	**Date**
P.W.	X.X.X.		JAN 2016

Drawing No. SDS 204810.02 | Revision



Name	Easting	Northing	Level	Description
STN1	601267.909	162263.616	8.888	PK NAIL
STN2	601352.082	162354.949	7.667	PK NAIL
STN3	601304.717	162246.703	6.625	PEG
STN4	601355.493	162295.370	5.601	PEG
STN5	601289.602	162166.021	7.195	PK NAIL
STN6	601303.098	162194.977	8.346	PK NAIL

Drawing No. SDS 204810.03 | Revision

SURVEY LEGEND

GENERAL

AR	ASSUMED ROUTE	LB	LETTER BOX
AV	AIR VALVE	LH	LAMP HOLE
		LP	LAMP POST
BB	BOLISHA BEACON		
BD	BACKDROP	MH	MANHOLE
Bdy	BOUNDARY	MK	MARKER POST
BH	BOREHOLE	MS	MILE STONE
BL	BED LEVEL		
BO	BOLLARD	NB	NOTICE BOARD
BS	BUS STOP	NP	NAME-PLATE
BKW	BRICK WALL		
		OH	OVERHEAD
CATV	CABLE TELEVISION	OSBM	ORDNANCE SURVEY BENCH MARK
CB	CABLE RISER		
CG	CATTLE GRID	PE	PENSTOCK
CH	CHANNEL LEVEL	PI	PIPE
CL	COVER LEVEL	PM	PARKING METER
Conc	CONCRETE	PO	POST
Corr	CORRUGATED		
CP	COPING LEVEL	RB	RUBBISH BIN
CPS	CONC. PAVING SLABS	RE	RODDING EYE
CR	CROWN LEVEL	RS	ROAD SIGN
CUL	CULVERT	RTW	RETAINING WALL
		RWP	RAIN WATER PIPE
DK	DROP KERB		
DP	DOWN PIPE	SA	SAPLING
		S/Awgy	SOAKAWAY
EB	ELECTRICITY BOX	SC	STOP COCK
EC	ELECTRICITY CABLE	SL	SOFFIT LEVEL
ElecMH	ELECTRICITY MANHOLE	SVP	SOIL VENT PIPE
EP	ELECTRICITY POLE	SP	SIGN POST
EPy	ELECTRICITY PYLON	STN	SURVEY STATION
ER	EARTHING ROD	SW	SURFACE WATER
FH	FIRE HYDRANT	T B	TREE BOLE
FL	FLOOR LEVEL	TBM	TEMPORY BENCH MARK
FM	FLOW METER	TCB	TELEPHONE CALL BOX
FB	FLOWER BED	TH	THRESHOLD
FW	FOUL WATER	TL	TRAFFIC LIGHT
		TMH	TELEPHONE MANHOLE
GL	GROUND LEVEL	TOW	TOP OF WALL
GP	GATE POST	TP	TELEGRAPH POLE
GU	GULLY	TS	TREE STUMP
GV	GAS VALVE		
		U/G	UNDERGROUND
H	HIGH	UTL	UNABLE TO LOCATE
HO	HOLE	UTR	UNABLE TO RAISE
HW	HEADWALL		
		VA	VALVE
IC	INSPECTION COVER	VP	VENT PIPE
IL	INVERT LEVEL		
		W	WIDE
JB	JUNCTION BOX	WL	WATER LEVEL
		WM	WATER METER
KIG	KERB INLET GULLY	WO	WASH OUT
KL	KEEP LEFT ROAD SIGN	WP	WOODEN POST
		WV	WATER VALVE

FENCE TYPES

BWF	BARBED WIRE FENCE	IWF	INTERWOVEN FENCE
CBF	CLOSE BOARDED FENCE	LLF	LARCH LAP FENCE
CLF	CHAINLINK FENCE	PAL	PALISADE FENCE
CPF	CHESTNUT PALING FENCE	PRF	POST & RAIL FENCE
CWF	CHICKEN WIRE FENCE	PWF	POST & WIRE FENCE
IRF	IRON RAILING FENCE	TR	TRELLIS

TREE TYPES

AA	ACACIA	EM	ELM	PE	PINE
AH	ASH	FR	FIR	PO	POLLARDED
AL	ALDER	HB	HORNBEAM	PR	POPLAR
AN	ASPEN	HC	HORSE CHESTNUT	RW	REDWOOD
AP	APPLE	HN	HAWTHORN	SB	SILVER BIRCH
BH	BEECH	HY	HOLLY	SC	SWEET CHESTNUT
BR	BIRCH	LA	LARCH	SU	SPRUCE
CE	CHERRY	LE	LIME	SY	SYCAMORE
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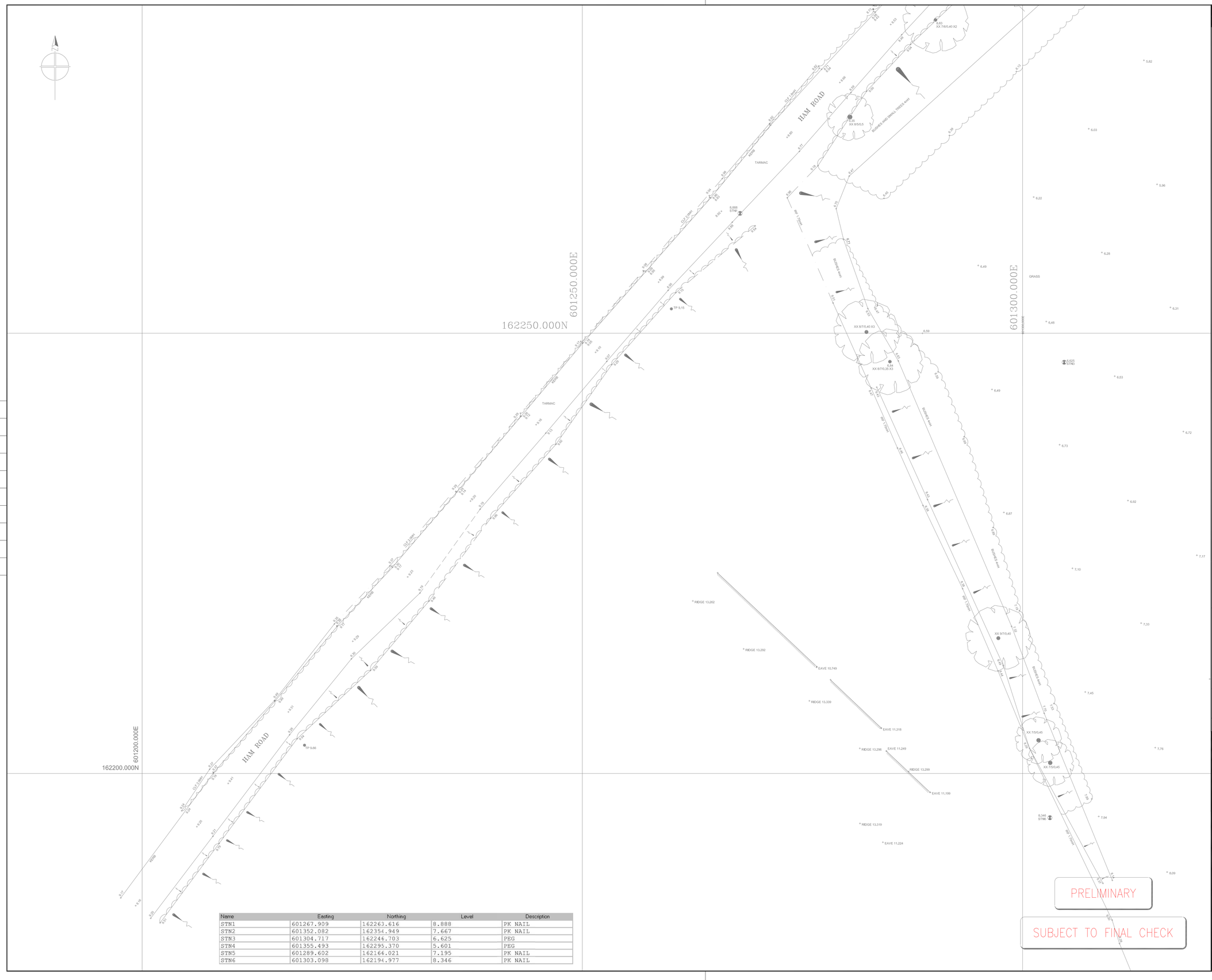
Scales 1:200	Drawn by P.W.	Sheet size A1	
Surveyed by P.W.	Checked by X.X.X.	Approved by	Date JAN 2016

Drawing No. SDS 204810.03 | Revision



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Drawing No. SDS 204810.04 | Revision

SURVEY LEGEND

GENERAL

AR	ASSUMED ROUTE	LB	LETTER BOX
AV	AIR VALVE	LH	LAMP HOLE
		LP	LAMP POST
BB	BOLISHA BEACON		
BD	BACKDROP	MH	MANHOLE
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Client: DHA

Scales	Drawn by	Sheet size
1:200	P.W.	A1
Surveyed by: P.W.	Checked by: X.X.X.	Approved by:	Date: JAN 2016

Drawing No. SDS 204810.04 | Revision

APPENDIX 2.0 – PROPOSED CONTRIBUTING AREAS AND RUN OFF RATES

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.499	Urban	0.000
SAAR (mm)	717	Region Number	Region 7

Results l/s

QBAR Rural	2.3
QBAR Urban	2.3
Q100 years	7.2
Q1 year	1.9
Q30 years	5.1
Q100 years	7.2

N

INDICATIVE ONLY

Gate House

Pond

HAM ROAD

PUMPING STATION

LANDSCAPE BUFFER

PUBLIC OPEN SPACE

PUBLIC OPEN SPACE

El Sub Sta

SPRINGHEAD ROAD

FOSTALL ROAD

45 46 to 49

42

73

86

12

34

36

32

23

19

NOTES

Contributing areas

Proposed roof areas: 2052m^2

Proposed porous paving: 2941m^2

Total: 4993m^2

Site boundary

REV	AMENDMENTS	DATE	CHK
P1	FIRST ISSUE	28/04/16	SM

Client

GBH WHELER WILL TRUST

Project

HAM ROAD, FAVERSHAM

Title

PROPOSED CONTRIBUTING AREAS PLAN

Drwg	Rev	Scale	Date
11311 - D-01	P1	1:500	28/04/2016

dha transport
integrated transport & travel planning

Eclipse House, Eclipse Park, Sittingbourne Road
Maidstone, Kent. ME14 3EN

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f: 01622 776227
e: info@dhaplanning.co.uk
w: www.dhatransport.co.uk

CAD Reference: CAD REF

A1

APPENDIX 3.0 – SOUTHERN WATER RECORD DRAWINGS

SOUTHERN WATER

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site.

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Southern Water

O.S. REF: TR0162SW

Scale: 1:1250

N

Printed By: sierrob

Date: 21-3-2016

Sewer Plot

Southern Water MapGuide Browser

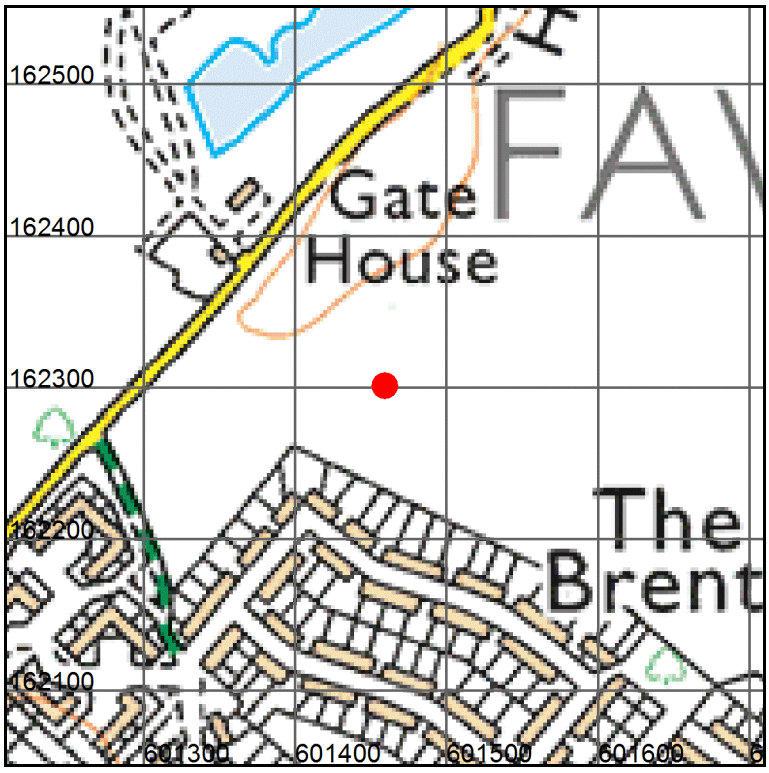
WARNING: BAC pipes are constructed of Bonded Asbestos Cement

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

Requested By:
Sewer Record Extract

APPENDIX 4.0 – SITE GEOLOGY AND INFILTRATION

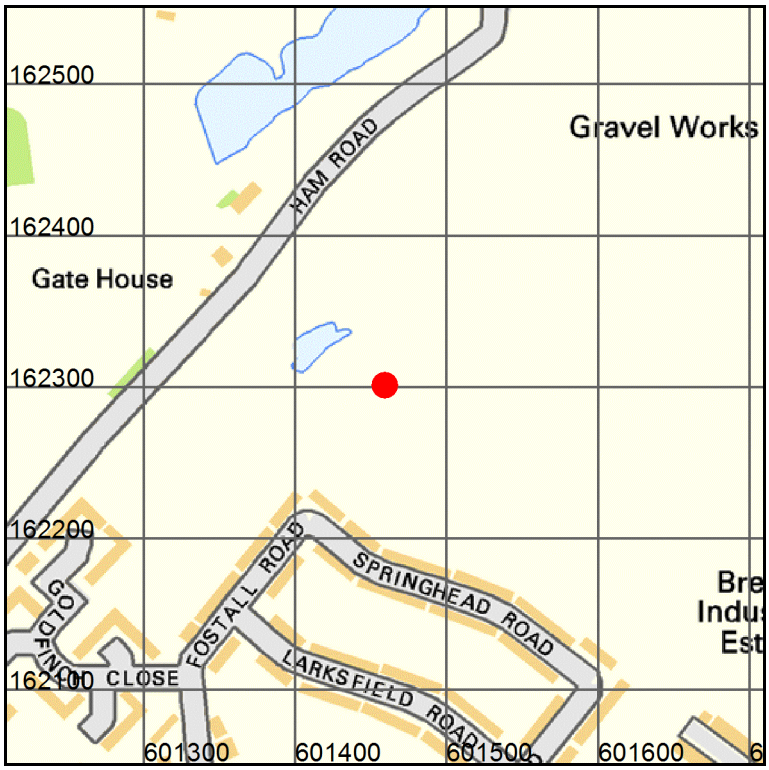
Search location



Point centred at:
601459,162301

Search location indicated in red

Scale: 1:5 000 (1cm = 50 m)



OS Street View: Scale: 1:5 000 (1cm = 50 m)

Assessment for an infiltration sustainable drainage system

Introduction

Sustainable drainage systems (SuDS) are drainage solutions that manage the volume and quality of surface water close to where it falls as rain. They aim to reduce flow rates to rivers, increase local water storage capacity and reduce the transport of pollutants to the water environment. There are four main types of SuDS, which are often designed to be used in sequence. They comprise:

- **source control:** systems that control the rate of runoff
- **pre-treatment:** systems that remove sediments and pollutants
- **retention:** systems that delay the discharge of water by providing surface storage
- **infiltration:** systems that mimic natural recharge to the ground.

This report focuses on infiltration SuDS. It provides subsurface information on the properties of the ground with respect to drainage, ground stability and groundwater quality protection. It is intended principally for those involved in the preliminary assessment of the suitability of the ground for infiltration SuDS, and those involved in assessing proposals from others for sustainable drainage, but it may also be useful to help house-holders judge whether or not further professional advice should be sought. If in doubt, users should consult a suitably-qualified professional about the results in this report before making any decisions based upon it.

This GeoReport is structured in two parts:

- **Part 1. Summary data**.

  Comprises three maps that summarise the data contained within Part 2.

- **Part 2. Detailed data**.

  Comprises a further 24 maps in four thematic sections:

  - **Very significant constraints.** Maps highlight areas where infiltration may result in adverse impacts due to factors including: ground instability (soluble rocks, non-coal shallow mining and landslide hazards); persistent shallow groundwater, or the presence of made ground, which may represent a ground stability or contamination hazard.
  - **Drainage potential**. Maps indicate the drainage potential of the ground, by considering subsurface permeability, depth to groundwater and the presence of floodplain deposits.
  - **Ground stability**. Maps indicate the presence of hazards that have the potential to cause ground instability resulting in damage to some buildings and structures, if water is infiltrated to the ground.
  - **Groundwater protection**. Maps provide key indicators to help determine whether the groundwater may be susceptible to deterioration in quality as a result of infiltration.

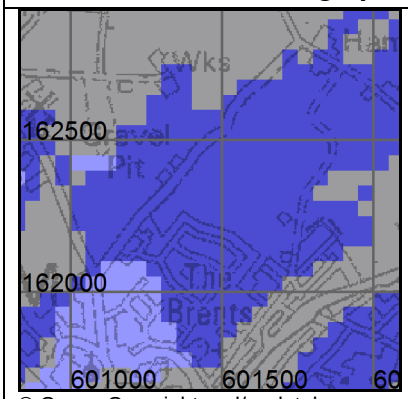
This report considers the suitability of the subsurface for the installation of infiltration SuDS, such as soakaways, infiltration basins or permeable pavements. It provides subsurface data to indicate whether, and which type of infiltration system may be appropriate. It does not state that infiltration SuDS are, or are not, appropriate as this is highly dependent on the design of the individual system. This report therefore describes the subsurface conditions at the site, allowing the reader to determine the suitability of the site for infiltration SuDS.

The map and text data in this report is similar to that provided in the '*Infiltration SuDS Map: Detailed'* national map product. For further information about the data, consult the '*User Guide for the Infiltration SuDS Map: Detailed'*, available from http://nora.nerc.ac.uk/16618/.

PART 1: SUMMARY DATA

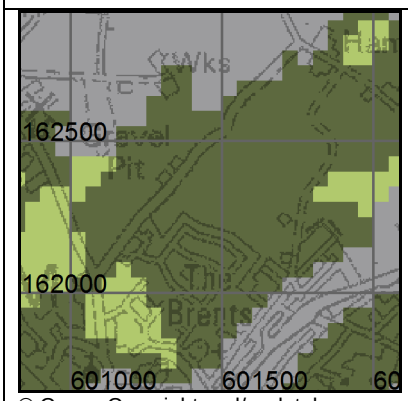
This section provides a summary of the data on the following pages.

In terms of the drainage potential, is the ground suitable for infiltration SuDS?



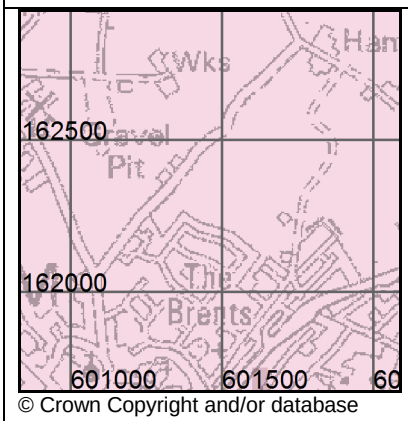
- Highly compatible for infiltration SuDS.
  The subsurface is likely to be suitable for free-draining infiltration SuDS.
- Probably compatible for infiltration SuDS.
  The subsurface is probably suitable although the design may be influenced by the ground conditions.
- Opportunities for bespoke infiltration SuDS.
  The subsurface is potentially suitable although the design will be influenced by the ground conditions.
- Very significant constraints are indicated.
  There is a very significant potential for one or more hazards associated with infiltration.

Is ground instability likely to be a problem?



- Increased infiltration is very unlikely to result in ground instability.
- Ground instability problems may be present or anticipated, but increased infiltration is unlikely to result in ground instability
- Ground instability problems are probably present. Increased infiltration may result in ground instability.
- There is a very significant potential for one or more geohazards associated with infiltration.

Is the groundwater susceptible to deterioration in quality?



- The groundwater is not expected to be especially vulnerable to contamination.
- The groundwater may be vulnerable to contamination.
- The groundwater is likely to be vulnerable to contaminants.
- Made ground is present at the surface. Infiltration may increase the possibility of remobilising pollutants.

PART 2: DETAILED DATA

This section provides further information about the properties of the ground and will help assess the suitability of the ground for infiltration SuDS.

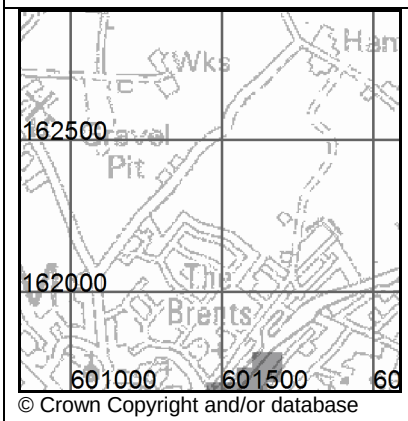
Section 1. Very significant constraints

Where maps are overlain by grey polygons, geological or hydrogeological hazards may exist that could be made worse by infiltration. The following hazards are considered:

- soluble rocks
- landslides
- shallow mining
- shallow groundwater
- made ground

For more information read 'Explanation of terms' at the end of this report.

Soluble rock hazard

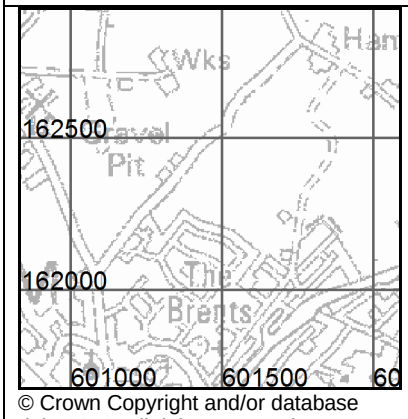


■ Very significant soluble rock hazard.

Soluble rocks are present with a very significant possibility of localised subsidence that could be initiated or made worse by infiltration. The site investigation should consider whether the potential for or the consequences of subsidence as a result of infiltration are significant.

☐ Very significant soluble rock hazards are not present; however this hazard may still need to be considered. See Part 3.

Landslide hazard

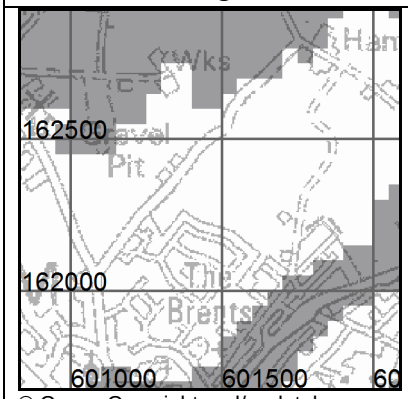


■ Very significant landslide hazard.

Slope instability problems are almost certainly present and may be active. An increase in moisture content as a result of infiltration may cause the slope to fail. The site investigation should consider whether the potential for or the consequences of landslide as a result of infiltration are significant.

☐ Very significant landslide hazards are not present; however this hazard may still need to be considered. See Part 3.

Shallow mining hazard

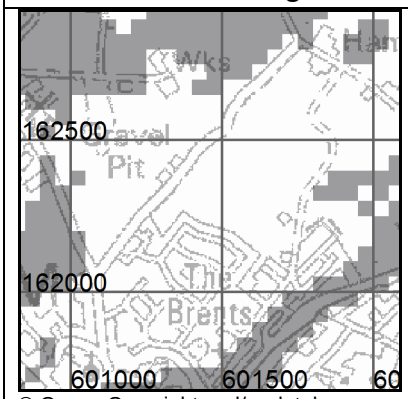


■ Very significant mining hazard.

Shallow mining is likely to be present with a very significant possibility of localised subsidence that could be initiated or made worse by increased infiltration. Also, infiltration may increase the possibility of remobilising pollutants. The site investigation should consider whether the potential for or consequences of subsidence and/or remobilisation of pollutants as a result of infiltration are significant.

☐ Very significant mining hazards are not present; however this hazard may still need to be considered. See Part 3.

Persistent shallow groundwater

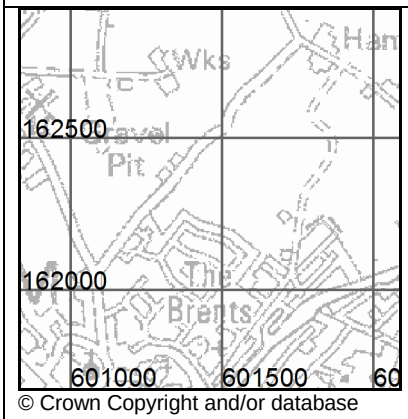


■ Very high likelihood of persistent or seasonally shallow groundwater.

Persistent or seasonally shallow groundwater is likely to be present. Infiltration may increase the likelihood of soakaway inundation, or groundwater emergence at the surface. The site investigation should consider whether the potential for or the consequences of groundwater level rise as a result of infiltration are significant.

☐ See Part 2 for the likely depth to water table.

Made ground



■ Made ground present.

Made ground is present at the surface. Infiltration may affect ground stability or increase the possibility of remobilising pollutants. The site investigation should consider whether the potential for or consequences of ground instability and/or pollutant leaching as a result of infiltration are significant.

☐ None recorded

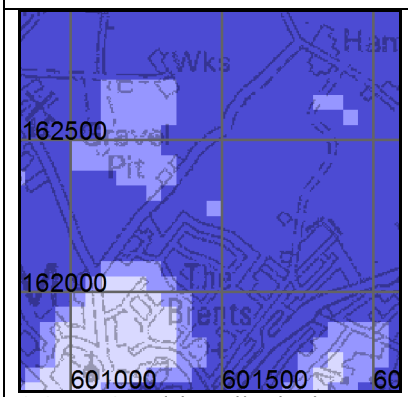
Section 2. Drainage potential

The following pages contain maps that will help you assess the drainage potential of the ground by considering the:

- depth to water table
- permeability of the superficial deposits
- thickness of the superficial deposits
- permeability of the bedrock
- presence of floodplains

Superficial deposits are not present everywhere and therefore some areas of the *superficial deposit permeability* map may not be coloured. Where this is the case, the *bedrock permeability* map shows the likely permeability of the ground. Superficial deposits in some places are very thin and hence in these places you may wish to consider both the permeability of the superficial deposits and the permeability of the bedrock. The *superficial thickness* map will tell you whether the superficial deposits are thin (< 3 m thick) or thick (>3 m). Where they are over 3 m thick, the permeability of the bedrock may not be relevant.
For more information read 'Explanation of terms' at the end of this report.

Depth to groundwater table

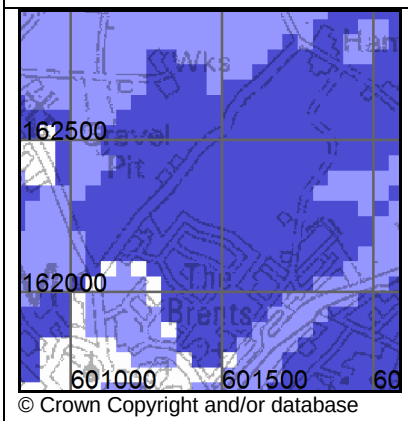


Groundwater is likely to be **more than 5 m** below the ground surface throughout the year.

Groundwater is likely to be between **3 and 5 m** below the ground surface for at least part of the year.

Groundwater is likely to be **less than 3 m** below the ground surface for at least part of the year.

Superficial deposit permeability



Superficial deposits are likely to be **free-draining**.

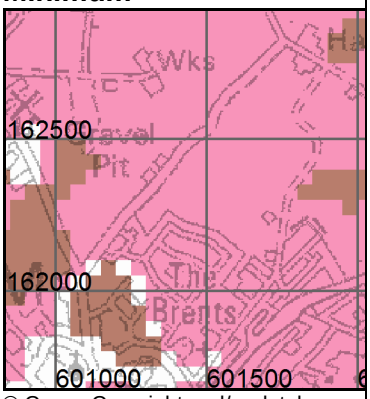
The superficial deposit permeability is **spatially variable**, but likely to permit moderate infiltration.

Superficial deposits are likely to be **poorly draining**.

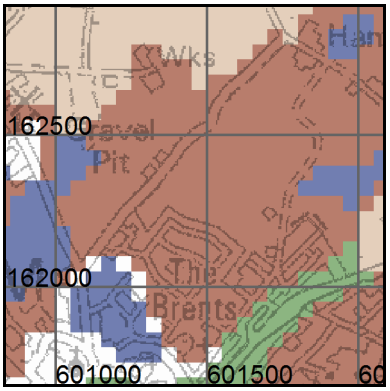
These maps show the permeability range that is summarised above.

- Very Low
- Low
- Moderate
- High
- Very High

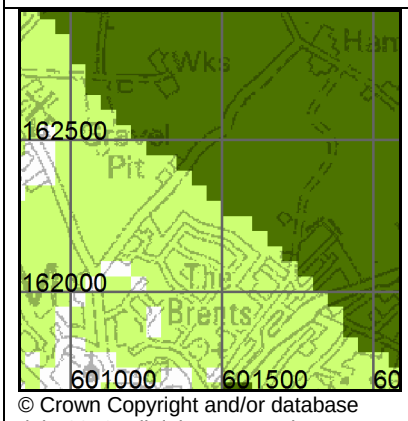
Minimum



Maximum



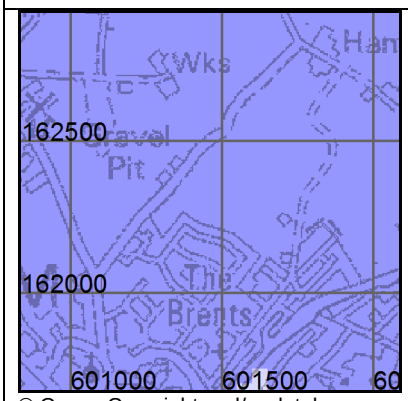
Superficial deposit thickness



The thickness of superficial deposits is **< 3 m** and hence the permeability of the ground may be dependent on both the superficial deposits (where present) and underlying bedrock (see below).

The thickness of superficial deposits is **> 3 m** and hence the permeability of the superficial deposits is likely to determine the permeability of the ground.

Bedrock permeability



Bedrock deposits are likely to be **free-draining**.

The bedrock permeability is **spatially variable**, but likely to permit moderate infiltration.

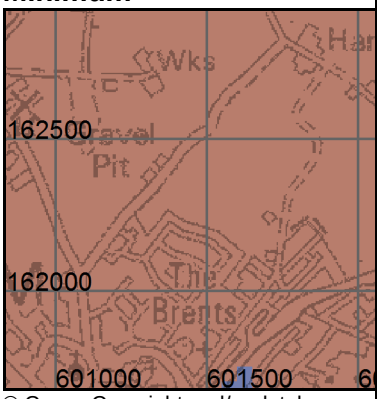
Bedrock deposits are likely to be **poorly draining**.

These maps show the permeability range that is summarised above.

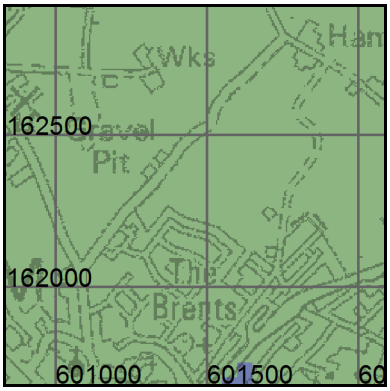
Key

- Very Low
- Low
- Moderate
- High
- Very High

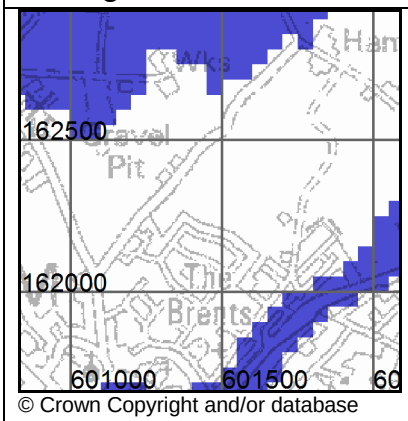
Minimum



Maximum



Geological indicators of flooding



Superficial floodplain deposits or low-lying coastal areas have been identified. Groundwater levels may rise in response to high river or tide levels, potentially causing inundation of subsurface infiltration SuDS.

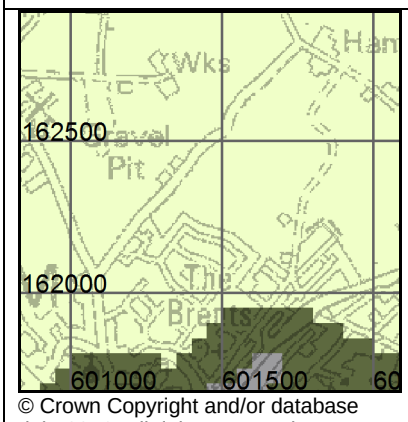
Section 3. Ground stability

The following pages contain maps that will help you assess whether infiltration may impact the stability of the ground. They consider hazards associated with:

- soluble rocks
- landslides
- shallow mining
- running sands
- swelling clays
- compressible ground, and
- collapsible ground

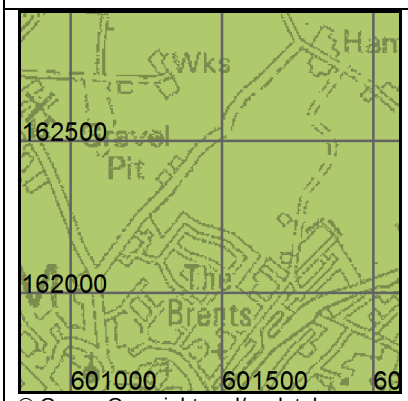
In the following maps, geohazards that are identified in green are unlikely to prevent infiltration SuDS from being installed, but they should be considered during design. For more information read 'Explanation of terms' at the end of this report.

Soluble rocks



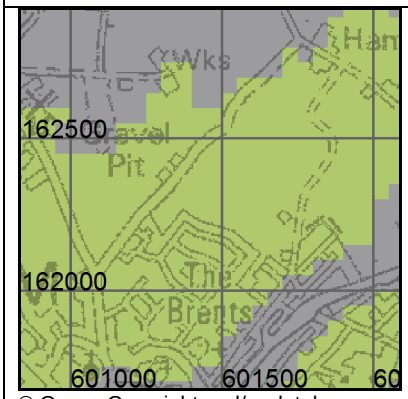
	Increased infiltration is unlikely to result in subsidence.
	Increased infiltration is unlikely to cause localised subsidence, but potential impacts should be considered.
	Increased infiltration may result in localised subsidence. The potential for or the consequences of subsidence associated with soluble rocks should be considered.
	Very significant possibility of localised subsidence that could be initiated or made worse by infiltration.

Landslides



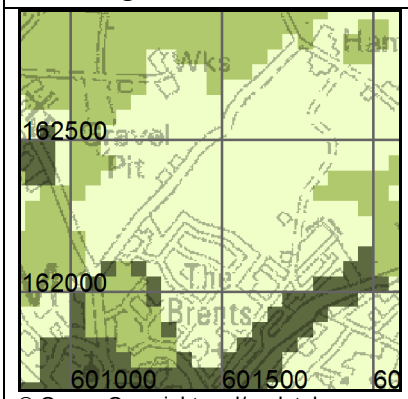
- Increased infiltration is unlikely to lead to slope instability.
- Slope instability problems may be present or anticipated, but increased infiltration is unlikely to cause instability
- Slope instability problems are probably present or have occurred in the past, and increased infiltration may result in slope instability.
- Slope instability problems are almost certainly present and may be active. An increase in moisture content as a result of infiltration may cause the slope to fail.

Shallow mining



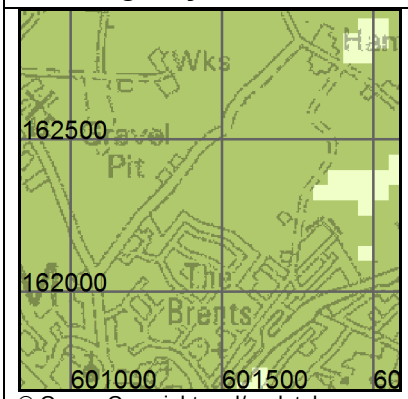
- Increased infiltration is unlikely to lead to subsidence.
- Shallow mining is possibly present. Increased infiltration is unlikely to cause a geohazard, but potential impacts should be considered.
- Shallow mining could be present with a significant possibility that localised subsidence could be initiated or made worse by increased infiltration.
- Shallow mining is likely to be present, with a very significant possibility that localised subsidence may be initiated or made worse by increased infiltration.

Running sand



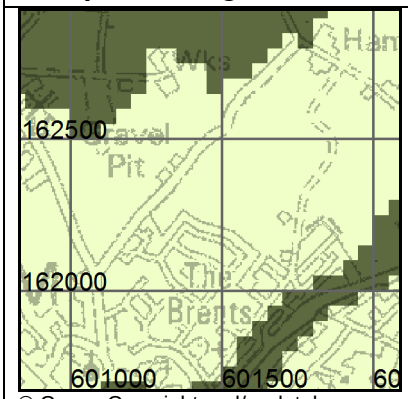
- Increased infiltration is unlikely to cause ground collapse associated with running sands.
- Running sand is possibly present. Increased infiltration is unlikely to cause a geohazard, but potential impacts should be considered.
- Significant possibility for running sand problems. Increased infiltration may result in a geohazard.

Swelling clays



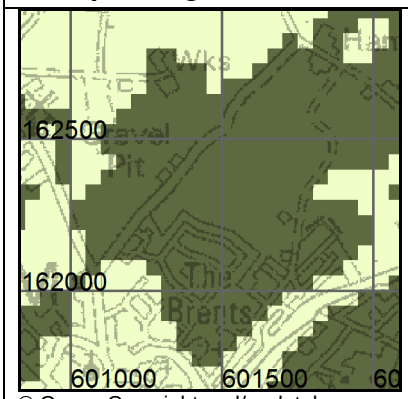
- Increased infiltration is unlikely to cause shrink-swell ground movement.
- Ground is susceptible to shrink-swell ground movement. Increased infiltration is unlikely to cause a geohazard, but potential impacts should be considered.
- Ground is susceptible to shrink-swell ground movement. Increased infiltration may result in a geohazard.

Compressible ground



- Increased infiltration is unlikely to lead to ground compression.
- Compressibility and uneven settlement hazards are probably present. Increased infiltration may result in a geohazard.

Collapsible ground



- Increased infiltration is unlikely to result in subsidence.
- Deposits with potential to collapse when loaded and saturated are possibly present in places. Increased infiltration is unlikely to cause a geohazard, but potential impacts should be considered.
- Deposits with potential to collapse when loaded and saturated are probably present in places. Increased infiltration may result in a geohazard.

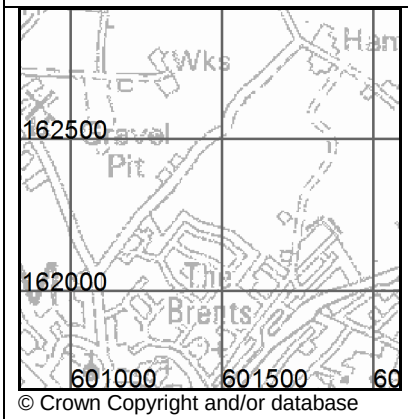
Section 4. Groundwater quality protection

The following pages contain maps showing some of the information required to ensure the protection of groundwater quality. Data presented includes:

- groundwater source protection zones (Environment Agency data)
- predominant flow mechanism
- made ground

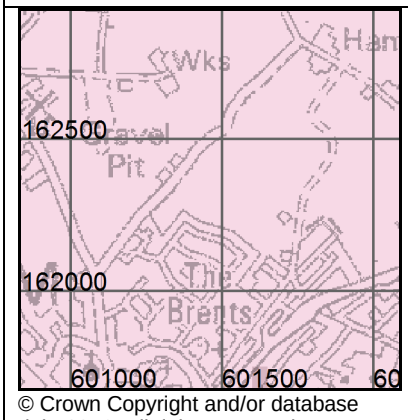
For more information read 'Explanation of terms' at the end of this report.

Groundwater source protection zones



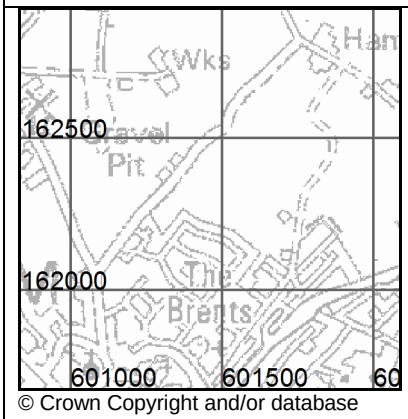
- Groundwater is not within a source protection zone.
- Source protection zone IV
- Source protection zone III
- Source protection zone II
- Source protection zone I.

Predominant flow mechanism



- Water is likely to percolate through the unsaturated zone to the groundwater through either the pore space in granular media or through porespace and fractures; these processes have some potential for contaminant removal and breakdown.
- Water is likely to percolate through the unsaturated zone to the groundwater through fractures, a process which has little potential for contaminant removal and breakdown.

Made ground

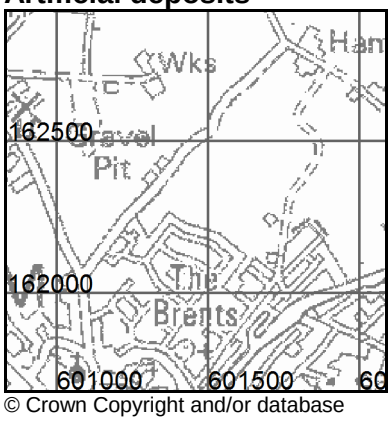


Made ground is present at the surface. Infiltration may increase the possibility of remobilising pollutants.

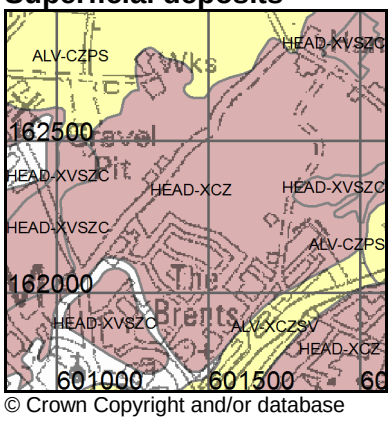
Section 5. Geological Maps

The following maps show the artificial, superficial and bedrock geology within the area of interest.

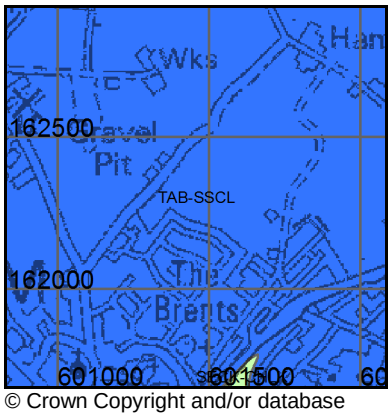
Artificial deposits



Superficial deposits



Bedrock



Fault

Coal, ironstone or mineral vein

Note: Faults and Coals, ironstone & mineral veins are shown for illustration and to aid interpretation of the map. Not all such features are shown and their absence on the map face does not necessarily mean that none are present

Key to Artificial deposits:
No deposits recorded by BGS in the search area

Key to Superficial deposits:

Map colour	Computer Code	Rock name	Rock type
	ALV-CZPS	ALLUVIUM	CLAY, SILTY, PEATY, SANDY [UNLITHIFIED DEPOSITS CODING SCHEME]
	ALV-XCZSV	ALLUVIUM	CLAY, SILT, SAND AND GRAVEL [UNLITHIFIED DEPOSITS CODING SCHEME]
	HEAD-XCZ	HEAD	CLAY AND SILT [UNLITHIFIED DEPOSITS CODING SCHEME]
	HEAD-XVSZC	HEAD	GRAVEL, SAND, SILT AND CLAY [UNLITHIFIED DEPOSITS CODING SCHEME]

Key to Bedrock geology:

Map colour	Computer Code	Rock name	Rock type
	TAB-SSCL	THANET FORMATION	SAND, SILT AND CLAY
	SECK-CHLK	SEAFORD CHALK FORMATION	CHALK

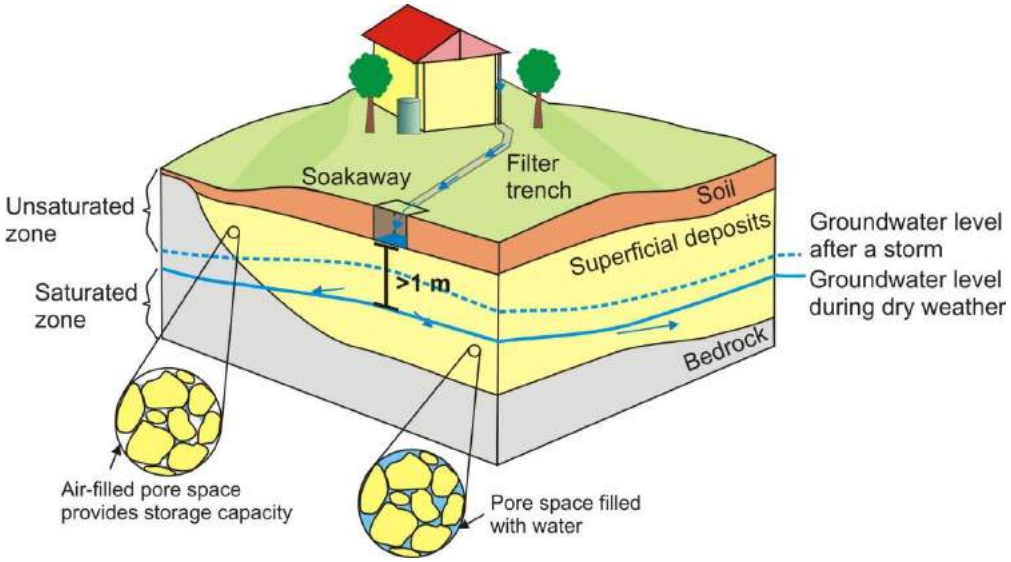
Limitations of this report:

- This report is concerned with the potential for infiltration-to-the-ground to be used as a SuDS technique at the site described. It only considers the subsurface beneath the search area and does NOT consider potential surface or subsurface impacts outside of that area.
- This report is NOT an alternative for an on-site investigation or soakaway test, which might reach a different conclusion.
- This report must NOT be used to justify disposal of foul waste or grey water.
- This report is based on and limited to an interpretation of the records held by the British Geological Survey (BGS) at the time the search is performed. The datasets used (with the exception of that showing depth to water table) are based on 1:50 000 digital geological maps and not site-specific data.
- Other more specific and detailed ground instability information for the site may be held by BGS, and an assessment of this could result in a modified assessment.
- To interpret the maps correctly, the report must be viewed and printed in colour.
- The search does NOT consider the suitability of sites with regard to:
    - previous land use,
    - potential for, or presence of contaminated land
    - presence of perched water tables
    - shallow mining hazards relating to coal mining. Searches of coal mining should be carried out via The Coal Authority Mine Reports Service: www.coalminingreports.co.uk.
    - made ground, where not recorded
    - proximity to landfill sites (searches for landfill sites or contaminated land should be carried out through consultation with local authorities/Environment Agency)
    - zones around private water supply boreholes that are susceptible to groundwater contamination.
- This report is supplied in accordance with the GeoReports Terms & Conditions available separately, and the copyright restrictions described at the end of this report

Explanation of terms

Depth to groundwater

In the shallow subsurface, the ground is commonly unsaturated with respect to water. Air fills the spaces within the soil and the underlying superficial deposits and bedrock. At some depth below the ground surface, there is a level below which these spaces are full of water. This level is known as the groundwater level, and the water below it is termed the groundwater. When water is infiltrated, the groundwater level may rise temporarily. To ensure that there is space in the unsaturated zone to accommodate this, there should be a minimum thickness of 1 m between the base of the infiltration system and the water table. An estimate of the *depth to groundwater* is therefore useful in determining whether the ground is suitable for infiltration.



Groundwater flooding

Groundwater flooding occurs when a rise in groundwater level results in very shallow groundwater or the emergence of groundwater at the surface. If infiltration systems are installed in areas that are susceptible to groundwater flooding, it is possible that the system could become inundated. The susceptibility map seeks to identify areas where the geological conditions and water tables indicate that groundwater level rise could occur under certain circumstances. A high susceptibility to groundwater flooding classification does not mean that groundwater flooding has ever occurred in the past, or will do so in the future as the susceptibility maps do not contain information on how often flooding may occur. The susceptibility maps are designed for planning; identifying areas where groundwater flooding might be an issue that needs to be taken into account.

Geological indicators of flooding
In floodplain deposits, groundwater level can be influenced by the water level in the adjacent river. Groundwater level may increase during periods of fluvial flood and therefore this should be taken into account when designing infiltration systems on such deposits. The *geological indicators of flooding* dataset shows where there is geological evidence (floodplain deposits) that flooding has occurred in the past.

For further information on flood-risk, the likely frequency of its recurrence in relation to any proposed development of the site, and the status of any flood prevention measures in place, you are advised to contact the local office of the Environment Agency (England and Wales) at www.environment-agency.gov.uk/ or the Scottish Environment Protection Agency (Scotland) at www.sepa.org.uk.

Artificial ground
Artificial ground comprises deposits and excavations that have been created or modified by human activity. It includes ground that is worked (quarries and road cuttings), infilled (back-filled quarries), landscaped (surface re-shaping), disturbed (near surface mineral workings) or classified as made ground (embankments and spoil heaps). The composition and properties of artificial ground are often unknown. In particular, the permeability and chemical composition of the artificial ground should be determined to ensure that the ground will drain and that any contaminants present will not be remobilised.

Superficial permeability
Superficial deposits are those geological deposits that were formed during the most recent period of geological time (as old as 2.6 million years before present). They generally comprise relatively thin deposits of gravel, sand, silt and clay and are present beneath the pedological soil in patches or larger spreads over much of Britain. The ease with which water can percolate through these deposits is controlled by their permeability and varies widely depending on their composition. Those deposits comprising clays and silts are less permeable and thus infiltration is likely to be slow, such that water may pool on the surface. In comparison, deposits comprising sands and gravels are more permeable allowing water to percolate freely.

Bedrock permeability
Bedrock forms the main mass of rock forming the Earth. It is present everywhere, commonly beneath superficial deposits. Where the superficial deposits are thin or absent, the ease with which water will percolate into the ground depends on the permeability of the bedrock.

Natural ground instability

Natural ground instability refers to the propensity for upward, lateral or downward movement of the ground that can be caused by a number of natural geological hazards (e.g. ground dissolution/compressible ground). Some movements associated with particular hazards may be gradual and of millimetre or centimetre scale, whilst others may be sudden and of metre or tens of metres scale. Significant natural ground instability has the potential to cause damage to buildings and structures, especially when the drainage characteristics of a site are altered. It should be noted, however, that many buildings, particularly more modern ones, are built to such a standard that they can remain unaffected in areas of significant ground movement.

Shrink-swell

A shrinking and swelling clay changes volume significantly according to how much water it contains. All clay deposits change volume as their water content varies, typically swelling in winter and shrinking in summer, but some do so to a greater extent than others. Contributory circumstances could include drought, leaking service pipes, tree roots drying-out the ground or changes to local drainage patterns, such as the creation of soakaways. Shrinkage may remove support from the foundations of buildings and structures, whereas clay expansion may lead to uplift (heave) or lateral stress on part or all of a structure; any such movements may cause cracking and distortion.

Landslides (slope stability)

A landslide is a relatively rapid outward and downward movement of a mass of ground on a slope, due to the force of gravity. A slope is under stress from gravity but will not move if its strength is greater than this stress. If the balance is altered so that the stress exceeds the strength, then movement will occur. The stability of a slope can be reduced by removing ground at the base of the slope, by placing material on the slope, especially at the top, or by increasing the water content of the materials forming the slope. Increase in subsurface water content beneath a soakaway could increase susceptibility to landslide hazards. The assessment of landslide hazard refers to the stability of the present land surface. It does not encompass a consideration of the stability of excavations.

Soluble rocks (dissolution)

Some rocks are soluble in water and can be progressively removed by the flow of water through the ground. This process tends to create cavities, potentially leading to the collapse of overlying materials and possibly subsidence at the surface. The release of water into the subsurface from infiltration systems may increase the dissolution of rock or destabilise material above or within a cavity. Dissolution cavities may create a pathway for rapid transport of contaminated water to an aquifer or water course.

Compressible ground
Many ground materials contain water-filled pores (the spaces between solid particles). Ground is compressible if a building (or other load) can cause the water in the pore space to be squeezed out, causing the ground to decrease in thickness. If ground is extremely compressible the building may sink. If the ground is not uniformly compressible, different parts of the building may sink by different amounts, possibly causing tilting, cracking or distortion. The compressibility of the ground may alter as a result of changes in subsurface water content caused by the release of water from soakaways.

Collapsible deposits
Collapsible ground comprises certain fine-grained materials with large pore spaces (the spaces between solid particles). It can collapse when it becomes saturated by water and/or a building (or other structure) places too great a load on it. If the material below a building collapses it may cause the building to sink. If the collapsible ground is variable in thickness or distribution, different parts of the building may sink by different amounts, possibly causing tilting, cracking or distortion. The subsurface underlying a soakaway will experience an increase in water content that may affect the stability of the ground. This hazard is most likely to be encountered only in parts of southern England.

Running sand
Running sand conditions occur when loosely-packed sand, saturated with water, flows into an excavation, borehole or other type of void. The pressure of the water filling the spaces between the sand grains reduces the contact between the grains and they are carried along by the flow. This can lead to subsidence of the surrounding ground. Running sand is potentially hazardous during the drainage system installation. During installation, excavation of the ground may create a space into which sand can flow, potentially causing subsidence of surrounding ground.

Shallow mining hazards (non coal)
Current or past underground mining for coal or for other commodities can give rise to cavities at shallow or intermediate depths, which may cause fracturing, general settlement, or the formation of crown-holes in the ground above. Spoil from mineral workings may also present a pollution hazard. The release of water into the subsurface from soakaways may destabilise material above or within a cavity. Cavities arising as a consequence of mining may also create a pathway for rapid transport of contaminated water to an aquifer or watercourse. The mining hazards map is derived from the geological map and considers the potential for subsidence associated with mining on the basis of geology type. Therefore if mining is known to occur within a certain rock, the map will highlight the potential for a hazard within the area covered by that geology.

For more information regarding underground and opencast **coal mining**, the location of mine entries (shafts and adits) and matters relating to subsidence or other ground movement induced by **coal mining** please contact the Coal Authority, Mining Reports, 200 Lichfield Lane, Mansfield, Nottinghamshire, NG18 4RG; telephone 0845 762 6848 or at www.coal.gov.uk**.** For more information regarding other types of mining (i.e. non-coal), please contact the British Geological Survey.

Groundwater source protection zones

In England and Wales, the Environment Agency has defined areas around wells, boreholes and springs that are used for the abstraction of public drinking water as source protection zones. In conjunction with Groundwater Protection Policy the zones are used to restrict activities that may impact groundwater quality, thereby preventing pollution of underlying aquifers, such that drinking water quality is upheld. The Environment Agency can provide advice on the location and implications of source protection zones in your area (www.environment-agency.gov.uk/)

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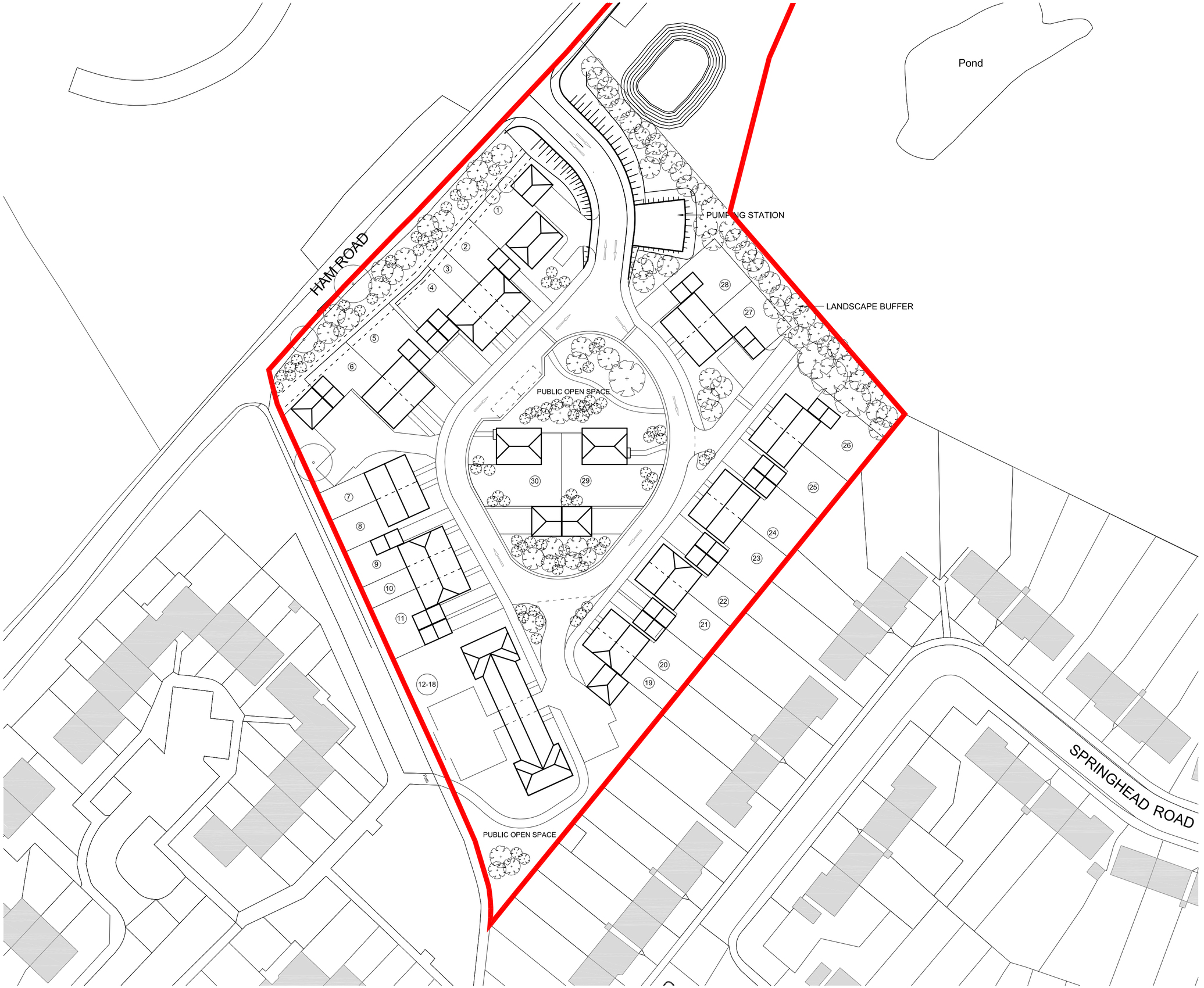
- The data, information and related records supplied in this Report by BGS can only be indicative and should not be taken as a substitute for specialist interpretations, professional advice and/or detailed site investigations. You must seek professional advice before making technical interpretations on the basis of the materials provided.
- Geological observations and interpretations are made according to the prevailing understanding of the subject at the time. The quality of such observations and interpretations may be affected by the availability of new data, by subsequent advances in knowledge, improved methods of interpretation, and better access to sampling locations.
- Raw data may have been transcribed from analogue to digital format, or may have been acquired by means of automated measuring techniques. Although such processes are subjected to quality control to ensure reliability where possible, some raw data may have been processed without human intervention and may in consequence contain undetected errors.
- Detail, which is clearly defined and accurately depicted on large-scale maps, may be lost when small-scale maps are derived from them.
- Although samples and records are maintained with all reasonable care, there may be some deterioration in the long term.
- The most appropriate techniques for copying original records are used, but there may be some loss of detail and dimensional distortion when such records are copied.
- Data may be compiled from the disparate sources of information at BGS's disposal, including material donated to BGS by third parties, and may not originally have been subject to any verification or other quality control process.
- Data, information and related records, which have been donated to BGS, have been produced for a specific purpose, and that may affect the type and completeness of the data recorded and any interpretation. The nature and purpose of data collection, and the age of the resultant material may render it unsuitable for certain applications/uses. You must verify the suitability of the material for your intended usage.
- If a report or other output is produced for you on the basis of data you have provided to BGS, or your own data input into a BGS system, please do not rely on it as a source of information about other areas or geological features, as the report may omit important details.
- The topography shown on any map extracts is based on the latest OS mapping and is not necessarily the same as that used in the original compilation of the BGS geological map, and to which the geological linework available at that time was fitted.
- Note that for some sites, the latest available records may be quite historical in nature, and while every effort is made to place the analysis in a modern geological context, it is possible in some cases that the detailed geology at a site may differ from that described.

Report issued by
BGS Enquiry Service

APPENDIX 5.0 – PROPOSED MASTER PLAN



notes

N

5 0 5 10 15 20 25

Metres (1:500)

SCHEDULE OF ACCOMMODATION

4 x 1-BED FLATS @ 54 SQM GIA
PLOTS 12-15

3 x 2-BED FLATS @ 72 SQM GIA
PLOTS 16-18

10 x 2-BED HOUSES @ 79 SQM GIA
PLOTS 2-4, 9-11 & 19-22

10 x 3-BED HOUSES @ 93 SQM GIA
PLOTS 5-8 & 23-28

3 x 4 BED HOUSES @ 110 SQM GIA
PLOTS 1, 29 & 30

PARKING

50 SPACES (INCLUDING 6 VISITOR SPACES) PROVIDED BASED KENT INTERIM GUIDANCE NOTE 3 ON PARKING PROVISION. FOR 'SUBURBAN EDGE' RESIDENTIAL DEVELOPMENTS.

rev	reason	date

client

GBH WHELER WILL TRUST

project

LAND OFF HAM ROAD, FAVERSHAM, KENT

title

PROPOSED SITE LAYOUT PLAN

drwg	rev	scale	date
DHA/10622/20		1:500	APRIL 2016

dha urban design & development masterplanning

Eclipse House, Eclipse Park. Sittingbourne Road
Maidstone, Kent. ME14 3EN

t: 01622 776226 f: 01622 776227
e: info@dhaplanning.co.uk w: www.dhaplanning.co.uk

CAD Reference: DHA_10622_HAM ROAD AWH

A2

APPENDIX 6.0 – ENVIRONMENT AGENCY PRODUCT 4 REPORT

Product 4 (Detailed Flood Risk) for: Ham Lane, Faversham
Requested by: Chris Smoker – dha transport
Reference: KSL 2600 TT
Date: 18 February 2016

Contents

The information provided is based on the best data available as of the date of this letter.

You may feel it is appropriate to contact our office at regular intervals, to check whether any amendments/ improvements have been made to the data for this location. Should you re-contact us after a period of time, please quote the above reference in order to help us deal with your query.

This information is provided subject to the enclosed notice which you should read.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

Flood Map Confirmation

The Flood Map:

Our Flood Map shows the natural floodplain for areas at risk from river and tidal flooding. The floodplain is specifically mapped ignoring the presence and effect of defences. Although flood defences reduce the risk of flooding they cannot completely remove that risk as they may be over topped or breached during a flood event.

The Flood Map indicates areas with a 1% (0.5% in tidal areas), Annual Exceedance Probability (AEP) - the probability of a flood of a particular magnitude, or greater, occurring in any given year, and a 0.1% AEP of flooding from rivers and/or the sea in any given year. The map also shows the location of some flood defences and the areas that benefit from them.

The Flood Map is intended to act as a guide to indicate the potential risk of flooding. When producing it we use the best data available to us at the time, taking into account historic flooding and local knowledge. The Flood Map is updated on a quarterly basis to account for any amendments required. These amendments are then displayed on the internet at www.gov.uk/prepare-for-a-flood.

At this Site:

The Flood Map shows that this site lies partly within the outline of the 0.5% chance of flooding in any given year from the sea.

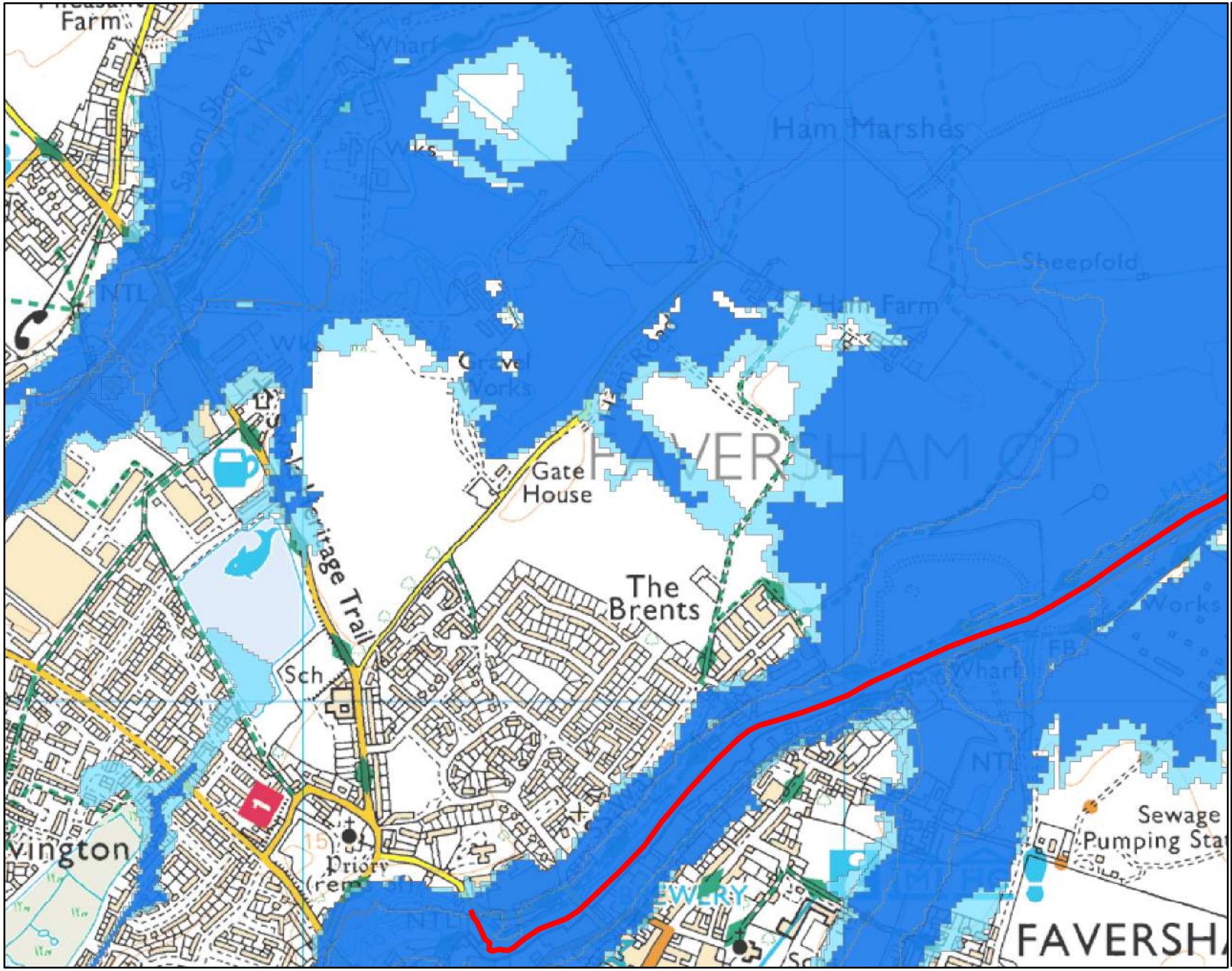
Enclosed is an extract of our Flood Map which shows this information for your area.

Method of production

The Flood Map at this location has been derived using detailed tidal modelling of the North Kent Coast, completed in August 2013.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

Flood Map Centred on Ham Lane, Faversham
Created 18 February 2016 (Ref KSL 2600 TT)



Environment Agency

N

Legend

- Main Rivers
- Flood Defences
- Areas Benefiting From Flood Defence
- Flood Zone 3
- Flood Zone 2

Scale 1:10,000

0 250 500

Meters

Contact us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506. Email:enquiries@environment-agency.gov.uk

Model Output Data

You have requested flood levels for various return periods at this location.

The modelled flood levels for the closest most appropriate model grid cells, any additional information you may need to know about the modelling from which they are derived and/or any specific use or health warning for their use are set out below.

Using a 2D TuFLOW model the floodplain has been represented as a grid. The flood water levels have been calculated for each grid cell.

A map showing the location of the points from which the data is taken is enclosed. Please note you should read the notice enclosed for your specific use rights.

Table 1: Defended Modelled Tidal Flood levels for Annual Exceedance Probability shown in mAOD

Node Location ID	Modelled Tidal Flood levels for Annual Exceedance Probability shown in mAOD						
	National Grid Ref		Defended				
	Easting	Northing	5% AEP 2012	0.5% AEP 2012	0.5% AEP 2070	0.5% AEP 2115	0.1% AEP (2012)
1	601372	162503	3.78	4.52	5.14	5.65	5.04
2	601624	162489	0.00	0.00	4.86	5.65	3.82
3	601937	162492	0.00	4.52	5.16	5.65	5.06
4	601440	162371	0.00	0.00	0.00	5.51	0.00
5	601751	162376	0.00	0.00	4.86	5.65	3.82
6	601955	162371	0.00	0.00	5.16	5.65	5.06
7	601620	162226	0.00	0.00	0.00	0.00	0.00
8	601889	162221	0.00	0.00	5.16	5.65	5.06

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

Table 2: Undefended Modelled Tidal Flood levels for Annual Exceedance Probability shown in mAOD

Node Location ID	Modelled Tidal Flood levels for Annual Exceedance Probability shown in mAOD						
	National Grid Ref		Undefended				
	Easting	Northing	5% AEP 2012	0.5% AEP 2012	0.5% AEP 2070	0.5% AEP 2115	0.1% AEP 2012
1	601372	162503	4.01	4.53	5.10	5.83	4.97
2	601624	162489	0.00	0.00	4.96	5.83	3.69
3	601937	162492	0.00	4.54	5.10	5.83	4.97
4	601440	162371	0.00	0.00	0.00	5.84	0.00
5	601751	162376	0.00	0.00	4.96	5.83	3.61
6	601955	162371	0.00	0.00	5.10	5.83	4.97
7	601620	162226	0.00	0.00	0.00	0.00	0.00
8	601889	162221	0.00	0.00	5.11	5.83	4.97

Data taken from North Kent Coast Modelling and Mapping Study, completed by JBA Consulting, in August 2013.

There are no health warnings or additional information for these levels or the model from which they were produced.

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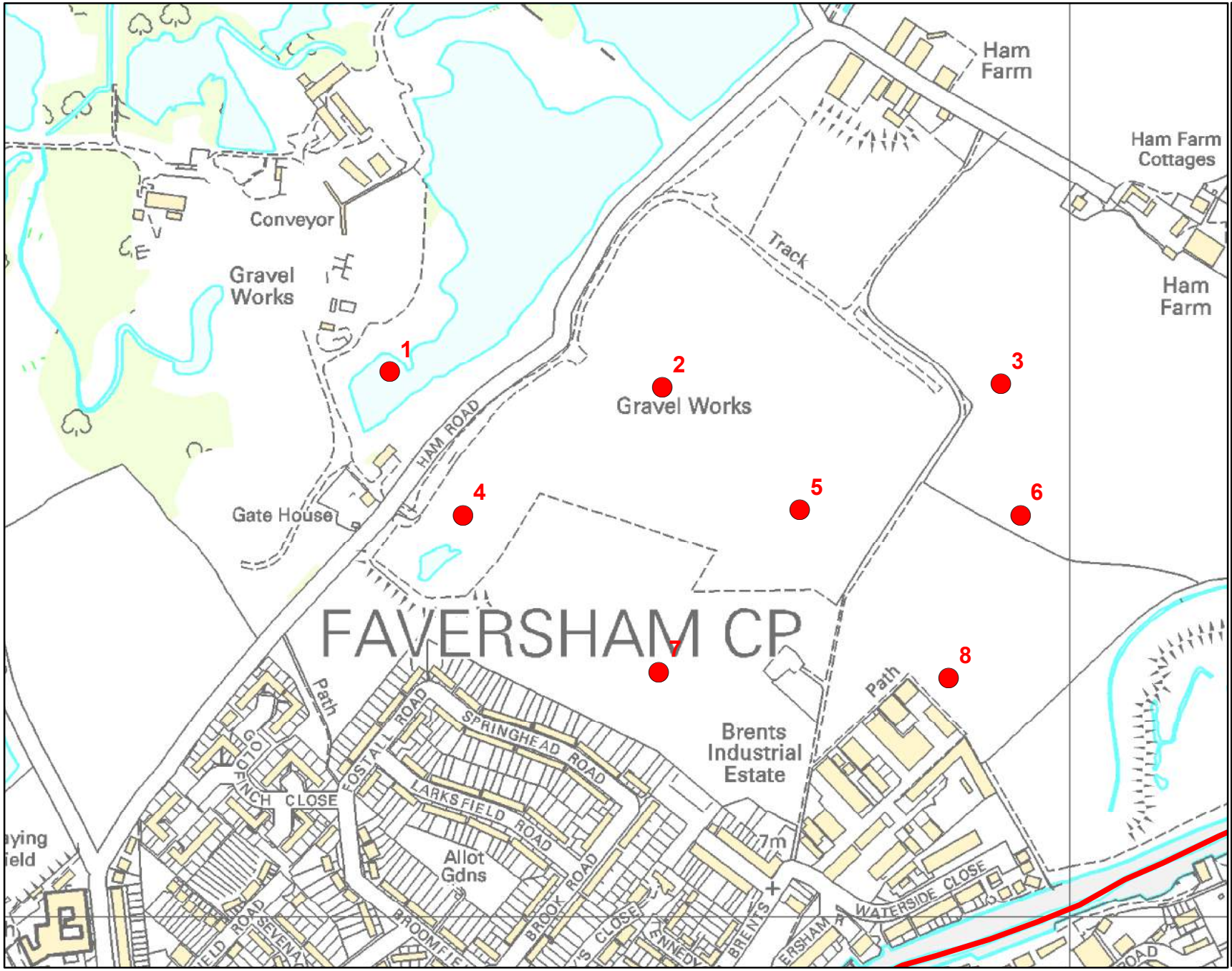
Email: kslenquiries@environment-agency.gov.uk

Modelled Node Locations Centred on Ham Lane, Faversham
Created 18 February 2016 (Ref KSL 2600 TT)



Environment Agency

N

Legend

- NodeLocations
- Main Rivers

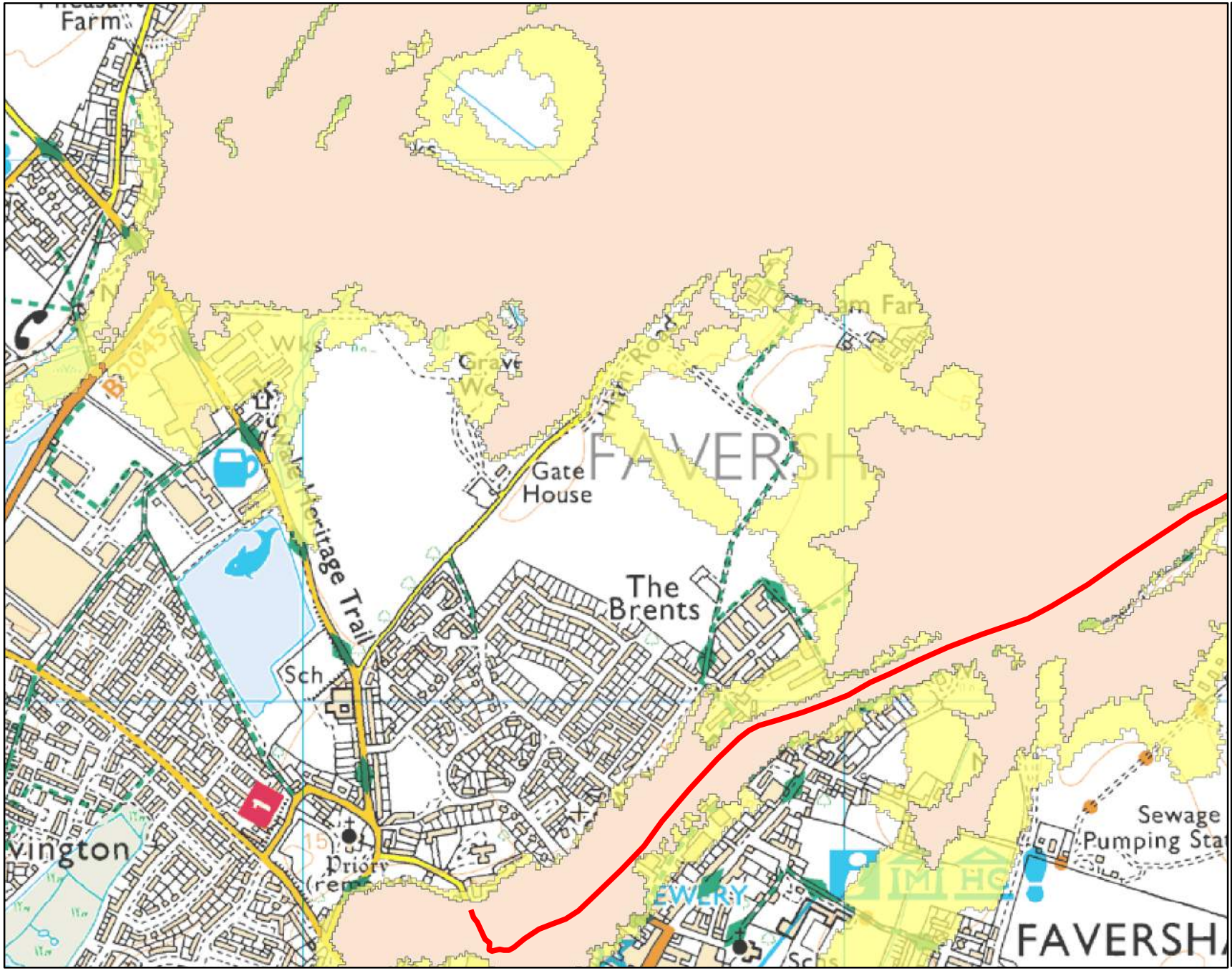
Scale 1:5,000

0 125 250

Meters

Contact us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506. Email:enquiries@environment-agency.gov.uk

Defended Modelled Tidal Flood Outlines Centred on Ham Lane, Faversham
Created 18 February 2016 (Ref KSL 2600 TT)



Environment Agency

N

Legend

- Main Rivers
- 5% AEP (2012)
- 0.1% AEP (2012)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occuring in any given year.

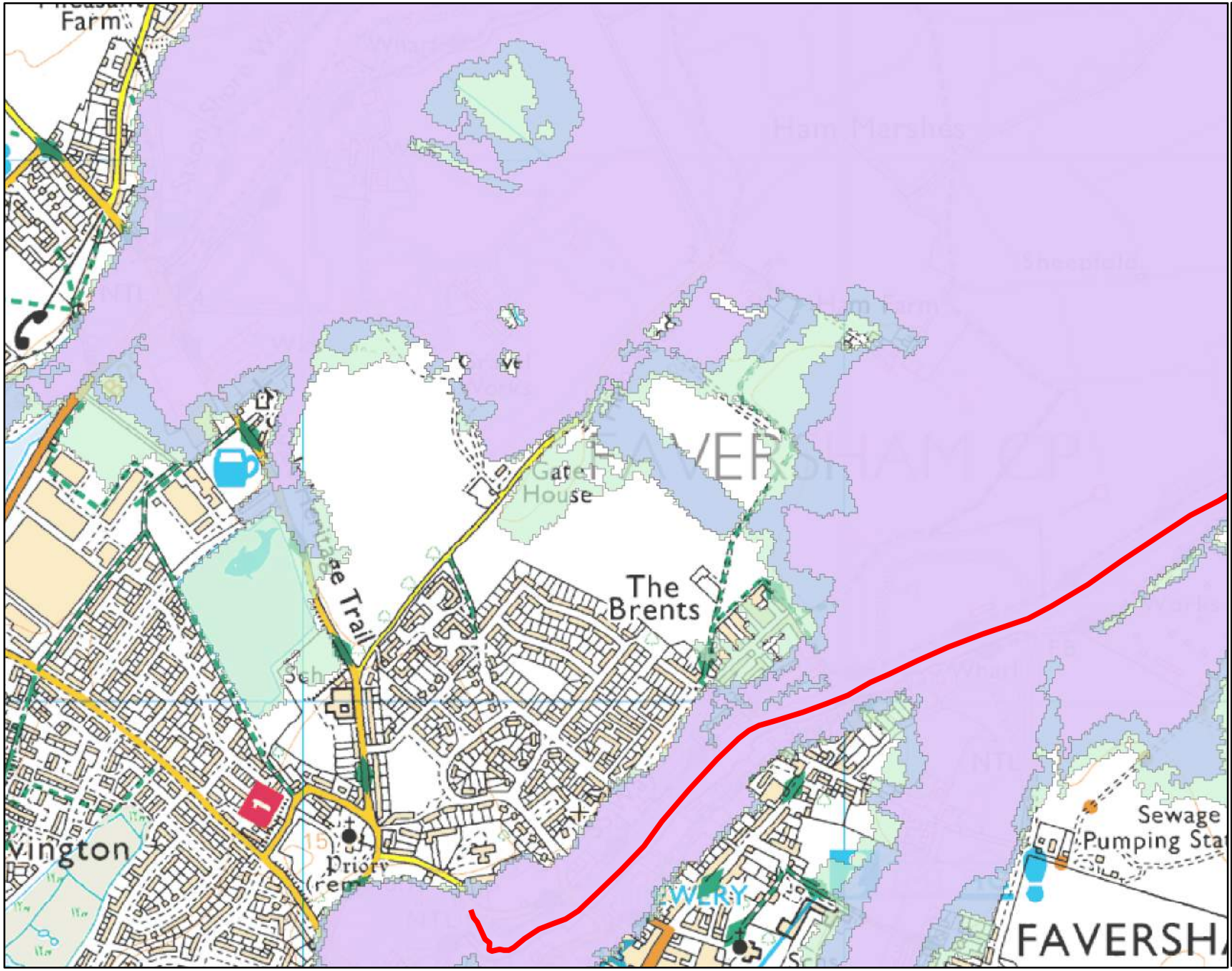
Scale 1:10,000

0 250 500

Meters

Contact us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506. Email:enquiries@environment-agency.gov.uk

Defended Modelled Tidal Flood Outlines Centred on Ham Lane, Faversham
Created 18 February 2016 (Ref KSL 2600 TT)



Environment Agency

N

Legend

- Main Rivers
- 0.5% AEP (2012)
- 0.5% AEP (2070)
- 0.5% AEP (2115)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occuring in any given year.

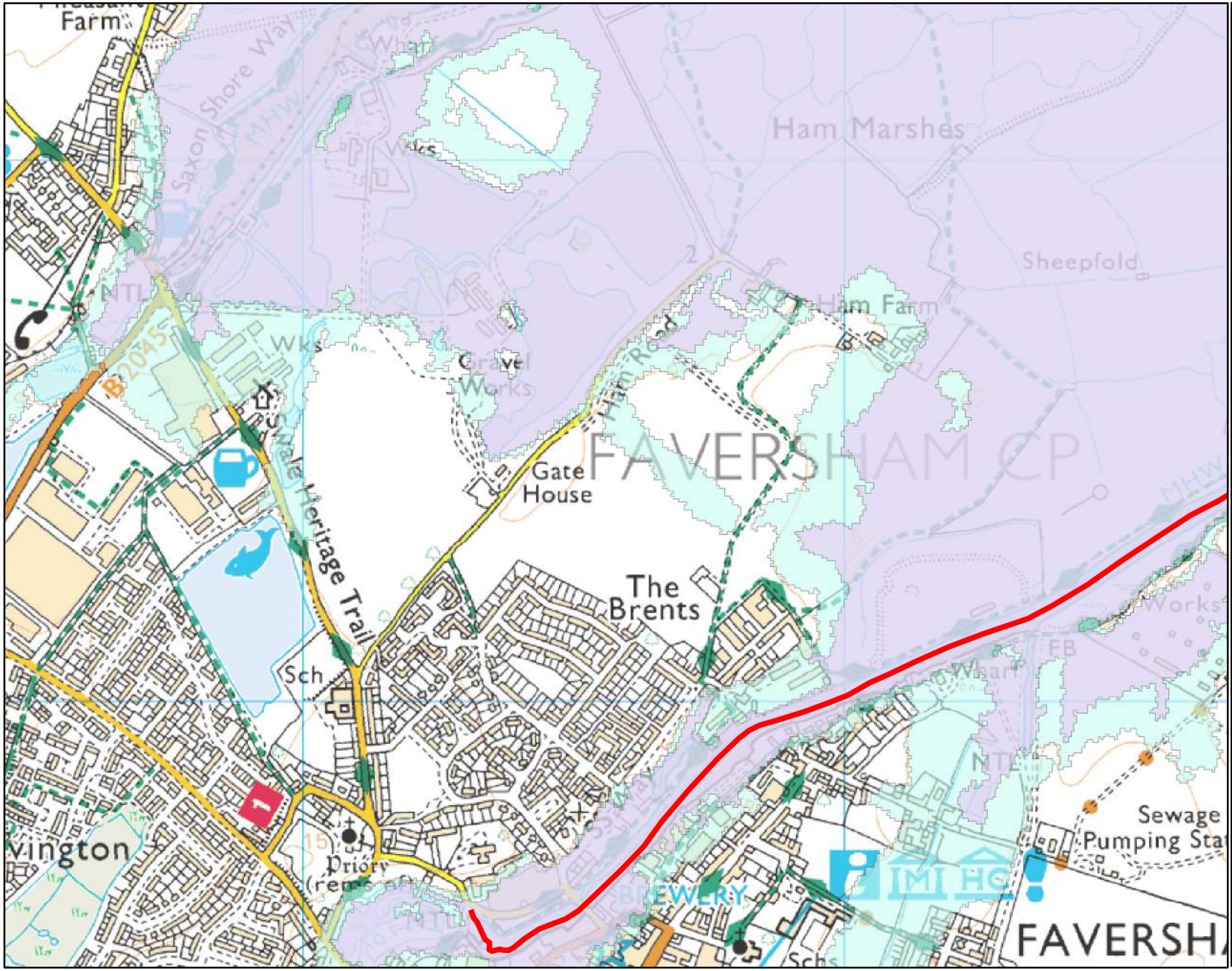
Scale 1:10,000

0 250 500

Meters

Contact us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506. Email:enquiries@environment-agency.gov.uk

Undefended Modelled Tidal Flood Outlines Centred on Ham Lane, Faversham
Created 18 February 2016 (Ref KSL 2600 TT)



Environment Agency

N

Legend

- Main Rivers
- 5% AEP (2012)
- 0.1% AEP (2012)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occuring in any given year.

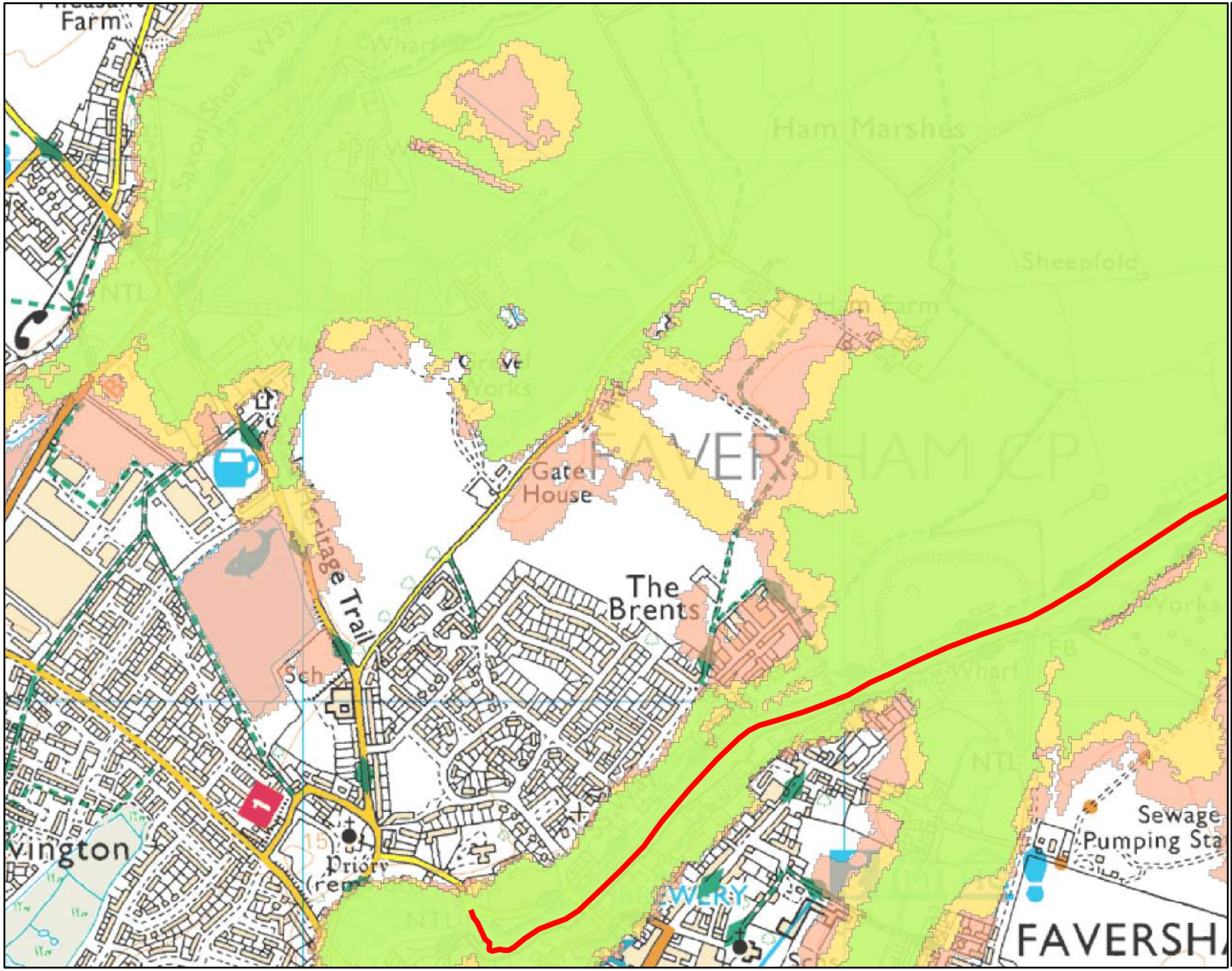
Scale 1:10,000

0 250 500

Meters

Contact us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506. Email:enquiries@environment-agency.gov.uk

Undefended Modelled Tidal Flood Outlines Centred on Ham Lane, Faversham
Created 18 February 2016 (Ref KSL 2600 TT)



Environment Agency

N

Legend

- Main Rivers
- 0.5% AEP (2012)
- 0.5% AEP (2070)
- 0.5% AEP (2115)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occuring in any given year.

Scale 1:10,000

0 250 500

Meters

Contact us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506. Email:enquiries@environment-agency.gov.uk

Defence Details

There are currently a range of flood defences around Ham Marshes, Faversham Creek, and Oare Creek. These are generally made up of raised embankments which provide a less that 20 year standard of protection.

The Environment Agency does not currently have any planned defences in this area.

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Email: kslenquiries@environment-agency.gov.uk

Historic Flood Data

We hold records of historic flood events from rivers and the sea. Information on the floods that may have affected the area local to your site are provided below and in the enclosed map (if relevant).

Flood Event Data

We do not hold records of historic flood events from rivers and/or the sea affecting the area local to this site. However, please be aware that this does not necessarily mean that flooding has not occurred here in the past, as our records are not comprehensive.

Please note that our records are not comprehensive. We would therefore advise that you make further enquiries locally with specific reference to flooding at this location. You should consider contacting the relevant Local Planning Authority and/or water/sewerage undertaker for the area.

We map flooding to land, not individual properties. Our historic flood event record outlines are an indication of the geographical extent of an observed flood event. Our historic flood event outlines do not give any indication of flood levels for individual properties. They also do not imply that any property within the outline has flooded internally.

Please be aware that flooding can come from different sources. Examples of these are:

- from rivers or the sea;
- surface water (i.e. rainwater flowing over or accumulating on the ground before it is able to enter rivers or the drainage system);
- overflowing or backing up of sewer or drainage systems which have been overwhelmed,
- groundwater rising up from underground aquifers

Currently the Environment Agency can only supply flood risk data relating to the chance of flooding from rivers or the sea. However you should be aware that in recent years, there has been an increase in flood damage caused by surface water flooding or drainage systems that have been overwhelmed.

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Email: kslenquiries@environment-agency.gov.uk

Additional Information

Use of Environment Agency Information for Flood Risk / Flood Consequence Assessments

Depending on the enquiry, we may also provide advice on other issues related to our responsibilities including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

In **England**, you should refer to the Environment Agency's Flood Risk Standing Advice, the technical guidance to the National Planning Policy Framework and the existing PPS25 Practice Guide for information about what flood risk assessment is needed for new development in the different Flood Zones. These documents can be accessed via:

https://www.gov.uk/government/publications/flood-risk-standing-advice-for-local-planning-authorities-frsa
http://planningguidance.planningportal.gov.uk/

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

You should note that:

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk / Consequence Assessment (FRA / FCA) where one is required, but does not constitute such an assessment on its own.

2. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as groundwater or overland runoff. The information produced by the local planning authority referred to above may assist here.

3. Where a planning application requires a FRA / FCA and this is not submitted or deficient, the Environment Agency may well raise an objection.

4. For more significant proposals in higher flood risk areas, we would be pleased to discuss details with you ahead of making any planning application, and you should also discuss the matter with your local planning authority.

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Email: kslenquiries@environment-agency.gov.uk

Surface Water

We have provided two national Surface Water maps, under our Strategic Overview for flooding, to your Lead Local Flood Authority –Kent County Council, who are responsible for local flood risk (i.e. surface runoff, ground water and ordinary watercourse), which alongside their existing local information will help them in determining what best represents surface water flood risk in your area.

Kent County Council have reviewed these and determined what it believes best represents surface water flood risk. You should therefore contact this authority so they can provide you with the most up to date information about surface water flood risk in your area.

You may also wish to consider contacting the appropriate relevant Local Planning Authority and/or water/sewerage undertaker for the area. They may be able to provide some knowledge on the risk of flooding from other sources. We are working with these organisations to improve knowledge and understanding of surface water flooding.

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Email: kslenquiries@environment-agency.gov.uk

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