

Flood Risk Assessment

**Land Adjacent To Loxley, Bolney Chapel Road, Twineham,
Haywards Heath, West Sussex, RH17 5NN**

Rev -

Reference

Date **08/11/2022**

REVISION

Revision	Status	Description	Date	Issued	Checked
-	Final v1	Issued for Approval	18.11.24	RH	RH
1	Final v1.1	Updated site plans to include outbuildings	27.11.24	RH	RH

1 SITE AND DEVELOPMENT OVERVIEW

DEVELOPMENT DESCRIPTION	EXISTING (PRE-DEVELOPMENT)	PROPOSED (POST-DEVELOPMENT)
Site Use	Residential (report ref: existing site coverage)	Residential Development
Development Use	Residential (report ref: existing site use)	Residential (report ref: proposed site use)
Use Design Life		100 years (epoch 2085)
Number of Dwellings	1	1
EA Vulnerability Classification	More Vulnerable (ref: existing site vulnerability)	More Vulnerable (ref: proposed site vulnerability)
Development Class		Minor
County Planning Authority	West Sussex County Council (WSCC) (ref: district Council)	
District Planning Authority	Mid Sussex District Council (MSDC)	
Local Sewer Authority	Southern Water (ref: Local Sewer Authority)	
SITE CATCHMENT CHARACTERISTICS	DESCRIPTION	SOURCE
Management Catchment	Adur and Ouse Management Catchment (report ref: River Basin Catchment)	https://environment.data.gov.uk/catchment-planning
Nearest EA Main River	River Adur (East) located on the sites southern boundary (report ref: EA Main River)	https://environment.maps.arcgis.com/apps/MapSeries/
Nearest Ordinary watercourse or surface waters	Assumed natural drainage and ditches associated with surrounding agricultural and historical land use (report ref: local water features)	Online Mapping and topography
KEY FLOOD RISK AND DATA SOURCES	DATA TYPE	SOURCE
EA Fluvial and Tidal Planning Data	UK Government Flood Maps for Planning (ref: FMP)	https://flood-map-for-planning.service.gov.uk/
EA Surface Water Data	DEFRA Risk of Flooding from Surface Water Sources GIS Data (ref: RoFSW)	https://environment.data.gov.uk/DefraDataDownload/?Mode=rofsw
EA Long term Flood Risk	UK Government Long term Flood Risk Maps (ref: LTFRM)	https://www.gov.uk/check-long-term-flood-risk
Environment Agency Product 4/5 Data	Yes (report ref: EA Product Data)	Upper Adur Eastern Branch Modelling (2011) (Levels Only) with new climate change allowances (2016) https://environment.data.gov.uk/DefraDataDownload/?mapService=EA/HistoricFloodMap&Mode=spatial
Historic Flood Risk Data	DEFRA Historic Flood Outlines GIS Data	
Strategic Flood Risk Assessment Data	Mid Sussex and West Sussex SFRA (ref SFRA)	
Local Flood Risk Assessment Data	(refer to SFRA)	
Topographic Information	DEFRA Opensource LIDAR Data	https://environment.data.gov.uk/DefraDataDownload/?Mode=survey
River or Sea Flood Risk Present	High (River)	Refer Section 3: Table 3
Surface Water Flood Risk Present	High	Refer Section 3: Table 3
DESIGNATION	FLOOD RISK DESIGNATION	NOTE
Critical Design Flood Event (DFE)	River (Fluvial) 1% AEP	*Designation based on highest flood risk between River, Sea or Surface Water - Refer Section 3: Table 3

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2 INTRODUCTION

- 2.1 The following report is a Flood Risk Assessment (FRA) for the proposed residential development located at the Land adjacent to Loxley, Bolney Chapel Road, Twineham, Haywards Heath, West Sussex, RH17 5NN, at approximate National Grid Reference TQ25562037 (see site location map, Figure 1).
- 2.2 This assessment is required under the National Planning Policy Framework (NPPF) and Local and District Councils given the location, scale and associated flood risks.

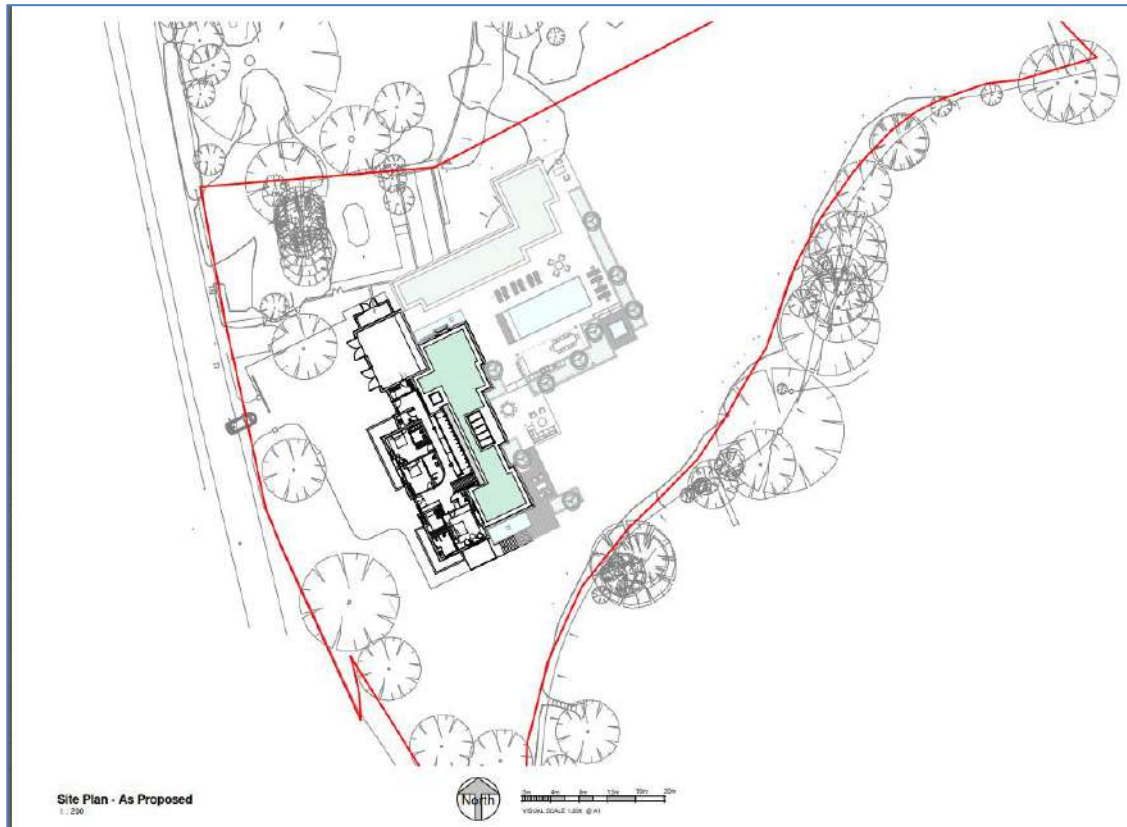


Figure 1 - Site Location Plan (site bordered red) Source: Location Map

- 2.3 This FRA has been written in general accordance with the National Planning Policy Framework (NPPF) and its Planning Practice Guidance (PPG), Environment Agency (EA) Standing Advice, LFRMS, County SFRA and associated guidance. This FRA has relied upon publicly available information and data provided from the EA (where relevant). The interpretation of this data has been undertaken with the understanding of its accuracy and to a detail deemed suitable for this development type, location and relevant flood risk.
- 2.4 Where required, assumptions or extrapolation of the data may have been undertaken to estimate (in particular) climate change impacts or extreme flood extents. This is only undertaken where up-to-date climate change modelling is not available.

DEVELOPMENT PROPOSALS

- 2.5 The development proposals are for the demolition of the existing dwelling and tennis court and the construction of a replacement dwelling split over two levels. Development proposals also include proposed swimming pool and supporting outbuildings. Access will be provided from Bolney Chapel Road. Architectural Plans are included in Appendix 1.

FLOOD RISK VULNERABILITY

- 2.6 This FRA has been undertaken with due regard to the statutory requirements of the NPPF (2022) and with reference to the Planning Practice Guidance (PPG) in relation to development and flood risk. This FRA has been undertaken to

inform on the current flood risk to the site. Therefore, this FRA aims to ensure that the development proposals take into account the site-specific flood risk and to **avoid** inappropriate development in areas potentially at risk of flooding.

- 2.7 Annex 3 of the NPPF Flood Risk Vulnerability Classification provides guidance on assigning development vulnerability. A summary of this information is provided in Table 1.

Table 1 – Extract from Annex 3 of the National Planning Policy Framework and Table 2: Flood risk vulnerability classification of PPG detailing Flood Risk Vulnerability Classification by use. (Existing Site Classification is Shaded Gray, Proposed Site specific classification shaded blue).

ESSENTIAL INFRASTRUCTURE	HIGHLY VULNERABLE	MORE VULNERABLE	LESS VULNERABLE	WATER-COMPATIBLE
Essential transport infrastructure	Police and ambulance stations; fire stations and telecom installations	Hospitals	Police, ambulance and fire stations which are not required to be operational during flooding.	Flood control infrastructure.
Essential utility infrastructure which has to be located in a flood risk area for operational reasons	Emergency dispersal points.	Residential institutions such as residential care homes, prisons and hostels.	Buildings used for commercial purposes and of a non-residential nature	Water transmission infrastructure and pumping stations.
Wind turbines.	Basement dwellings.	Buildings used for dwelling houses and sleeping, drinking establishments	Land and buildings used for agriculture and forestry.	Sewage transmission infrastructure and pumping stations.
Solar farms.	Caravans, mobile homes and park homes intended for permanent residential use.	Non-residential uses for health services, nurseries and educational uses	Waste treatment (except landfill* and hazardous waste facilities).	Sand and gravel working.
	Installations requiring hazardous substances consent.	Landfill* and sites used for waste management facilities for hazardous waste.	Minerals working and processing (except for sand and gravel working).	Docks, marinas and wharves and Navigation facilities.
		Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.	Water treatment and Sewage treatment works which do not need to remain operational during times of flood.	Ministry of Defence installations.

- 2.8 The existing dwelling is presently considered 'More Vulnerable' in accordance with the NPPF. The development proposals will not increase vulnerability (in terms of number of dwellings or higher vulnerability) post development. Therefore, there will be no change in vulnerability post development.

3 FLOOD RISK ASSESSMENT SCOPE

- 3.1 Flood risk as defined by the NPPF, is a combination of the probability and the potential consequences of flooding. Areas at risk of flooding are those at risk of flooding from any source, now or in the future. Sources include rivers and the sea, direct rainfall on the ground surface, rising groundwater, overwhelmed sewers and drainage systems, reservoirs, canals and lakes and other artificial sources. Flood risk also accounts for the interactions between these different sources. This term is key to the application of the presumption in favour of sustainable development in paragraph 11 of the National Planning Policy Framework (NPPF).
- 3.2 The NPPF requires flood risk to be considered on all sites, however more detailed site-specific FRA's are required when one or more of the following criteria apply to the site:
- Where a site is affected by the **Design Flood Event** (DFE) from any source (typically the 1% AEP) for all proposals of any new development (including minor development and change of use); or
 - Greater than 1 ha in size and located in Flood Zone 1; or
 - Located in Flood Zone 1 where there are critical drainage problems or within a designated Critical Drainage Area (CDA) as notified to the LPA by the Environment Agency; or
 - Subject to a change of use to a higher vulnerability classification which may be subject to other sources of flooding; or
 - A Major planning application (i.e. more than 10 residential dwellings).
- 3.3 The NPPF designates that the '**Design Flood Event**' (DFE) is used to assess the suitability of a development proposal against the criteria of the NPPF. The design flood, is a flood event of a given annual flood probability, but is generally taken as:
- River flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year), typically shown as Flood Zone 3a as designated on the EA's Flood Map for Planning; or
 - Tidal flooding with a 0.5% annual probability (1 in 200 chance each year), typically shown as Flood Zone 3a as designated on the EA's Flood Map for Planning; or
 - Surface water flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year), typically shown as the Medium Risk of Surface Water flooding as designated on the EA's Long Term Flood Risk mapping,
- 3.4 In addition to assessing present day risk, the DFE also must be assessed to include and appropriate allowance for climate change (refer to Section 5 for climate change allowances) based on the site's geographical location, vulnerability and design life.
- 3.5 For the purpose of this FRA, the worst case DFE (whether this be from tidal, river or surface water sources), has been used to steer the recommendations of this report. Consideration of extreme events above that of the DFE have not been considered further beyond identifying these as residual risks.
- 3.6 Table 1 of the NPPF provides definitions of the Flood Zones, from low to high probability of river and sea flooding and also in regards to surface water flood risk. These Flood Zone Classification for the purpose of this FRA are:
- Flood Zone 1 - land assessed as having a less than a 1 in 1,000 annual probability (<0.1%);
 - Flood Zone 2 - land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river (1% – 0.1%), 1:100 year or greater of surface water flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year;
 - Flood Zone 3 - land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year. Flood Zone 3b is land have greater than 1 in 20 to 1 in 30 year annual probability of flooding.

3.7 Following an assessment from the various sources of flood risk for the DFE, this site-specific FRA has applied the key principles for decision making when flood risk is a consideration and includes in order of importance:

1. **Avoid** – This is to physically locating the development proposals to areas of lowest flood risk within the site and/or determined how to vertically place the proposals to such that more vulnerable uses are positioned above the design flood level (such as raising floor levels or placing more vulnerable uses on upper levels). Developers should refer to the BS 85500:2012-Flood resistant and resilient construction. Guide to improving the flood performance of buildings for applicable strategies);
2. **Control** - Planning authorities and developers can investigate measures to control the risk of flooding affecting the site (this may be through flood defences, flood gates, flood storage or other engineered solutions such as SUDS). This is rarely applied at the site level and is mostly address through strategic and county level flood defence strategies. At this site level, typically this will be through applying a Water Exclusion or Water Entry strategy when design a building or space.
3. **Mitigate** – Is the use of flood resistance and resilience measures to address any residual risks remaining after the use of the avoidance and control measures described above. Passive measures should be prioritised over active measures as they are likely to be more effective and more reliable. Flood Resilience is an approach to building design which aims to reduce flood damage and speed recovery and reoccupation following a flood. It uses a combination of flood resistance and recovery measures (referred to here as resilience measures), and is described in the industry-developed CIRIA Property Flood Resilience Code of Practice, which provides advice for both new-build and retrofit.
4. **Managing Residual Risk** – this will usually involve ensuring either safe access and egress is available from the site in a DFE, Flood Warning Systems/Evacuation Plans are in place, safe refuge is on site during a DFE, the building is designed to account for flood loadings etc.
5. **Flood Risk is not increased elsewhere** – assuming all the above items can be address, it is critical that the development does not increase flood risk elsewhere as a result. Typically this is addressed by ensuring flood waters are not displaced (in surface water or river flood affected areas, the loss of floodplain storage is less likely to be a concern in areas benefitting from appropriate flood risk management infrastructure or where the source of flood risk is **solely** tidal.) or appropriate hydraulic modelling is provided in support of an application to demonstrate that flood risk is not increased outside of a site (such as through on site flood compensation or detailed site specific hydraulic modelling).

3.8 It should be noted, where up-to date flood risk or climate change models are not available, best efforts have been made to assess these risks and extrapolate the available data where necessary. However, this approach may require further detailed modelling if deemed necessary by the reviewing authorities. Detailed hydraulic modelling is deemed outside the scope of this report.

SEQUENTIAL TEST/EXCEPTION TEST

3.9 For the purpose of this assessment, the application of the Sequential Test has been broken down into three levels. Passing the Sequential Test at the strategic level is a weighting of the risks versus benefit of a development against a wider criterion (such as meeting other sustainability targets, housing needs or other strategic planning goals) than just purely avoiding flood risk issues. However, the Sequential Test can also be applied at the site level, where development is steered towards lower areas of flood risk within a site boundary, and is much more objective in its assessment. For the purpose of this FRA, the assessment ‘Level’ of the Sequential Test are considered to be:

Level 1 - At the high-level, this test is first implemented by local planning authorities (LPA) at the strategic planning scale. The Sequential Test is applied to steer local planning policy by directing particularly vulnerable new developments (e.g., residential, hospitals, mobile homes etc.) outside of the floodplain and for designating new land uses and future development areas.

Level 2 - At the second instance, the Sequential Test is implemented for a specific development at the request of the LPA to assess other sites within an area defined by the LPA, this type of Sequential Test is present where there is a significant conflict between a proposed development and flood risk.

Level 3 - The third instance is where the Sequential Test is applied with the confines of the site, namely by steering development proposals to **avoid** areas of flood risk within a site itself.

3.10 Application of the first and second level of the Sequential Test is deemed outside the scope of this report.

3.11 Table 2 below presents a helpful guide in identifying the suitability of a site prior to applying Level 1 and 2 of the Sequential Tests and identifies when the Exception Test is required.

Table 2 - The Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table as specified by NPPF. Shaded cells denote the proposed re-development. Please note: ✓ means development is appropriate; x means the development should not be permitted and should be subject to a full sequential test. Refer to Table 2 for selected Flood Zone Designation

FLOOD RISK VULNERABILITY CLASSIFICATION		ESSENTIAL INFRASTRUCTURE	WATER COMPATIBLE	HIGHLY VULNERABLE	MORE VULNERABLE	LESS VULNERABLE
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test Required	✓	✓
	Zone 3a	Exception Test Required	✓	x	Exception Test Required	✓
	Zone 3b <i>Functional Floodplain</i>	Exception Test Required	✓	x	x	x

3.12 Based on the principles above, a development of this nature is considered appropriate in its current location (subject to passing an Exception Test). However, the LPA may still consider that full application of the Sequential Test is required in accordance with the NPPF.

3.13 This FRA presents the findings of the Exception Test and recommendations for incorporation of flood resilient measures to improve long term flood resilience of the proposals. The following sections undertakes further analysis of the data available from the Local and District Council and EA data sets relating to flooding from a number of sources.

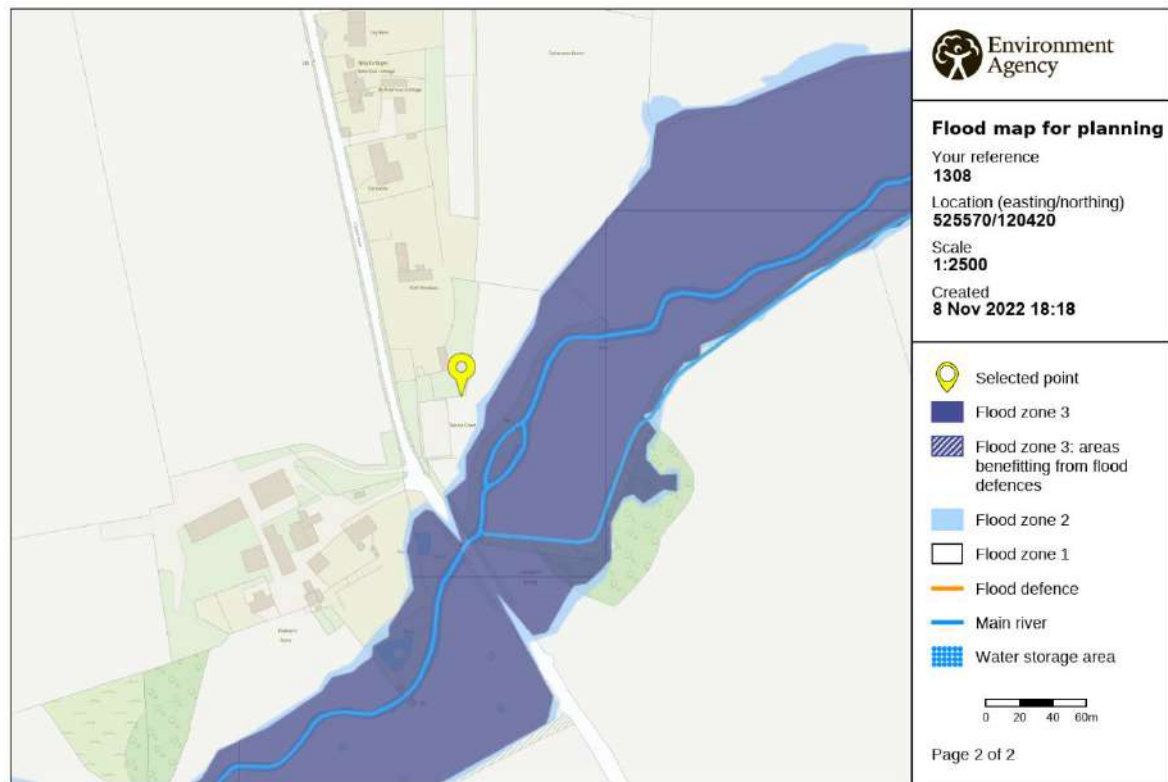
3.14 Table 3 summarises the sites primary flood risk classifications and the source for the DFE. This designation is based on the EA's Flood Map for Planning (extract provided in Figure 2) and the EA's Long Term Flood Risk Maps (LTFRM): Risk of Flooding from Surface Water (RoFSW) (extract provided in Figure 3). The EA's Flood Maps for Planning (Fluvial flooding) and RoFSW (Pluvial flooding) are both shown to affect the site (i.e. flooding within the redline boundary). However, the proposed dwelling has been sequentially located above the flood zones and is considered to be located within Flood Zone 1. Therefore, this assessment also looks at how climate change impacts may affect these flood extents (where this data is readily available).

3.15 Other sources of flooding have been considered in Section 6 below (such as Groundwater and sewer flooding), but these are typically considered to be 'minor' sources of flood risk.

Table 3 - Summarises the overall Flood Zone designation based on the highest rated flood risk from either rivers and sea or surface water.

FLOOD ZONE AND DFE SOURCE IDENTIFICATION SUMMARY			
	FLOOD ZONES AFFECTING THE SITE		DOMINANT SOURCE FOR THE DESIGN FLOOD EVENT (DFE)
	Flood Zone 2 (medium risk)	Flood Zone 3 (high risk)	Source
River Or Sea	Yes (site only partially affected)	Yes (site only partially affected)	Fluvial
Surface Water	Yes (site only partially affected)	Yes (site only partially affected)	

**Flood Zone Designation for assessment is based on the highest flood risk from river, sea or surface water flooding taken from EA's Flood Map for Planning and EA's LTFRM:RoFSW*



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Figure 2 extract from EA Flood Maps for Planning (Source: DEFRA)

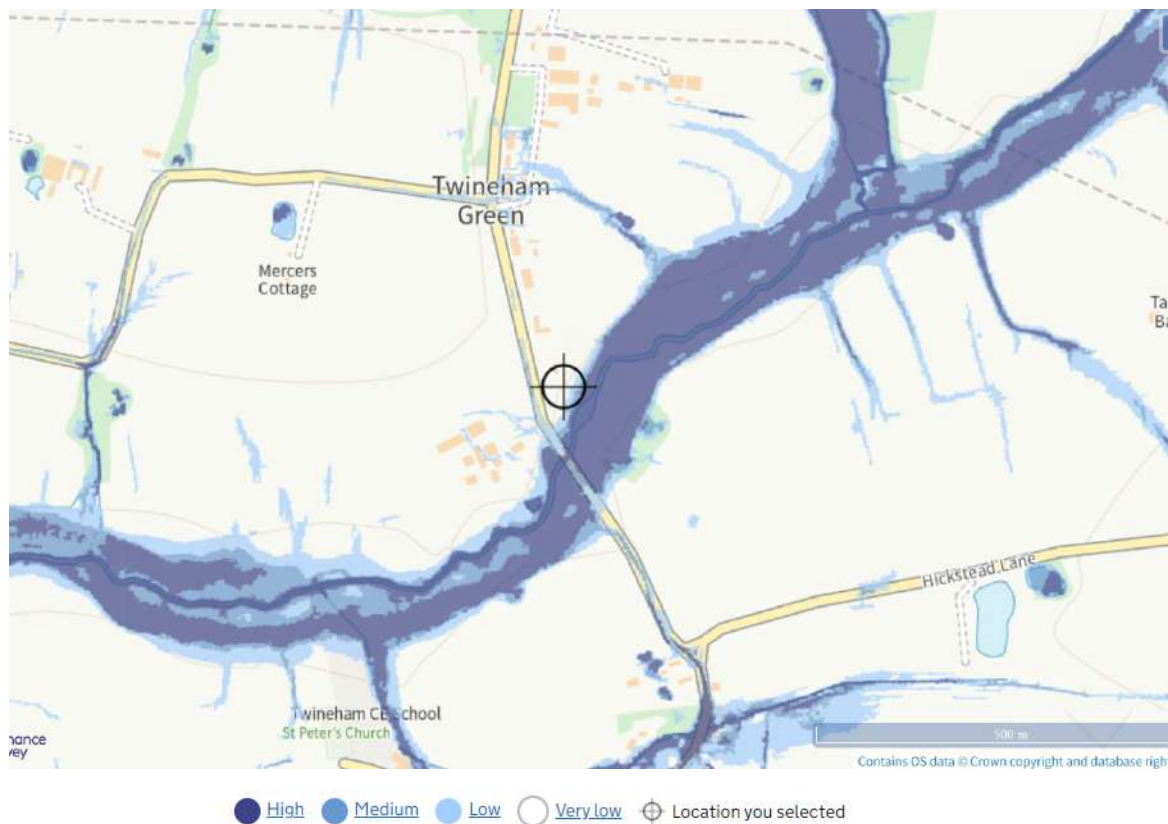


Figure 3 - extract from the EA's Long-Term Risk of Flooding from Surface Water (RoFSW) maps

4 LOCAL FEATURES

SITE DESCRIPTION

- 4.1 The site is located in a relatively rural/agricultural area of Twineham. The site is bordered on its southern boundary by the river Adur, its western boundary by Bolney Chapel Road, and with fields forming its northern and eastern boundaries. Access to the site is provided off Bolney Chapel Road.
- 4.2 Burgess Hill is located approximately 5.5km to the east, with the English Channel located approximately 15.5km to the south.
- 4.3 The site presently contains an existing residential dwelling located in the northwestern corner of the site, with outbuildings and a tennis court. The site presently has multiple access points off of Bolney Chapel Road.

RIVERS, WATERCOURSES AND EXISTING DRAINAGE

- 4.4 The nearest EA main river is the river Adur, forming the sites southwestern boundary. The river Adur at this location flows from the north to the southwest.
- 4.5 It is uncertain how the existing site is drained, but it is likely given the rural location that runoff is allowed to discharge to ground and flows via sheet flow overland and into the River Adur. It is also likely that there is some existing land-drainage in place given the sites historic land use.

TOPOGRAPHY

- 4.6 Figure 4 below provides an extract from the DEFRA National 1m DTM LiDAR data. This data shows that the land falls at approximately 9% from the north to the south, towards the river Adur. It appears that the proposed dwelling would have an approximate floor level of 12mAOD. The northwestern top of bank level of the river Adur appears to be c10mAOD, with the southeastern bank c1m lower at 9mAOD. The land to the south of the river Adur is generally flatter than the land to north, and therefore should the river Adur flood, flood waters would likely be directed to the south into the flood plain and away from the site (refer to Section 6 for more information).

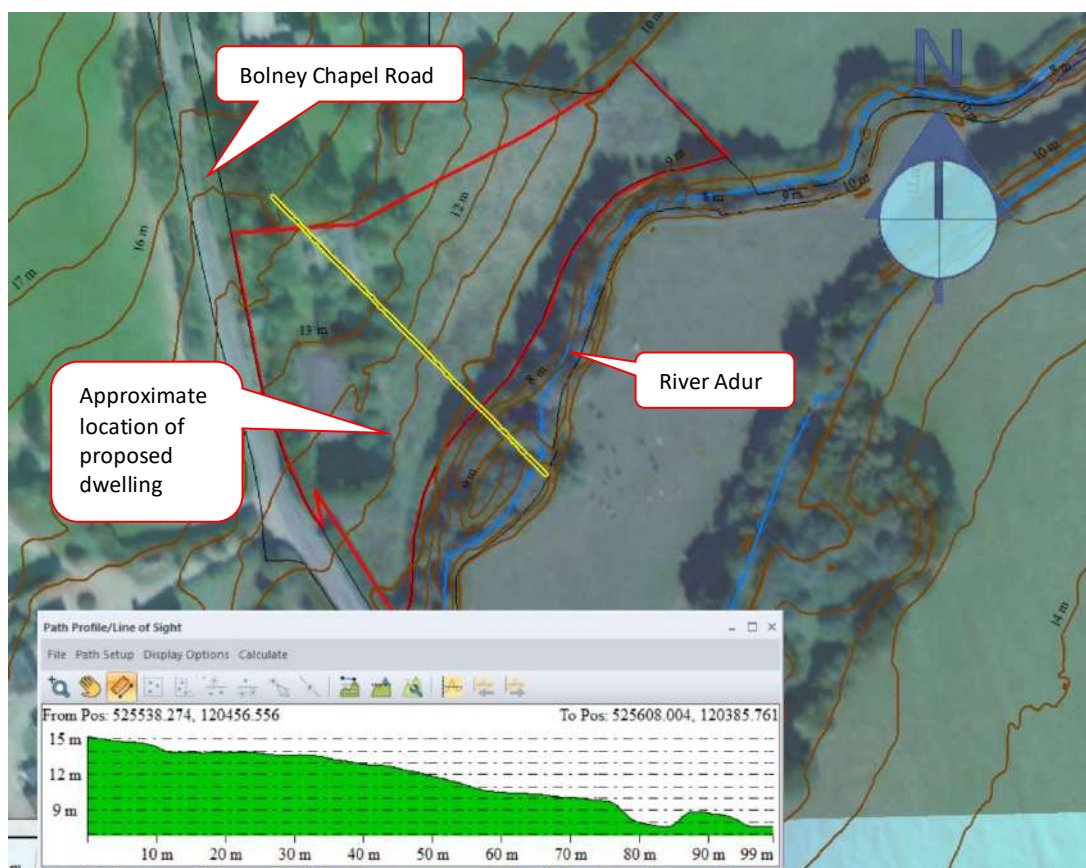


Figure 4 – Contour Map, site bordered red, yellow line represent section line of path profile (source: DEFRA Lidar Data 1m)

GEOLOGY & HYDROGEOLOGY

- 4.7 The online British Geological Survey (BGS) (Figure 5) shows the site to be underlain by a small band (at 1:50 000 scale) bedrock geology Weald Clay formation – Ironstone, with more widespread Mudstone. No superficial deposits recorded.



Figure 5 extract from BGS Bedrock and Superficial Deposits Mapping (source: BGS)

- 4.8 Table 4 below present a summary of the site hydrogeological classifications and considerations.

Table 4 - Summary of Hydrogeology Classifications (source Magic Map, BGS) – applicable classification shaded Blue

HYDROGEOLOGY CLASSIFICATIONS			
Aquifer Designation (Bedrock)	Principle	Secondary	Unproductive
Aquifer Designation (Superficial)	Principle	Secondary	Unproductive
Groundwater Vulnerability	High	Medium	Low
Located within Source Protection Zone	Yes	No	N/A
Soluble Rock Risk	Present	Not Present	N/A

- 4.9 The sensitivity of the underlying groundwater should be carefully considered in the design of surface water management systems and during construction. Details of groundwater levels and soil permeability are unknown and should be confirmed. The design permeability should be investigated further for the purpose of surface water management on the site, however, based on the previous drainage schemes for the earlier phases, it is deemed unlikely that infiltration will be feasible on this site. Nonetheless, this should be confirmed through onsite material testing.

FLOOD DEFENCES

- 4.10 The Environment Agency releases a range of flood asset information as Open Data through their AIMS Defence (Spatial Flood Defences) GIS mapping. They are the only comprehensive and up-to-date group of datasets in England that show flood defences currently owned, managed or inspected by the EA.
- 4.11 EA AIMS Defence data (2022) extract is included in Appendix 2 and shows that there are no formal defences to the river Arun at this location. Therefore the site is considered to be undefended for the purposes of this assessment.

5 CLIMATE CHANGE

- 5.1 In 2022, the EA issued updated guidance on the impacts of climate change on flood risk in the UK15 to support the NPPF. This guidance sets out that peak rainfall intensity, sea level, peak river flow; offshore wind speed and extreme wave heights are all expected to increase in the future as a result of climate change.
- 5.2 The guidance acknowledges that in relation to certain factors there is considerable uncertainty with respect to the absolute level of change that is likely to occur. As such, in these instances, the guidance provides estimates of possible changes that reflect a range of different emission scenarios (Table 5).

Table 5 - Extract from NPPF designating Flood Risk Climate Change Allowances by Flood Zone and Use. The developments required climate change probability scenario is highlighted blue

FLOOD ZONE	ESSENTIAL INFRASTRUCTURE	HIGHLY VULNERABLE	MORE VULNERABLE	LESS VULNERABLE	WATER COMPTABLE
1/2	Higher Central and Upper End	Higher Central and Upper End	Central and Higher Central	Central	None of these allowances
3a	Upper End	Development should not be permitted	Higher Central and Upper End	Central and Higher Central	Central
3b	Upper End	Development should not be permitted	Development should not be permitted	Development should not be permitted	Central

INCREASES IN SEA AND TIDAL LEVELS

- 5.3 There are a range of allowances for each river basin district and epoch for sea level rise. They are set out in 'Table 2: sea level allowances by river basin district for each epoch in mm for each year (based on a 1981 to 2000 baseline) – the total sea level rise for each epoch is in brackets of the NPPF: Flood risk assessments: climate change allowances' and are based on percentiles. A percentile describes the proportion of possible scenarios that fall below an allowance level.
- 5.4 The allowances in Table 2 (of the NPPF) account for slow land movement. This is due to 'glacial isostatic adjustment' from the release of pressure at the end of the last ice age. The northern part of the UK is slowly rising, and the southern part is slowly sinking. This is why net sea level rise is less for the north-west and north-east than the rest of the country.
- 5.5 For flood risk assessments and strategic flood risk assessments, a site should assess both the higher central and upper end allowances. It should be noted that the NPPF considers residential developments to have a minimum design life of 100 years, with non-residential developments having a design life of 75 years (note, some developments may have greater than 100 years like critical infrastructure).
- 5.6 Based on the EA data available, the nearest area of tidal flood risk is over 10km from the site. Therefore, it is highly unlikely that tidal or sea flooding from will ever affect the site, even when considering climate change. As such flood risk from this source is not considered further.

INCREASES IN PEAK RIVER FLOW ALLOWANCES

- 5.7 Guidance states that the increases in peak river flow should be assessed as a percentage uplift that varies based on the river basin district and the proposed lifetime of the development and the sites vulnerability and flood zone mapping. Based on the site's vulnerability classification, Table 6 below highlights the minimum climate change values to be adopted based on the sites River Management Catchment.

Table 6 - Summary of Table 1: peak river flow allowances by river basin district (base on a 1981 to 2000 baseline). Site required climate change based on Table 5.

Management Catchment peak river flow allowances			
Design Epoch	Central	Higher	Upper
2020s	16%	23%	40%
2050s	18%	28%	57%
2080s	37%	55%	107%

- 5.8 Fluvial flood risk is considered the primary source of risk to the site. The EA has provided product 4 data that includes climate change data up to 105% (see Appendix 2). This is data is considered suitable to assess the Higher and Upper End Climate change impacts.

INCREASES IN SURFACE WATER FLOODING AND RAINFALL ALLOWANCES

- 5.9 When considering climate change impacts to surface water (pluvial) flooding, The DEFRA peak climate change rainfall allowances detail predicted rainfall increase due to climate change in different regions around England. For all developments with a design epoch up to (and presently beyond) 2070, the NPPF states developments should adopt the Upper End and Central allowances. The site specific climate change allowances based on the DEFRA data is summarised in Table 7 below, and should also be adopted for the purposes of surface water drainage design.

Table 7 - Summary of Table 2: peak rainfall intensity allowance in small catchments (less than 5km²) or urban drainage

Management Catchment peak rainfall allowances 2070's	3.3% Annual Exceedance Probability Event	1% Annual Exceedance Probability Event
Central	20%	25%
Upper End	40%	45%

- 5.10 Neither the EA or LPA have provided climate change affected surface water flood risk models for this site, and so it's not possible to directly determine the DFE level with an allowance for climate change. However, based on the available data, it is likely that surface water and fluvial flood risk is closely linked, and therefore it is considered that the climate change impacts provided in the Product 4 data will provide a suitable assessment of climate change risks from both fluvial and pluvial flooding.
- 5.11 Nevertheless, current planning policy dictates that the sites surface water drainage systems are designed to accommodate the 1% AEP plus climate change, to account for future climate change risks associated with flooding from this source.

6 SOURCES OF FLOOD RISK

6.1 To assist the implementation of the Governments NPPF, the EA has undertaken national scale flood risk mapping. This mapping considers a range of sources including flooding from rivers, sea, surface water and reservoir breach. Furthermore, each Council produces a Strategic (county scale) Flood Risk Assessments (SFRA) that aim to specifically identify local flood risk issues (such as critical drainage areas and local groundwater flooding).

6.2 The following section reviews both the EA data as well as the relevant information available from the SFRA.

FLUVIAL (RIVER) AND TIDAL (SEA)

6.3 The EA have undertaken fluvial and tidal modelling of the nation's main rivers in flood to support and ensure developments are steered away from flood prone areas or are designed to ensure risk to people is not increased as a result. It should be noted that the EA's Flood Maps for Planning do not allow for the presence of defences and so illustrate a conservative representation of flood risk from rivers or seas.

6.4 The EA's Flood Maps for Planning shows that the site is primarily located within Flood Zone 1, however the southern portion of the site, that borders with the River Adur, is shown to be affected by Flood Zone 2 and 3. The proposals have taken into account this flood risk, and positioned the house clear of both Flood Zone 2 and 3, resulting in the proposed dwelling to be located wholly within Flood Zone 1.

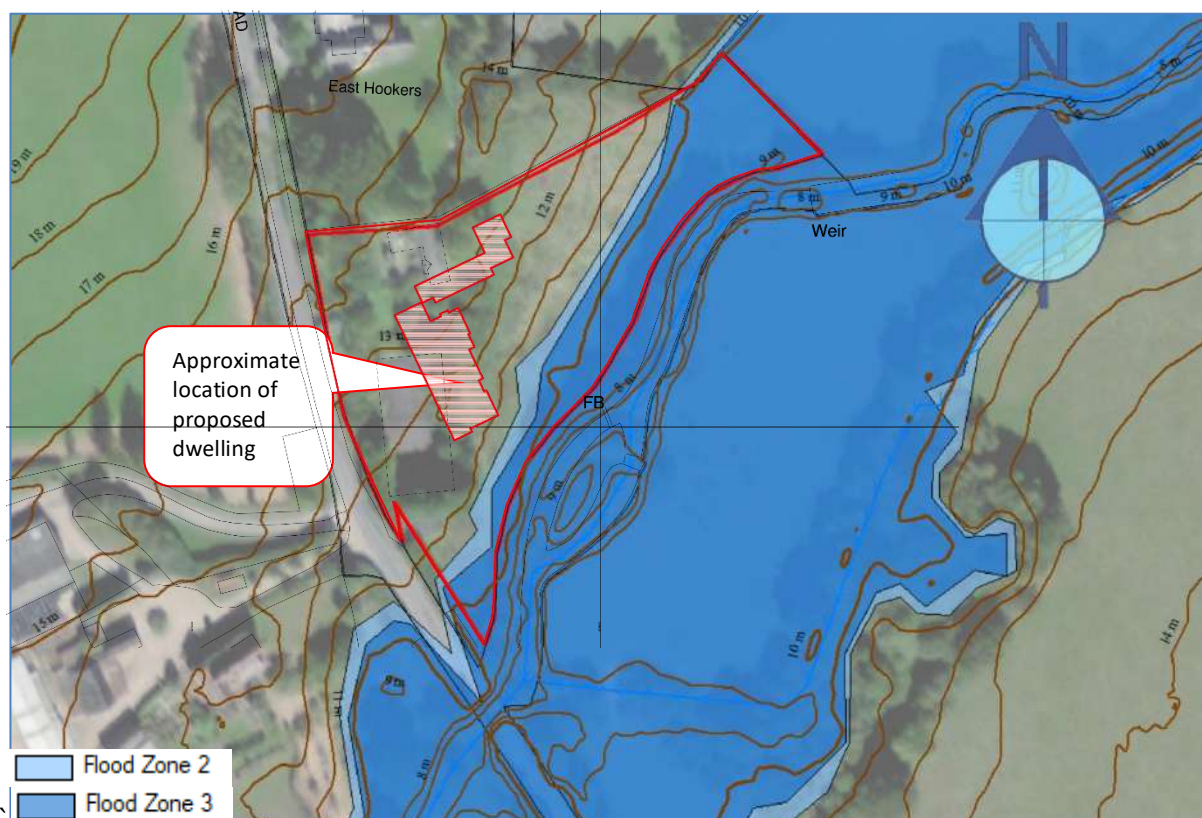


Figure 6 EA Flood Map for Planning overlain in GIS with Site (Lidar) Topography (source Environment Agency Flood Maps)

Impacts of Climate Change

6.5 The EA has provided climate change modelling up to the 105% climate change impact. Figure 8 below shows a comparison between the various climate change profiles. Interestingly, the difference between the 35% and 105% is minimal, which typically indicates that River Adur is not highly sensitive to climate change impacts at this location. As can also be seen, the development proposals have sequentially located the proposed dwelling outside of the Flood Zone 3 plus 105% climate change extents.

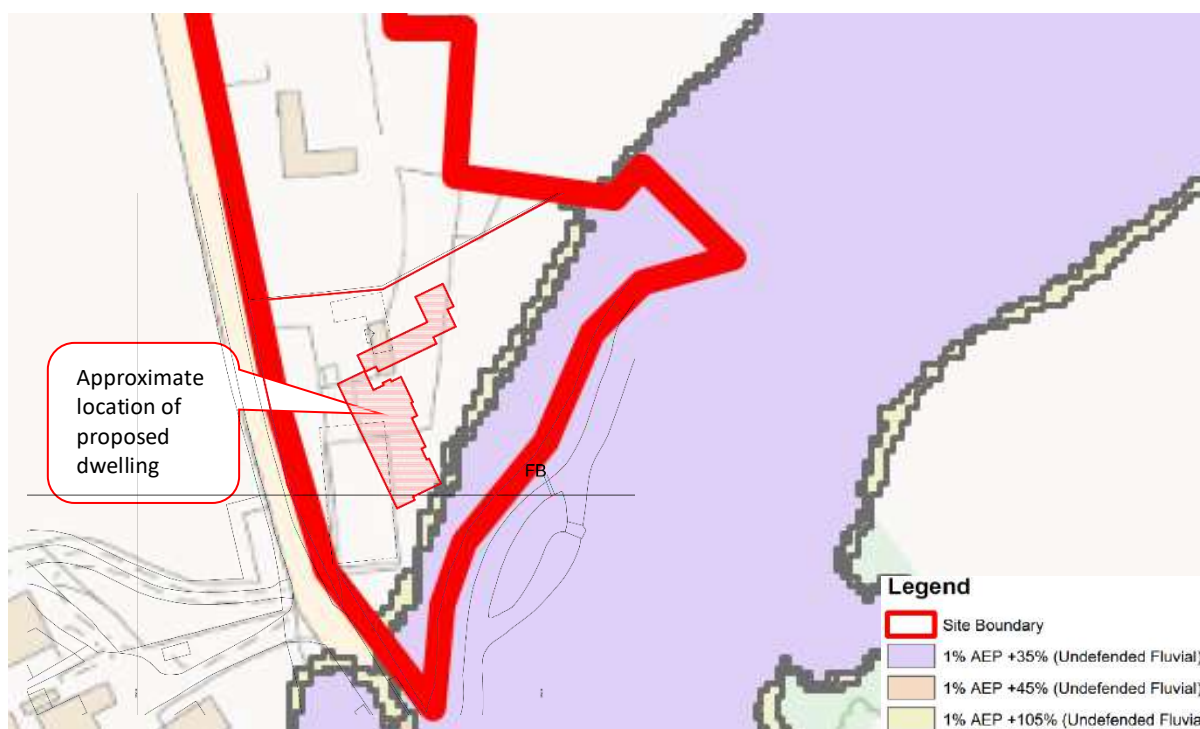


Figure 7 - Extract from EAs Product 4 Climate Change Data (source Upper Adur Eastern Branch Modelling (2011) (Levels Only) with new climate change allowances (2016))

6.6 Figure 9 below shows the node location and flood depths at each node point. The node data is taken along the alignment of the River Adur, with the closest upstream node point to the site at being node number 3. Using the flood data from Node 3, a conservative estimates the Design Flood Level (DFL) for the development can be set at 10.84m AOD.

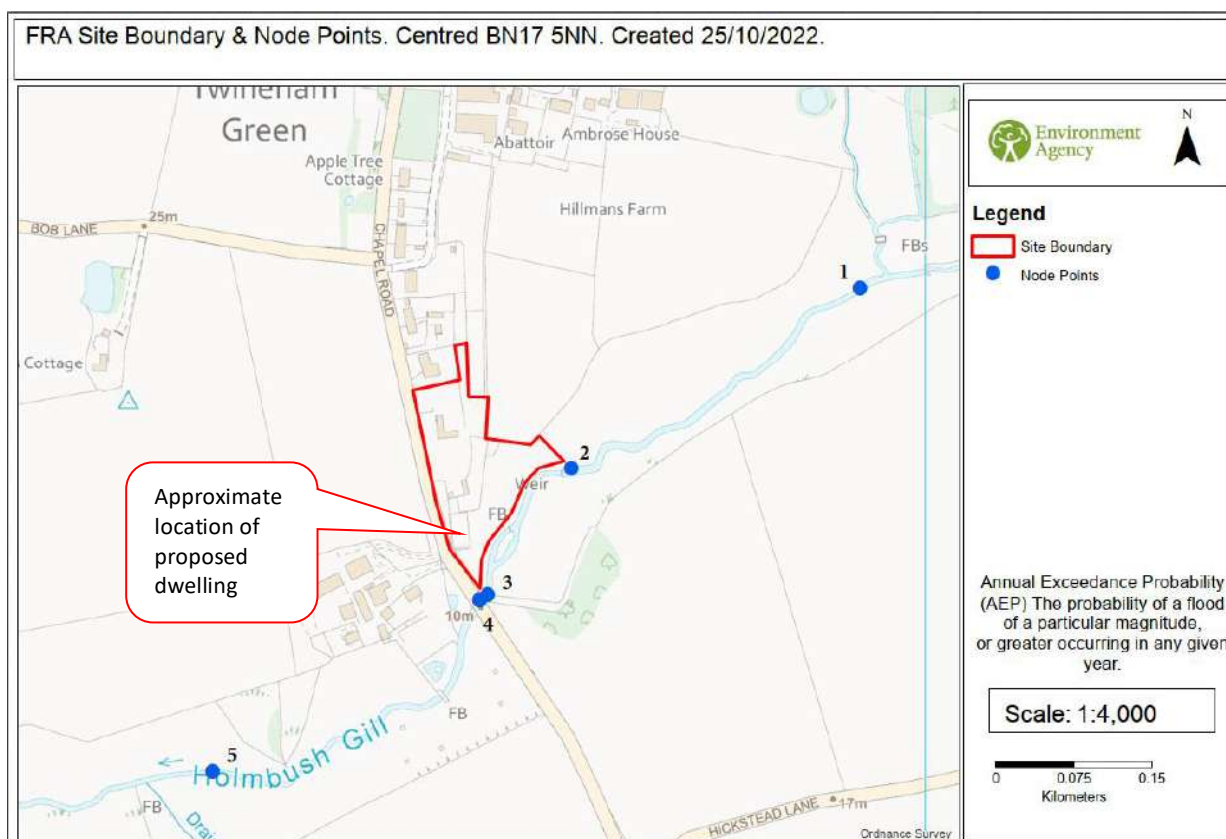


Table 1: Water Levels: Fluvial Undefended

Node Ref	NGR		Modelled Flood Levels in Metres AOD					
	Eastings	Northings	Undefended Annual Exceedance Probability					
			5%	1%	1% +CC (35%)	1% +CC (45%)	1% +CC (105%)	0.1%
1	525938	120632	10.22	10.43	10.61	10.68	10.98	10.73
2	525662	120460	10.08	10.31	10.49	10.55	10.84	10.60
3	525581	120340	10.06	10.28	10.43	10.49	10.77	10.57
4	525573	120333	10.04	10.26	10.18	10.24	10.54	10.55
5	525318	120169	8.92	9.08	9.23	9.29	9.60	9.35

Figure 8 - Extract from EA Product 4 Data (refer to Appendix 2 for full data set)

- 6.7 Based on this data, it is advised that no development, buildings or earthworks should be positioned below the DFL (10.84mAOD). It is considered that should all buildings and site works are positioned above the DFL, then flood risk to the dwelling can be considered very low, and there will be minimal impact on fluvial flood risk upstream of the site.

PLUVIAL (SURFACE WATER)

- 6.8 Surface water flooding is the term applied to flooding when intense rainfall overwhelms the ability of the land to infiltrate water, or in urban areas for the sewers and road drains to drain the water away, resulting in surface water runoff and consequent flooding. It is a particular problem in urban areas where the excess water will often travel along streets and paths, between and through buildings and across open space. It can result in indiscriminate flooding to properties when not controlled. The high-profile flooding across the UK in the summer of 2007 was largely attributed to excess runoff where the capacity of the drains was exceeded by intense summer rainstorms and led to the Government commissioning the independent Pitt Review in 2008.
- 6.9 The WSCC SFRA recommends the use of the EA RoSWF maps to assess the risk from these sources. These maps use remotely sensed LiDAR data to determine large areas of topography. In all urban areas this LiDAR has been edited to remove the buildings. This editing process results in a slightly un-even surface profile, which can result in the production of small depressions that fill with water but in reality, is not at risk of surface water flooding. This should be considered where very localised areas of flooding are evident and are independent of wider surface water flood flows and routes (as is the case on this site).
- 6.10 The EA mapping shows 3 event scenarios for the 1 in 30 (3.3% chance of occurring in any one year) return period (high risk – Figure 9), the DFE 1 in 100 (1% chance of occurring in any one year) return period (medium risk – Figure 10) and 1 in 1000 (0.1% chance of occurring in any one year) return period (low risk – Figure 11). Extracts of this mapping is provided below, along with an analysis of their likely source and projected impacts on the development.
- 6.11 Figure 9 shows the high-risk scenario (1 in 30-year event or equivalent Flood Zone 3b). In this event, the modelling shows that the proposed Dwelling would be wholly unaffected by surface water flooding being sequentially located on land above the modelled extents.

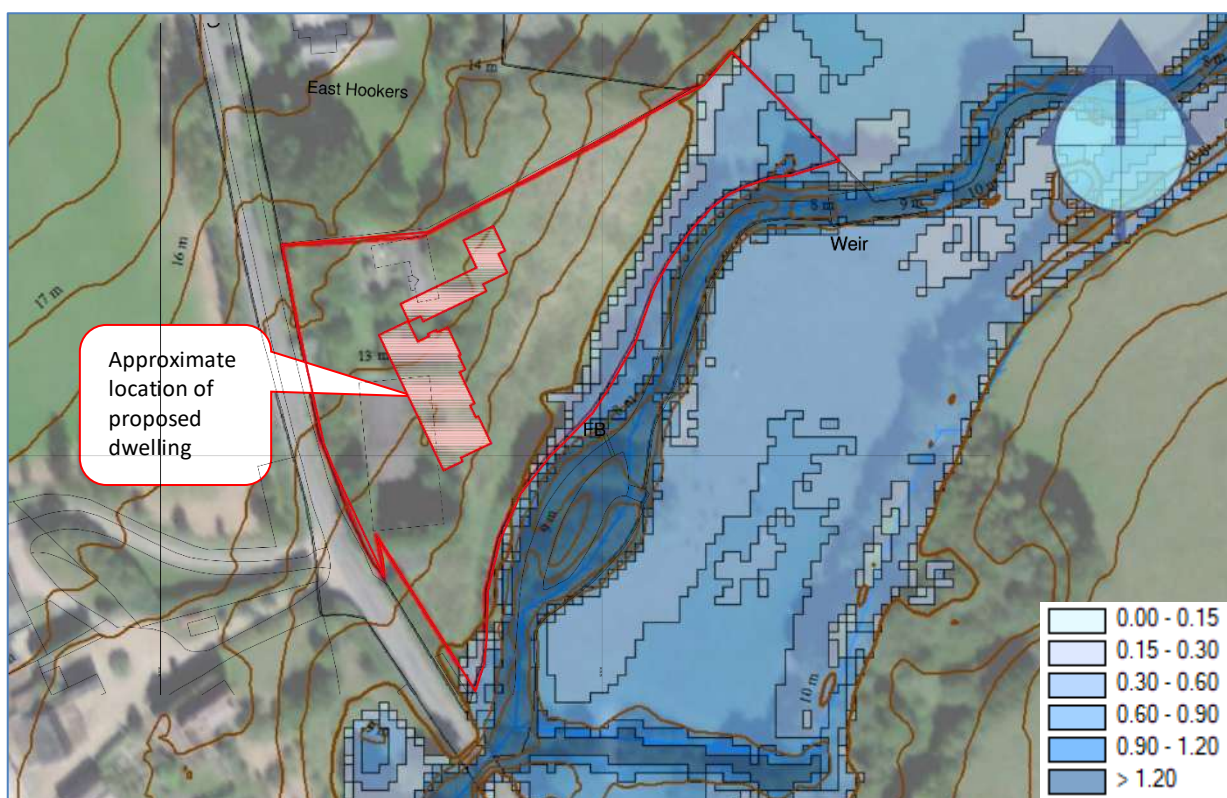


Figure 9 EA Long Term Flood Risk Maps (Depths) – High Risk of surface water flooding (source: EA Long Term Flood Risk Maps), site bordered red.

6.12 Figure 10 presents the DFE, medium risk scenario (1 in 100-year return period or equivalent Flood Zone 3a). This shows that the proposed dwelling remains unaffected by surface water flooding, being located above the DFE.

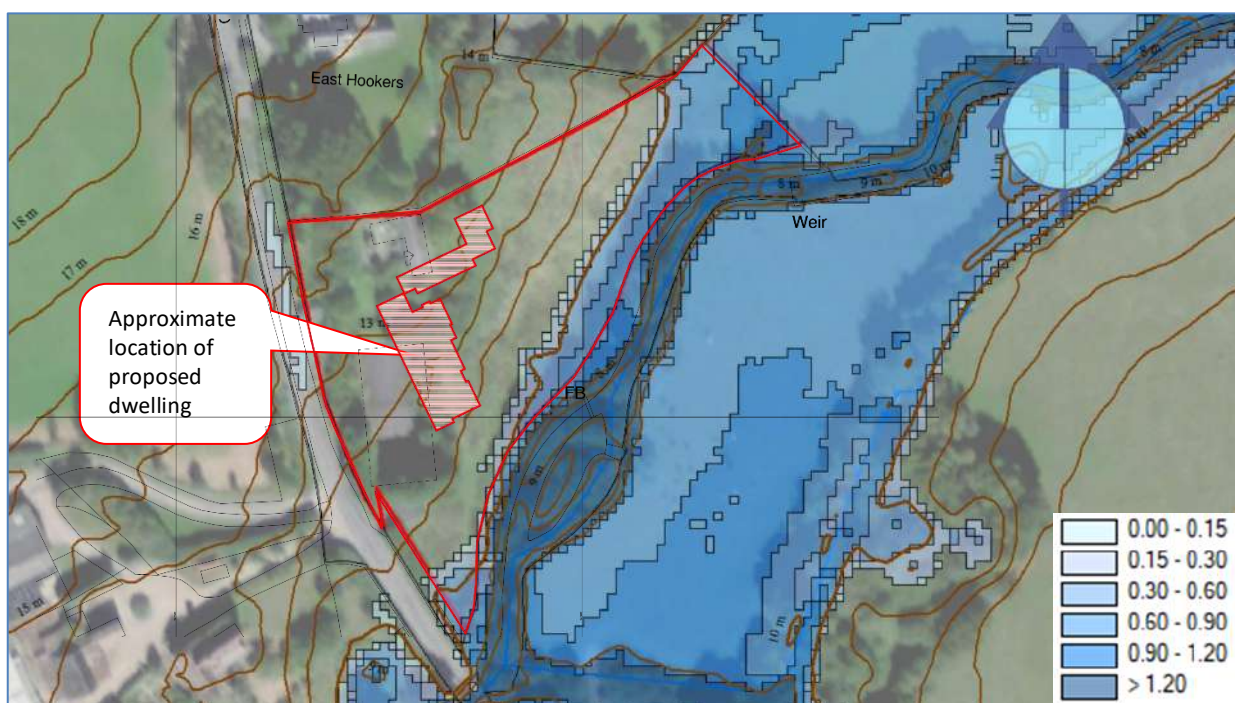


Figure 10 EA Long Term Flood Risk Maps – Medium Risk of surface water flooding depths (source: EA Long Term Flood Risk Maps), site bordered red

6.13 The low-risk scenario (1 in 1000-year event) continues to show that the majority of the site remains unaffected. Most importantly, the proposed dwelling location is sequentially located to be unaffected by surface water flooding for all the modelled events.

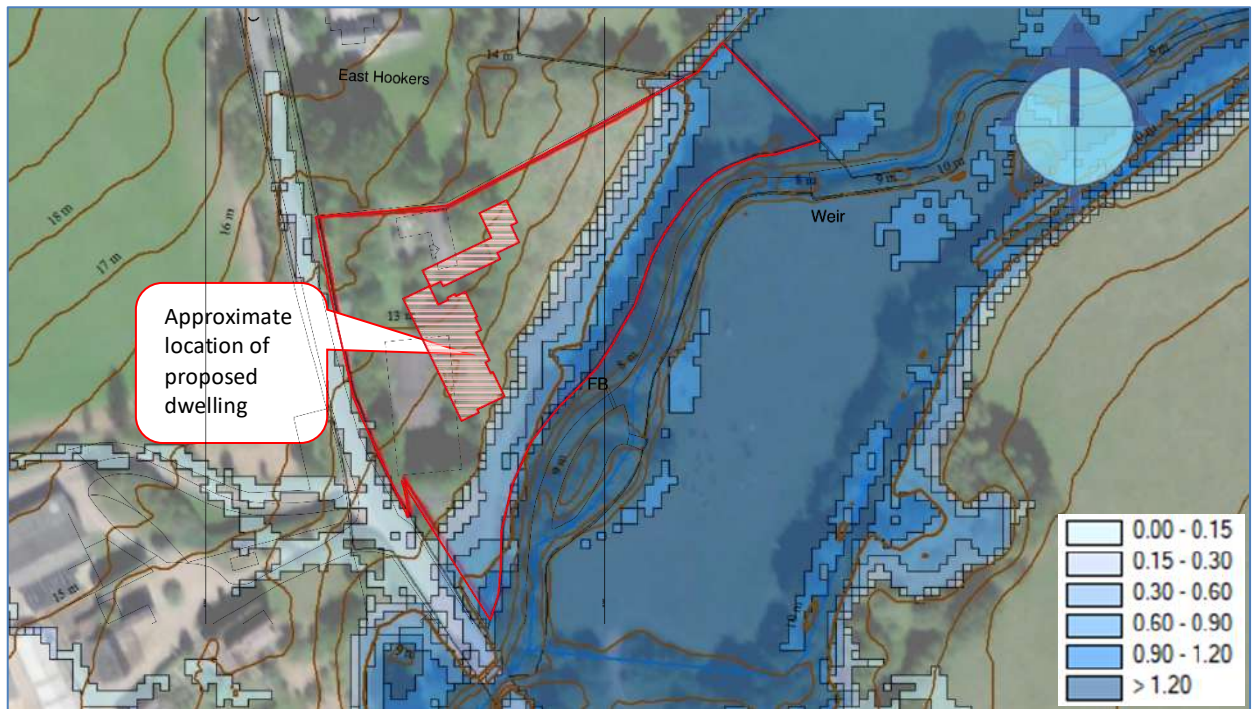


Figure 11 EA Long Term Flood Risk Maps – Low risk of surface water flooding depth (source: EA Long Term Flood Risk Maps), site bordered red.

- 6.14 Based on the EA's RoFSW data, the Dwelling is shown to be located above all modelled surface water flood risk event, and therefore can be at low risk of surface water flooding.

Impacts of Climate Change

- 6.15 With changes in climate profiles, it is expected that rainfall intensities and frequencies will increase, and as such the risk to property will increase with this. The EA and SFRA have not included climate change modelling for surface water flooding. In the absence of this data, an estimation of the DFE climate change impacts can be made by looking at the 1 in 1000 year event and the Product 4 Fluvial data. In the case of this site, the 1 in 1000 year event continues to show that the Dwelling would remain unaffected by surface water flooding. Therefore, it can be considered that the Dwelling would likely remain above the DFE plus climate change (in the absence of more detailed modelling).
- 6.16 It should be noted that the Council considers the implementation of SuDS as an essential element of reducing future flood risk to both the site and its surroundings. In particular, where surface water flood risk is noted to be highly localised due to topographic depressions (as is the case on this site), much of the associated risk can be managed through improving site drainage to manage up to the 1 in 100 year plus climate change.
- 6.17 In accordance with the NPPF, the sites surface water drainage should account for up to a 45% climate change allowance to site rainfall profiles, to ensure climate change is appropriately considered.
- 6.18 SUDS should try to achieve an infiltration solution; however careful consideration of the underlying geology needs to be considered in the water quality and treatment aspects of the drainage design.

RESERVOIR FLOODING (BREACH)

- 6.19 Reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoirs Act 1975 and are listed on a register held by the Environment Agency. The level and standard of inspection and maintenance required under the Act means that the risk of flooding from reservoirs is relatively low. Recent changes to legislation under the Flood and Water Management Act require the Environment Agency to designate the risk of flooding from these reservoirs. The Environment Agency is currently progressing a 'Risk Designation' process so that the risk is formally determined.

- 6.20 Reservoir flooding is very different from other forms of flooding. It may happen with little, or no warning and evacuation will need to happen immediately. The likelihood of such flooding is difficult to estimate, but it is less likely than flooding from rivers or surface water. It may not be possible to seek refuge upstairs from floodwater as buildings could be unsafe or unstable due to the force of water from the reservoir breach or failure. The risk of inundation to the study area as a result of reservoir breach or failure of a number of reservoirs within the area was assessed as part of the National Inundation Reservoir Mapping (NIRIM) study.
- 6.21 Maps of the flood extent can be found on the Government's Long term flood risk information website, Figure 12 shows that the site is at very low risk of flooding from any reservoir failures.

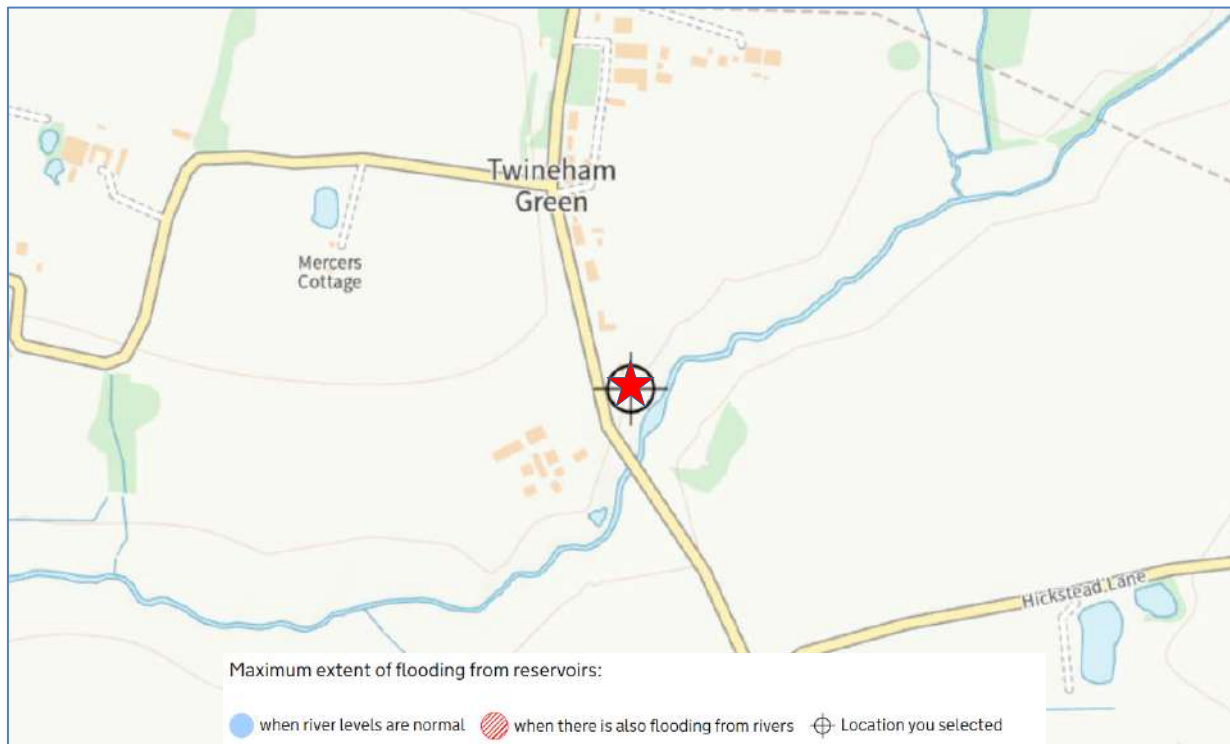


Figure 12 extract from EAs LTFRM Reservoir Flood Risk (star marks approximate site location)

HISTORICAL, SEWERS AND DRAINAGE

- 6.22 A common source of flooding is a result of sewer or other drainage infrastructure becoming surcharged and flooding. Flood risk associated with the potential surcharging of the sewerage network is extremely hard to predict and there are currently no datasets available that provide an indication of areas that may be at risk of flooding from the sewerage network. However, as most drainage systems are not designed for events greater than a 1 in 30 (3.33%) annual probability rainfall event (typically reducing to 1 in 5 (20%) for highway drainage systems and most likely less for older drainage systems) new development should always consider likely overland flow paths should flooding from these systems occur.
- 6.23 As emergence from sewerage systems is likely to follow the ground's topography, it is recommended that consideration is given to the EA's Risk of Flooding from Surface Water map and other available topographic data as this will provide an indication of likely flow routes should surcharging of the sewerage system occur.
- 6.24 The WSCC SFRA present records relating to sewer flooding. Specifically, Map S from the SFRA highlights that there have been at least one recorded incident of sewer flooding incidences nearby the site, however, it is unclear if the site has been affected in the past.

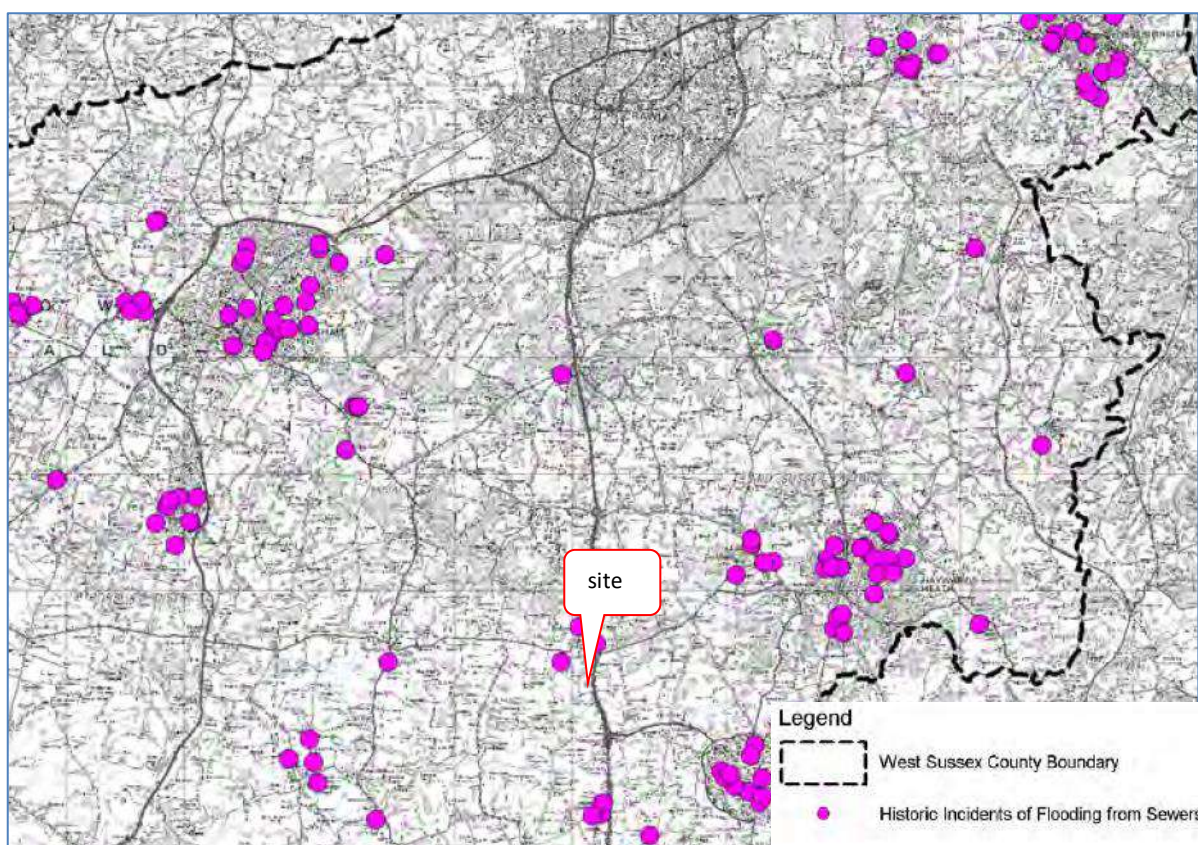


Figure 13 - extract from SFRA Map 5 – “Areas with Recorded Incidents of Sewer Flooding”

6.25 As such, it can be considered the risk of sewer flooding to the site is considered low, assuming that any new development proposals include appropriate protective measures to manage runoff, and any additional runoff proposed to be directed offsite (either into the public sewer system or elsewhere) are approved by the local authority or body responsible for its management prior to discharge.

6.26 The Environment Agency has no record of sewer flooding to this property/area in the past.

GROUNDWATER

6.27 Groundwater flooding is the emergence of groundwater at the ground surface or into subsurface voids arising as a result of:

- ⇒ abnormally high groundwater heads or flows;
- ⇒ the introduction of an obstruction to groundwater flow; or
- ⇒ the rebound of previously depressed groundwater levels.

6.28 Groundwater flooding usually occurs following a prolonged period of low intensity rainfall. As groundwater flow is much slower than surface flow, the flooding may not recede for long periods of time, typically weeks or even months. It is important to recognise the risk of groundwater flooding is typically highly variable and heavily dependent upon local geology, topography and weather conditions, as well as local abstraction regimes. Groundwater flooding is hard to predict and challenging to mitigate.

6.29 Records of groundwater flooding in around the area are limited. However, this is likely to be because groundwater flooding is often perceived as surface water flooding and therefore not always accurately recorded, rather than groundwater flooding not being a potentially significant source of flood risk. However, the WSCC SFRA does provide some records of groundwater emergence in the county, Figure 14 shows that the site appears to be located on the boundary of a low and medium risk area of groundwater emergence zone, with no specific records of groundwater flooding specifically impacting the site. In addition, site gradients would direct any groundwater emergence quickly

to the south into the nearby river and as such is highly unlikely that groundwater flooding would ever be of significant depth to impact the development. As such flood risk from this source is considered low.

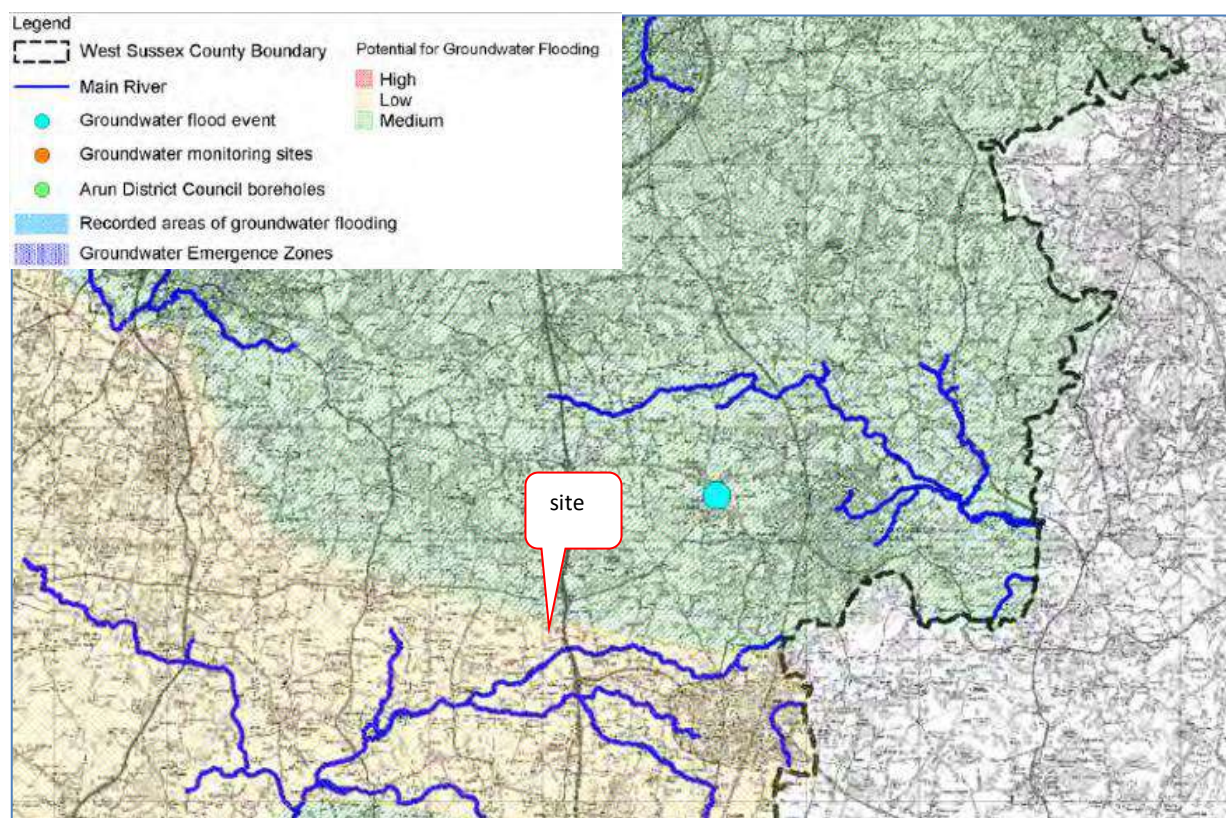


Figure 14 - Extract from WSCC SFRA Map G Areas More Prone to Groundwater Flooding (site marked with star)

Impacts of Climate Change

6.30 The potential effects of climate change on groundwater levels are uncertain. Greater seasonality in groundwater level fluctuation is a potential outcome under a pattern of higher winter rainfall and less summer rainfall. Broad predictions of the impacts of climate change on groundwater levels are difficult to make at the present time.

RESIDUAL RISKS

6.31 Residual risks are those remaining after applying the sequential approach to the location of development and taking mitigating actions. Examples of residual flood risk include:

- the failure of flood management infrastructure such as a breach of a raised flood defence, blockage of a surface water conveyance system, overtopping of an upstream storage area, or failure of a pumped drainage system;
- a severe flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot cope with.

6.32 There are no existing defences that provide protection above the DFE, therefore breach failure is not considered a residual risk.

6.33 Surface water drainage should be designed to account for the 1 in 100 year plus climate change, with external levels formed to direct site runoff around buildings and away from building thresholds to mitigate against flooding in an extreme rainfall event.

SUMMARY OF RISKS

6.34 Table 8 below summarises the generalised risk from the various sources of flooding assessed above, and if the site is at risk of a DFE from this source.

Table 8 - Summarising sources of flooding that affect the site up to the DFE. Critical DFE shaded blue

Source of Flooding	Flood Risk to site	Is proposed dwelling itself at risk from the DFE
Fluvial	High	No (dwelling sequentially located above the DFE)
Tidal/Sea	Very Low	No
Surface Water	High	No (dwelling sequentially located above the DFE)
Reservoir	Very Low	No
Groundwater	Very Low	No
Sewers and Drainage	Very Low	No

6.35 Section 7 below presents the proposed measures to avoid, control, mitigate, manage residual risk and ensure flood risk is not increased elsewhere, relevant to the DFE.

7 FLOOD MITIGATION MEASURES

- 7.1 The proposals allow the opportunity to improve flood resilience of the site by incorporating several flood mitigation measures, both through the incorporation of flood resilient building materials, surface water drainage improvements and signing up to the EA Flood Warning/Alert System.
- 7.2 Table 9 presents the key flood mitigation measures based the critical DFE on the NPPF and PPG decision making principles:

Table 9 - Key Decision Making principles and measures applied to avoid, control, mitigate, and manage flood risk

DECISION MAKING: ORDER OF PRIORITY	PROPOSED MEASURES
1. Avoid	The Dwelling is shown to be naturally located above the DFE for fluvial and pluvial flood risk, and therefore is at low risk of flooding from these sources
2. Control	Surface Water Drainage systems should be included to incorporate SUDS (where possible) and be designed to accommodate the 1 in 100 year plus climate change DFE.
3. Mitigate	Refer to Section 8 below for recommended Building Measures
4. Manage residual flood risk	Refer to Section 9 for assessment of Access and Egress (Flood Evacuation Planning).
5. Flood Risk is not increased elsewhere	Any new drainage should be designed in accordance with Building Regulations Part H, SuDS Manual and 'DCG' guidance, ensuring drainage proposals include an allowance for climate change; Any additional flows to be directed into the Local Sewer Authorities public sewers or water courses to receive confirmation of capacity and connection approvals prior to detailed design and construction.

8 BUILDING MATERIAL MITIGATIONS

- 8.1 The national government produced guidance for improving the flood resilience of building in the Communities and Local Government (CLG) 2007 'Improving the Flood Performance of New Buildings' publication. This publication provides recommendations on how to protect buildings in the case of a flood event, and propose two scenarios based on maximum expected flooded depths:

Water exclusion strategy – where emphasis is placed on minimising water entry whilst maintaining structural integrity, and on using materials and construction techniques to facilitate drying and cleaning. This strategy is favoured when low flood water depths are involved (not more than 0.3m). According to the definitions adopted in this Guidance, this strategy can be considered as a resistance measure but it is part of the aim to achieve overall building resilience

Water entry strategy – where emphasis is placed on allowing water into the building, facilitating draining and consequent drying. Standard masonry buildings are at significant risk of structural damage if there is a water level difference between outside and inside of about 0.6m or more. This strategy is therefore favoured when high flood water depths are involved (greater than 0.6m) by utilising resilient materials, and construction methods.

- 8.2 Given the primary risk is related to extreme flood events or failure of onsite drainage, it is considered that some key principles of the **Water Exclusion Strategy** should be adopted for the buildings on the site. Some recommendations include:

1. Preventing Water Entry:

⇒ Emphasis on creating a watertight envelope to minimize or prevent floodwater ingress entirely.

2. Structural Integrity:

⇒ Ensure that materials and construction methods can withstand hydrostatic pressure from floodwater, especially for water levels up to 0.6 meters.

3. Sealing Potential Entry Points:

⇒ Identify and seal all potential routes for water entry, including doors, windows, walls, and service penetrations.

4. Sustainability:

⇒ Use durable materials and designs that maintain effectiveness over time and withstand repeated flood events.

- 8.3 Some examples of materials to be considered include:

1. Foundations and Floors:

⇒ Use concrete foundations and ground floors with integral damp-proof membranes.

⇒ Avoid suspended timber floors in areas prone to flooding, as they are more susceptible to water ingress.

⇒ Include perimeter tanking to prevent water from seeping in below ground.

2. Walls:

⇒ Construct walls with solid materials like reinforced concrete or high-density brickwork that have low permeability.

⇒ Apply external water-resistant coatings or renders to block water penetration.

⇒ Seal wall cavities to prevent water build-up.

3. Doors and Windows:

⇒ Use flood-resistant doors and windows with watertight seals.

⇒ Consider installing barriers or flood boards that can be deployed in high-risk scenarios.

4. Fittings and Penetrations:

⇒ Seal all service penetrations (e.g., pipes, cables) with water-resistant gaskets or sealants.

⇒ Use raised thresholds and robust seals for doorways.

5. Drainage:

⇒ Include non-return valves in drainage systems to prevent backflow of floodwater through sewers.

⇒ Ensure effective site drainage to direct water away from the property.

6. Other Considerations:

⇒ Install water pumps for emergency removal of any seepage.

⇒ Avoid materials like untreated timber, gypsum boards, and unprotected electrical fixtures in low-lying areas.

8.4 The water exclusion strategy is particularly effective for areas with low to moderate flood depths (up to 0.6 meters) and focuses on minimizing water entry to maintain the usability and integrity of the building immediately after a flood.

8.5 Further detail can be found within the Improving the Flood Resilience of Buildings Through Improved Materials Methods and Details Technical Report.

9 SITE ACCESS AND EGRESS (FLOOD EVACUATION PLANNING)

- 9.1 To comply with the NPPF, all occupants should be able to make their way, unassisted by the Emergency Services, to dry land. This is known as 'safe access to dry land' and does not have to be dry, just not *hazardous* at the peak of the predicted critical 1% (1 in 100 year) plus climate change storm.
- 9.2 Table 13.1 of FD2320 shows the maximum depths/velocity combinations that are safe for 3 categories of user (occupant). The methodology for calculating "Flood Hazard" is reproduced below according to the methodology stated within the "Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purposes – Clarification of the Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1" (Figure 15).
- 9.3 For an access/egress route to be acceptable under the NPPF, the combination of flood depths, velocities and debris must be analysed.

HR	Depth of flooding - d (m)												
	DF = 0.5				DF = 1								
Velocity v (m/s)	0.05	0.10	0.20	0.25	0.30	0.40	0.50	0.60	0.80	1.00	1.50	2.00	2.50
0.0	0.03+0.5 = 0.53	0.05+0.5 = 0.55	0.10+0.5 = 0.60	0.13+0.5 = 0.63	0.15+1.0 = 1.15	0.20+1.0 = 1.20	0.25+1.0 = 1.25	0.30+1.0 = 1.30	0.40+1.0 = 1.40	0.50+1.0 = 1.50	0.75+1.0 = 1.75	1.00+1.0 = 2.00	1.25+1.0 = 2.25
0.1	0.03+0.5 = 0.53	0.06+0.5 = 0.56	0.12+0.5 = 0.62	0.15+0.5 = 0.65	0.18+1.0 = 1.18	0.24+1.0 = 1.24	0.30+1.0 = 1.30	0.36+1.0 = 1.36	0.48+1.0 = 1.48	0.60+1.0 = 1.60	0.90+1.0 = 1.90	1.20+1.0 = 2.20	1.50+1.0 = 2.50
0.3	0.04+0.5 = 0.54	0.08+0.5 = 0.58	0.15+0.5 = 0.65	0.19+0.5 = 0.69	0.23+1.0 = 1.23	0.30+1.0 = 1.30	0.38+1.0 = 1.38	0.45+1.0 = 1.45	0.60+1.0 = 1.60	0.75+1.0 = 1.75	1.13+1.0 = 2.13	1.50+1.0 = 2.50	1.88+1.0 = 2.88
0.5	0.05+0.5 = 0.55	0.10+0.5 = 0.60	0.20+0.5 = 0.70	0.25+0.5 = 0.75	0.30+1.0 = 1.30	0.40+1.0 = 1.40	0.50+1.0 = 1.50	0.60+1.0 = 1.60	0.80+1.0 = 1.80	1.00+1.0 = 2.00	1.50+1.0 = 2.50	2.00+1.0 = 3.00	2.50+1.0 = 3.50
1.0	0.08+0.5 = 0.58	0.15+0.5 = 0.65	0.30+0.5 = 0.80	0.38+0.5 = 0.88	0.45+1.0 = 1.45	0.60+1.0 = 1.60	0.75+1.0 = 1.75	0.90+1.0 = 1.90	1.20+1.0 = 2.20	1.50+1.0 = 2.50	2.25+1.0 = 3.25	3.00+1.0 = 4.00	3.75+1.0 = 4.75
1.5	0.10+0.5 = 0.60	0.20+0.5 = 0.70	0.40+0.5 = 0.90	0.50+0.5 = 1.00	0.60+1.0 = 1.60	0.80+1.0 = 1.80	1.00+1.0 = 2.00	1.20+1.0 = 2.20	1.60+1.0 = 2.60	2.00+1.0 = 3.00	3.00+1.0 = 4.00	4.00+1.0 = 5.00	5.00+1.0 = 6.00
2.0	0.13+0.5 = 0.63	0.25+0.5 = 0.75	0.50+0.5 = 1.00	0.63+0.5 = 1.13	0.75+1.0 = 1.75	1.00+1.0 = 2.00	1.25+1.0 = 2.25	1.50+1.0 = 2.50	2.00+1.0 = 3.00	3.50	4.75	6.00	7.25
2.5	0.15+0.5 = 0.65	0.30+0.5 = 0.80	0.60+0.5 = 1.10	0.75+0.5 = 1.25	0.90+1.0 = 1.90	1.20+1.0 = 2.20	1.50+1.0 = 2.50	1.80+1.0 = 2.80	3.40	4.00	5.50	7.00	8.50
3.0	0.18+0.5 = 0.68	0.35+0.5 = 0.85	0.70+0.5 = 1.20	0.88+0.5 = 1.38	1.05+1.0 = 2.05	1.40+1.0 = 2.40	1.75+1.0 = 2.75	3.10	3.80	4.50	6.25	8.00	9.75
3.5	0.20+0.5 = 0.70	0.40+0.5 = 0.90	0.80+0.5 = 1.30	1.00+0.5 = 1.50	1.20+1.0 = 2.20	1.60+1.0 = 2.60	3.00	3.40	4.20	5.00	7.00	9.00	11.00
4.0	0.23+0.5 = 0.73	0.45+0.5 = 0.95	0.90+0.5 = 1.40	1.13+0.5 = 1.63	1.35+1.0 = 2.35	1.80+1.0 = 2.80	3.25	3.70	4.60	5.50	7.75	10.00	12.25
4.5	0.25+0.5 = 0.75	0.50+0.5 = 1.00	1.00+0.5 = 1.50	1.25+0.5 = 1.75	1.50+1.0 = 2.50	2.00+1.0 = 3.00	3.50	4.00	5.00	6.00	8.50	11.00	13.50
5.0	0.28+0.5 = 0.78	0.60+0.5 = 1.10	1.10+0.5 = 1.60	1.38+0.5 = 1.88	1.65+1.0 = 2.65	3.20	3.75	4.30	5.40	6.50	9.25	12.00	14.75
Flood Hazard Rating (HR)		Colour Code		Hazard to People Classification									
Less than 0.75				Very low hazard - Caution									
0.75 to 1.25				Danger for some – includes children, the elderly and the infirm									
1.25 to 2.0				Danger for most – includes the general public									
More than 2.0				Danger for all – includes the emergency services									

Figure 15: Extracts from the Supplementary Note to FD2320/TR2 and FD2321/TR1 describing the methodology for calculating 'Flood Hazard' under the NPPF (Source: EA)

- 9.4 Figure 16 below illustrates that Flood Hazard throughout the majority of the site and from the access off of Boleny Chapel Road is no more than 'very low', and therefore the site can be considered to have 'safe' access and egress from the site in a flood event.
- 9.5 However, it is advised that if evacuation in a flood event is required, that users evacuate to the north, rather than to the south where flood hazard is notable higher.

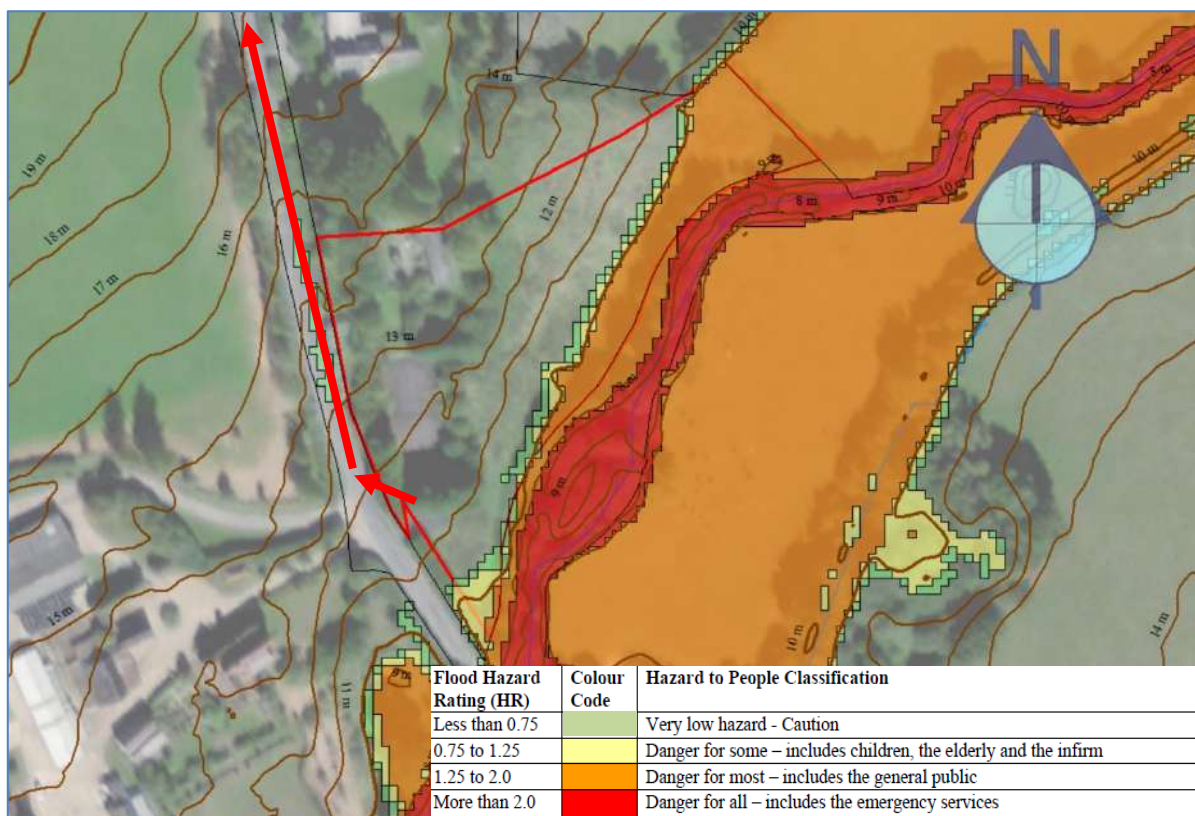


Figure 16 - EA RoFSW Hazard Mapping – Medium Risk of surface water flooding (source: Risk of Flooding from Surface Water (RoFSW)) - Red arrows designate suggested evacuation route.

9.6 Further information can be found on www.environment-agency.gov.uk/floodline. General advice includes:

On receipt of a FLOOD ALERT, the individual property owners and occupiers should:

- ⇒ Monitor the situation via local media;
- ⇒ Make themselves aware of forecast local weather conditions;
- ⇒ Alert both current visitors, and those scheduled to arrive, of the situation;
- ⇒ Prepare to evacuate if necessary.

On receipt of a FLOOD WARNING, the individual property owners and occupiers should:

- ⇒ Follow advice to “go in, stay in, and tune in”;
- ⇒ Move all vehicles to an area outside of the potential flood extent, if safe to do so;
- ⇒ Alert scheduled visitors that they should seek alternative accommodation;
- ⇒ Be prepared to follow instruction from the Emergency Services.

On receipt of a SEVERE FLOOD WARNING, the individual property owners and occupiers should:

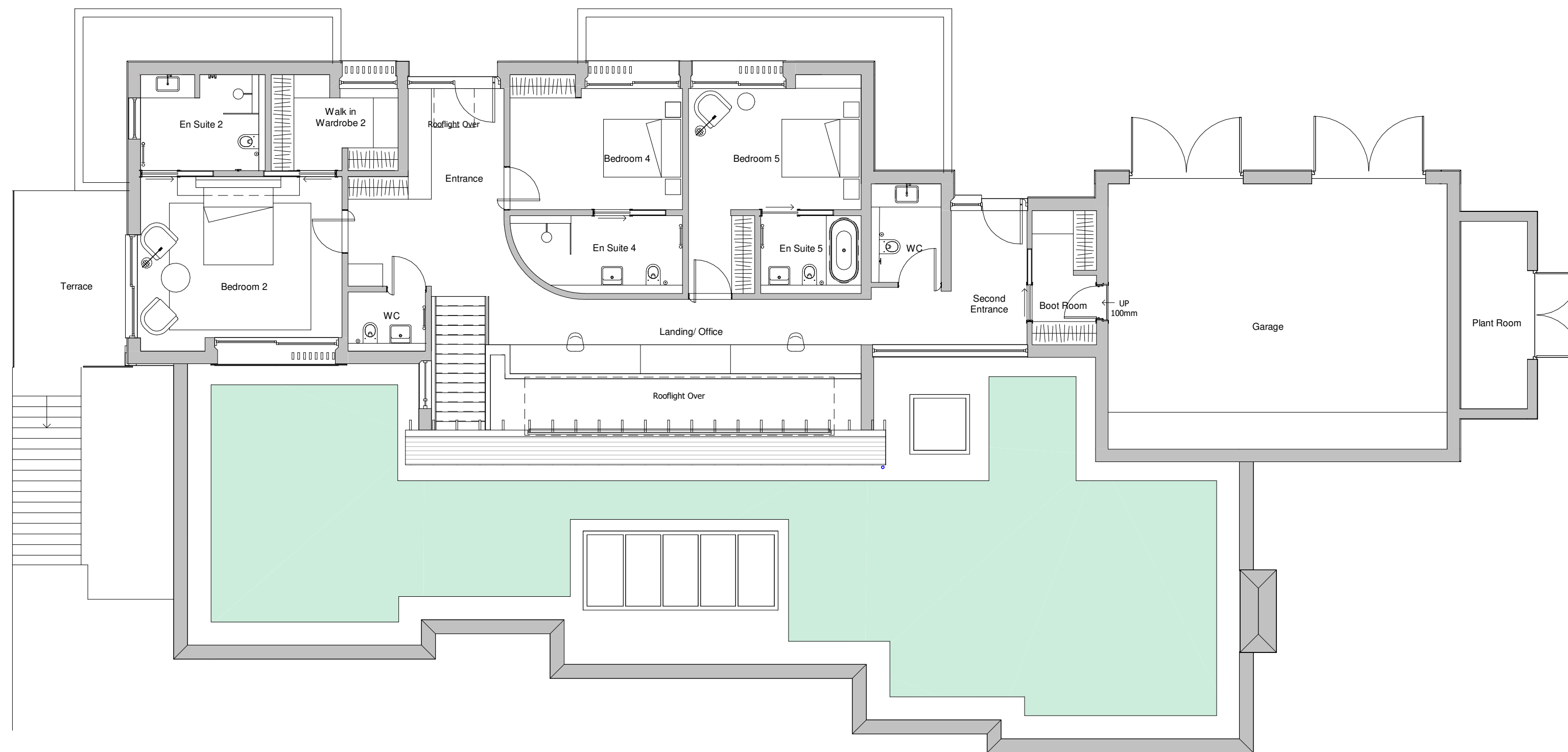
- ⇒ Follow advice to “go in, stay in, and tune in”;
- ⇒ Remain attentive to local media forecasts and news bulletins;
- ⇒ Do not evacuate unless instructed to do so by the Emergency Services;

9.7 If flood waters along the proposed evacuation route have exceed 25cm, site users are advised to seek advice from emergency services.

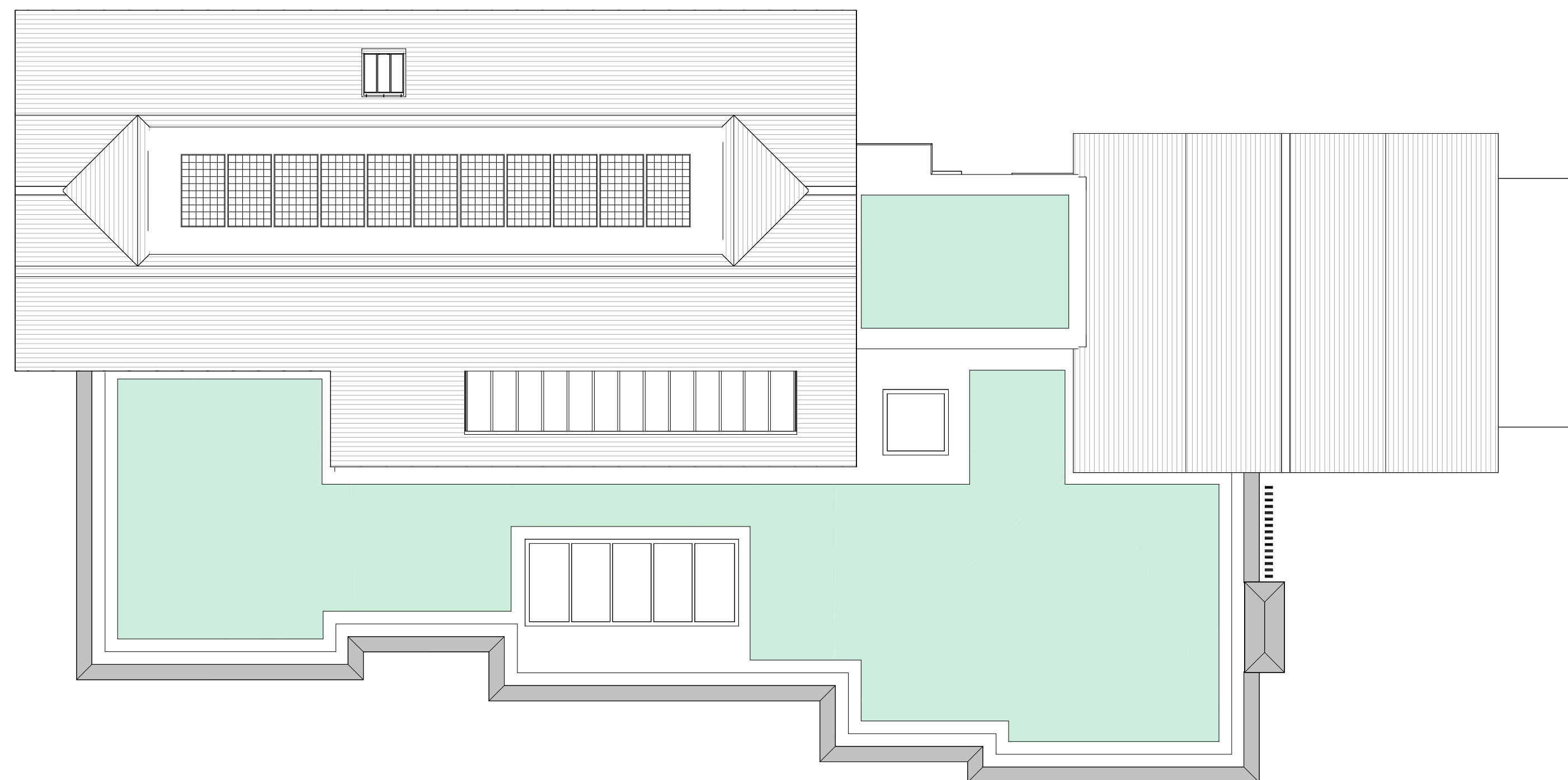
10 CONCLUSION

- 10.1 This assessment is required under the National Planning Policy Framework (NPPF) and Local and District Councils given the location, scale and associated flood risks.
- 10.2 Table 3 summarises the sites primary flood risk classifications and the source for the DFE. This designation is based on the EA's Flood Map for Planning (extract provided in Figure 2) and the EA's Long Term Flood Risk Maps (LTFRM): Risk of Flooding from Surface Water (RoFSW) (extract provided in Figure 3). The EA's Flood Maps for Planning (Fluvial flooding) and RoFSW (Pluvial flooding) are both shown to affect the site (i.e. flooding within the redline boundary). However, the proposed dwelling has been sequentially located above the flood zones and is located within Flood Zone 1.
- 10.3 Based on the information available at the time of writing, this FRA has determined that the critical DFE relates to fluvial flood risk associated with the River Adur along the site's southern boundary with a DFL of 10.84mAOD. The proposed Dwelling is shown to be located on land above the DFL and therefore is considered to be at low risk of flooding from all assessed sources for its design life.
- 10.4 It is advised that SUDS are incorporated into the proposals and standard flood resilient construction is incorporated into the proposals to further mitigate and better drain the area of the site.
- 10.5 Table 9 summarises how this FRA has applied the PPG's key decision making principles to avoid, control, mitigate, manage residual risk and to ensure the development proposals do not increase flood risk post development. Based on the PPG and NPPF, and assuming the recommendations of this FRA are followed, it is considered that a residential development on this site should be considered appropriate.

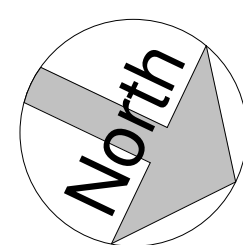
APPENDIX 1 – SUPPORTING INFORMATION



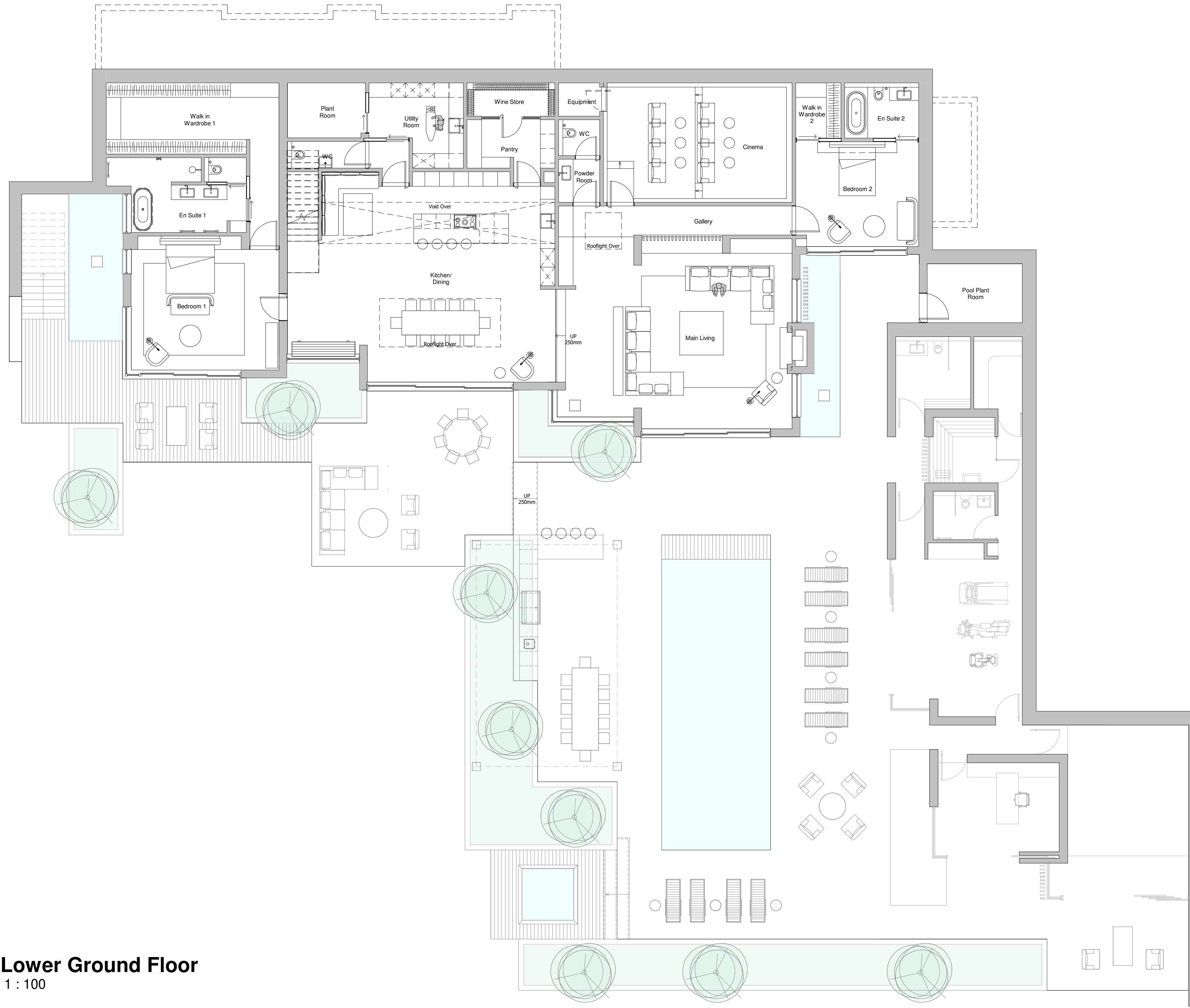
Ground Floor
1 : 100



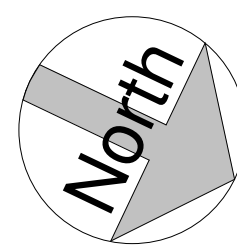
Roof Plan
1 : 100



0m 2m 4m 6m 8m 10m
VISUAL SCALE 1:100 @ A1



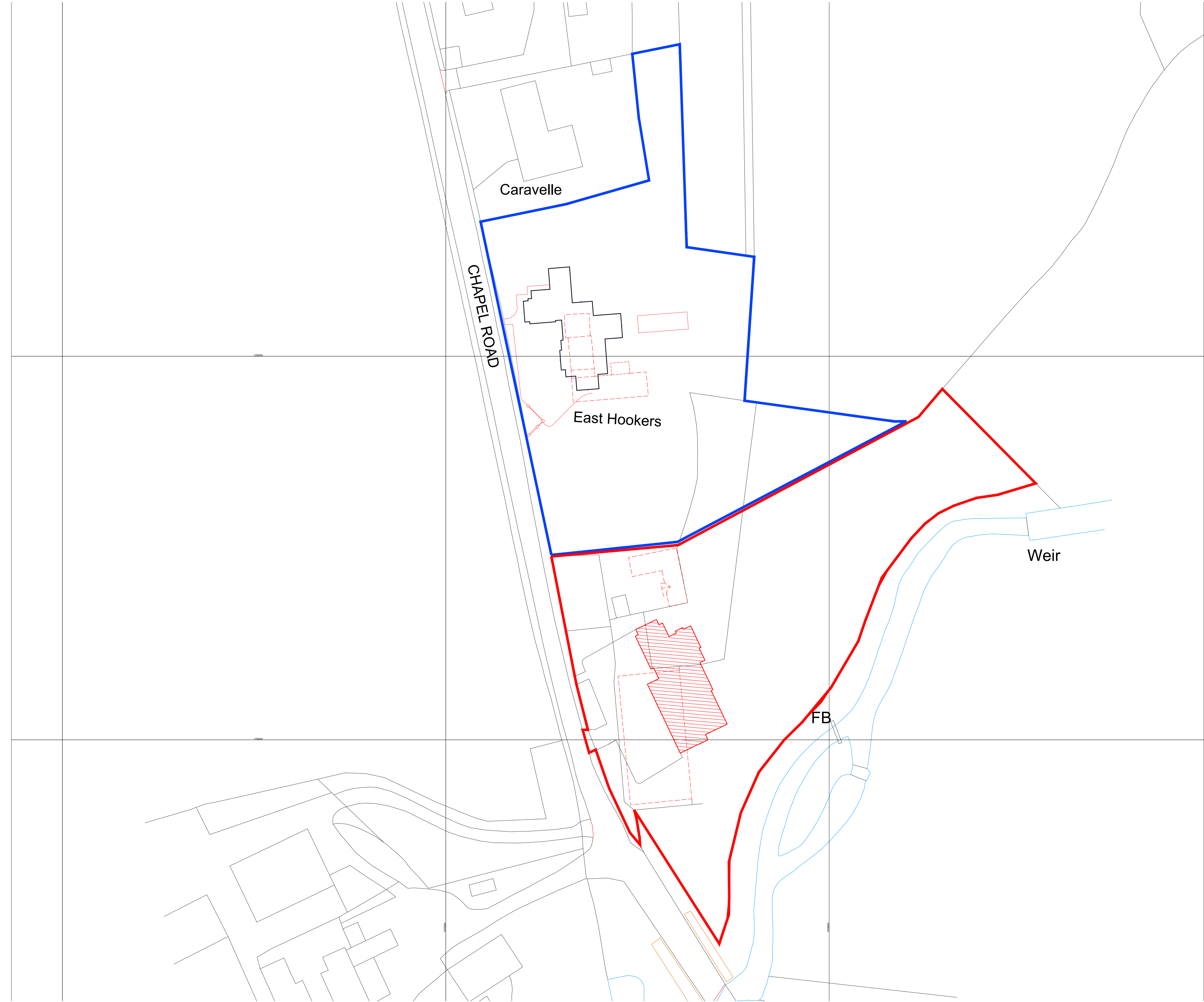
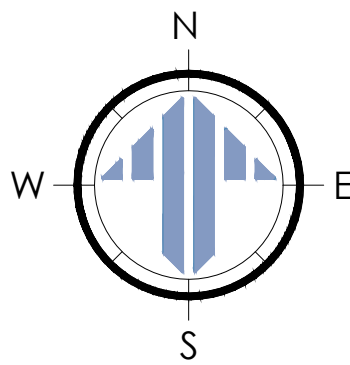
Lower Ground Floor
1 : 100



VISUAL SCALE 1:100 @ A1

FOR PLANNING
PURPOSES ONLY

NOT FOR CONSTRUCTION



SITE LOCATION PLAN - AS PROPOSED
SCALE @ 1:500 ON AN A1 SHEET



REV.	DATE.	BY.	AMENDMENT.	CHK.

PLANNING


2 Lucastes Mews, Paddockhall Road,
Haywards Heath,
West Sussex, RH16 1HE
(01444) 452604
h@goildbaxter.co.uk
www.goildbaxter.co.uk

NOTES:
DO NOT SCALE OFF THIS DRAWING UNLESS FOR PLANNING PURPOSES.
CHECK ALL DIMENSIONS ON SITE BEFORE ANY WORK IS COMMENCED.
ALL GOODS MATERIALS AND WORKMANSHIP MUST CONFORM WITH
CURRENT BUILDING REGULATIONS, BRITISH STANDARDS AND CODES OF
PRACTICE.
COPYRIGHT OF THIS DRAWING IS RETAINED BY GOULD PROPERTY
CONSULTANTS LLP T/A GOULD BAXTER AND IT MUST NOT BE REPRODUCED
WITHOUT WRITTEN CONSENT.

CLIENT.
MR AND MRS PRIOR

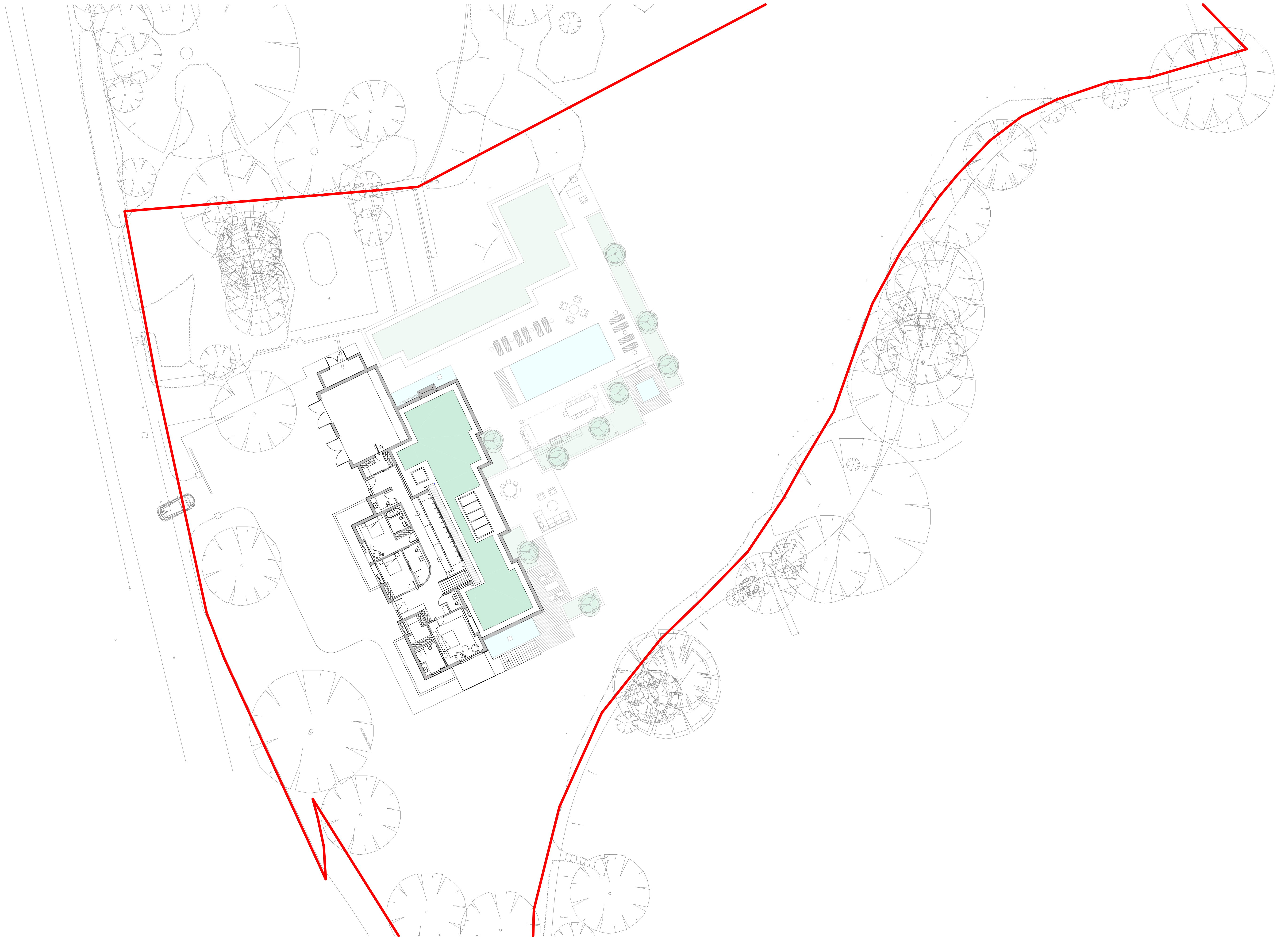
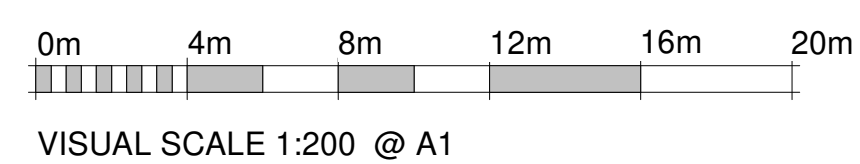
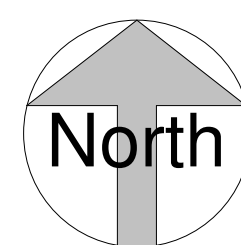
PROJECT.
RIVERSIDE
BOLNEY CHAPEL LANE
TWINEHAM, WEST SUSSEX
RH17 5NN

DRAWING.
Site Location Plan
As Proposed

DATE. 23.08.2022	SCALE AT A1. 1:500	DRAWN BY. GP CHECKED BY. MC
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JOB NO. GH165	DRAWING NO. PL.002	REV. B
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Site Plan - As Proposed
1 : 200



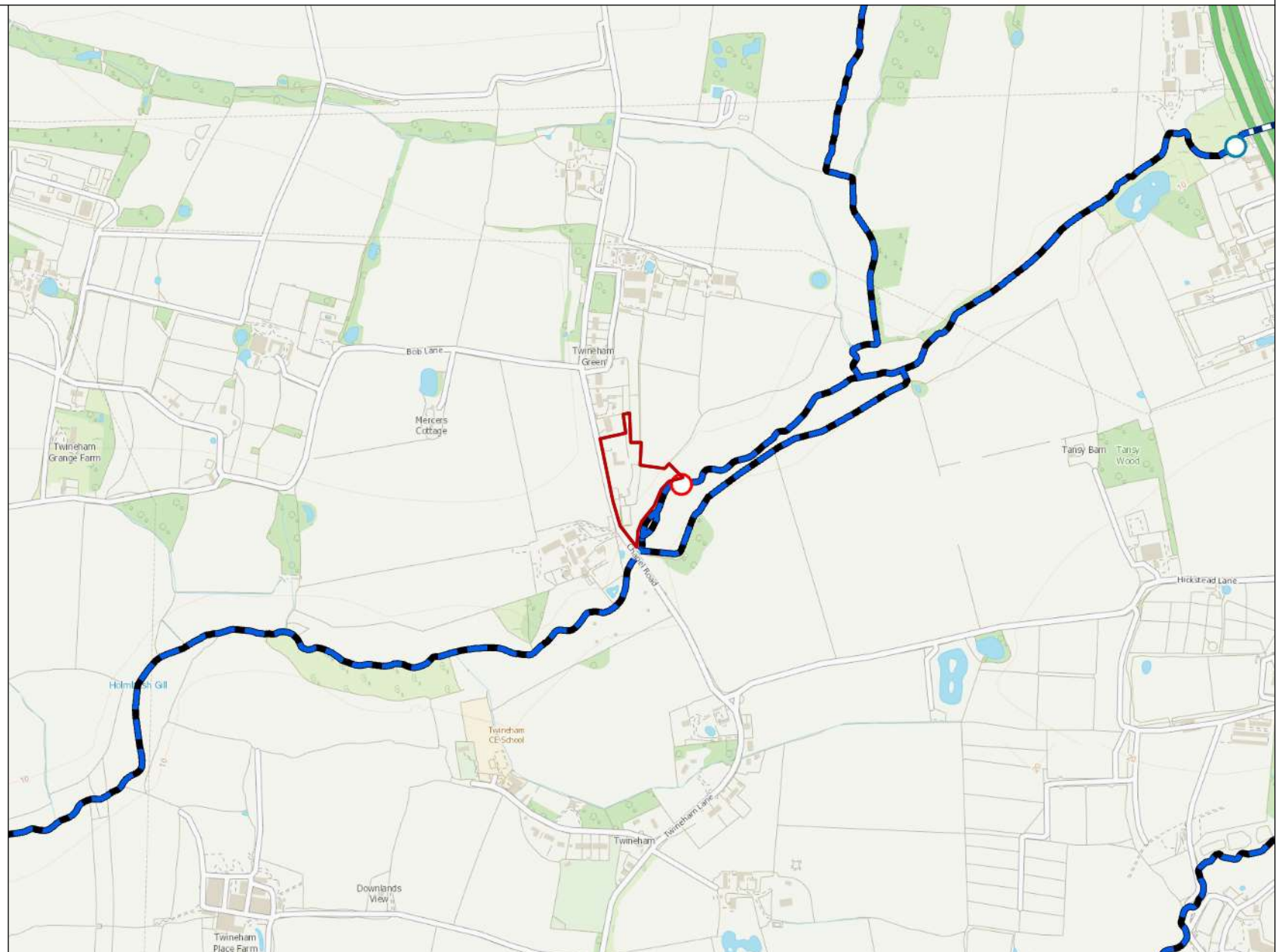
APPENDIX 2 – EA DATA

AIMS Flood Defences. Centred RH17 5NN. Created 25/10/2022.

Legend

Please see page 2 for asset symbology

- Stilling Well
- Water Baffles
- Water Distribution Pipeline
- Well
- Stilling Well
- Water Baffles
- Water Distribution Pipeline
- Well



Point Structures

-  Borehole
-  Central Pier
-  Control Gate
-  Debris Screen
-  Draw Off Tower
-  Fish or Eel Barrier
-  Fish Pass
-  Inspection Chamber
-  Outfall
-  Ramp
-  Security Screen
-  Slipway
-  Steps
-  Stilling Basin
-  Vortex Flow Control

Linear Structures

-   Debris Boom
-   In Channel Stoplogs
-   Pier
-   Weir
-  Other type or not defined

Defences

-  Embankment
-  Wall
-  Flood Gate
-  Demountable Defence
-  Bridge Abutment
-  Engineered High Ground
-  Natural High Ground
-  Cliff
-  Promenade
-  Quay
-  Beach
-  Barrier Beach
-  Dunes
-  Spillway

Channels

-  Open Channel
-  Complex Culvert
-  Simple Culvert

Instruments

-  CCTV Camera System
-  Flood Warning System
-  Gauge Board
-  Instrumentation
-  Piezometer
-  Rain Gauge
-  Telemetry System
-  Other type or not defined

Buildings and Compounds

-  Control Building
-  Gauging Station Building
-  Pump House
-  Storage Location
-  Other type or not defined

Channel Crossings

-   Bridge
-   Utility Services Crossing
-  Other type or not defined

Beach Structures

-   Breakwater
-   Groyne

Land

-  Water Storage Area
-  Other type or not defined

Point Aids to Navigation

-  Beacon
-  Buoy
-  Dolphin
-  Navigation Signage
-  Other type or not defined

Linear Aids to Navigation

-   Navigation Boom
-  Other type or not defined

Ryan Hofman
CGS Civils
Richard Cobden House
Lion Street
Chichester
West Sussex
PO19 1LW

Our ref: SSD280828
Date: 25/10/2022

Dear Ryan Hofman,

Enquiry Regarding Product 4 for Flood Risk Assessment for Loxley, Bolney Chapel Road, Twineham, Haywards Heath, RH17 5NN.

Thank you for your enquiry which was received on 07 September 2022.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004. The information is attached.

The information on Flood Zones in the area relating to this address is as follows:

The site is in an area located within Flood Zones 1, 2 & 3 as shown on our Flood Map for Planning (Rivers and Sea).

Note - This information relates to the area that the above named property is in and is not specific to the property itself as it is influenced by factors such as the height of door steps, air bricks or the height of surrounding walls. We do not have access to this information and is not currently used in our flood modelling.

Flood Zone definitions can be found at www.gov.uk/guidance/flood-risk-and-coastal-change#Table-1-Flood-Zones

Flood Defences

There are no formal raised flood defences in the vicinity of the site.

Model Information

The model used was the Upper Adur Eastern Branch Modelling which was completed by Hyder Consulting in 2011, with updated climate change allowances completed by JBA Consulting in 2016.

Flood History

We hold no record of previous flooding events affecting this site.

Please note our records are not comprehensive and may not include all events. I recommend contacting the Lead Local Flood Authority, **West Sussex County Council** or the Local Authority, **Mid Sussex District Council** for a more comprehensive flood history check.

[FRA advisory text](#)

Name	Product 4
Description	Detailed Flood Risk Assessment Map for Loxley, Bolney Chapel Road, Twineham, Haywards Heath, RH17 5NN.
Licence	Open Government Licence
Information Warnings	The flood risk data provided is based on existing EA hydraulic models with an allowance for climate change. Please note the climate change allowances provided are not up to date. These were updated on 27 July 2021. You should refer to 'Flood risk assessments: climate change allowances' for the most up to date allowances. You will need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence.
Information Warning - OS background mapping	<i>The mapping of features provided as a background in this product is © Ordnance Survey. It is provided to give context to this product. The Open Government Licence does not apply to this background mapping. You are granted a non-exclusive, royalty free, revocable licence solely to view the Licensed Data for non-commercial purposes for the period during which the Environment Agency makes it available. You are not permitted to copy, sub-license, distribute, sell or otherwise make available the Licensed Data to third parties in any form. Third party rights to enforce the terms of this licence shall be reserved to OS.</i>
Attribution	Contains Environment Agency information © Environment Agency and/or database rights. Contains Ordnance Survey data © Crown copyright 2022 Ordnance Survey 100024198.

Data Available Online

Many of our flood datasets are available online:

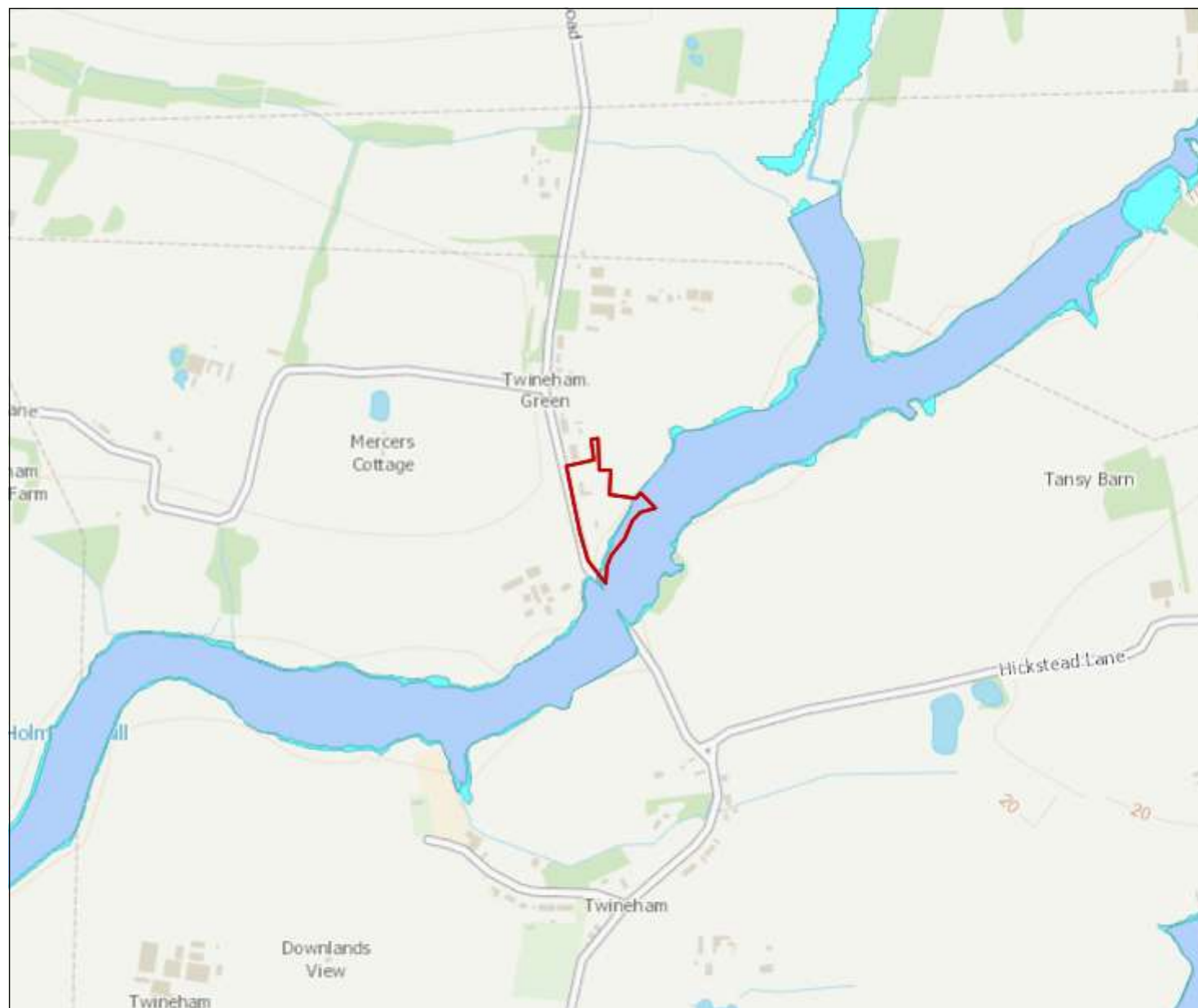
- Flood Map For Planning ([Flood Zone 2](#), [Flood Zone 3](#), [Flood Storage Areas](#), [Flood Defences](#), [Areas Benefiting from Defences](#))
- [Risk of Flooding from Rivers and Sea](#)
- [Historic Flood Map](#)
- [Current Flood Warnings](#)

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Yours sincerely,

Edward Conway
Partnership & Strategic Overview - West Sussex
Environment Agency, Guildbourne House, Chatsworth Road, Worthing, BN11 1LD

Flood Map for Planning (Rivers and Sea). Centred RH17 5NN. Created 25/10/2022.



1: 10,000

0 Metres 250



Flood Map for Planning (Rivers & Sea)

- Defences
- Flood Storage Areas
- Areas benefiting from flood defences
- Flood Zone 3
- Flood Zone 2

Flood Map Areas (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:

- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

Flood map for planning

Your reference
1308

Location (easting/northing)
525570/120420

Created
8 Nov 2022 18:18

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

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger than 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

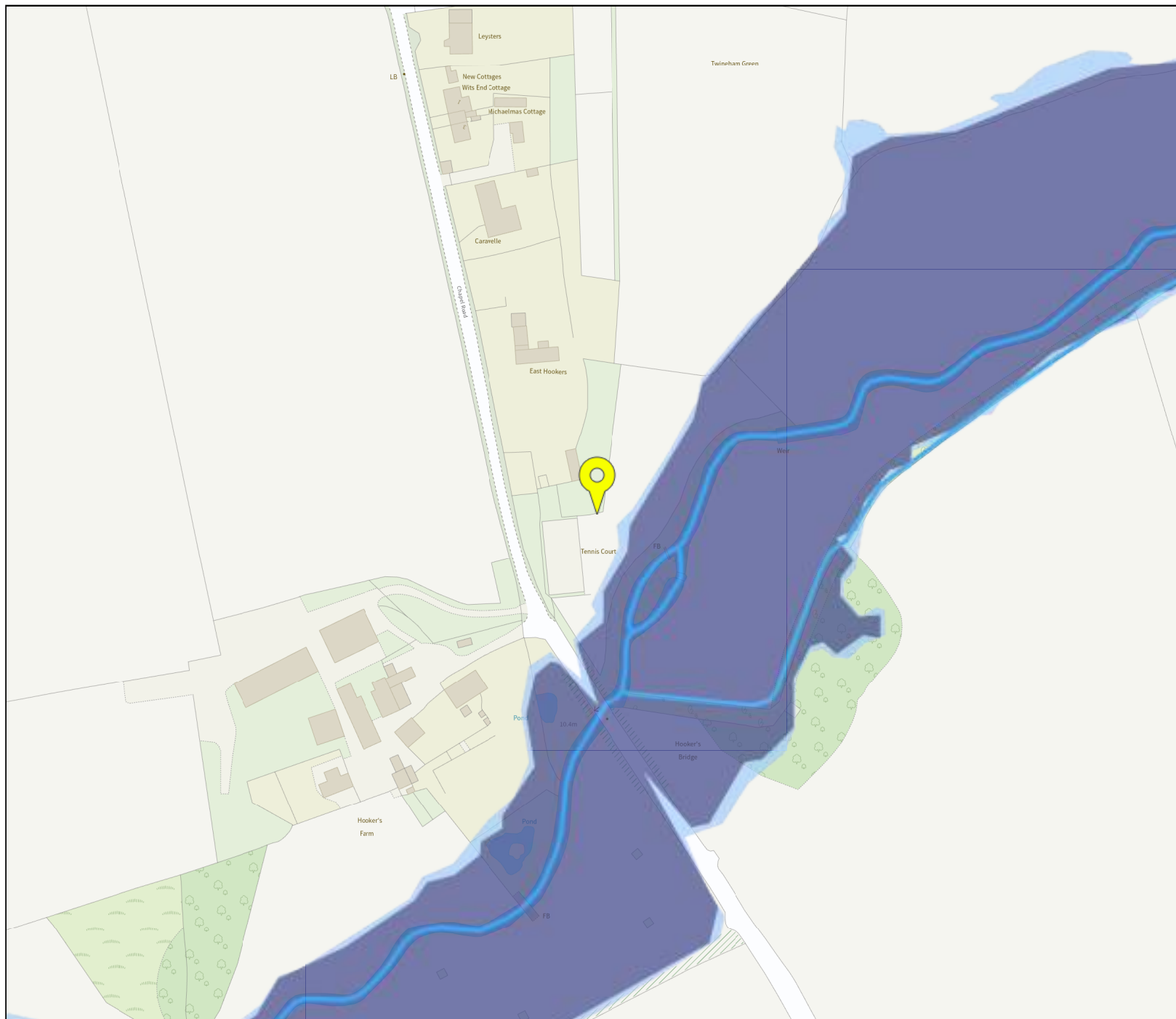
Notes

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.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2021 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>



Flood map for planning

Your reference
1308

Location (easting/northing)
525570/120420

Scale
1:2500

Created
8 Nov 2022 18:18

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


0 20 40 60m

Use of Environment Agency Information for Flood Risk Assessments

Important

The Environment Agency are keen to work with partners to enable development which is resilient to flooding for its lifetime and provides wider benefits to communities. If you have requested this information to help inform a development proposal, then we recommend engaging with us as early as possible by using the pre-application form available from our website:

<https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion>

We recognise the value of early engagement in development planning decisions. This allows complex issues to be discussed, innovative solutions to be developed that both enables new development and protects existing communities. Such engagement can often avoid delays in the planning process following planning application submission, by reaching agreements up-front. We offer a charged pre-application advice service for applicants who wish to discuss a development proposal.

We can also provide a preliminary opinion for free which will identify environmental constraints related to our responsibilities including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

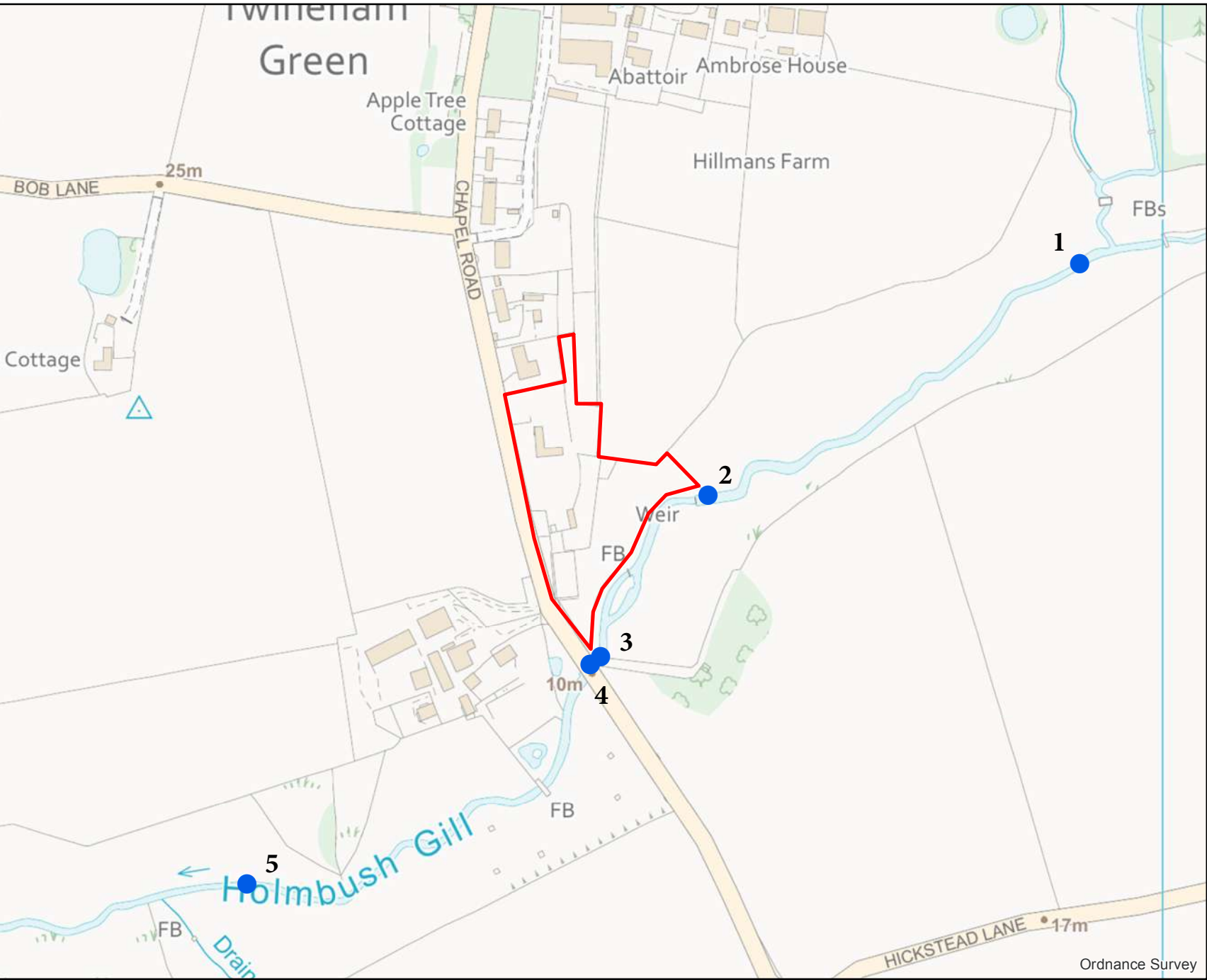
In preparing your planning application submission, you should refer to the Environment Agency's Flood Risk Standing Advice and the Planning Practice Guidance for information about what flood risk assessment is needed for new development in the different Flood Zones. This information can be accessed via:

<https://www.gov.uk/flood-risk-assessment-standing-advice>
<http://planningguidance.planningportal.gov.uk/>

You should also consult the Strategic Flood Risk Assessment or other relevant materials 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 Assessment (FRA) 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 surface water runoff. Information produced by the local planning authority referred to above may assist here.
3. Where a planning application requires an FRA and this is not submitted or is deficient, the Environment Agency may raise an objection.




Environment Agency



Legend

- Site Boundary
- Node Points

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

Scale: 1:4,000

00.0750.15

Kilometers

Ordnance Survey

Product 4 Flood Risk Data Requested by: CGS Civils

Site: Loxley, Bolney Chapel Road, Twineham, Haywards Heath, RH17 5NN

Table 1: Water Levels: Fluvial Undefended

Node Ref	NGR		Modelled Flood Levels in Metres AOD					
			Undefended Annual Exceedance Probability					
	Eastings	Northings	5%	1%	1% +CC (35%)	1% +CC (45%)	1% +CC (105%)	0.1%
1	525938	120632	10.22	10.43	10.61	10.68	10.98	10.73
2	525662	120460	10.08	10.31	10.49	10.55	10.84	10.60
3	525581	120340	10.06	10.28	10.43	10.49	10.77	10.57
4	525573	120333	10.04	10.26	10.18	10.24	10.54	10.55
5	525318	120169	8.92	9.08	9.23	9.29	9.60	9.35

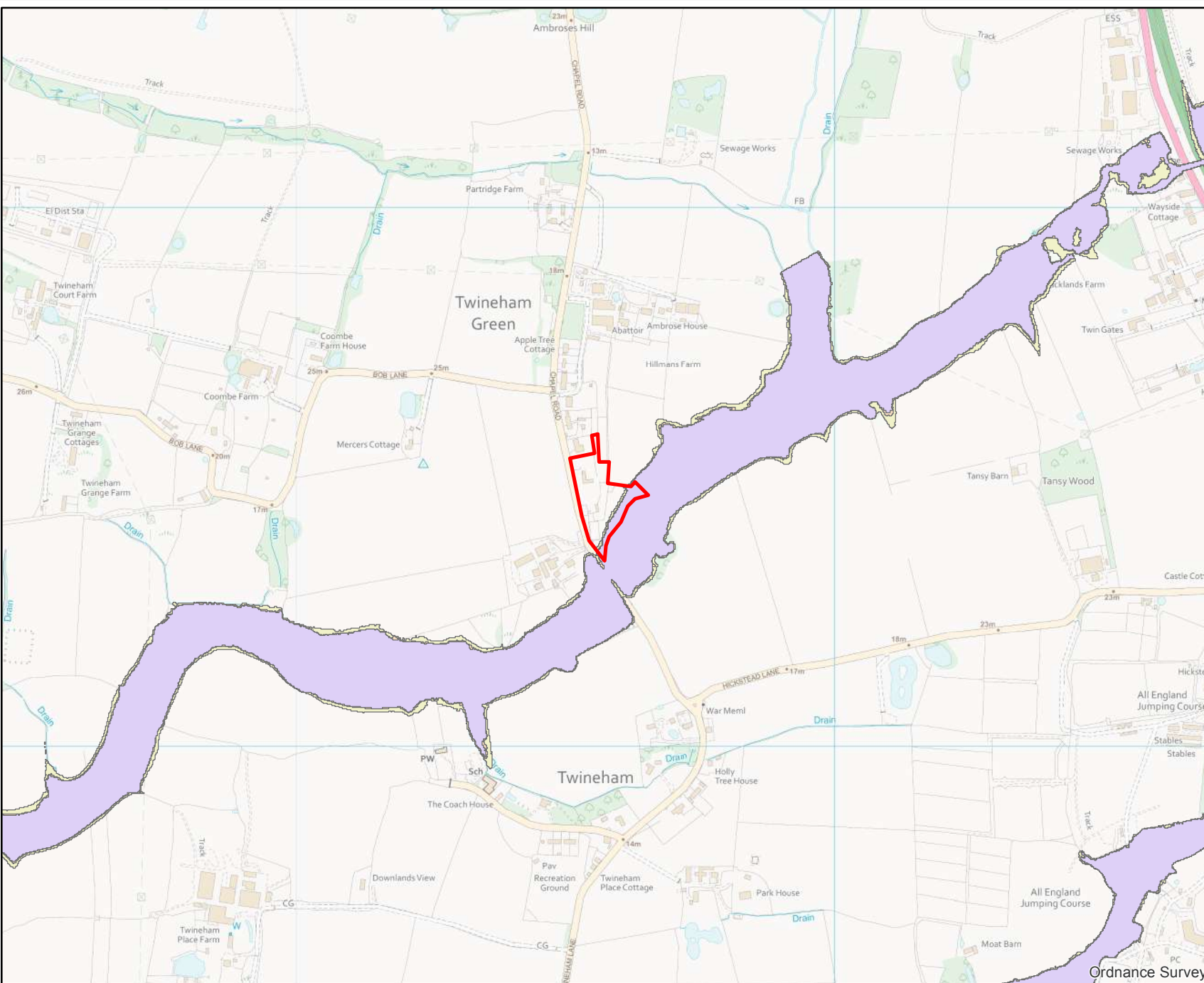
Table 2: Water Depths: Fluvial Undefended

Node Ref	NGR		Modelled Flood Depths in Metres					
			Undefended Annual Exceedance Probability					
	Eastings	Northings	5%	1%	1% +CC (35%)	1% +CC (45%)	1% +CC (105%)	0.1%
1	525938	120632	-	-	2.63	2.69	3.00	-
2	525662	120460	-	-	2.22	2.28	2.57	-
3	525581	120340	-	-	3.03	3.09	3.37	-
4	525573	120333	-	-	2.79	2.85	3.15	-
5	525318	120169	-	-	2.03	2.10	2.41	-

All levels taken from: Upper Adur Eastern Branch Modelling (2011) (Levels Only) with new climate change allowances (2016)

Produced on: 25/10/2022

There is no additional information or health warnings for these levels/depths or the model from which they have been produced.

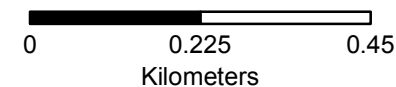


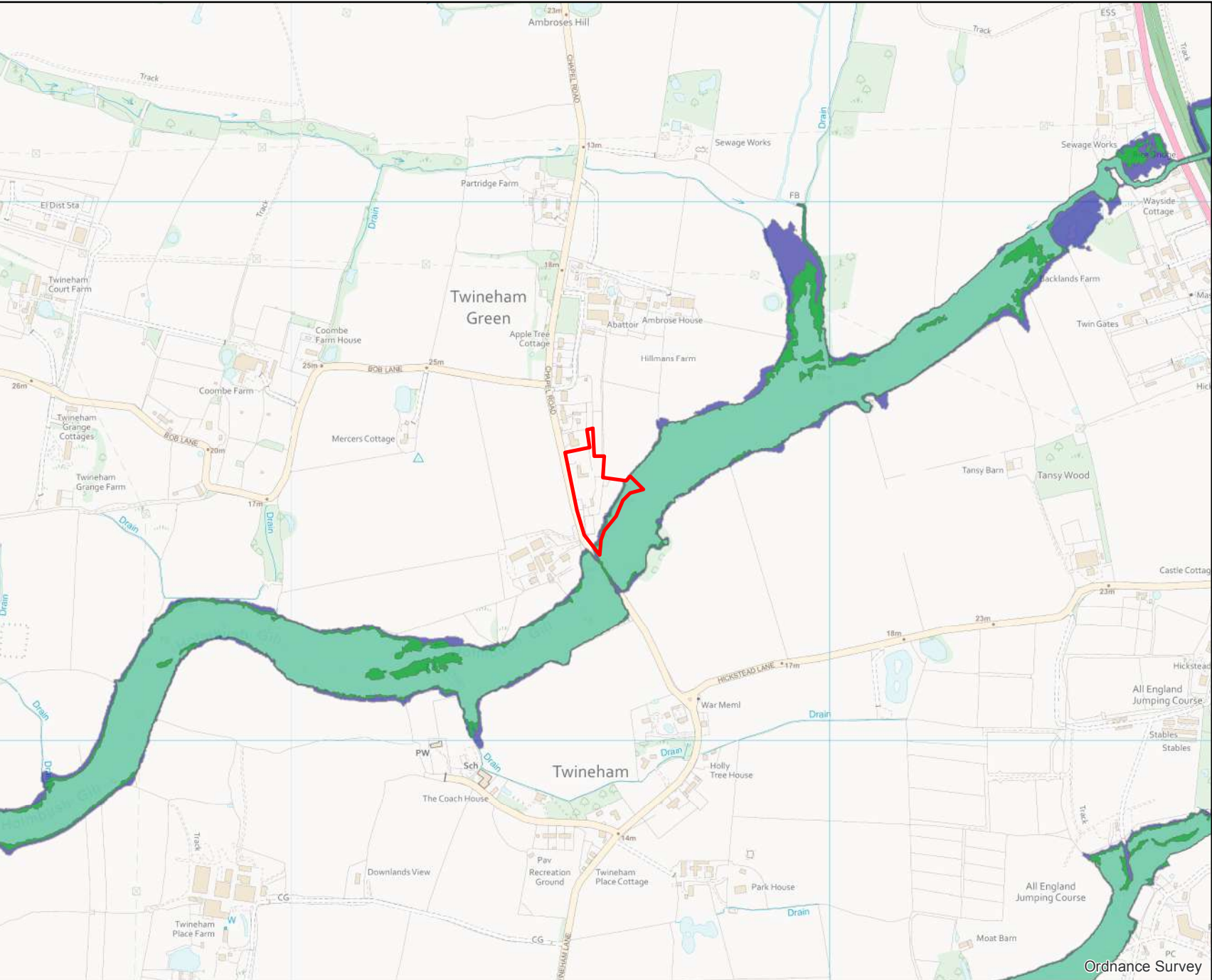
Legend

-  Site Boundary
 1% AEP +35% (Undefended Fluvial)
 1% AEP +45% (Undefended Fluvial)
 1% AEP +105% (Undefended Fluvial)

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

Scale: 1:10,000







Environment
Agency



Legend

Site Boundary

5% AEP (Undefended Fluvial)

1% AEP (Undefended Fluvial)

0.1% AEP (Undefended Fluvial)

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

Scale: 1:10,000

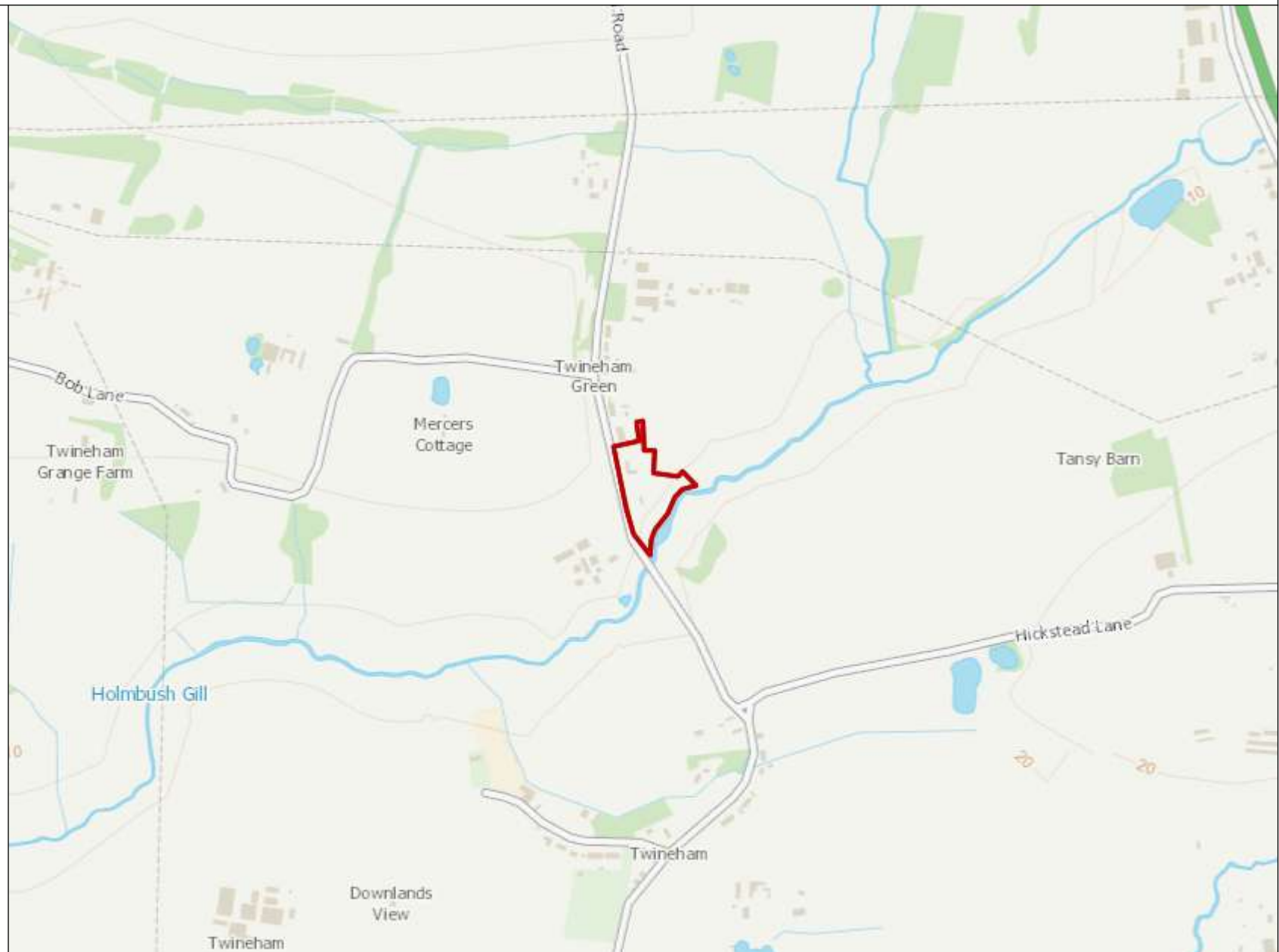
00.2250.45

Kilometers

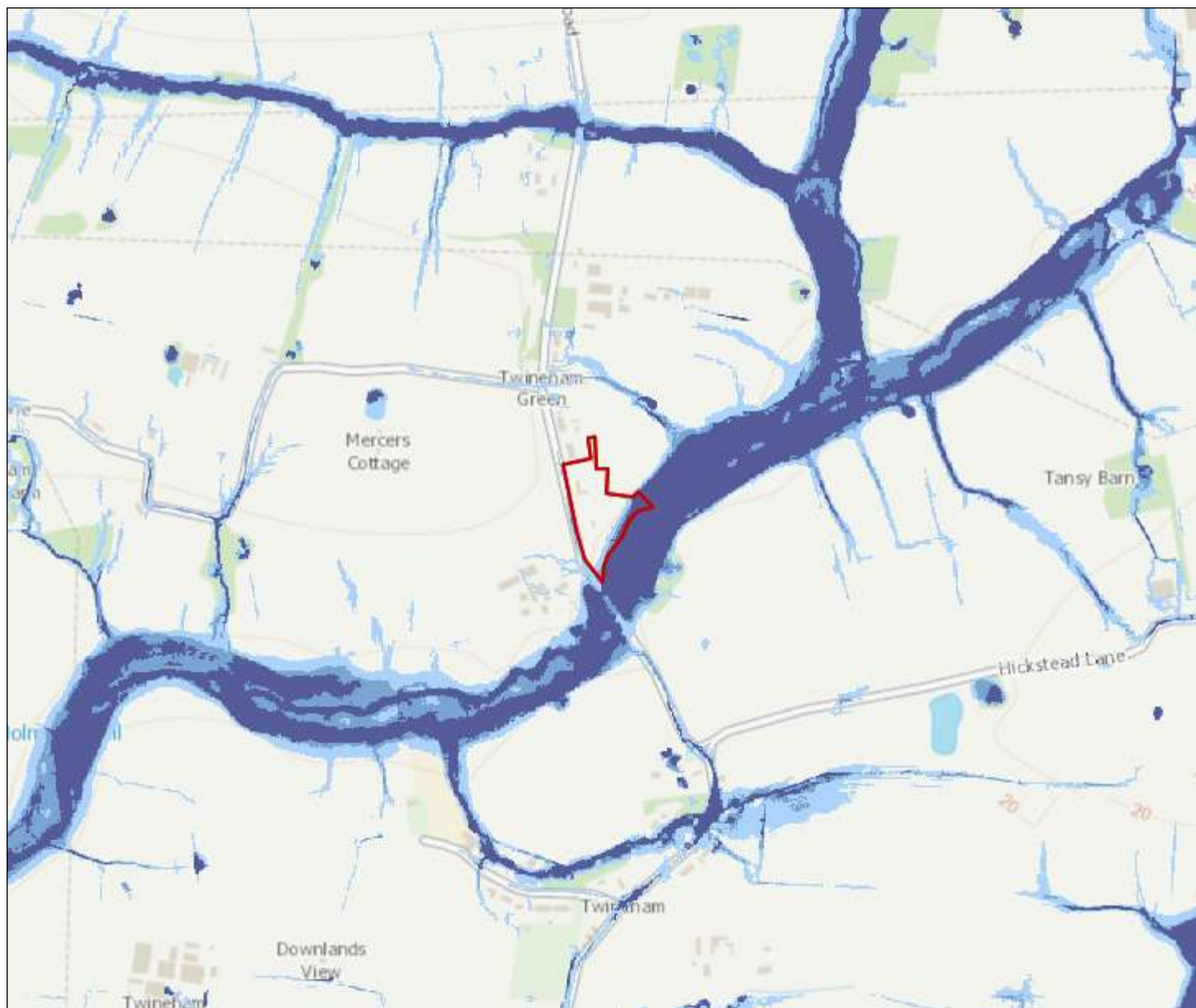
Recorded Flood Outlines. Centred RH17 5NN. Created 25/10/2022.

Legend

 All recorded flood outlines



Risk of flooding from Surface Water. Centred RH17 5NN. Created 25/10/2022.



1: 10,000

0 Metres 250



Likelihood of flooding from Surface Water

- High ($\geq 3.3\%$)
- Medium (3.3% - 1%)
- Low (1% - 0.1%)
- Very Low

Likelihood of flooding from Surface Water

- High: Greater than or equal to 3.3% (1 in 30) chance in any given year
- Medium: Less than 3.3% (1 in 30) but greater than or equal to 1% (1 in 100) chance in any given year
- Low: Less than 1% (1 in 100) but greater than or equal to 0.1% (1 in 1,000) chance in any given year
- Very Low: Less than 0.1% (1 in 1,000) chance in any given year

This information is shown on the Risk of Flooding from Surface Water map on GOV.UK.