

Flood Risk Assessment

**THE OLD RECTORY, CHURCH LANE, TWINEHAM, HAYWARDS
HEATH, RH17 5NR**

For

Gould Baxter

Rev -

Reference **C2562**

Date **14/04/2023**

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REVISION

Revision	Status	Description	Date	Issued	Checked
-	Final v1	Issued for Approval		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	Forming the sites northern boundary (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	No (report ref: EA Product Data)	Not applicable
Historic Flood Risk Data	DEFRA Historic Flood Outlines GIS Data	https://environment.data.gov.uk/DefraDataDownload/?mapService=EA/HistoricFloodMap&Mode=satial
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	Very Low (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)	Pluvial 1% AEP	*Designation based on highest flood risk between River, Sea or Surface Water - Refer Section 3: Table 3

Table of Contents

Revision	1
1 Site and Development Overview	2
2 Introduction.....	4
Development Proposals	4
Flood Risk Vulnerability	5
3 Flood Risk Assessment Scope	6
Sequential Test/Exception Test.....	7
Flood Zone	8
4 Local Features.....	10
Site Description	10
Rivers, Watercourses and Existing Drainage	10
Topography.....	10
Geology & Hydrogeology.....	11
Flood Defences	11
5 Climate Change.....	12
Increases in Surface Water Flooding and Rainfall Allowances	12
6 Sources of Flood Risk.....	13
Pluvial (Surface Water)	13
Reservoir Flooding (Breach)	15
Historical, Sewers and Drainage	16
Groundwater	16
Residual Risks	17
Summary of Risks	18
7 Building Material Mitigations	19
8 Flood Mitigation Measures	20
9 Conclusion	21
Appendix 1 – Supporting Information	22
Appendix 2 – EA Data	23

2 INTRODUCTION

- 2.1 The following report is a Flood Risk Assessment (FRA) for the proposed residential development located at The Old Rectory, Church Lane, Twineham, Haywards Heath, RH17 5NR, at approximate National Grid Reference TQ25461987 (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.

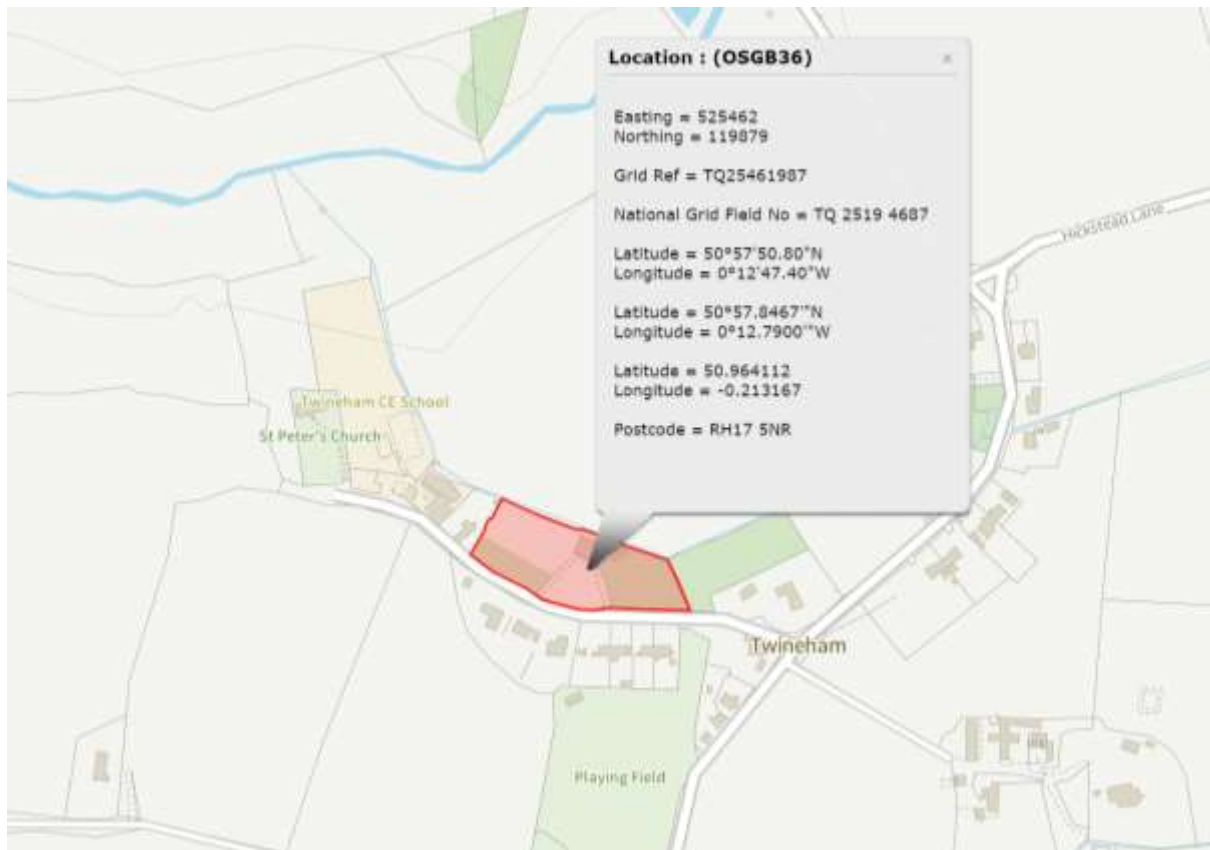


Figure 1 - Site Location Plan (site bordered red) Source: Location Map

- 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 Demolition of the existing garage and construction of a new garage with proposed gym and office in the roof space, with associated hard and soft landscaping. Alterations and enhancements to the driveway to provide access to the new garage (considered a minor extension of the existing site usage). The garage will allow for a three bay car garage on the ground floor and storage unit. In the roof space, that can be accessed by an external staircase, there is a gym, reading room, WC and office space proposed. The new driveway will link the new garage to the existing driveway. 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, and is considered an extension of the existing use. 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 a 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 safe 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 Functional Floodplain	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). 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.

3.13 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 shows that the site is wholly unaffected by both fluvial or tidal flooding (being located in Flood Zone 1). However, the EA's RoFSW (Pluvial flooding) shows there is a significant surface water overland flow path directed through the site from the east, flowing west and then north and into the River Arun.

3.14 Therefore, it is considered that the site is at very low risk of fluvial or tidal flood risk, and therefore flooding from these sources are not considered further in this assessment. As such, it is considered that pluvial flooding is the dominant risk to the site and is assessed further in Sections 5 and 6 below.

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	No	No	Pluvial (Surface Water)
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*

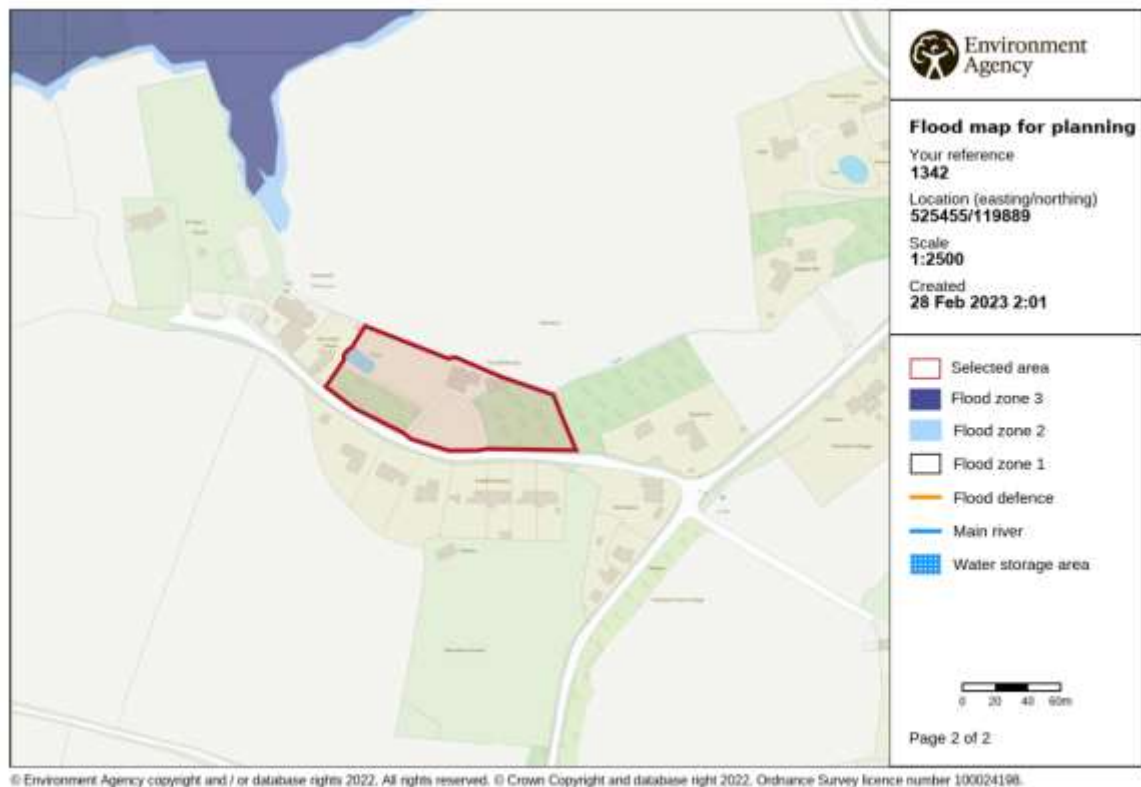


Figure 2 extract from EA Flood Maps for Planning (Source: DEFRA)

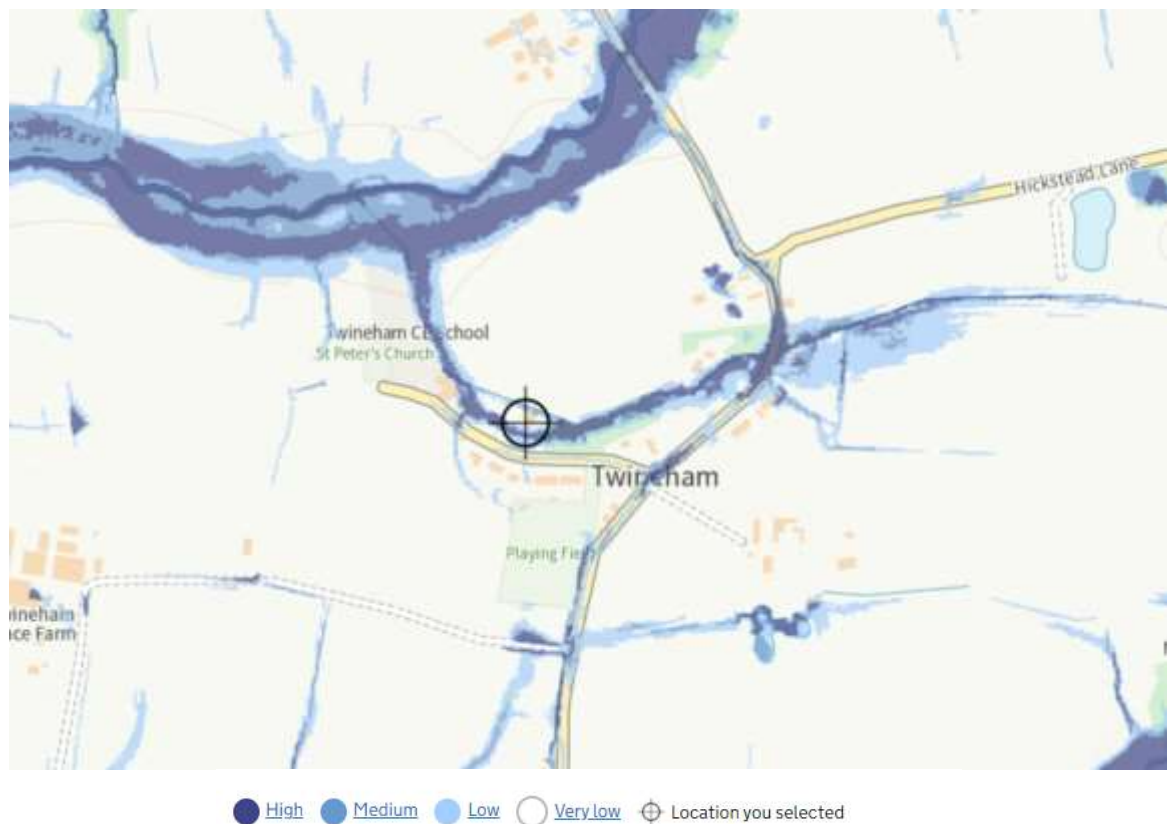


Figure 3 - extract from the EA's Long-Term Risk of Flooding from Surface Water (RoFSW) maps

4 LOCAL FEATURES

SITE DESCRIPTION

- 4.1 The Old Rectory is a Grade II listed detached dwelling located in the small rural village of Twineham. The site is located in a relatively rural/agricultural area of Twineham. The site is bordered on its southern boundary Church Lane, its eastern boundary by Beechurst (residential dwelling), and with an ordinary watercourse forming its northern boundary and fields beyond. The Coach House forms the site's western boundary. Access to the site is provided off of Church Road Chapel Road.

RIVERS, WATERCOURSES AND EXISTING DRAINAGE

- 4.2 The nearest EA main river is the river Adur, located 270m to the north. The river Adur at this location flows from the north to the south west.
- 4.3 There is an ordinary watercourse forming the site's northern boundary. This watercourse appears to collect runoff from the fields to the north of the site and the site itself, directing flows to the north and into the River Adur.
- 4.4 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 ordinary watercourse along the site's northern boundary. It is also likely that there are some existing land-drainage in place given the site's historic land use.

TOPOGRAPHY

- 4.5 Figure 4 below provides an extract from the DEFRA National 1m DTM LiDAR data. This data shows that the land appears to have a natural low profile 'valley' that runs longitudinally through the middle of the site starting at the north eastern corner through to the western boundary (via the pond) and then to the north. Section 6 illustrates this more clearly as this shallow valley provides the conveyance route for overland flows. Instead of runoff being directed through the ordinary water course along the site's northern boundary, site levels appear to allow overland flows through the property, rather than around it. It is because of this natural valley, that results in the primary flood risk within the site.



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

GEOLOGY & HYDROGEOLOGY

- 4.6 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 – Mudstone. No superficial deposits recorded.
- 4.7 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

- 4.8 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

- 4.9 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.
- 4.10 EA AIMS Defence data (2021) 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 SURFACE WATER FLOODING AND RAINFALL ALLOWANCES

- 5.3 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 6 below, and should also be adopted for the purposes of surface water drainage design.

Table 6 - 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	25	45%

- 5.4 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. 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.
- 5.5 In addition, flood risk from the 0.1% AEP (1 in 1000 year event), has been reviewed to direct the more vulnerable elements of the proposals (i.e. such as office space and the gym) to areas or at elevations at lower risk of flooding. It should be noted, that this development is considered an extension of the existing use and unlikely to noticeably impact flood risk post development.

6 SOURCES OF FLOOD RISK

- 6.1 In order to assist the implementation of the Governments NPPF, the EA has undertaken national scale flood risk mapping. This mapping takes into account 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.

PLUVIAL (SURFACE WATER)

- 6.3 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 rain storms and led to the Government commissioning the independent Pitt Review in 2008.
- 6.4 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 taken into account 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).
- 6.5 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 5), the DFE 1 in 100 (1% chance of occurring in any one year) return period (medium risk – Figure 6) and 1 in 1000 (0.1% chance of occurring in any one year) return period (low risk – Figure 7). Extracts of this mapping is provided below, along with an analysis of their likely source and projected impacts on the development.
- 6.6 Figure 5 shows the high-risk scenario (1 in 30-year event or equivalent Flood Zone 3b). In this event, the modelling shows the proposed building has been sequentially located outside of the high risk surface water flood event.



Figure 5 EA Long Term Flood Risk Maps (Depths) – High Risk of surface water flooding (source: EA Long Term Flood Risk Maps), site bordered red.

Figure 6 presents the DFE, medium risk scenario (1 in 100-year return period or equivalent Flood Zone 3a). This shows that the proposed building could be marginally affected by the 1 in 100 year (DFE). The modelling shows that the proposed external stairway on the building's eastern elevation and a small portion of the garage on the buildings south eastern corner could be affected by the 1 in 100 year event, up to 300mm. However, the external stairs are fully open underneath and so would not cause any displacement of surface water flood waters.

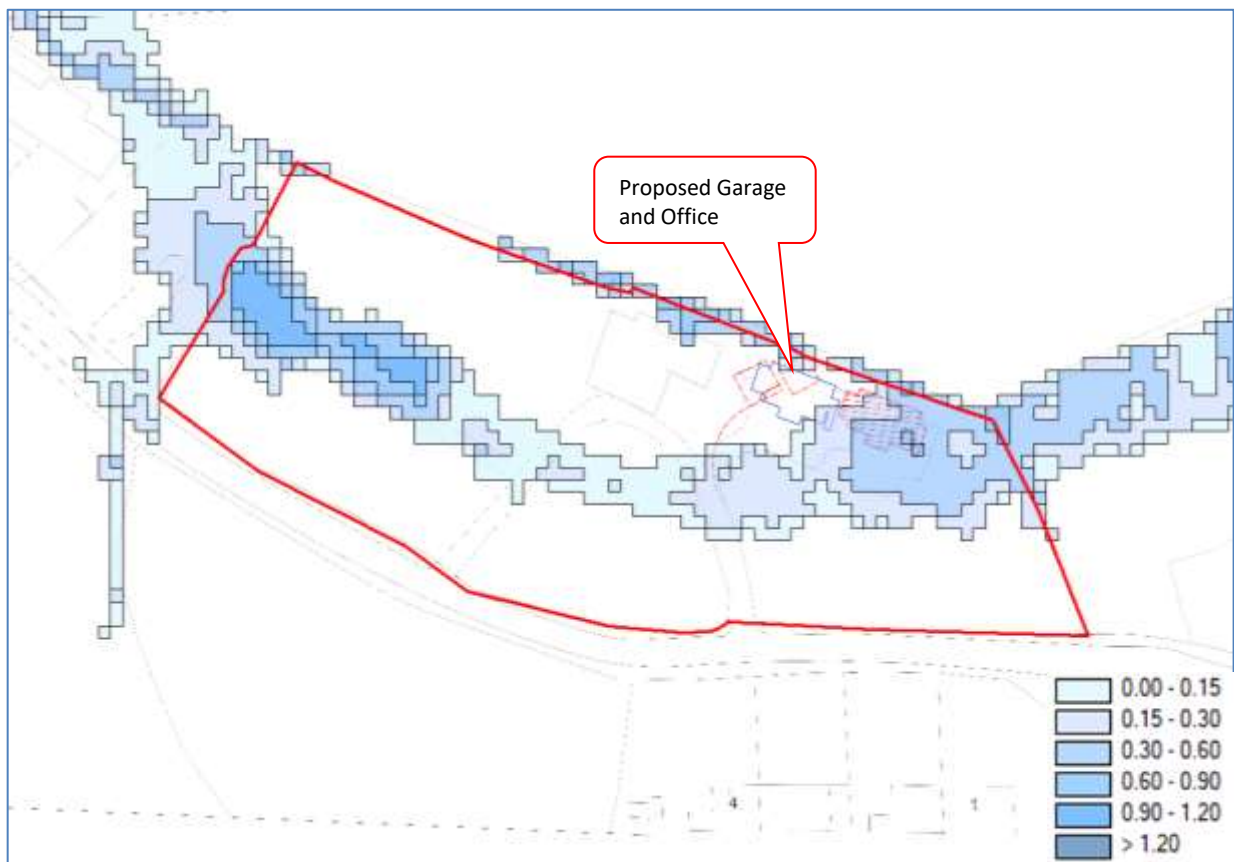


Figure 6 EA Long Term Flood Risk Maps – Medium Risk of surface water flooding depths (source: EA Long Term Flood Risk Maps), site bordered red

- 6.7 Based on the EA data, it is considered that there would only be a very minor degree of impact to the building from the DFE, with this being constrained to the garage at the ground floor and would be limited to less than 300mm. The garage is designed for the parking of vehicles, and for design purposes can be considered floodable. The architectural proposals show flood resilient construction (i.e. brickwork and hardwoods) to the lower portion of the garage, and so low level flooding is considered to pose limited risk or cause any significant level of damage.

Impacts of Climate Change

- 6.8 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, a very conservative estimation of the DFE plus climate change impacts can be made by looking at the 1 in 1000 year event.
- 6.9 Figure 7 below shows the low-risk scenario (1 in 1000-year event). Although this shows that almost the entire ground level of the garage could be affected by overland flows, flood depths are typically less than 900mm in depth. This means, that the more vulnerable uses of the office use and gym at the first floor would remain wholly unaffected during this event.
- 6.10 Although the garage at ground level would be affected during this event, there are locations on the site where vehicles could be temporarily re-located (i.e., closer to the dwelling or at the entrance to the site) that are at very low risk of flooding from all sources.

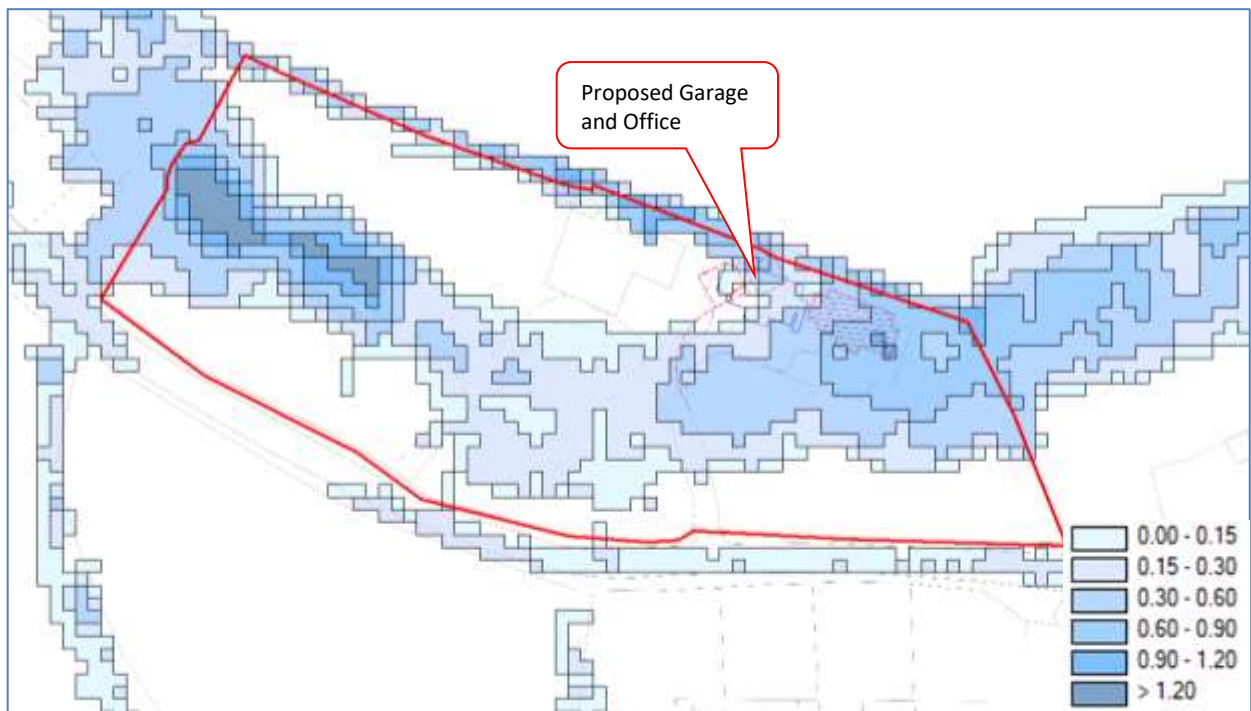


Figure 7 EA Long Term Flood Risk Maps – Low risk of surface water flooding depth (source: EA Long Term Flood Risk Maps), site bordered red.

- 6.11 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.
- 6.12 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.
- 6.13 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)

- 6.14 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.
- 6.15 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.
- 6.16 Maps of the flood extent can be found on the Government's Long term flood risk information website, these show that the site is not at risk of reservoir flooding.

HISTORICAL, SEWERS AND DRAINAGE

- 6.17 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 give consideration to likely overland flow paths should flooding from these systems occur.
- 6.18 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.
- 6.19 The WSCC SFRA present records relating to sewer flooding. Specifically, Map S from the SFRA highlights that there have been no recorded incident of sewer flooding incidences nearby the site, however, it is unclear if the site has been affected in the past.

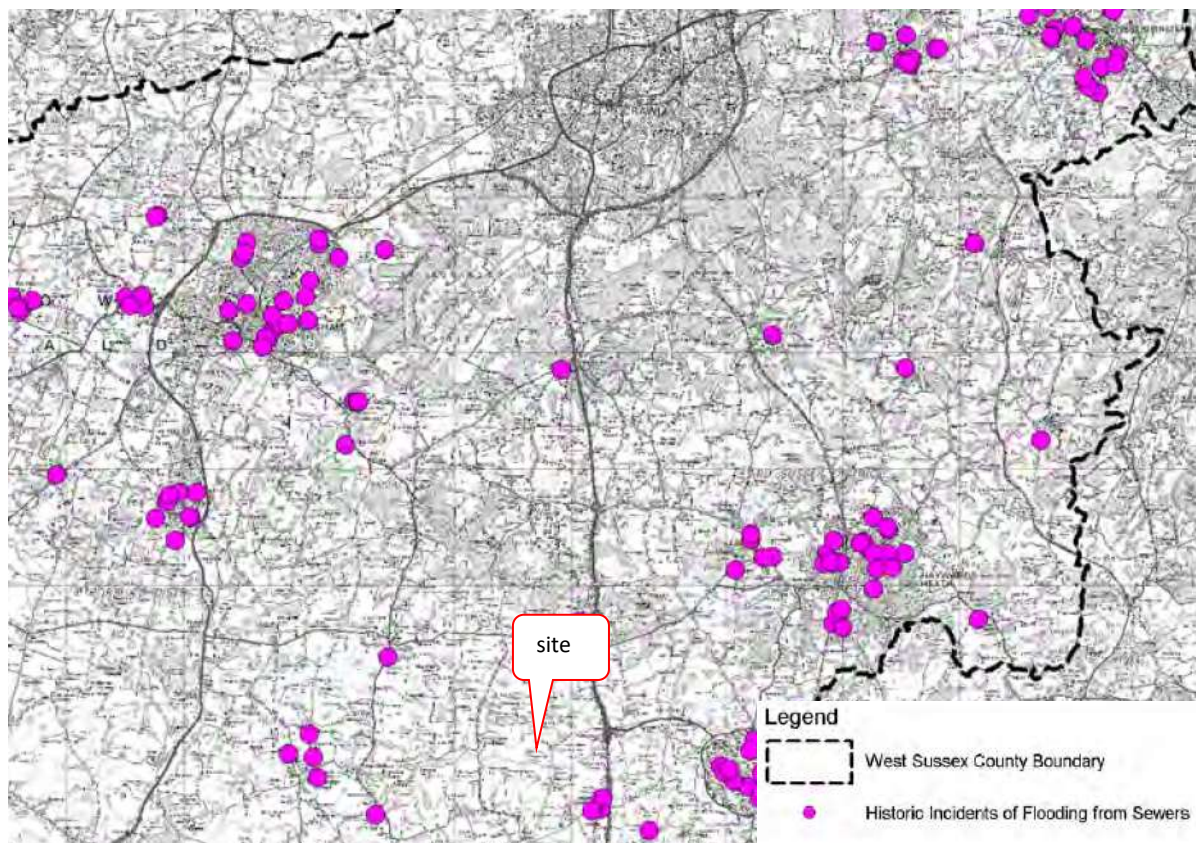


Figure 8 - extract from SFRA Map S – “Areas with Recorded Incidents of Sewer Flooding”

- 6.20 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.
- 6.21 The Environment Agency has no record of sewer flooding to this property/area in the past.

GROUNDWATER

- 6.22 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.

- 6.23 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.
- 6.24 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 9 shows that the site appears to be located in an area of low of groundwater emergence zone, with no specific records of groundwater flooding specifically impacting the site. As such flood risk from this source is considered low.

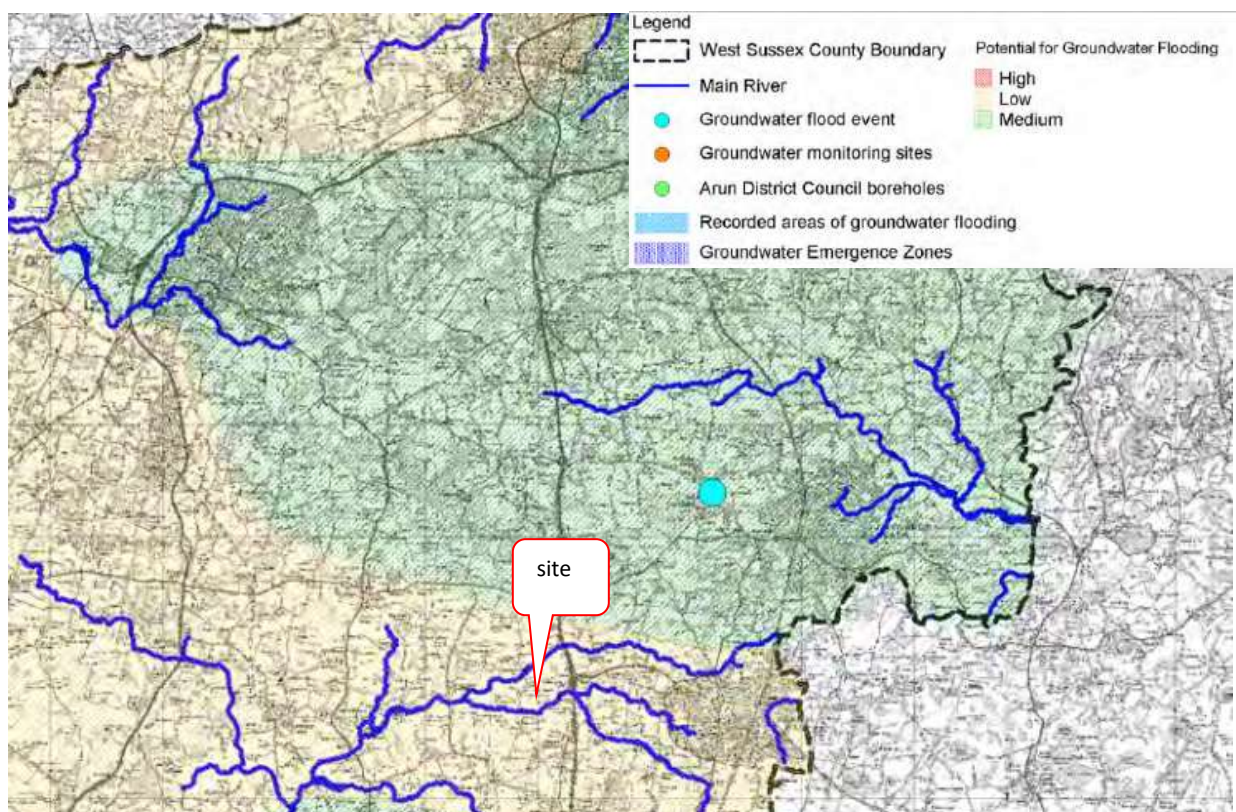


Figure 9 - Extract from WSCC SFRA Map G Areas More Prone to Groundwater Flooding (site marked with star)

Impacts of Climate Change

- 6.25 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

- 6.26 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.

- 6.27 There are no existing defences that provide protection above the DFE, therefore breach failure is not considered a residual risk.
- 6.28 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

- 6.29 Table 7 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 7 - 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 building itself at risk from the DFE
Fluvial	High	No
Tidal/Sea	Very Low	No
Surface Water	High	Yes (only marginally, and only affected the garage which is used for parking only)
Reservoir	Very Low	No
Groundwater	Very Low	No
Sewers and Drainage	Very Low	No

- 6.30 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 BUILDING MATERIAL MITIGATIONS

- 7.1 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.

- 7.2 Given the primary risk is related to overland surface water flows, the garage at the ground floor should be designed with consideration of the key principles of the **Water Entry Strategy**. Further detail can be found at <https://assets.publishing.service.gov.uk/> and within BS 85500:2012-Flood resistant and resilient construction. Guide to improving the flood performance of buildings for applicable strategies.

8 FLOOD MITIGATION MEASURES

- 8.1 The proposals allow the opportunity to improve flood resilience of the site by incorporating a number of 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.
- 8.2 Table 8 presents the key flood mitigation measures based the critical DFE on the NPPF and PPG decision making principles:

Table 8 - 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 more vulnerable elements of the building (i.e. office and gym) are located on the first floor and more than 1m above the 1 in 1000 year surface water flood risk mapping. The ground floor use is shown to be restricted to vehicle parking (i.e. garaging of cars) and therefore considered to be at lower risk to people during the DFE.
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, providing further mitigation against flood risk.
3. Mitigate	Refer to Section 7 below for recommended Building Measures, primarily ensuring the ground level (up to 900mm) is designed to account for flooding during the 1 in 1000 year event.
4. Manage residual flood risk	If required, there are alternative locations to temporarily relocate vehicles garaged to areas within the site if flooding of the ground floor of the garage is expected be affected. The storage and placement vulnerable assets or materials/chemicals should be elevated a minimum 900mm above the floor level within the garage. The office and gym at the first floor will be located more than 1m above the DFE plus climate change and so will not be at risk of flooding across all modelled events.
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.

9 CONCLUSION

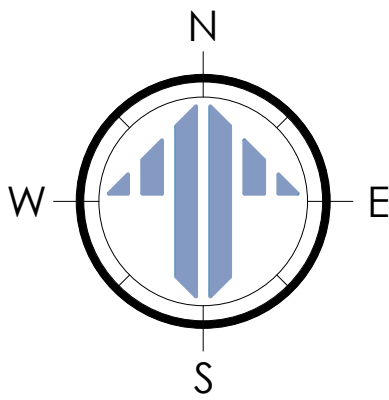
- 9.1 This assessment is required under the National Planning Policy Framework (NPPF) and Local and District Councils given the location, scale and associated flood risks.
- 9.2 Table 3 summarises the sites primary flood risk classifications and the source for the DFE. This designation is based on the 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 shows that the site is wholly unaffected by both fluvial or tidal flooding (being located in Flood Zone 1). However, the EA's RoFSW (Pluvial flooding) shows there is a significant surface water overland flow path directed through the site from the east, flowing west and then north and into the River Arun.
- 9.3 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.
- 9.4 Based on the information available at the time of writing, this FRA has determined that the critical DFE relates to pluvial (surface water) flood risk. Figure 4 provides an extract from the DEFRA National 1m DTM LiDAR data. This data shows that the land appears to have a natural low profile 'valley' that runs longitudinally through the middle of the site starting at the north eastern corner through to the western boundary (via the pond) and then to the north. Section 6 illustrates this more clearly as this shallow valley provides the conveyance route for overland flows. Instead of runoff being directed through the ordinary water course along the site's norther boundary, site levels appear to allow overland flows through the property, rather than around it. It is because of this natural valley that results in the primary flood risk within the site.
- 9.5 Based on the EA data, it is considered that there would only be a very minor degree of impact to the building from the DFE, with this being constrained to the garage at the ground floor and would be limited to less than 300mm. The garage is designed for the parking of vehicles and is considered less vulnerable and floodable. The architectural proposals show flood resilient construction (i.e. brickwork and hardwoods) to the lower portion of the garage, and so low level flooding is considered to pose limited risk or cause any significant level of damage. Most importantly however, is the more vulnerable uses of the proposals (being the office use and gym) have been sequentially located to the first floor of the proposed building, placing these uses above all modelled flood events.
- 9.6 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. It is advised that the garage at the ground floor should be designed with consideration of the key principles of the **Water Entry Strategy** to mitigate the residual risks associated with extreme flood events affecting the proposed building.
- 9.7 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

FOR PLANNING
PURPOSES ONLY

NOT FOR CONSTRUCTION

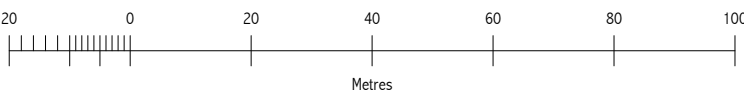
TO BE READ IN CONJUNCTION WITH
STRUCTURAL ENGINEER'S DRAWINGS, DETAILS
AND SPECIFICATIONS



- DASHED LINE DENOTES LINE OF EXISTING GARAGE TO BE
DEMOLISHED. ALLOWANCE TO REVISE DRIVEWAY TO
PROVIDE ACCESS TO NEW GARAGE

- RED HATCH DENOTES LINE OF NEW GARAGE WITH GYM
AND OFFICE OVER. SEE GENERAL ARRANGEMENT AND
EXTERIOR ELEVATIONS AS PROPOSED

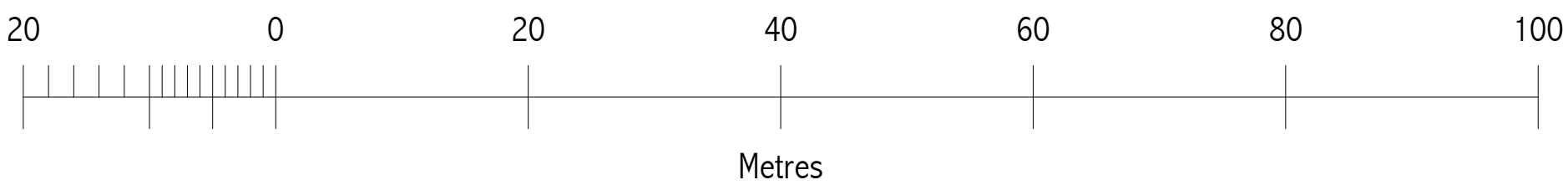
THE OLD RECTORY - SITE LOCATION PLAN AS PROPOSED



SCALE 1:1250 ON AN A1 SHEET



THE OLD RECTORY - SITE BLOCK PLAN AS PROPOSED



SCALE 1:500 ON AN A1 SHEET

REV.	DATE.	BY.	AMENDMENT.	CHK.
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PLANNING



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Haywards Heath,
West Sussex, RH16 1HE
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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 BAXTER AND IT MUST
NOT BE REPRODUCED WITHOUT WRITTEN CONSENT.

CLIENT:
MR & MRS M HATCHER

PROJECT:
THE OLD RECTORY
CHURCH LANE
TWINEHAM
HAYWARDS HEATH
RH17 5NR

DRAWING:
THE OLD RECTORY - SITE
LOCATION AND BLOCK PLAN AS
PROPOSED

DATE: 01.01.23	SCALE AT A1: AS NOTED	DRAWN BY: MC CHECKED BY:
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JOB NO. GH298	DRAWING NO. PL.002	REV.
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APPENDIX 2 – EA DATA

Flood map for planning

Your reference
1342

Location (easting/northing)
525455/119889

Created
28 Feb 2023 2:01

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 2022 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>



Flood map for planning

Your reference
1342

Location (easting/northing)
525455/119889

Scale
1:2500

Created
28 Feb 2023 2:01

-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area

0 20 40 60m