CONSULTING ENGINEERS

FLOOD RISK ASSESSMENTS

Land off Eldridge Close, Clavering
Flood Risk Assessment

2005-452

Author: Josh Kerridge | Approved By: Richard Wigzell | Date: Sep 2023 | Revision: D

Proposed development of 28 dwellings off Eldridge Close, Clavering, Essex

Flood Risk Assessment

Date: **Sep 2023**

Author: **Richard Wigzell**

Ingent Project Code & *Reference:* **2005-452**

Revision: D

INDEX

1 INTRODUCTION

1.1.1 The applicants are proposing to construct 28 new dwellings on a greenfield site, accessed off Eldridge Close, Clavering, Essex. The proposals will include the associated access and parking provisions.

1.1.2 The purpose of this assessment is to review the proposed development and to consider the risk to it of flooding, and also the affect it may have on existing flood flows and flood storage within adjacent floodplains. The risks of flooding and potential impact of alterations to the existing flood flow and storage regime and surface run-off characteristics are considered within the scope and parameters set out in the National Planning Policy Framework. Consideration is also given to the ODPM document “Preparing for Floods”, and the Essex County Council Sustainable Drainage Systems Design Guide.

1.1.3 The Environment Agency website and flood mapping was consulted during the course of this assessment, and reference also made to the updated Flood Maps for Surface Water (uFMfSW).

2 LOCATION

2.1.1 The site is located to the south west of Saffron Walden, approximately 4km to the west of the M11. The nearest watercourse to the site is the Wicken Water located 500m north east of the site.

3 FLOOD LEVEL INFORMATION AND PROTECTION

3.1.1 The Environment Agency fluvial and tidal flood mapping as shown in Appendix 1 indicates that the site is in Zone 1, outside any floodplain.

4 FLOOD PROTECTION

4.1.1 Given that the site is located within Zone 1, no special measures or constraints are proposed to protect the site from fluvial flooding.

4.1.2 Although within floodzone 1, consideration is also required of the flood risk presented from other potential sources such as overland water, groundwater, sewers and retained water features.

4.1.3 The site is bounded by existing ditches along the northern, western and southern boundaries. Overland surface water flood mapping is appended and indicates that there is flood flow in the western ditch in the low, medium and high risk scenarios but that no water is expected to escape from the ditch in any of these events.

4.1.4 The flood mapping also shows there to be no surface water flooding within the site for the low and medium risk events, representing up to the 100 year return event. The low risk mapping and medium risk events, representing up to the 100 year return event. The low risk mapping shows flood water up to the 1000-year event and provides a useful exceedance event check and in this case shows low depth floodwater running south down the centre of the site, for around half it's length. The water is shown to develop within the site and is considered to represent the greenfield runoff from the site becoming overland in the very extreme events. Following development much of this water will be collected and controlled by the site drainage and all properties will also be set a minimum of 150mm above the surrounding ground level. There is therefore not considered to be any risk to the properties even in the 1000 year event.

4.1.4 There is no known evidence of foul water flooding from Thames Water sewers and the threat from groundwater has also been assessed. Borehole records from the vicinity indicate that the ground conditions are expected to be glacial drift overlying boulder clay at relatively shallow depth, and the presence of the ditches on three sides is considered to demonstrate the interface of the clay at around 800mm. By draining the clay interface the ditches prevent the build up of any groundwater and this is therefore not considered to pose a flood threat.

5 FLOOD STORAGE

5.1 As the property will be above the 1% tidal and fluvial flood level, the proposed redevelopment is not considered to have any impact on existing floodplain storage.

6 SURFACE WATER DRAINAGE

6.1 It is understood that the existing geology of the area is to be underlain by boulder clay, as referenced above and appended British Geological Survey data. Therefore the use of infiltration structures on site will not be a viable option for surface water disposal.

6.2 The development site is presently greenfield draining south with a fall of 4m to the existing ditch that runs from east to west along the southern boundary. An HR Wallingford greenfield runoff calculation has been undertaken for the site as appended, demonstrating the site has a Qbar runoff of 3.17 L/s. Post development it is considered that around a third of the site to the east might still be able to drain as greenfield in extreme storm events. It is therefore intended to restrict the discharge from the remaining two thirds of the developed site to a rate of no more than 2 L/s in any storm event. This approach accords with current national and Essex CC policy and will provide a considerable improvement in downstream impact for all events over Qbar.

6.3 The proposed surface water drainage strategy for the site is therefore SuDS based capture, conveyance and storage before ultimately discharging to the southern ditch at 2 L/s, thereby mimicking the existing regime. Although an Outline Application at this time, a strategy has been detailed as appended to illustrate how all surface water can be captured, treated and attenuated to enable the restricted outfall. The strategy shown assumes an adoptable standard access road to be constructed in impermeable paving, draining to a swale which connects to a basin to the South.

As shown, all private drives will be constructed in permeable paving to provide a high level of water quality treatment in those areas, leaving the swales to treat the access road runoff. From SuDS Manual table 26.2 below it is considered that the access road and private hardstandings will present a Low Pollution Hazard Level with pollution indices as shown.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

From table 26.3 below of mitigation indices, it can be seen that permeable pavement in isolation and a combination of swale and basin all provide pollution mitigation well in excess of the required indices.

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation indices[1]		
Type of SuDS component	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

6.4 Storage required in order to limit the discharge rate from site, will be provided via Geocellular crates under the front gardens as shown.

6.5 The strategy is therefore considered to provide a robust solution to surface water drainage for the proposed development with all water contained in such a way as to pose no threat to life or property. The proposed system can accommodate surface water from events up to and including the extreme 1 in 100 year event plus a 40% allowance for climate change, as per appended calculations.

6.6 Water quality will be provided by the SuDS features detailed which will treat all surface water runoff to a higher standard than that required.

7.0 FOUL WATER DRAINAGE

7.1 Foul water drainage from the proposed development tis expected to drain by gravity into Thames Water equipment in the adjacent Eldridge Close.

8 SUMMARY AND CONCLUSIONS

8.1 The proposed new residential dwellings off Eldridge Close, Clavering, has been assessed for the risk to the development on the site from fluvial flooding in accordance with the guidelines of the NPPF. Assessment has also been made of the impact of the proposed development on the existing floodplain storage at this location, and of the risk of storm water contribution from the development exacerbating downstream flooding, as directed by the guidance.

8.2 The site has been found to lie within Flood Zone 1 and is therefore not considered to be at risk from fluvial flooding. Other sources of flooding have similarly been assessed and found to pose no threat to development on the site.

8.3 The proposals do not affect fluvial flood storage within the floodplain and surface water runoff is contained and managed entirely within the site. Significant reduction in the rate and volume of surface water runoff in storm events up to and including the 1 in 100 year + 40% event is achieved by the development.

8.4 It is considered from this assessment that the level of risk of flooding to and from the proposed development is of an acceptable level.

Appendix 1: 2005-452-001D Surface Water drainage strategy

GENERAL

1. DO NOT SCALE THIS DRAWING. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED. ANY DISCREPANCIES ARE TO BE RECORDED AND REPORTED TO THE ENGINEERS IMMEDIATELY.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER ENGINEERS AND ARCHITECTS DRAWINGS AND THE SPECIFICATION.

3. ALL WORK IS TO BE TO THE SATISFACTION OF THE ENGINEER AND LOCAL AUTHORITY BUILDING CONTROL.

4. THE CONTRACTOR IS RESPONSIBLE FOR AND MUST TAKE ALL NECESSARY PRECAUTIONS TO ENSURE THE STABILITY OF THE WORKS AT ALL TIMES DURING CONSTRUCTION.

5. ALL WORKMANSHIP AND MATERIALS ARE TO BE TO CURRENT BRITISH STANDARDS.

6. ALL SERVICES ARE TO BE LOCATED AND PROTECTED AS NECESSARY BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF THE WORKS.

7. ANY EXISTING DETAILS WHICH ARE SHOWN ON THIS DRAWING ARE FOR GUIDANCE ONLY AND ARE TO BE CHECKED ON SITE BY THE CONTRACTOR. ANY VARIATIONS ARE TO BE RECORDED AND REPORTED TO THE ENGINEER IMMEDIATELY.

8. ALL HIGHWAY WORKS ARE TO BE IN ACCORDANCE WITH THE LOCAL AUTHORITIES DESIGN GUIDE AND SPECIFICATION.

9. DURING CONSTRUCTION WORKS ON SITE, ALL ROADS AND FOOTPATHS ARE TO BE SWEPT AND KEPT CLEAR OF OBSTRUCTIONS, THIS IS TO INCLUDE EXISTING HIGHWAYS AS APPROPRIATE TO ENSURE SAFE PASSAGE OF ALL ROAD USERS.

10. PROVISION SHALL BE MADE FOR THE INSTALLATION OF ALL MAINS SERVICES INCLUDING DUCTING PRIOR TO THE LAYING OF THE ROAD BASE-COURSE.

11. ALL SEWER WORKS ARE TO BE IN ACCORDANCE WITH 'SEWERS FOR ADOPTION 6th EDITION.

12. ALL PRIVATE CONNECTIONS TO ADOPTABLE SEWERS SHOULD BE A MINIMUM OF 100mm DIAMETER (FOUL) &150mm DIAMETER (SURFACE) MADE IN VITRIFIED CLAY CONNECTING SOFFIT TO SOFFIT.

Rev	Revision Notes	Dwn	Apvd	Date
D	REVISED TO SUIT NEW LAYOUT	JS	RGW	28.09.2023
C	UPDATED SITE LAYOUT	RGW	RGW	18.05.2022
B	REVISED TO SUIT NEW LAYOUT	JH	RGW	03.02.2022
A	REVISED TO NEW LAYOUT & TREE RPA	JK	RGW	01.06.2020

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STRATEGY

Project:
STICKLING GREEN
CLAVERING

Drawing Title:
DRAINAGE STRATEGY

Client:	Date:
RICHSTONE PROPERTIES	MAY 2020

Drawn:	Designed:	Checked:	Approved:
JK	JK	RGW	RGW

Scale: 1:250 (5m 0m 5m 10m 15m)

Project No:	Drawing No & Revision:	Size:
2005-452	001D	A1

Appendix 2: Greenfield runoff and Flow Calculations for drainage strategy

HR Wallingford
Working with water

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Richard Wigzell
Site name:	Eldridge Close
Site location:	Clavering

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.97496° N
Longitude:	0.15438° E
Reference:	1178622280
Date:	May 22 2020 11:44

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 1.29

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	3	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.37	0.37

Hydrological characteristics

	Default	Edited
SAAR (mm):	612	612
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	3.17	3.17
1 in 1 year (l/s):	2.69	2.69
1 in 30 years (l/s):	7.28	7.28
1 in 100 year (l/s):	10.1	10.1
1 in 200 years (l/s):	11.84	11.84

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Width (mm)	Easting (m)	Northing (m)	Depth (m)
S1			100.585	600		548102.297	232961.733	1.902
S2	0.081	5.00	100.023	1200		548094.326	232939.753	1.633
S3	0.137	5.00	99.160	1200		548075.300	232900.831	0.960
S4	0.076	5.00	98.700	600		548068.536	232879.707	0.950
S5	0.098	5.00	98.325	1200		548046.343	232853.699	0.725
S6			98.400	1200		548038.293	232853.888	0.918
S7			98.395	900	675	548036.958	232853.184	0.920
S1.0	0.018	5.00	100.852	600		548094.483	232975.830	1.000
S1.1	0.025	5.00	101.300	600		548121.583	232974.858	1.000

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S1	S2	23.381	0.600	98.683	98.390	0.293	79.8	100	5.64	50.0
1.001	S2	S3	43.323	0.600	98.390	98.200	0.190	228.0	300	6.34	50.0
1.002	S3	S4	22.181	0.600	98.200	97.750	0.450	49.3	300	6.50	50.0
1.003	S4	S5	34.190	0.600	97.750	97.600	0.150	227.9	300	7.05	50.0
1.004	S5	S6	8.052	0.600	97.600	97.482	0.118	68.2	300	7.12	50.0
1.005	S6	S7	1.509	0.600	97.482	97.475	0.007	215.6	300	7.15	50.0
1.1	S1.0	S1	16.118	0.600	99.852	98.683	1.169	13.8	100	5.13	50.0
1.2	S1.1	S1	23.328	0.600	100.300	98.683	1.617	14.4	100	5.19	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.862	6.8	5.8	1.802	1.533	0.043	0.0	71	0.969
1.001	1.037	73.3	16.8	1.333	0.660	0.124	0.0	98	0.847
1.002	2.244	158.7	35.4	0.660	0.650	0.261	0.0	96	1.818
1.003	1.037	73.3	45.7	0.650	0.425	0.337	0.0	172	1.092
1.004	1.906	134.7	59.0	0.425	0.618	0.435	0.0	139	1.843
1.005	1.067	75.4	59.0	0.618	0.620	0.435	0.0	200	1.176
1.1	2.091	16.4	2.4	0.900	1.802	0.018	0.0	26	1.504
1.2	2.044	16.1	3.4	0.900	1.802	0.025	0.0	31	1.612

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	23.381	79.8	100	Circular	100.585	98.683	1.802	100.023	98.390	1.533
1.001	43.323	228.0	300	Circular	100.023	98.390	1.333	99.160	98.200	0.660
1.002	22.181	49.3	300	Circular	99.160	98.200	0.660	98.700	97.750	0.650
1.003	34.190	227.9	300	Circular	98.700	97.750	0.650	98.325	97.600	0.425
1.004	8.052	68.2	300	Circular	98.325	97.600	0.425	98.400	97.482	0.618
1.005	1.509	215.6	300	Circular	98.400	97.482	0.618	98.395	97.475	0.620
1.1	16.118	13.8	100	Circular	100.852	99.852	0.900	100.585	98.683	1.802
1.2	23.328	14.4	100	Circular	101.300	100.300	0.900	100.585	98.683	1.802

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Width (mm)	Node Type	MH Type
1.000	S1	600	Manhole	Adoptable	S2	1200		Manhole	Adoptable
1.001	S2	1200	Manhole	Adoptable	S3	1200		Manhole	Adoptable
1.002	S3	1200	Manhole	Adoptable	S4	600		Manhole	Adoptable
1.003	S4	600	Manhole	Adoptable	S5	1200		Manhole	Adoptable
1.004	S5	1200	Manhole	Adoptable	S6	1200		Manhole	Adoptable
1.005	S6	1200	Manhole	Adoptable	S7	900	675	Manhole	1 STANDARD
1.1	S1.0	600	Manhole	Adoptable	S1	600		Manhole	Adoptable
1.2	S1.1	600	Manhole	Adoptable	S1	600		Manhole	Adoptable

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m^3/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	40	0	0

Node S2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	98.390	Product Number	CTL-SHE-0096-4000-0900-4000
Design Depth (m)	0.900	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	4.0	Min Node Diameter (mm)	1200

Node S3 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.800	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	0.5		
Invert Level (m)	98.200	Diameter (m)	0.016		

Node S6 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	97.482	Product Number	CTL-SHE-0068-2000-0920-2000
Design Depth (m)	0.920	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node S5 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.400	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	10.0		
Invert Level (m)	97.600	Diameter (m)	0.089		

Node S2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	98.390
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	136

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	11.4	0.0	0.900	86.1	0.0	0.901	0.0	0.0

Node S3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	98.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	296.0	0.0	0.800	296.0	0.0	0.801	0.0	0.0

Node S5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	97.600
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	248.0	0.0	0.400	248.0	0.0	0.401	0.0	0.0

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.27%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	14	100.585	1.902	19.5	0.5382	0.0000	FLOOD RISK
120 minute winter	S2	114	99.461	1.071	23.8	46.1918	0.0000	SURCHARGED
1440 minute winter	S3	1440	98.916	0.716	6.5	204.2820	0.0000	FLOOD RISK
360 minute winter	S4	352	98.093	0.343	6.8	0.6450	0.0000	SURCHARGED
360 minute winter	S5	352	98.093	0.493	14.8	96.2462	0.0000	FLOOD RISK
360 minute winter	S6	352	98.082	0.600	2.1	0.6786	0.0000	SURCHARGED
15 minute summer	S7	1	97.475	0.000	2.0	0.0000	0.0000	OK
15 minute winter	S1.0	13	100.756	0.904	11.3	0.5816	0.0000	FLOOD RISK
15 minute winter	S1.1	13	101.282	0.981	15.7	0.7685	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	1.000	S2	14.7	1.877	2.169	0.1829	
120 minute winter	S2	1.001	S3	4.0	0.697	0.055	2.9960	
1440 minute winter	S3	1.002	S4	0.4	0.311	0.003	0.4480	
360 minute winter	S4	1.003	S5	6.6	0.603	0.090	2.4076	
360 minute winter	S5	Orifice	S6	2.1				
360 minute winter	S6	Hydro-Brake®	S7	2.0				59.2
15 minute winter	S1.0	1.1	S1	8.1	1.165	0.493	0.1261	
15 minute winter	S1.1	1.2	S1	11.4	1.538	0.710	0.1825	

Appendix 3: Environment Agency flood mapping

Environment Agency

Flood map for planning

Your reference	Location (easting/northing)	Created
Clavering	**548046/232810**	**12 May 2020 15:45**

Your selected location is in flood zone 1, an area with a low probability of flooding.

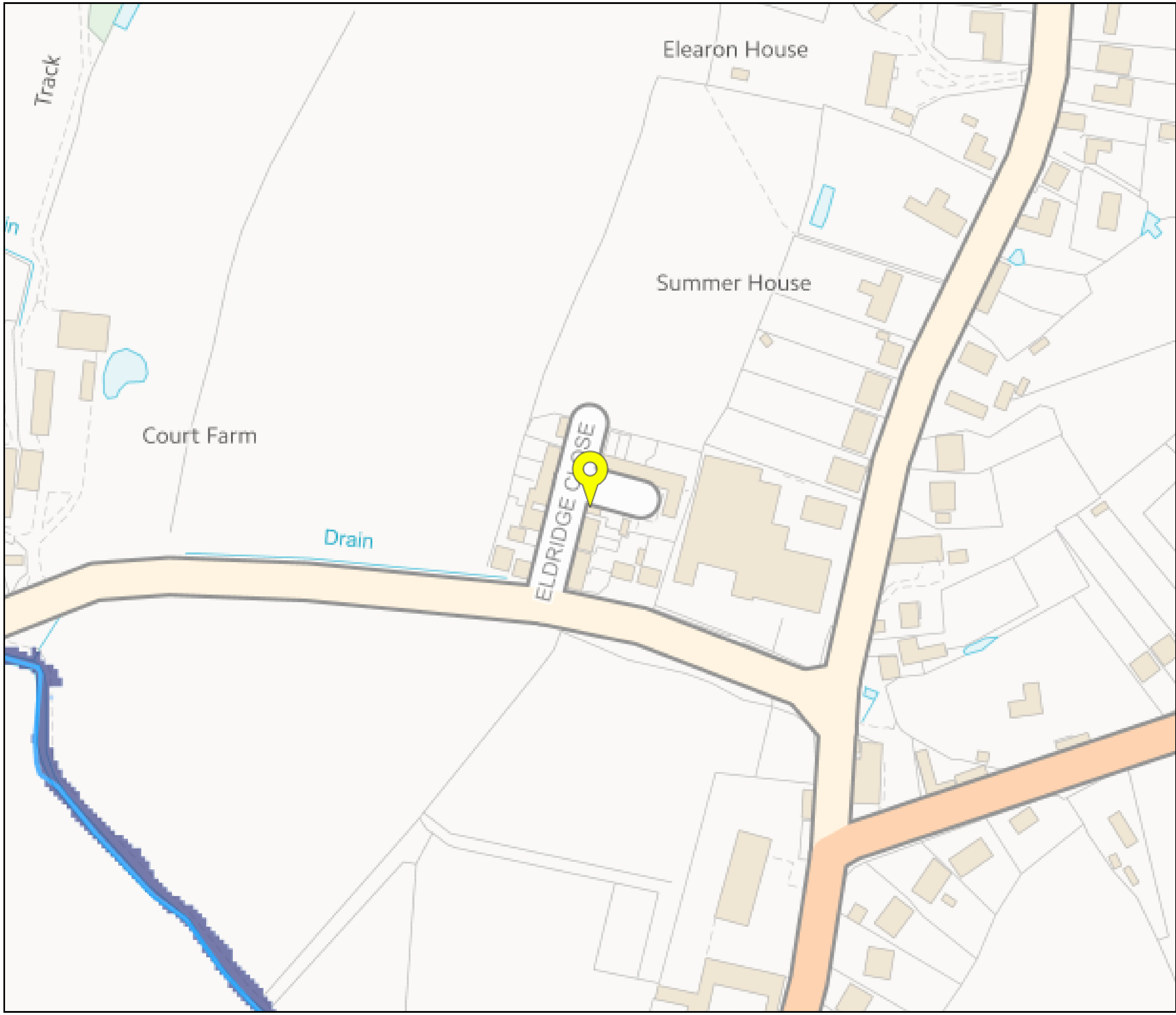
This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.



Environment Agency

Flood map for planning

Your reference
Clavering

Location (easting/northing)
548046/232810

Scale
1:2500

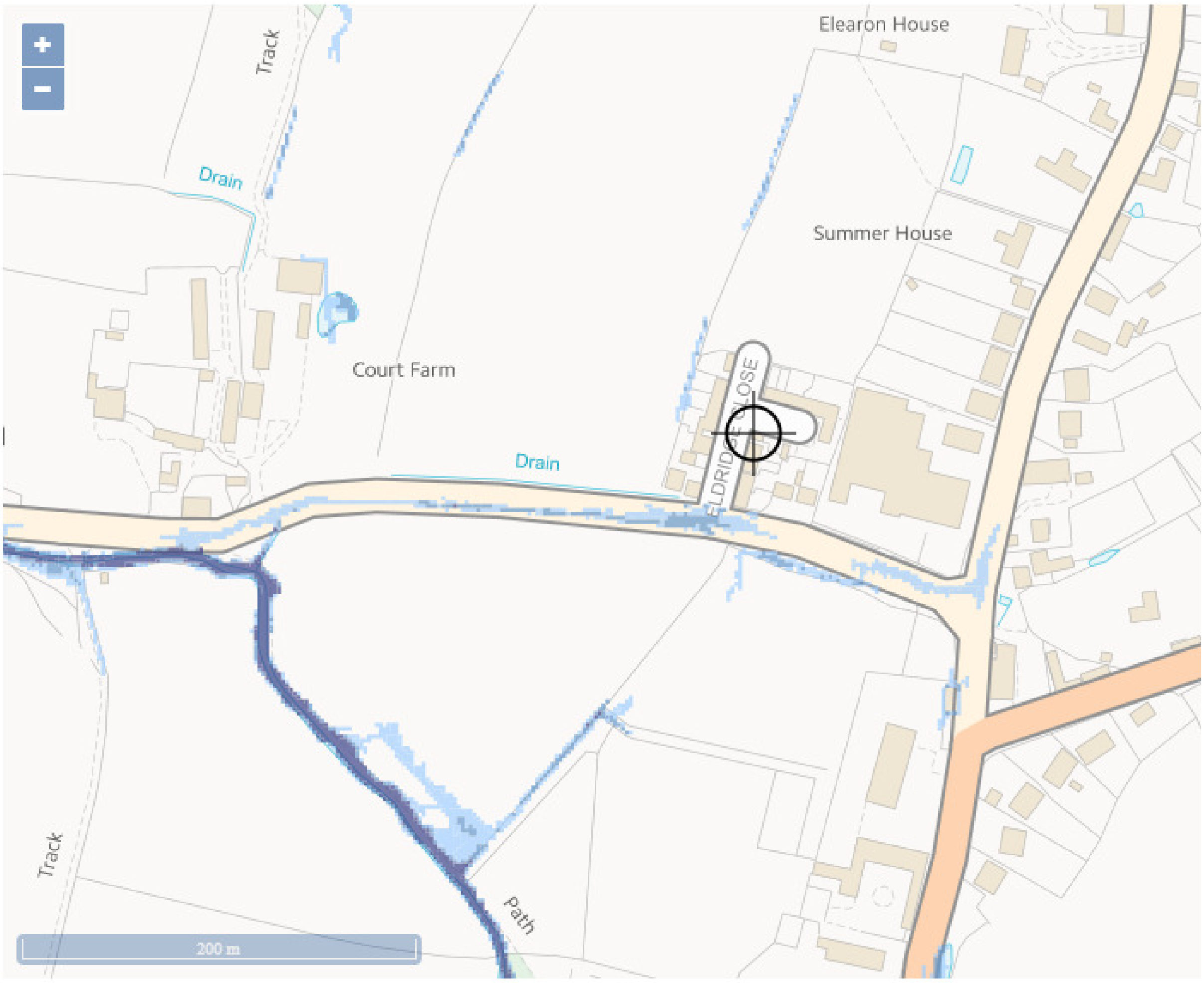
Created
12 May 2020 15:45

- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m

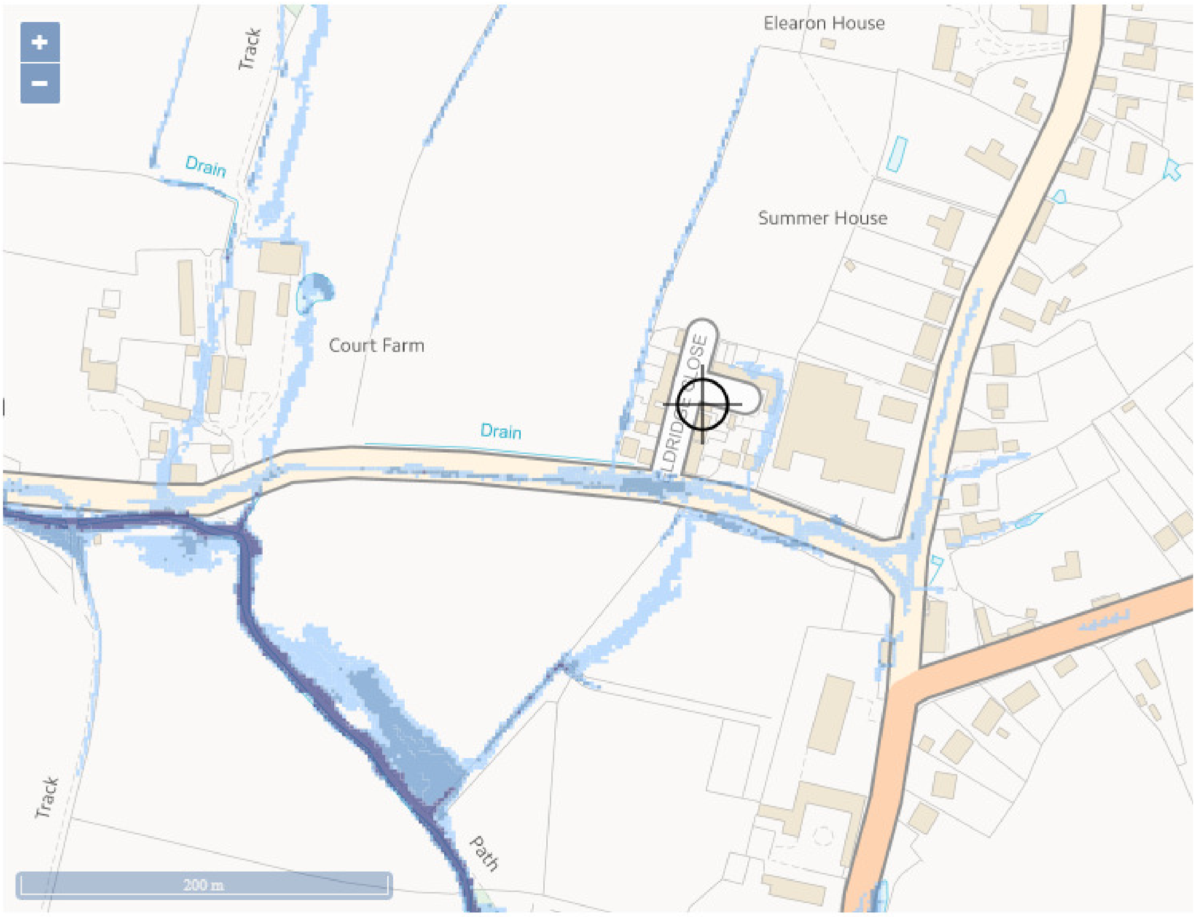
Appendix 4: Overland Surface Water Flood Mapping

OVERLAND SURFACE WATER FLOOD MAPPING



Surface water flood risk: water depth in a high risk scenario

Flood depth (millimetres)



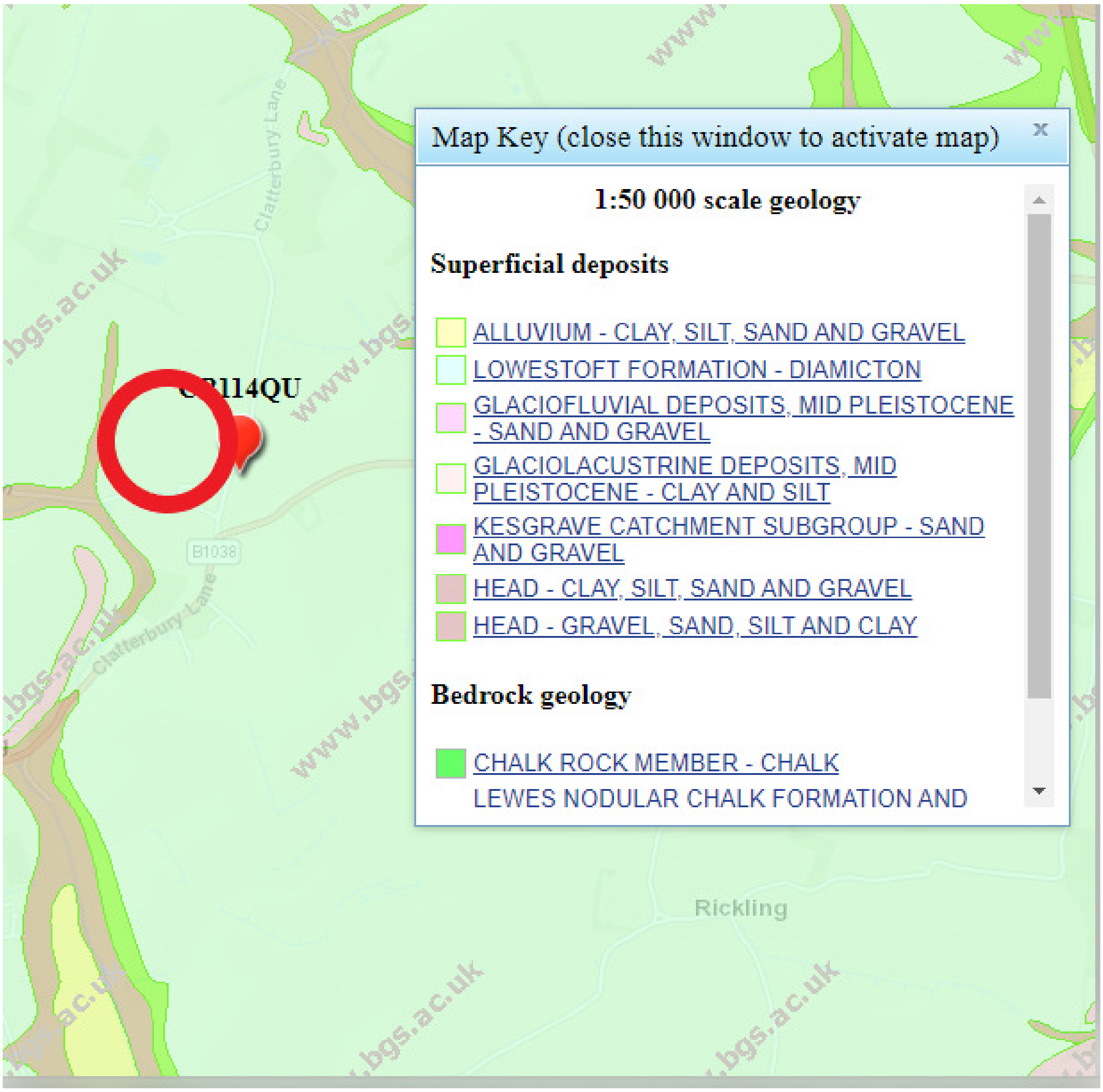
Surface water flood risk: water depth in a medium risk scenario

Flood depth (millimetres)

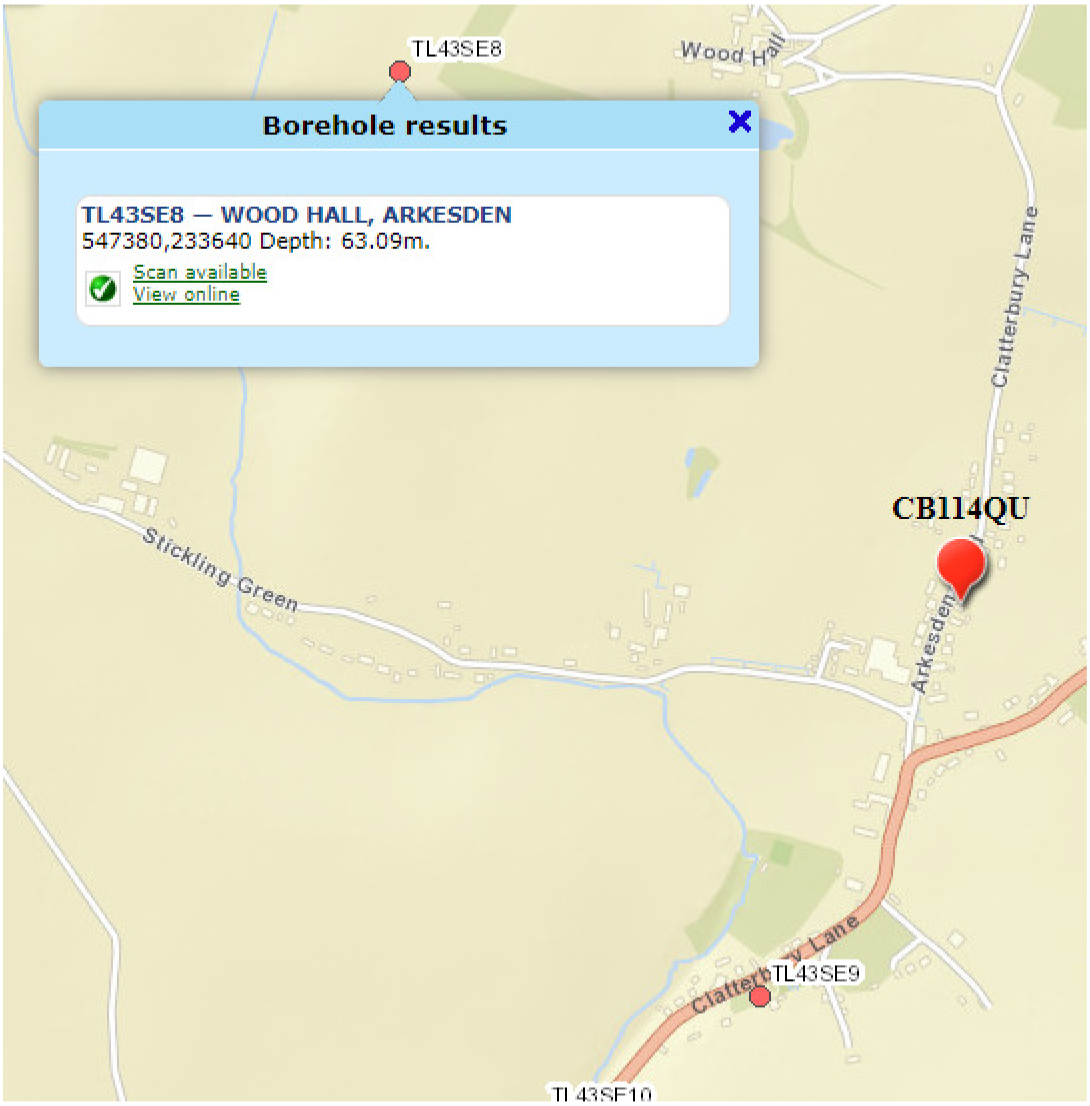
Surface water flood risk: water depth in a low risk scenario

Flood depth (millimetres)

Appendix 5: British Geological Society Data



Map Key (close this window to activate map)
1:50 000 scale geology
Superficial deposits
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
LOWESTOFT FORMATION - DIAMICTON
GLACIOFLUVIAL DEPOSITS, MID PLEISTOCENE - SAND AND GRAVEL
GLACIOLACUSTRINE DEPOSITS, MID PLEISTOCENE - CLAY AND SILT
KESGRAVE CATCHMENT SUBGROUP - SAND AND GRAVEL
HEAD - CLAY, SILT, SAND AND GRAVEL
HEAD - GRAVEL, SAND, SILT AND CLAY
Bedrock geology
CHALK ROCK MEMBER - CHALK
LEWES NODULAR CHALK FORMATION AND
Clatterbury Lane
B1038
Rickling
www.bgs.ac.uk


TL43SE8
Wood Hall
Borehole results
TL43SE8 — WOOD HALL, ARKESDEN
547380,233640 Depth: 63.09m.
Scan available
View online
Clatterbury Lane
CB114QU
Stickling Green
Arkesden
Clatterbury Lane
TL43SE9
TL43SE10

TL 43 SE/8
4738 . 3364

8 1": 222.

222/64 Wood Hall, Arkesden. (Disused)

W.S.E. p. 88. Surface +350. +106.7 Shaft 167; rest bore. *Ingold, 1898.*
I/c engine. *June 1942.*

Boulder Clay	...	...	105	32.0	105	32.0
UCk	...	...	? 102	31.1	? 207	63.1

79612)

12

		Thickness (ft)	Depth (ft)		
Glacial Drift / boulder clay etc	Brown clay	3	3	0.9	
	Yellow sandy loam with water	3	6	1.8	
	Brown clay	12	18	5.5	
	Blue clay	79	97	29.6	
	Sandy loam, brown clay	8	105	32.0	+74.7
Chalk		102	207	63.1	+43.6

TL 43 SE/8.

4788 3344

222/64

Arkesden.

Wood Hall.

4. Woodhall. SSW. of the Church. 1898.
Made and communicated by Mr. G. Ingold.
Shaft 167 ft., the rest bored.

O.D c. 360'

Petrol Engine
Visited & sited on Essex 5 SE/W
AWW 17.6.40

64)
1100 yds. S.S.W. of St. Margaret's Church.

N13SW/W

		Thickness. Ft.	Depth. Ft.
[Glacial Drift. Boulder Clay, etc.]	Brown clay	3	3
	Yellow sandy loam with water ...	3	6
	Brown clay	12	18
	Blue clay	79	97
	Sandy loam, brown clay	8	105
Chalk		102 ? 162	267 ? 207

Disused. Petrol engine dismantled.
Well inaccessible at present as hay-making machinery is stored above it, but level could be measured in June-July.
Owner J.M. Leonard.
Sited on Essex N. 13 SW/W.

O.D. +350.

21/10/59. p.p R.M.

Boulder Clay 105
UCK 102

OR

Boulder Clay 105
UCK c 145 } 162
MCK c 17 }

16/12/63
JRO.

DATA Bank