cgs civils Consulting Civil Engineers

Flood Risk Assessment

18 Fairfield Road, Bosham, PO18 8JH

Rev -

Reference **C2977**

Date **20.03.2024**

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-	Final v1	Issued for Approval	22.03.24	RH	RH

1 SITE AND DEVELOPMENT OVERVIEW

DEVELOPMENT DESCRIPTION	EXISTING (PRE-DEVELOPMENT)	PROPOSED (POST-DEVELOPMENT)
Site Use	Existing residential dwelling	The development proposal is for an extensive refurbishment and extension of the dwelling, with potential new garage
Development Use	Residential	Residential
Use Design Life		100 years
Number of Dwellings	1	1
EA Vulnerability Classification	More vulnerable	More vulnerable (extension of existing use)
Development Class		Minor
County Planning Authority	West Sussex County Council	
District Planning Authority	Chichester District Council	
Local Sewer Authority	Southern Water	
SITE CATCHMENT CHARACTERISTICS	**DESCRIPTION**	**SOURCE**
River Management Catchment	Arun and Western Streams Management Catchment	https://environment.data.gov.uk/
River Basin District	South East	https://environment.data.gov.uk/
Nearest EA Main River	EA Main River forming western boundary	https://environment.maps.arcgis.com/
Nearest Ordinary watercourse or surface waters		Online Mapping
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	Available (report ref: EA Product Data)	EA Detailed Flood Model
Historic Flood Risk Data	DEFRA Historic Flood Outlines GIS Data	https://environment.data.gov.uk/DefraDataDownload/?mapService=EA/HistoricFloodMap&Mode=spatial
Strategic Flood Risk Assessment Data	West Sussex County Council (ref SFRA)	Council Website - https://www.westsussex.gov.uk/media/1595/local_flood_risk_management_strategy.pdf
Local Flood Risk Assessment Data	Chichester SFRA (refer to SFRA)	Council Website
Topographic Information	DEFRA Opensource LIDAR Data	https://environment.data.gov.uk/DefraDataDownload/?Mode=survey
River or Sea Flood Risk Present	High	Refer Section 1: Table 2
Surface Water Flood Risk Present	Medium	Refer Section 1: Table 2
DESIGNATION	**FLOOD RISK DESIGNATION**	**NOTE**
EA/LLFA Designated Flood Zone	**Flood Zone 3 – High Risk**	*Designation based on highest flood risk between River, Sea or Surface Water - Refer Section 1: Table 2

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2 INTRODUCTION

2.1 The following report is a Phase 1 Flood Risk Assessment (FRA) for the development proposals 18 Fairfield Road, Bosham, PO18 8JH (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.

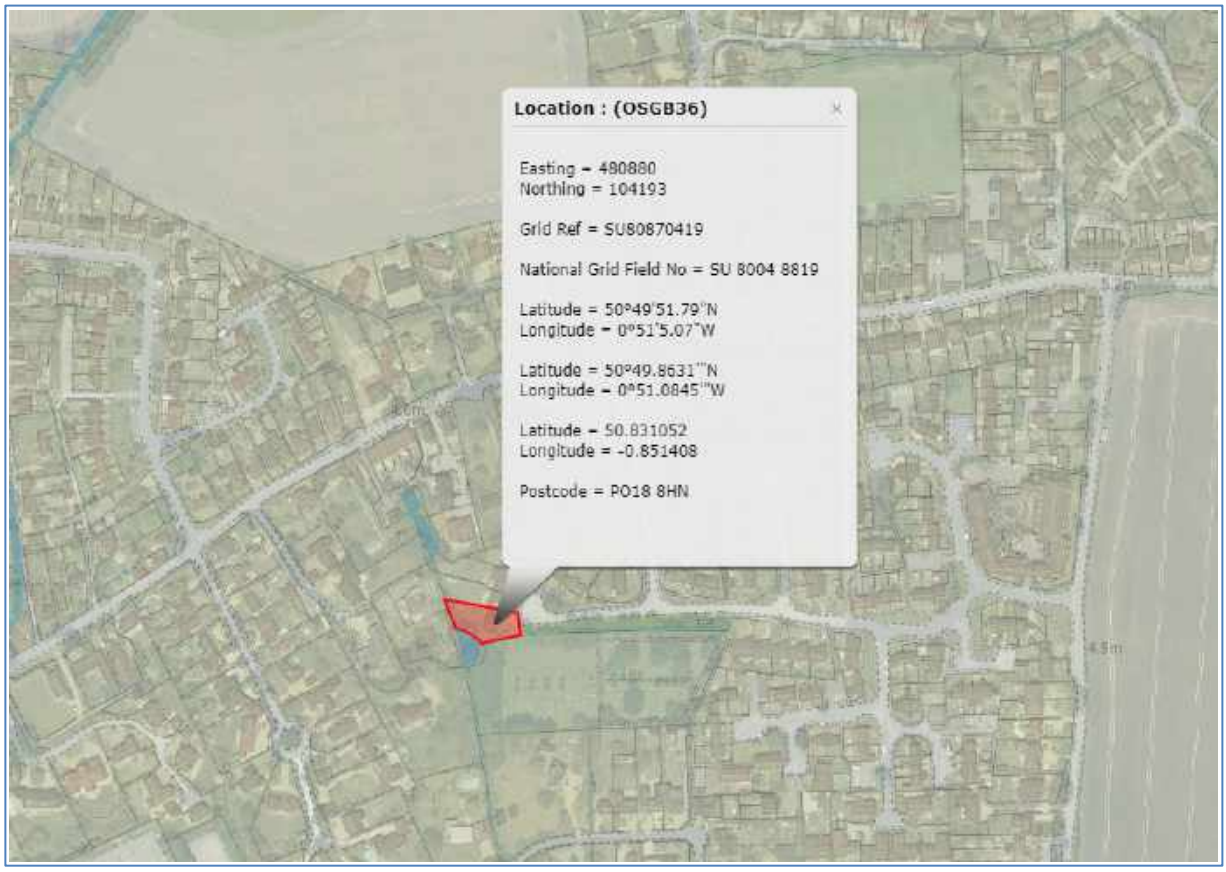


Figure 1 - Site Location Plan (site bordered red) Source: Location Map

2.3 This FRA has been written in general accordance with the National Planning Policy Framework (NPPF) and its Technical Guidance, 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 understand of its accuracy and to a detail deemed suitable for this development type, location and relevant flood risk.

DEVELOPMENT PROPOSALS

2.4 The development proposal is for an extensive refurbishment and extension of the dwelling, with potential new garage.

FLOOD RISK ASSESSMENT SCOPE

2.5 The purpose of this FRA is to inform the feasibility and appropriateness of the proposals and to ensure the development proposals incorporate flood resilient measures appropriate to its flood risk.

2.6 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.

FLOOD RISK VULNERABILTY

2.7 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.

2.8 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.

2.9 The site is presently considered ‘More vulnerable’ in accordance with Table 1 and the NPPF.

2.10 The development proposals are considered ‘More vulnerable’. There will be no change in vulnerability or intensification of use post development. The works are considered an extension of the existing use, and so from a flood risk perspective it is considered the EA’s Standing Advice should apply.

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.

ENVIRONMENT AGENCY FLOOD RISK DESIGNATION

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 and acceptable and full application of the Sequential Test is not deemed necessary at this time. Therefore, 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.

3.13 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).

3.15 Based on the EA's Flood Maps for Planning mapping and the EA's Product 4 data (see Appendix 2), shows both tidal and fluvial flooding within the site. However, fluvial flooding is relatively minor in comparison to the tidal flood risk and is not shown to impact on the dwelling location, being a maximum height of 3.68mAOD (including 105% climate change allowance), with the dwelling having finish floor level of 4.71mAOD (1m above the fluvial flood event). Whereas in the design tidal flood event (DFE), flood levels on site could reach 4.83mAOD in the 1 in 200 year 2124 event. This could see the dwelling affected by up to 120mm and the garage location 830mm.

3.16 A review of the surface water flood risk to the site appears similar in nature to that of the fluvial flood risk. The mapping shows that the 1 in 100 year event plus climate change, that surface water flood risk may extend into the site up to c3.7mAOD. This would suggest that the surface water flood mapping is closely linked to the fluvial flows within the watercourse along the western boundary and can be considered to contribute a similar risk profile as that shown for fluvial flooding and may be viewed in the same manner.

3.17 As tidal flood risk poses a significantly greater flood risk to the site (in terms of depth), tidal flood risk is seen as the dominant source. Any measures therefore proposed to mitigate flood risk from tidal sources will also mitigate the risk from a fluvial or surface water event. Therefore, fluvial flood risk is not considered further.

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 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 (Partial)	Yes (Partial)	Tidal Flooding
Surface Water	Yes (Partial)	Yes (Partial)	

**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*

3.18 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.

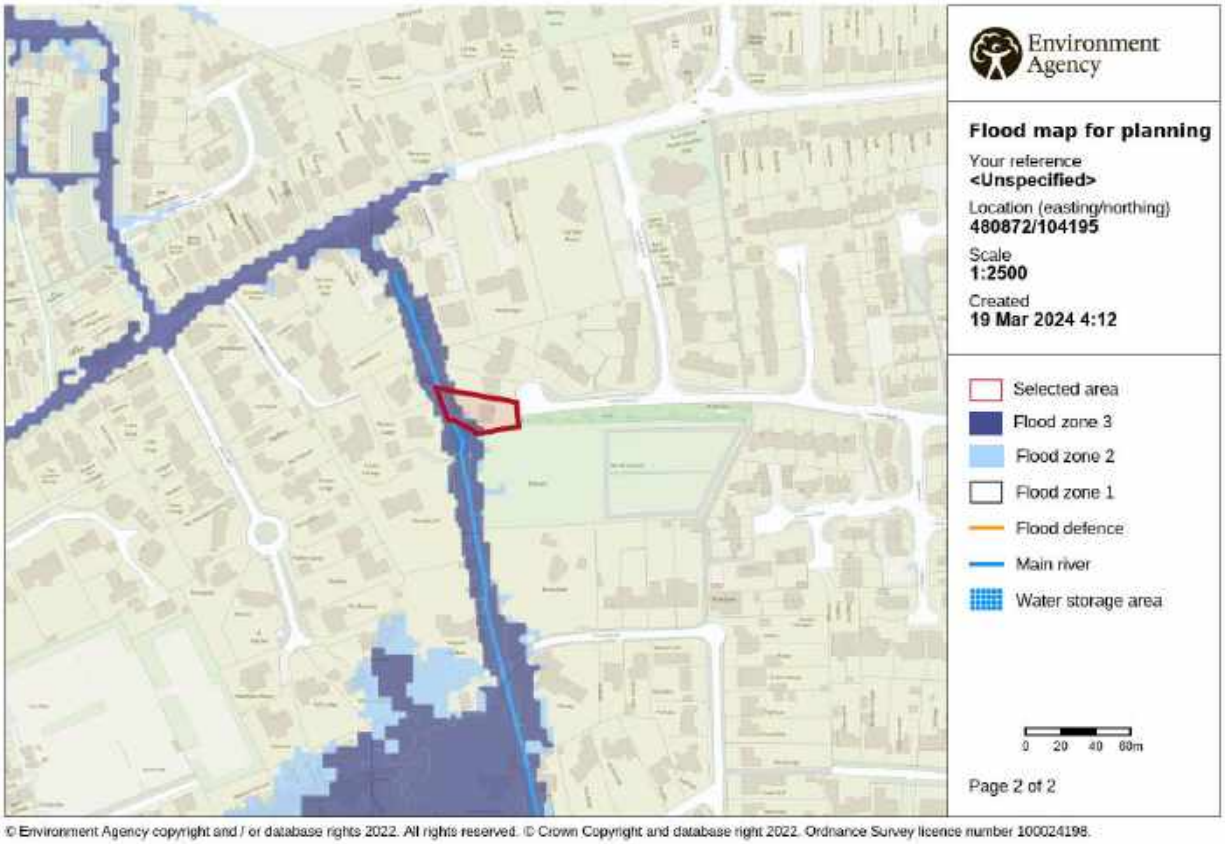


Figure 2 extract from EA Flood Maps for Planning (Source: DEFRA)

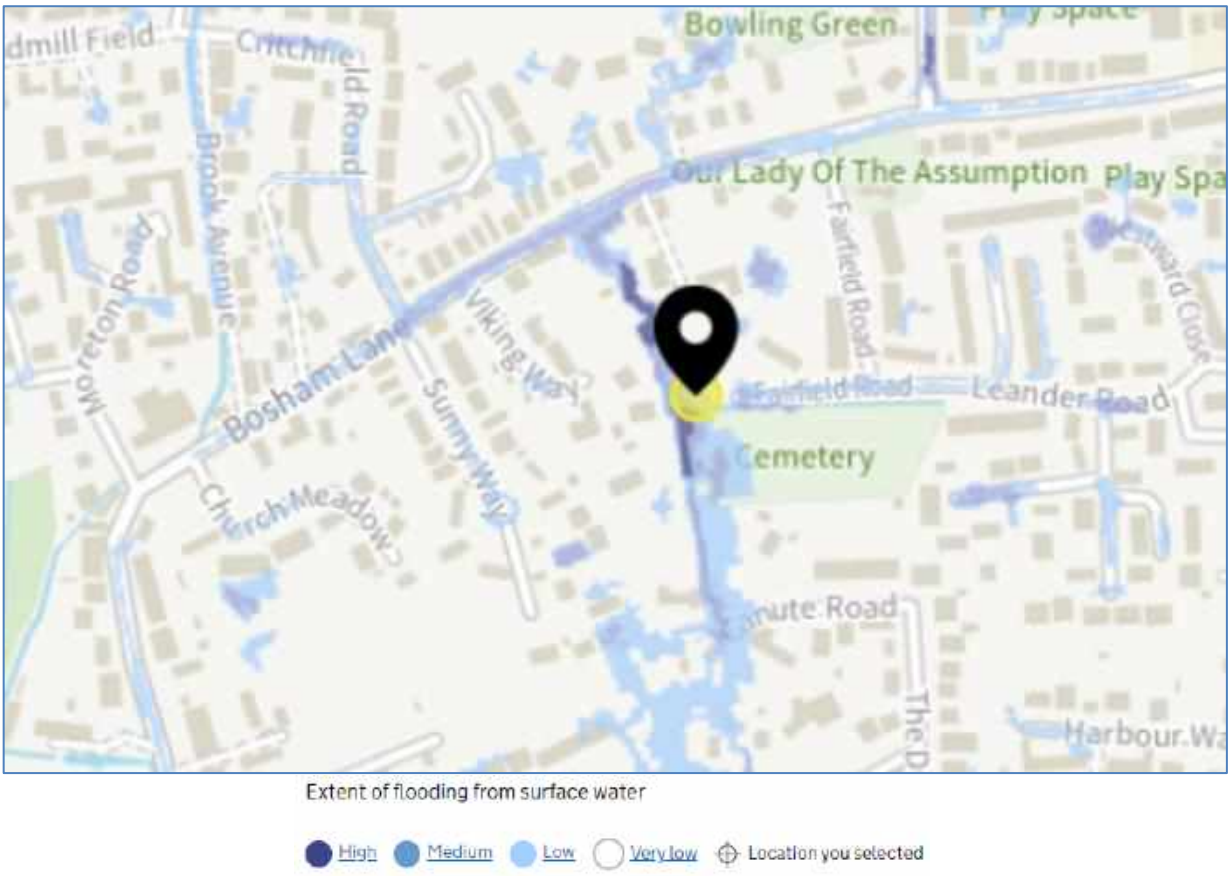


Figure 3 - extract from the EA's Long-Term Risk of Flooding from Surface Water (RoFSW) maps

4 LOCAL FEATURES

RIVERS AND WATERCOURSES.

4.1 The nearest EA main river is one that runs along the western boundary of the site and discharges into the Bosham Channel approximately 260m to the south of the site. This watercourse is culverted under Shore Road to the south of the site.

4.2 Off of this river is a small pond that sits along the southwestern corner of the site. This pond appears to pick up a drainage ditch along the southern edge of Fairfield Drive. It is understood that this drainage ditch may be partly culverted through the site along the southern boundary.

4.3 This watercourse is also classed as an EA main river and based on the EAs Product 4 data is subject to low levels of fluvial flooding. The Product 4 data indicates that the tidal flooding remains the dominant source of flood risk to the site as flood depth in the tidal event are approximately 1.1m greater than those of the fluvial flood event.

TOPOGRAPHY

4.4 The site has a general fall from east to west. A topographic survey has been provided and is included in Appendix 1. This shows that at the site access, ground levels are c4.2mAOD rising up to the dwelling FFL of 4.71mAOD. Ground levels then fall from the dwelling to the rear of the property to approximately 3.0mAOD (adjacent to the pond and watercourse.

4.5 Figure 4 below provides long and cross-sectional data through the site demonstrating an approximation of existing site levels based on the available LIDAR information.

Figure 4 –Terrain 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 1:50 000 scale bedrock geology description: Lewes Nodular Chalk, Seaford Chalk, Newhaven Chalk, Culver Chalk and Portsdown Chalk Formations – Chalk. Sedimentary deposit consisting of River Terrace Deposits - Sand, silt and clay.

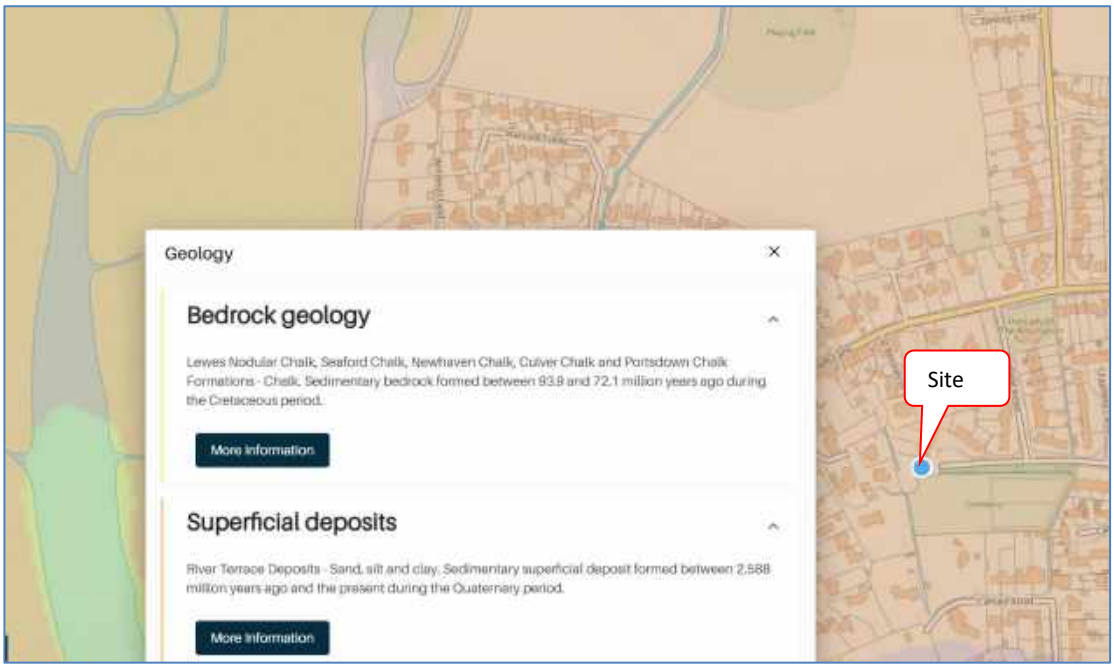


Figure 5 extract from BGS Bedrock and Superficial Deposits Mapping (source: BGS)

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 BGS GeoIndex: Borehole Records provides publicly available borehole data at locations around England. These can provide general information relating to groundwater and can provide greater insight into site specific ground conditions. A nearby borehole located at BGS ID: 430167: BGS Reference: SU80SW83 (720m to the east of the site) at a ground level of 4.4mAOD, a depth of 3m (or >3.4mAOD), did not record groundwater present within the borehole. Although this is a fair distance from the site, its close enough to provide a good indication that ground water depths are more than 3m below ground level.

4.9 However, the BGS data should be taken as only indicative and should not be relied upon for detailed 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.

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 Figure 6 provides an extract from EA AIMS Defence data (2022). There are no formal raised flood defences in the vicinity of the site. The defences shown are natural embankments associated with the watercourse.

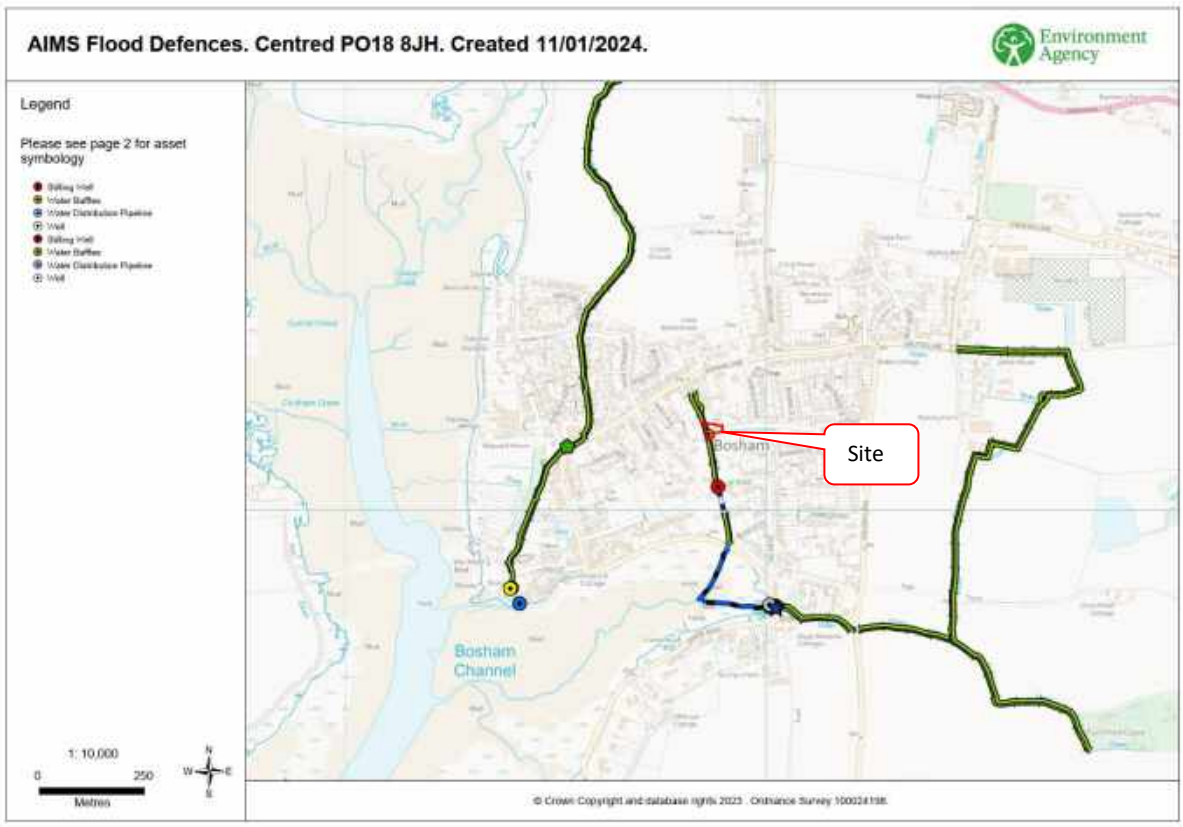


Figure 6 - Extract from EA AIMS Defence Dataset. Site edge red, defences shown in green.

5 CLIMATE CHANGE

5.1 In 2022, the EA issued updated guidance on the impacts of climate change on flood risk in the UK18 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 - 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	ESSIENTIAL INFRASTRUCTURE	HIGHLY VULNERABLE	MORE VULNERABLE	LESS VULNERABLE	WATER COMPTABILE
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 1: 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 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, sites should assess both the higher central and upper end allowances for more vulnerable developments.

5.6 The present day extreme sea levels in Coastal design sea levels – coastal flood boundary extreme sea levels (2018) account for storm surge. Most Environment Agency coastal models use these extreme sea levels. This FRA has assessed the data from Coastal design sea levels – coastal flood boundary extreme sea levels (2018) for extreme sea levels, and used the climate change sea level rise values in table 1 of the NPPF to determine a DFL.

5.7 The Sea and Tidal sea level increases for the site based on the geographic region are summarised in Table 6:

Table 6 – information taken from Table 1 (NPPF): sea level allowances for 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

Area of England	Allowance	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)
South East	Higher Central	5.7 (200)	8.7 (261)	11.6 (348)	13.1 (393)
	Upper End	6.9 (242)	11.3 (339)	15.8 (474)	18.2 (546)

5.8 The Fluvial modelling used was the Bosham Climate Change Allowance Update, completed by JBA Consulting in 2016. The Bosham Stream Model Improvements, completed by Hyder Consulting in 2012, were used for the basic

Undefended Fluvial Modelling. The Tidal modelling used was the Chichester District Council SFRA Coastal Modelling, which was completed by JBA Consulting in 2022.

5.9 This modelling provides climate change estimates up to the 2121 design event. To account for the addition 3 years to the year 2124, a further 54.6mm has been added to the EA Product 4 data.

INCREASES IN SURFACE WATER FLOODING AND RAINFALL ALLOWANCES

5.10 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	25%	25%
Upper End	40%	45%

5.11 The CDC SFRA presents the 1 in 100 year plus 45 climate change surface water flood maps. These have been reviewed in Section 6.

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.

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.

6.4 The EA's Flood Maps for Planning shows that the site is affected by Flood Zone 2 and 3 for both tidal and fluvial flood risk. The EA Product 4 data shows that the site is marginally affected by fluvial flooding (refer to Appendix 2 for mapping) in the climate change event, but much more significantly affected by tidal flood risk from the Bosham Channel (see Figure 7 below).

6.5 As tidal flooding is significantly worse than river flooding, this FRA has reviewed the direct risk from tidal flood risk acknowledging that any measures proposed for mitigating tidal flood risk will also mitigate the risk of river flooding (and surface water flooding). 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.

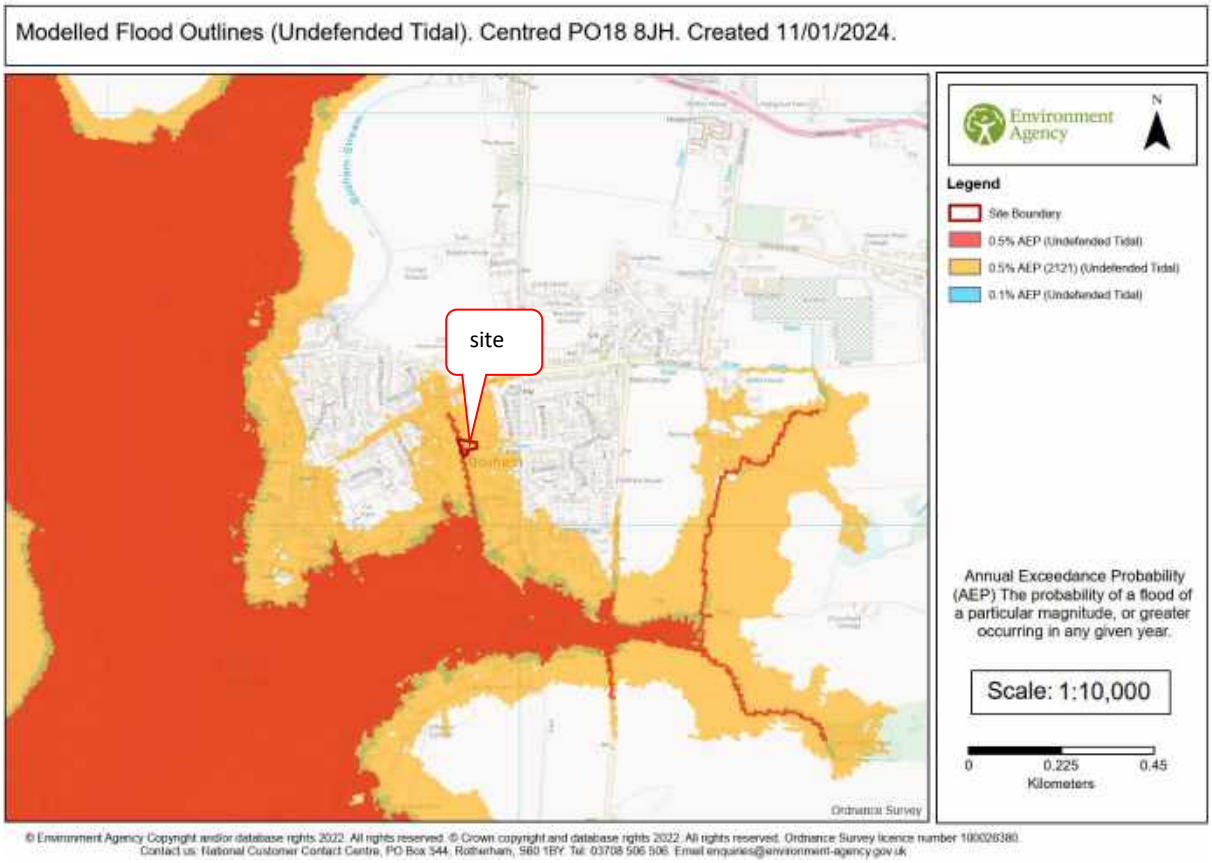


Figure 7 - EA Flood Map for Planning (source Environment Agency Flood Maps)

6.6 Figure 8 below provides an extract from the EA's Product 4 requested for the purpose of this FRA. The EA has provided data relating to a number of nodal points across the site to assess flood depths from a number of return periods. The EA have also provided climate change impacts to the 0.5% AEP (that is Flood Zone 3 extents for tidal

flood risk). In the context to this site, Node point 3 has been used for advising on flood levels and mitigation measures.

6.7 The undefended scenario has been used, as these present the worst scenario in terms of flooded depths.

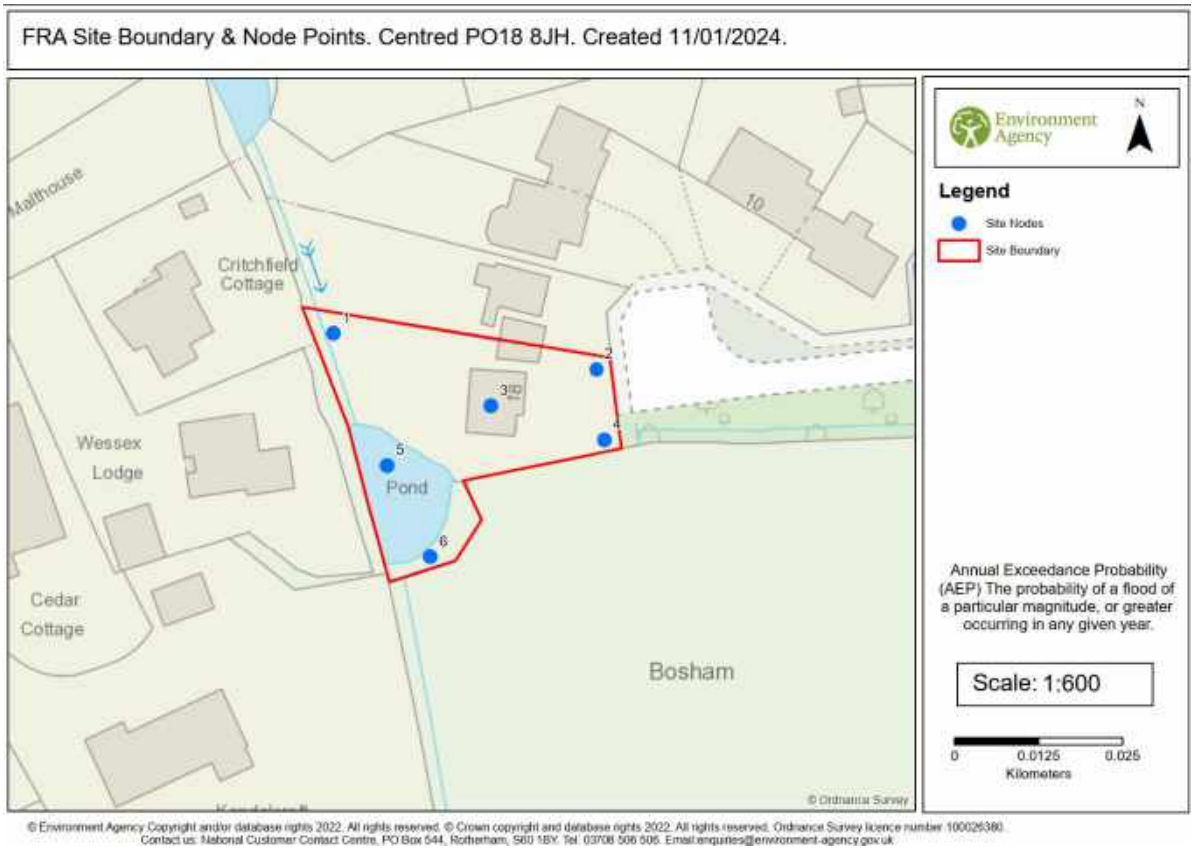


Table 1: Water Levels: Fluvial Undefended

	NGR		Modelled Flood Levels in Metres AOD Undefended Annual Exceedance Probability		
Node Ref	Eastings	Northings	1% +CC (35%)	1% +CC (45%)	1% +CC (105%)
1	480854	104204	3.62	3.63	3.69
2	480893	104198	-	-	-
3	480877	104193	-	-	-
4	480894	104188	-	-	-
5	480862	104184	3.61	3.62	3.68
6	480868	104171	3.60	3.61	3.67

Table 2: Water Levels: Tidal Undefended

	NGR		Modelled Flood Levels in Metres AOD Undefended Annual Exceedance Probability		
Node Ref	Eastings	Northings	0.5%	0.5% (2121)*	0.1%
1	480854	104204	3.40	4.77	3.57
2	480893	104198	-	4.77	-
3	480877	104193	-	4.77	-
4	480894	104188	-	4.77	-
5	480862	104184	3.40	4.77	3.57
6	480868	104171	3.40	4.77	3.56

Figure 8 - extract from the JFLOW Model 2006, with updated climate change runs completed by JBA Consulting in 2016.

6.8 Based on the EA data, a DFL for the development proposals of 4.83mAOD (4.77m + 0.0546m) can be determined.

6.9 Appendix 2 includes the full EA Product 4 data.

PLUVIAL (SURFACE WATER)

6.10 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.

6.11 The RoFSW 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.

6.12 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), 1 in 100 (1% chance of occurring in any one year) return period (medium risk – Figure 10) and 1 in 100 year plus 45% climate change taken from the SFRA (Figure 11). Extracts of this mapping is provided below, along with an analysis of their likely source and projected impacts on the development.

6.13 Figure 9 shows the high-risk scenario (1 in 30-year event). In this event, the immediate building and surrounds are wholly unaffected by surface water flooding. Surface water 'ponding' is shown within the pond along the south western corner of the site. As there is an existing pond at this location, this does not demonstrate a risk to the site in this event as water is designed to pond at this location.

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.

6.14 Figure 10 present the medium risk scenario (1 in 100-year return period) and continues to show that the building is wholly unaffected by surface water flooding. Surface water flooding appears to extend further into the site up to an elevation of c3.65mAOD. This flooding appears very similar in nature and extent to the fluvial flood extents for the same event as presented in the product 4 data. Therefore, given the 'main river' nature of this watercourse, it is likely that surface water and fluvial flood risk is closely linked at this location.

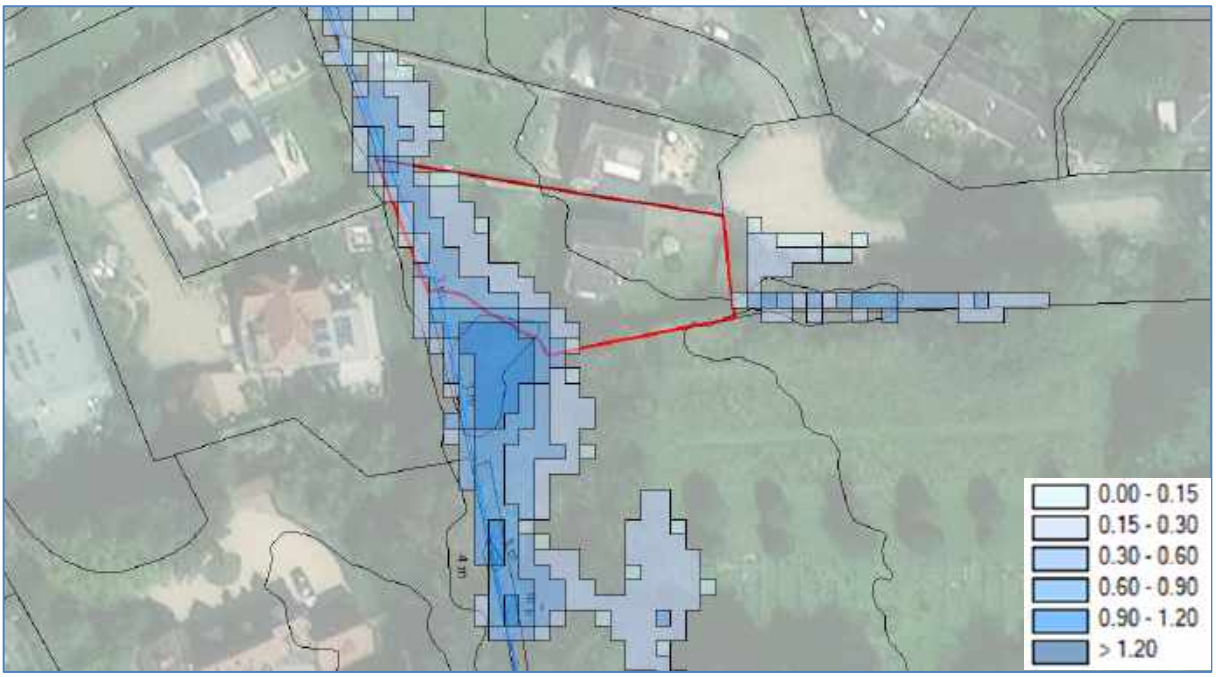


Figure 10 EA Long Term Flood Risk Maps – Medium Risk of surface water flooding depths (source: EA Long Term Flood Risk Maps), site bordered red

Impacts of Climate Change

6.15 The 1 in 100 year event plus 45% climate change uplift does not appear to show a significant increase in flood extents when compared to the present day event. In addition, the difference between the 1 in 30 year event and the 1 in 100 year event appears very minor, suggesting that climate change impacts to surface water flooding is likely to be limited and therefore not expected to increase significantly over time (unless other external catchment changes affect the site).

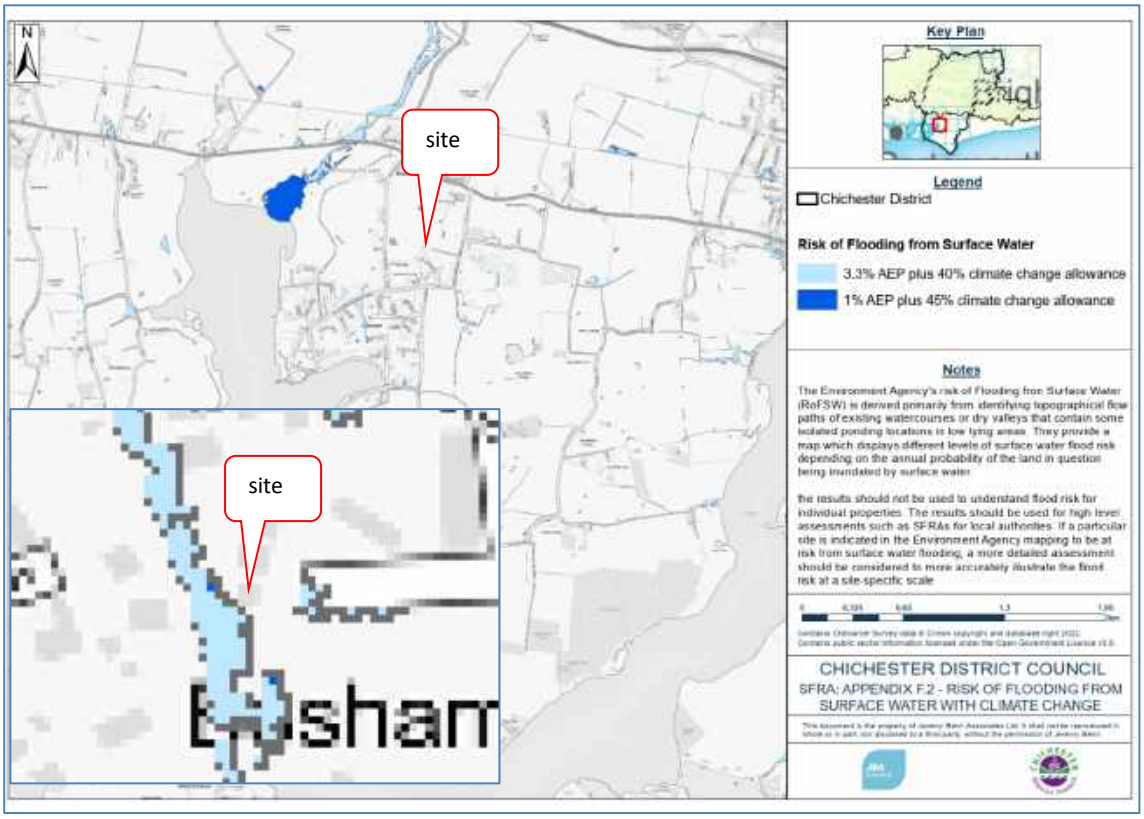


Figure 11 EA Long Term Flood Risk Maps – Low risk of surface water flooding depth (source: EA Long Term Flood Risk Maps), site bordered red.

6.16 Based on the RoFSW and SFRA data, flooding may affect the western half of the site by up to 700mm. However, this flooding is unlikely to affect the dwelling (or the proposed extension) as flooding only appears to affect land below 3.7mAOD, with the dwelling have an FFL of 4.71mAOD and the garage set at a ground level of approximately 4.0mAOD.

6.17 As such tidal flood risk remains the dominant source of flooding and any measures proposed to address the tidal flood risk will sufficiently address the surface water flood risk present on the site.

6.18 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. It is important to ensure that the proposals do not increase flood risk as a result, incorporates flood resilient building measures and Sustainable Drainage Systems (SuDS).

6.19 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. Indeed, reducing the rate of discharge from sites is one of the most effective ways of reducing and managing flood risk. SuDS can effectively be used to minimise the potential increase of risk to the property and users in the future. In accordance with the NPPF, the sites surface water drainage should account for minimum 45% climate change allowance to site rainfall profiles, to ensure climate change is appropriately considered.

6.20 SUDS should try to achieve an infiltration solution, however careful consideration of the underlying geology and its principal nature as an aquifer needs to be considered in the water quality and treatment aspects of the drainage design.

HISTORICAL, SEWERS AND DRAINAGE

6.21 A common source of flooding is a result of sewer or other drainage infrastructure becoming surcharged and flooding. The SFRA records (see extract in Figure 12) does not directly present any records relating to sewer flooding directly impacting the site, however, it does highlight the site has experienced flooding in the past. The EA have records that show this site experienced flooding in December 1993 (Flood Event ID: 2001). The source of this flooding event was the Main River running along the western boundary. However, the flood extents (as shown below) are not indicated to have had directly affected the dwelling.

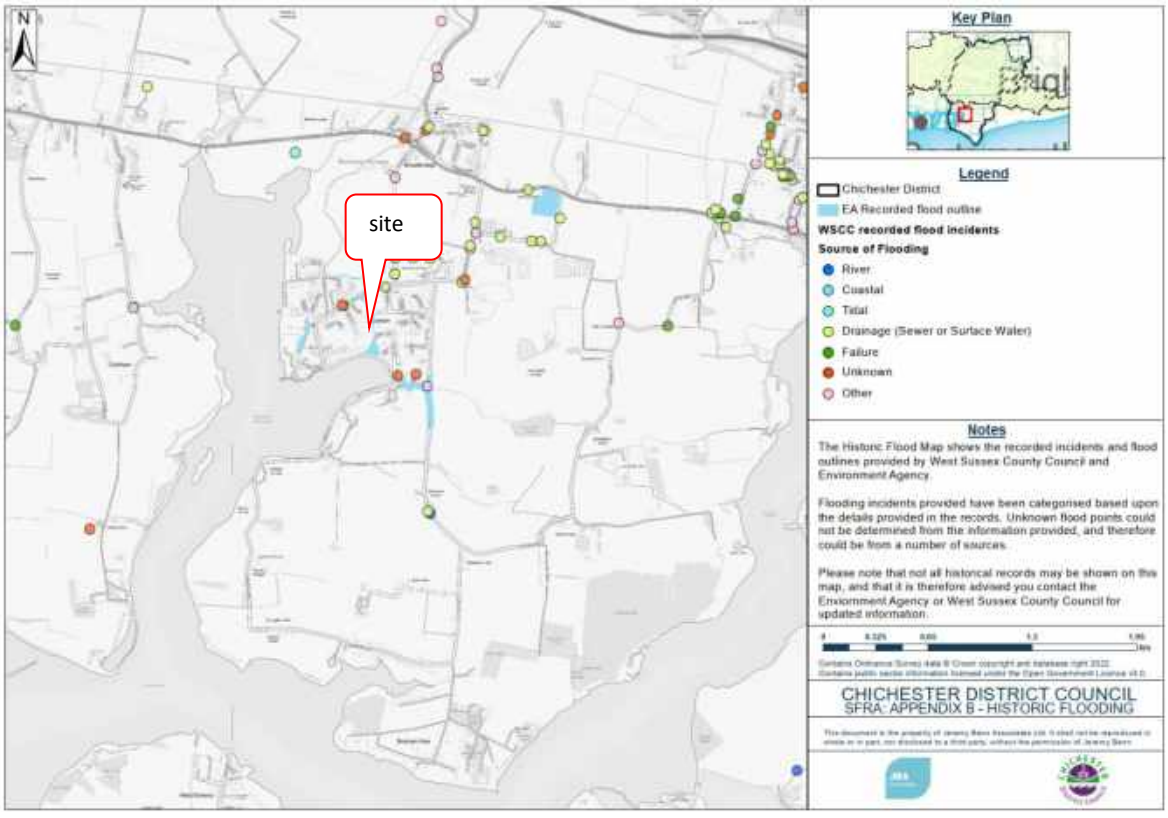


Figure 12 - extract from SFRA showing historical flood records

6.22 There have been no other noted flood events specifically at the site, however this does not directly indicate that the site has not flooded in the past or may flood in the future.

6.23 Therefore, it is considered the risk of sewer flooding to the site is considered low, assuming that any new development flows include appropriate protective measures to manage runoff and not increase the risk of sewer flooding.

GROUNDWATER

6.24 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.

6.25 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.

6.26 A nearby borehole located at BGS ID: 430167 : BGS Reference: SU80SW83 (700m to the east of the site) at a ground level of 4.4mAOD, a depth of 3m, did not record groundwater present within the borehole. Although this is a fair distance from the site, its close enough (and at a similar elevation) to provide a good indication that ground water depths are more than 3m below ground level.

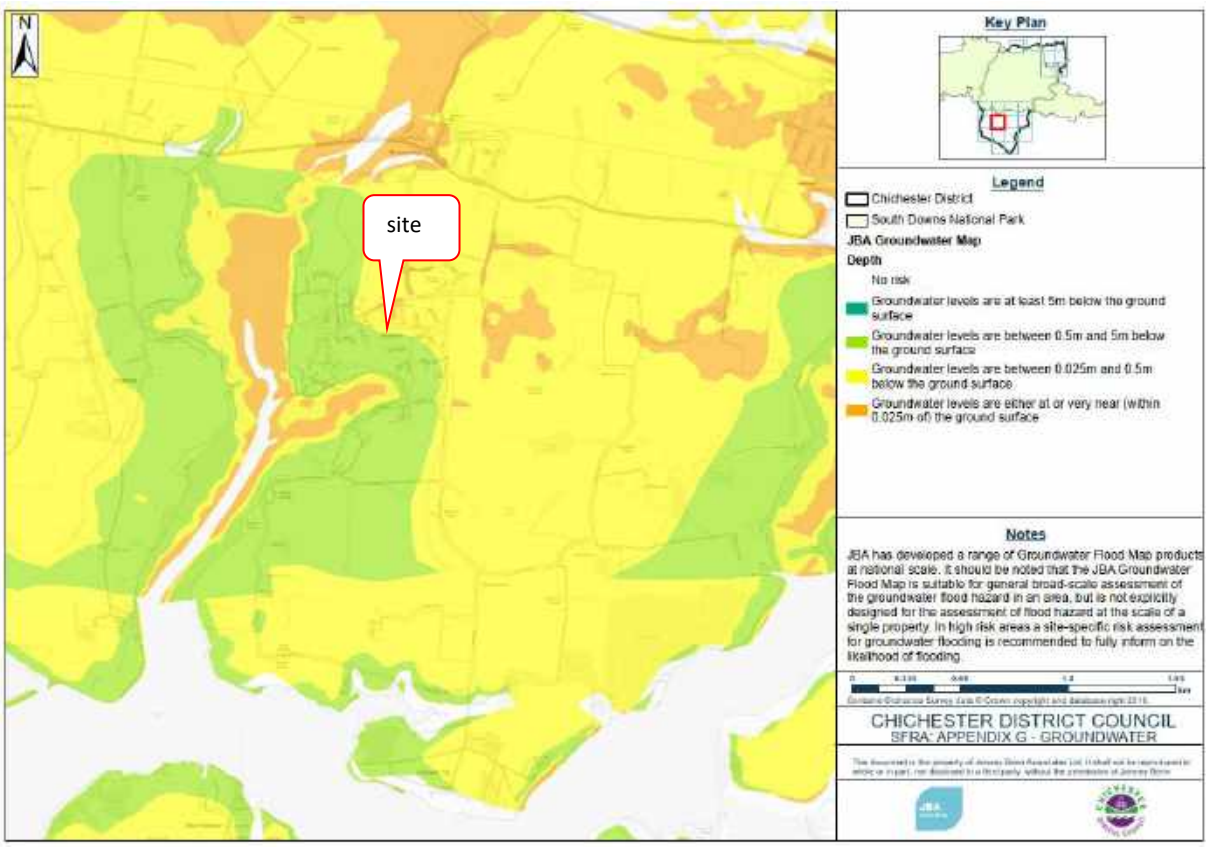


Figure 13 - extract from CDC SFRA - Groundwater Flood map

6.27 In addition, there have been no recorded incidences of groundwater flooding to the site, and it is notably difficult to predict where groundwater may emerge and cause damage. Nevertheless, groundwater flooding is typically low

level in depth, and all but the worst cases can be managed through appropriate flood resilient designs. However, the risk of high groundwater needs to be carefully considered in both the design of the structure, foundations, and drainage (as well as during the construction process).

Impacts of Climate Change

6.28 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

6.29 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;
- failure of a reservoir, or;
- 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.

6.30 Given that the site is not located behind flood defences or in a reservoir failure area, the primary risk to the site is residual failure of onsite drainage or an extreme exceedance event.

6.31 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.

6.32 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. Several reservoirs are located within the study area. However, there are also reservoirs outside of the area whose inundation mapping is shown to affect the study area. Maps of the flood extent can be found on the Government's Long term flood risk information website.

6.33 The EA has undertaken failure scenarios of the UK reservoirs and summarised these extents through their Long Term Flood Risk Maps for Reservoir Flooding. This mapping shows that the site is at low risk flooding from this source.

6.34 A number of mitigation measures have been proposed below in Section 5 in order to minimise/mitigate flood risk from the above sources.

SUMMARY OF RISKS

6.35 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.

Source of Flooding	Flood Risk to site	Is the dwelling itself at risk from the DFE
Fluvial	Moderate	No, the DFL for fluvial flooding is 3.69mAOD, this is c.1.1m below the FFL of the dwelling and 300mm below the FFL of the garage.
Tidal/Sea	High	Yes, the building has an existing FFL of 4.71mAOD with a DFL of 4.83mAOD. Therefore, the existing dwelling could be affected by up to 120mm of flooding in the DFE.
Surface Water	Moderate	No, as the proposed extension and garage will have a FFL above the DFL for surface water flood risk.
Reservoir	Very Low	No
Groundwater	Very Low	No
Sewers and Drainage	Very Low	No

6.36 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 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.

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 development proposals are for an extension of the existing dwelling and extensive refurbishment of the dwelling (along with the potential construction of a new garage). The works can be considered a 'minor extension' under the EA's standing advice. The EAs standing advice recommends that building extensions at a minimum should not have FFLs lower than existing. Therefore, if deemed possible the extension should raise FFLs by up to 420mm (this includes the recommended 300mm freeboard above the DFL). However, if this is not possible, FFLs of the extension should be no lower than existing and follow the proposed building mitigation measures (presented in Section 8). The proposed garage should be raised above the existing ground as much as possible, but with the understanding that achieving an FFL in the garage of 4.83mAOD (c800mm above existing ground levels) may not be feasible. As such, the construction of the garage should be of flood resilient materials, and structurally designed to withstand hydraulic loads up to 0.8m. Should the garage be constructed over an existing culvert, a build over agreement will be required from the culvert asset owners.
2. Control	Surface Water Drainage systems should be designed to accommodate the 1 in 100 year plus climate change DFE.
3. Mitigate	Recommend that the developer incorporates the recommendations of BS 85500:2012-Flood resistant and resilient construction. Refer to Section 8 below for recommended Building Measures
4. Manage residual flood risk	Site users should sign up to the EAs flood warning and alert services.
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. All works are proposed within tidal flood zones, as such these works are not considered to 'displace' flood waters given the nature of tidal flooding.

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 Flood resistant measures are incorporated where it is considered feasible to prevent floodwater entering the building, and take the form of flood barriers. However, given the height of flooding in the DFE (up to 925m), it is not considered practical to implement flood resistant measures to the whole site where flood depths are over 0.68m. The core reason to this is the listed nature of the site and constraints around retrofitting many flood resistant measures within such a building. In addition, many flood resistant products/barriers are only suitable to typical maximum height being 0.68m, before the risk of structural damage is incurred.

8.3 Flood resilient measures are incorporated where it is accepted that, in severe flood events, water may enter parts of the building so it is necessary to ensure the building will remain useable after the floodwater has receded and the area has been cleaned. Therefore, materials should be incorporated that retain their structural integrity and have good drying and cleaning properties or are waterproof, and services and sockets etc. are located as high as practical to minimise flood damage.

8.4 To mitigate the flood risk to the dwelling extension (and wherever possible as part of the renovation), it is advised where flood depths are likely to be less than 0.6m, that the key principles of the Water Exclusion Strategy are be adopted.

8.5 Whereas for the garage (where flood depths may be up to 830mm), it is advised that a Water Entry Strategy with Flood Resilient measures are applied. A sacrificial approach should be adopted to the provision of fittings (such as cabinetry, etc).

8.6 The below are standards that should be followed and adhered to wherever possible:

- Standards for the installation and retrofit of resistance measures are in British Standard 851188-1:2019+A1:2021.
- Standards for speeding the recovery of buildings after a flood are in British Standard 85500:2015.

8.7 The proposals should comply with relevant Building Regulations in Part P. They set minimum and maximum heights for certain electrical infrastructure.

8.8 In addition to ensuring building resilience in flood prone areas of the site, it is also advised that the storage of fuels/chemicals and the placement of sensitive or electronic equipment are stored above the DFE (or 4.83mAOD), to protect them from damage or polluting the tidal waters.

8.9 It is also important to ensure that the design of the building adequately caters for the expected hydraulic loading cause by tidal flooding and wave surges. This will require the structural engineer to appropriately design structural supports to allow the walls and doors to withstand flood waters up to 4.83mAOD.

8.10 Further recommendations and material reference include:

- Standards for the installation and retrofit of resistance measures are available in British Standard 851188-1:2019+A1:2021.
- Standards for materials and design approaches that will speed the recovery of buildings after flooding are available in British Standard 85500:2015.
- Comply with relevant Building Regulations in Part P. They set minimum and maximum heights for certain electrical infrastructure.

8.11 Some simple construction measures can greatly protect buildings during such an event without incurring large additional construction costs. Some recommendations include:

- The route of all electrical services will run from ceilings at ground floor (where possible), down toward sockets;
- All plumbing insulation to be of closed-cell design;
- Non-return valves to be fitted to all drain and sewer outlets;

8.12 Further detail can be found at https://assets.publishing.service.gov.uk/:

9 CONCLUSION

8.13 This assessment is required under the National Planning Policy Framework (NPPF) and Local and District Councils given the location, scale and associated flood risks.

8.14 Based on the EA's Flood Maps for Planning mapping and the EAs Product 4 data, tidal and fluvial flooding is shown within the site. However, fluvial flooding is relatively minor in comparison to the tidal flood risk and is not shown to impact on the dwelling location, being a maximum height of 3.68mAOD (including 105% climate change allowance), with the dwelling having finish floor level of 4.71mAOD (1m above the fluvial flood event). Whereas in the design tidal flood event (DFE), flood levels on site could reach 4.83mAOD in the 1 in 200 year 2124 event. This could see the dwelling affected by up to 120mm.

8.15 A review of the surface water flood risk to the site appears similar in nature to that of the fluvial flood risk. The mapping shows that in the 1 in 100 year event plus 45% climate change uplift, surface water flood risk may extend into the site up to c3.7mAOD. This would suggest that the surface water flood mapping is closely linked to the fluvial flows within the watercourse along the western boundary and can be considered to contribute a similar risk profile as that shown for fluvial flooding and may be viewed in the same manner.

8.16 However, as tidal flood risk poses a significantly greater flood risk to the site (in terms of depth), tidal flood risk is seen as the dominant source. Any measures therefore proposed to mitigate flood risk from tidal sources will also mitigate the risk from a fluvial or surface water flood event.

8.17 The development proposals are for an extension of the existing dwelling and extensive refurbishment of the dwelling (along with the potential construction of a new garage). The works can be considered a 'minor extension' under the EA's standing advice.

8.18 The EAs standing advice recommends that building extensions at a minimum should not have FFLs lower than existing. Therefore, if deemed possible the extension should raise FFLs by up to 420mm (this includes the recommended 300mm freeboard above the DFL). However, if this is not possible, FFLs of the extension should be no lower than existing and follow the proposed building mitigation measures.

8.19 To mitigate the flood risk to the dwelling extension, it is advised where flood depths are likely to be less than 0.6m, that the key principles of the Water Exclusion Strategy are be adopted.

8.20 Whereas for the garage (where flood depths may be up to 830mm), it is advised that a Water Entry Strategy with Flood Resilient measures are applied. A sacrificial approach should be adopted to the provision of fittings (such as cabinetry, etc).

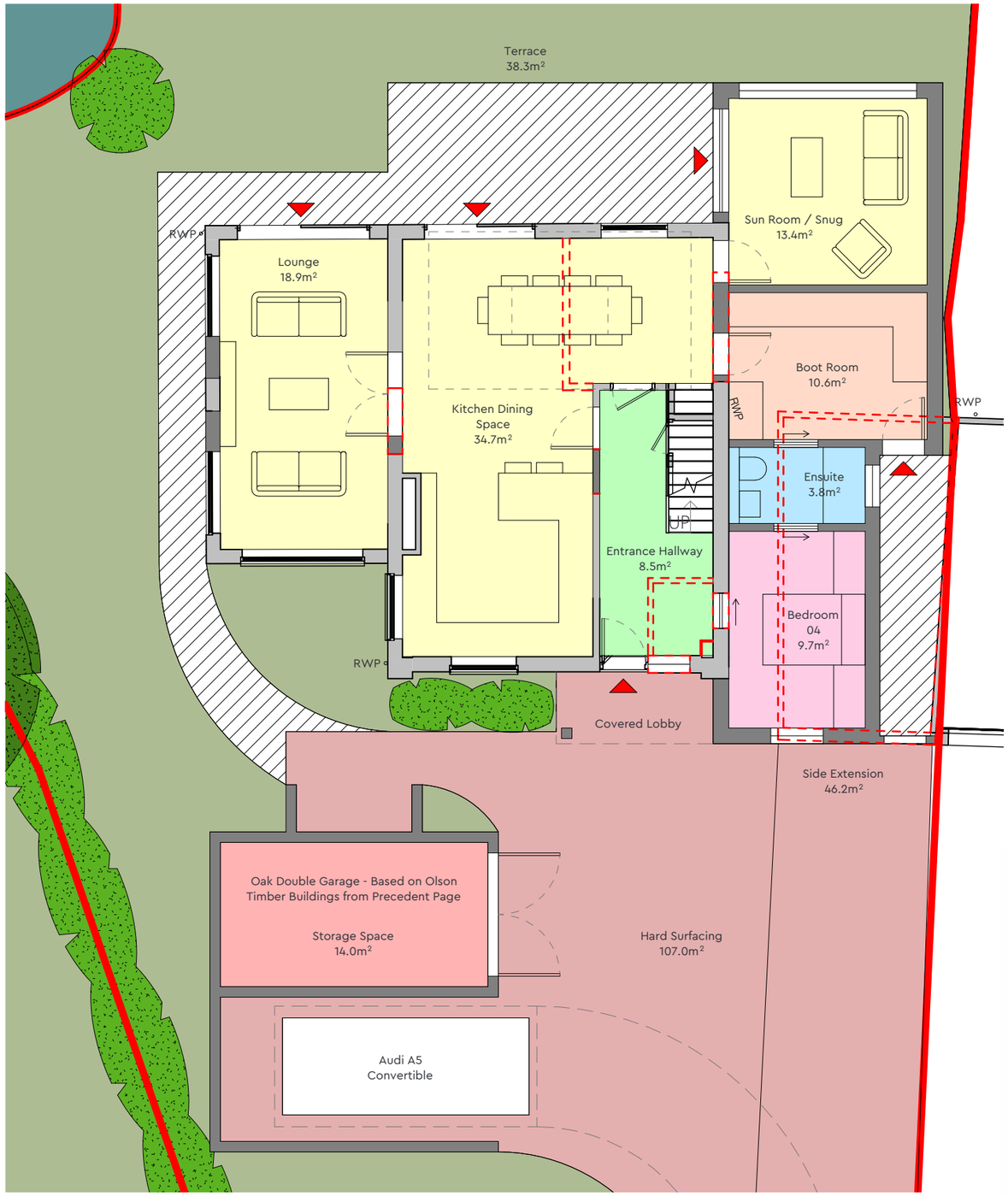
8.21 This report demonstrates that the proposals could be accommodated within the site by in accordance with the EAs Standing Advice. guidance, Council SFRA, and the NPPF. It is considered that as long as the development follows the advice presented in this report, that the development proposals may be considered appropriate at this location.

APPENDIX 1 – ARCHITECTURAL PROPOSALS

THIS DRAWING IS FOR :

FEASIBILITY PURPOSES ONLY

Not to Be Used for Construction



1. Feasibility Ground Floor Plan

scale 1 : 100

Feasibility Key

- Entrance Points
- Existing Walls
- Demolished Walls
- Proposed Walls

2. Feasibility First Floor Plan

scale 1 : 100

N

THIS IS A

COLOURED DRAWING

If this box does not appear Red, the drawing may not be represented properly

1:100 0m 2 4 6

CLIENT Mr & Mrs Kent

PROJECT 18 Fairfield Road, Bosham

DRAWING TITLE Feasibility Floor Plans - Sheet 1

DATE 20/11/23

DWG NO. 300 / 2.101

SCALE 1 : 100 @ A3

REVISION DATE

NOTES

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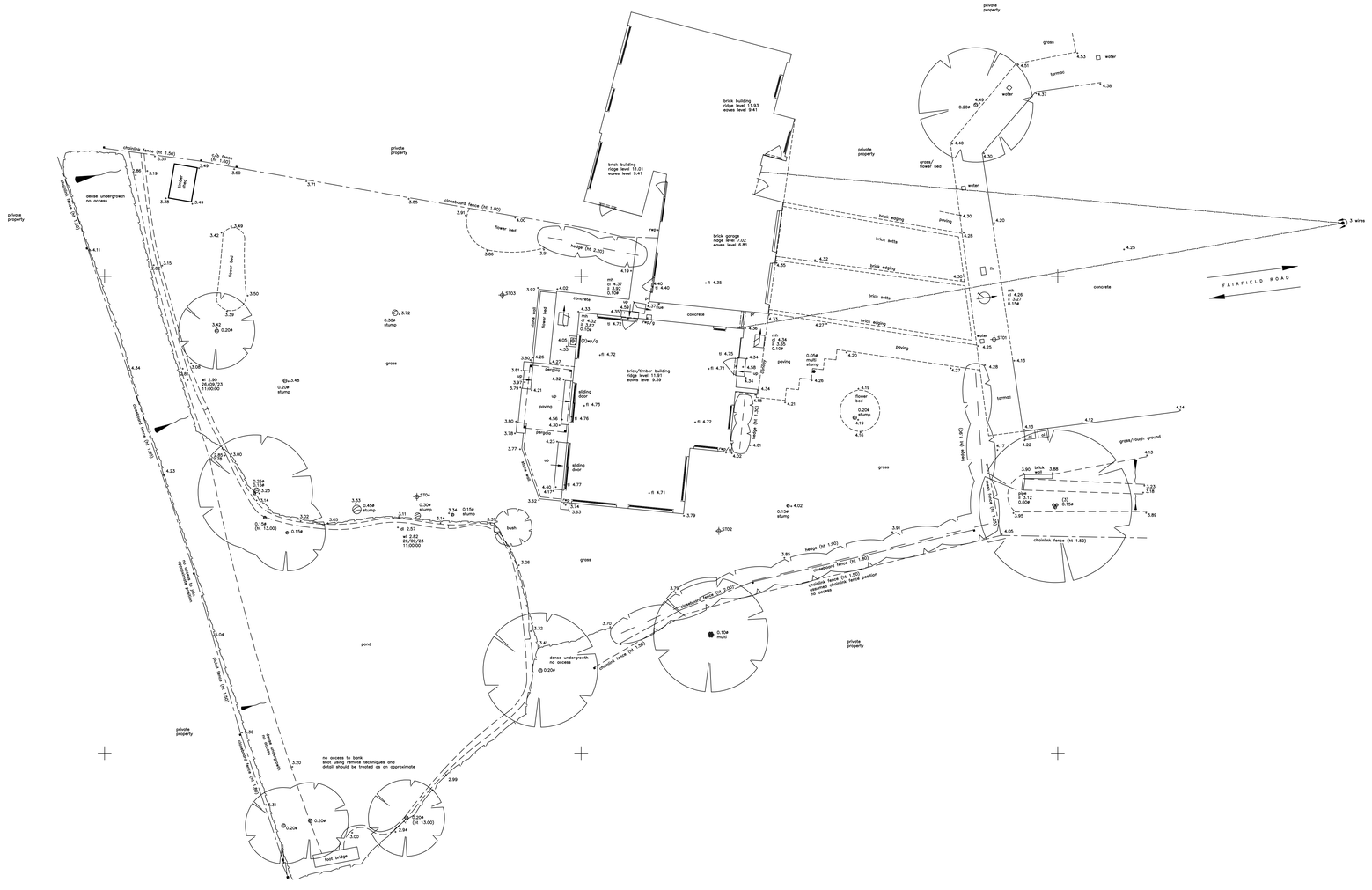

NOTES

GENERAL NOTES :-

ALL LEVELS ARE IN METRES DERIVED FROM GPS TRANSFORMATION.
GRID COORDINATES ARE ORDINANCE SURVEY NATIONAL GRID DERIVED FROM GPS TRANSFORMATION.
GPS COORDINATES AND LEVELS SET AT ST01 (NO SCALE FACTOR APPLIED)

THIS DRAWING HAS BEEN PRODUCED WITH A PLOT SCALE ACCURACY OF 1:100

SERVICE COVERS INDICATED WHERE VISIBLE. PIPE INVERTS / DETAILS SURVEYED FROM SURFACE INSPECTION ONLY. GENERALLY DAMAGED COVERS AND COVERS WITHIN HIGHWAYS WILL NOT BE LIFTED

TREE SPECIES SHOULD BE CONFIRMED BY TREE SPECIALIST IF CRITICAL.

OVERHEAD CABLES ARE INDICATED USING REMOTE SURVEY METHODS AND ARE SUBJECT TO SEASONAL VARIATION, AND SHOULD BE TREATED AS APPROXIMATE.

THE SURVEYOR WILL NOT BE RESPONSIBLE FOR THE OMISSION OF DETAILS OBSCURED DURING SITE SURVEY

RICS PROFESSIONAL STANDARDS 3RD EDITION RULE 1.19 APPLIES TO THIS SURVEY.

TOPOGRAPHICAL SURVEY/UTILITY KEY :-

(ht) – height
ø – diameter
● – pas trap
o/g – above ground
o/r – assumed route
bh – borehole
bs – betalic beacon
bd – book drop
bol – bollard
bott – bottom
box – bottom of shaft
bt – telecom
c/s fence – closeboard fence
cp – concrete post
cctv – cable television
cl – cover level
cr – cast iron
cr – cable riser
cws – combined water sewer
d/chan – drainage channel
ejb – electric junction box
ep – electric pole
exit – end of trace
ep – electric pole
fb – fuse box
f/bed – flower bed
fh – fire hydrant
fp – flag pole
ft – fire tank
fws – foul water sewer
g – gully
g/run – gully run
h/rail – hand rail
h/chestnut – horse chestnut
h/thorn – hawthorn
i – inspection cover
il – light base
ill – illuminated
int – interceptor
lp – lamp post
mh – manhole cover
mkr – marker
o/h – over head
ol – off lot
oss – off survey area
OSBM – ordnance survey bench mark
p & r fence – post & rail fence
pd – pd depth
pol – pole
ptg – pipe to ground
ptw – pipe to surface
rail – railway
ret wall – retaining wall
rs – road sign
sfw – surface water pipe
s/birch – silver birch
s/p – safety paving
sep – sapling
sec fence – security fence
sc – service chamber
sl – spot light
sp – soil pipe
sv – stop valve
sv – stop valve
svp – soil vent pipe
tbm – temporary bench mark
TBM – temporary bench mark
trr – taken from records
t – threshold level
toc – top of cap
tob – top of bank
tot – top of tank
tp – telecom pole
tr – traffic signal
t/k – trench scar
u/s – underside
utl – unable to lift
utr – unable to rod
uts – unable to survey
uti – unable to trace
vp – vent pipe
wc – water board chamber
wl – water level
wm – water meter
wp – waste pipe
wr – water riser

SURVEY CONTROL :-

STATION	EASTINGS	NORTHINGS	LEVEL
ST01	480898.662	104196.689	4.213
ST02	480882.220	104186.648	3.907
ST03	480870.862	104188.017	3.875
ST04	480866.381	104188.439	3.377

NORTH POINT :-

NORTH

UTILITY SURVEY KEY :-

HATCHED AREA
BOREHOLE
CPT
TRIAL PIT
HAND PIT
WINDOW SAMPLE

ELECTRIC CABLE
WATER PIPE
FOUL SEWER
STORM SEWER
COMBINED SEWER
DUCTS
CABLE TELEVISION
DATA CABLE
TELECOM CABLE
GAS MAIN
UNIDENTIFIED SERVICE
OTHER
CCTV
TRAFFIC LIGHT
OIL/DIST PLL
VENT
FUEL PIPE
GAUGE LINES
PIPE
ASSUMED ROUTE
TRACED FROM RECORDS

DISCLAIMER :-

Electromagnetic techniques have been used in the location of underground services. The results are not infallible and trial excavations should be carried out to confirm the accuracy of information before any excavation work where these are critical. The completeness of the underground services information cannot be guaranteed.

This method of survey does not differentiate between live and dead services, and as such all services should be treated as live. This drawing may not include the location of all services within the area and reference to the appropriate utility companies should be obtained from the appropriate utility company and used in conjunction with this drawing.

Private service pipes and cables in highways are not shown, but there presence should be considered.

Buried non-ground structures or obstructions not shown on this drawing may be present. Reference should be made to historical plans and as-built drawings. Excavations in the vicinity of services should be carried out with due diligence ref: HSG47 document avoiding dangers from underground services

Please note that factors such as ground conditions, proximity of other utilities, material and method of construction have an influence on the quality of the data collected on site.

Accuracy – "A utility mapping survey can be considered a 100% accurate depiction of the sub-surface environment, and the use of these drawings does not remove the requirement for the use of safe digging techniques at all times, in line with requirements of HSG47 and current CDM regulations".

UTILITY NOTES

0 1 2 4 6 8 10

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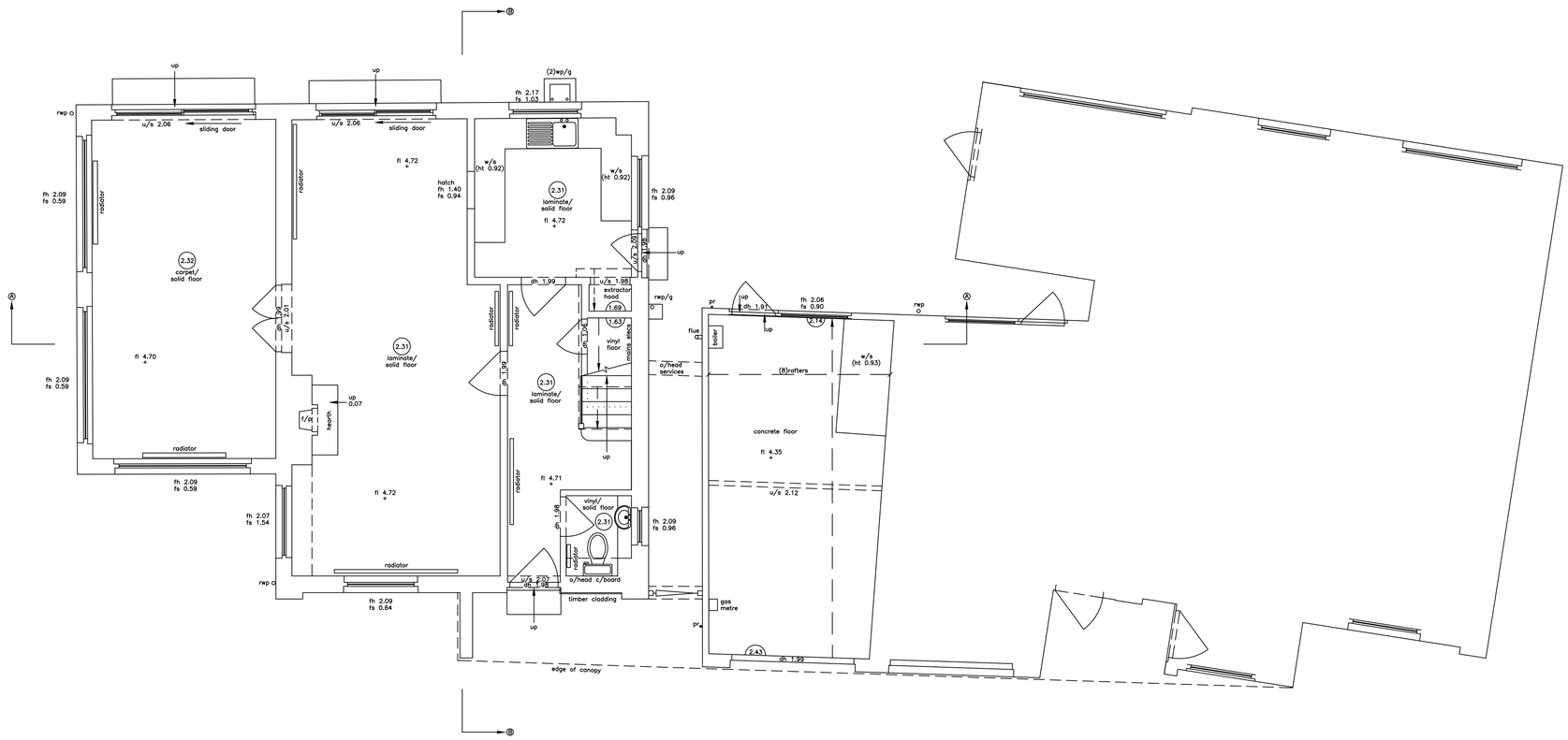
Client	RANDELL DESIGN GROUP
Project	18 FAIRFIELD ROAD, BOSHAM, PO18 8JH
Title	TOPOGRAPHICAL SURVEY
Date	SEPTEMBER 2023
Scale	1:100@A0
Dwg No	102646 –1
Surveyor	M.G
Checked	L.G

Revisions

TOPOGRAPHICAL (LAND) SURVEYORS / UTILITY SURVEYORS
BUILDING MEASUREMENT SURVEYORS / 3D LASER SCANNING



GROUND FLOOR PLAN

NOTES

GENERAL NOTES :-

ALL LEVELS ARE IN METRES DERIVED FROM GPS TRANSFORMATION.

THIS DRAWING HAS BEEN PRODUCED WITH A PLOT SCALE ACCURACY OF 1:50

BUILDING SURVEY KEY :-

(2.3) – room height
f/b – floor boards
ø – pipe diameter
a/b – air brick
ab – alarm box
ah – arch head height
bd – back drop
bk – brick
conc – concrete
cr – cable riser
db – fuse box
dh – door height
dp – depth
e/mtr – electricity metre
elec – electricity
f/p – fire place
fh – floor to head height
fl – floor level
fs – floor to sill height
g/mtr – gas metre
gr – gas riser
hd – hand dryer
htr – heater
hwt – hot water tank
ic – inspection cover
il – invert level
mh – manhole cover
OSBM – ordnance survey bench mark
q/tiles – quarry tiles
rad – radiator
rl – roof light
rwp – rain water pipe
sfc – soil filled chamber
sh – floor to sill height
sp – arch springing point height
sp – soil pipe
sus.c – suspended ceiling
svp – soil vent pipe
T.rail – heated towel rail
TBM – temporary bench mark
tl – threshold level
toc – top of cap
top – top of pipe
tot – top of tank
u/s – underside height
UTL – unable to lift
vp – vent pipe
wf – water fountain
wfc – water filled chamber
wp – waste pipe

SERVICES KEY :-

strip light
light
wall light
EML emergency light
spot light
pull cord
V vent/extractor
SW switch
LS light switch
FS fused switch
IS isolator switch
C cooker switch
F fuse
B blank socket
single socket
double socket
CS ceiling socket/fuse/switch
T thermostat
CA card access point (swipe card)
DR emergency door release
AK alarm keypad
IN intercom
ACP alarm control panel
SPK speaker
PROJ projector
CCTV closed circuit tv
sensor
NC network point
TV coaxial aerial
S smoke detector
H heat detector
FA fire alarm siren
BG fire brakeglass
fire sprinkler
fire blanket
water fire extinguisher
co2 fire extinguisher
powder fire extinguisher
fire extinguisher
FAP fire alarm control panel

NORTH POINT :-

SHEET LAYOUT :-

0 0.5 1 2 3 4 5

MIDLAND SURVEY LTD

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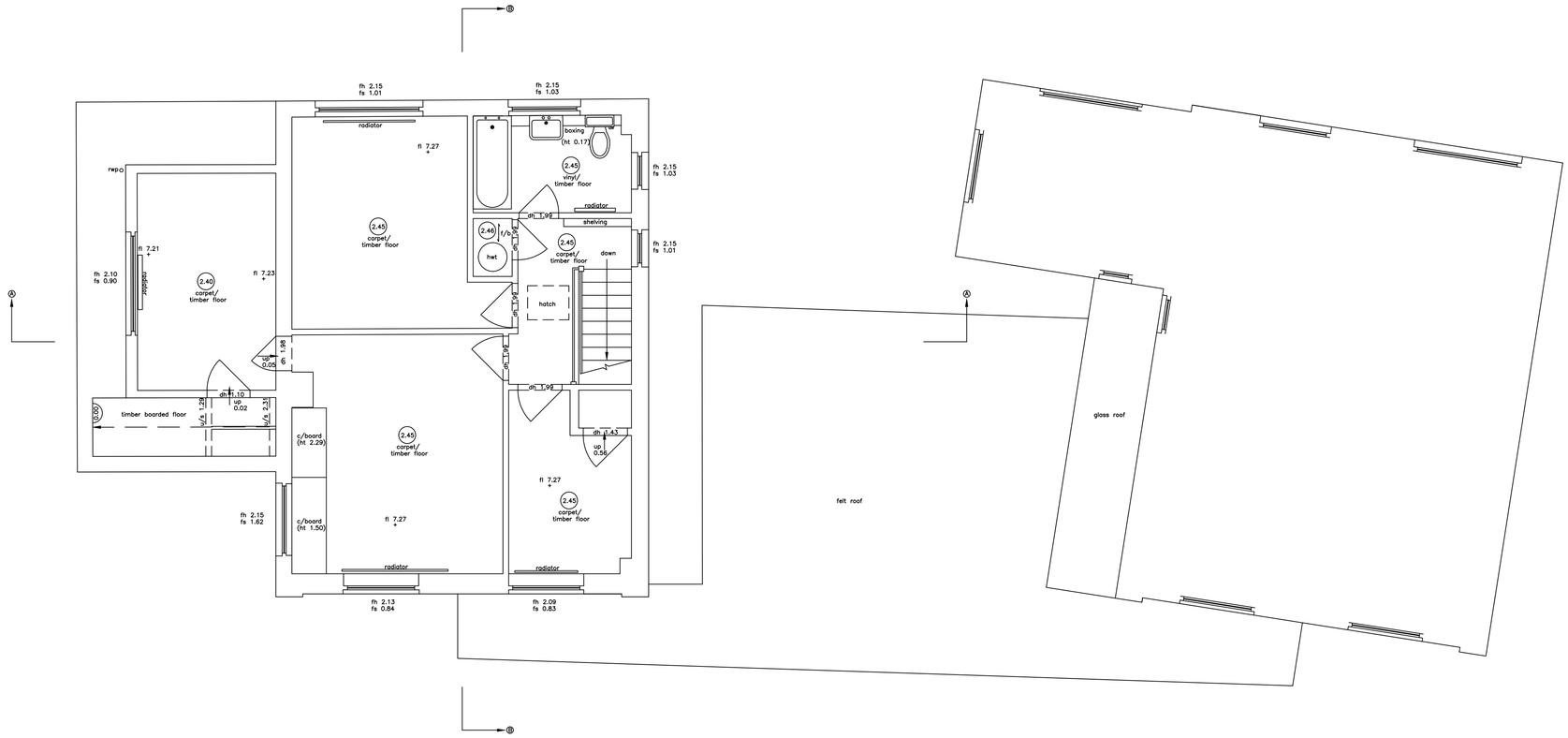
Client	RANDELL DESIGN GROUP
Project	18 FAIRFIELD ROAD, BOSHAM, PO18 8JH
Title	GROUND FLOOR PLAN
Date	SEPTEMBER 2023
Scale	1:50@A1
Dwg No	102646 – 2
Surveyor	M.G
Checked	L.G

Revisions

TOPOGRAPHICAL (LAND) SURVEYORS / UTILITY SURVEYORS
BUILDING MEASUREMENT SURVEYORS / 3D LASER SCANNING

Accredited Contractor
constructionLine
THE SURVEY ASSOCIATION



FIRST FLOOR PLAN

NOTES

GENERAL NOTES :-

ALL LEVELS ARE IN METRES DERIVED FROM GPS TRANSFORMATION.

THIS DRAWING HAS BEEN PRODUCED WITH A PLOT SCALE ACCURACY OF 1:50

BUILDING SURVEY KEY :-

(2.2) – room height

f/b – floor boards

ø – pipe diameter
a/b – air brick
ab – alarm box
ah – arch head height
bd – back drop
bk – brick
conc – concrete
cr – cable riser
db – fuse box
dh – door height
dp – depth
e/mtr – electricity metre
elec – electricity
f/p – fire place
fh – floor to head height
fl – floor level
fs – floor to sill height
g/mtr – gas metre
gr – gas riser
hd – hand dryer
htr – heater
hwt – hot water tank
ic – inspection cover
il – invert level
mh – manhole cover
OSBM – ordnance survey bench mark
q/tiles – quarry tiles
rad – radiator
rl – roof light
rwp – rain water pipe
sfc – soil filled chamber
sh – floor to sill height
sp – arch springing point height
sp – soil pipe
sus.c – suspended ceiling
svp – soil vent pipe
T.rail – heated towel rail
TBM – temporary bench mark
tl – threshold level
toc – top of cap
top – top of pipe
tot – top of tank
u/s – underside height
UTL – unable to lift
vp – vent pipe
wf – water fountain
wfc – water filled chamber
wp – waste pipe

SERVICES KEY :-

strip light
light
wall light
EML emergency light
spot light
pull cord
V vent/extractor
SW switch
LS light switch
FS fused switch
IS isolator switch
CS cooker switch
F fuse
B blank socket
S single socket
D double socket
CS ceiling socket/fuse/switch
T thermostat
CA card access point (swipe card)
DR emergency door release
AK alarm keypad
IN intercom
ACP alarm control panel
SPK speaker
PROJ projector
CCTV closed circuit tv
sensor
NC network point
TV coaxial aerial
S smoke detector
H heat detector
FA fire alarm siren
BG fire brakeglass
fire sprinkler
fire blanket
water fire extinguisher
co2 fire extinguisher
powder fire extinguisher
fire extinguisher
FAP fire alarm control panel

NORTH POINT :-

SHEET LAYOUT :-

0 0.5 1 2 3 4 5

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Client	RANDELL DESIGN GROUP
Project	18 FAIRFIELD ROAD, BOSHAM, PO18 8JH
Title	FIRST FLOOR PLAN
Date	SEPTEMBER 2023
Scale	1:50@A1
Dwg No	102646 – 3
Surveyor	M.G
Checked	L.G

Revisions

TOPOGRAPHICAL (LAND) SURVEYORS / UTILITY SURVEYORS
BUILDING MEASUREMENT SURVEYORS / 3D LASER SCANNING

Accredited Contractor
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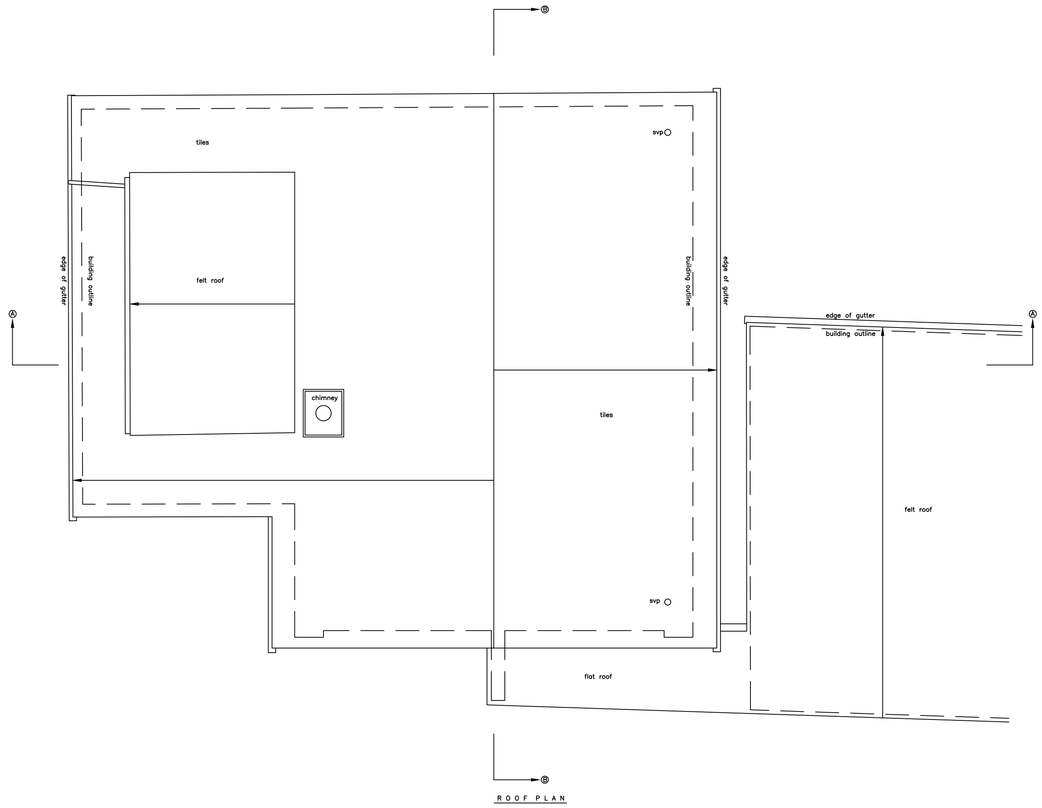
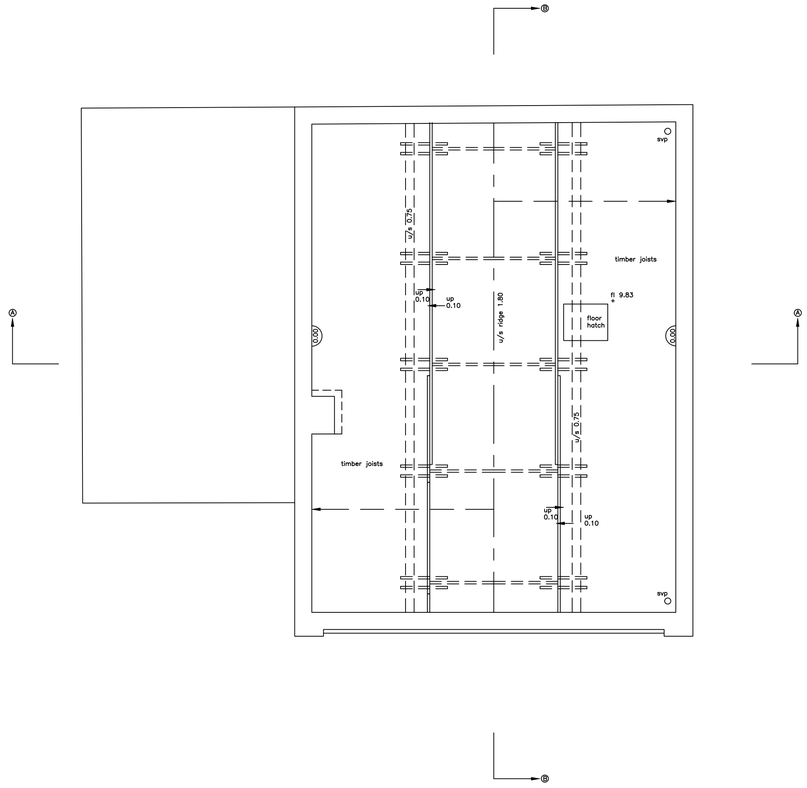


ROOF PLAN



SECOND FLOOR PLAN

NOTES

GENERAL NOTES :-

ALL LEVELS ARE IN METRES DERIVED FROM GPS TRANSFORMATION.

THIS DRAWING HAS BEEN PRODUCED WITH A PLOT SCALE ACCURACY OF 1:50

BUILDING SURVEY KEY :-

(1.23) – room height

f/b – floor boards

ø – pipe diameter
a/b – air brick
ab – alarm box
ah – arch head height
bd – back drop
bk – brick
conc – concrete
cr – cable riser
db – fuse box
dh – door height
dp – depth
e/mtr – electricity metre
elec – electricity
f/p – fire place
fh – floor to head height
fl – floor level
fs – floor to sill height
g/mtr – gas metre
gr – gas riser
hd – hand dryer
htr – heater
hwt – hot water tank
ic – inspection cover
il – invert level
mh – manhole cover
OSBM – ordnance survey bench mark
q/tiles – quarry tiles
rad – radiator
rl – roof light
rwp – rain water pipe
sfc – soil filled chamber
sh – floor to sill height
sp – arch springing point height
sp – soil pipe
sus.c – suspended ceiling
svp – soil vent pipe
T.rail – heated towel rail
TBM – temporary bench mark
tl – threshold level
toc – top of cap
top – top of pipe
tot – top of tank
u/s – underside height
UTL – unable to lift
vp – vent pipe
wf – water fountain
wfc – water filled chamber
wp – waste pipe

SERVICES KEY :-

	strip light	AK	alarm keypad
	light	IN	intercom
	wall light	ACP	alarm control panel
EML	emergency light	SPK	speaker
	spot light	PROJ	projector
	pull cord	CCTV	closed circuit tv
V	vent/extractor		sensor
SW	switch	NC	network point
LS	light switch	TV	coaxial aerial
FS	fused switch	S	smoke detector
ISO	isolator switch	H	heat detector
C	cooker switch	FA	fire alarm siren
F	fuse	BG	fire brakeglass
B	blank socket		fire sprinkler
	single socket		fire blanket
	double socket		water fire extinguisher
DS	ceiling socket/fuse/switch		co2 fire extinguisher
T	thermostat		powder fire extinguisher
CA	card access point (swipe card)		fire extinguisher
DR	emergency door release	FAP	fire alarm control panel

NORTH POINT :-

SHEET LAYOUT :-

0 0.5 1 2 3 4 5

MIDLAND SURVEY LTD

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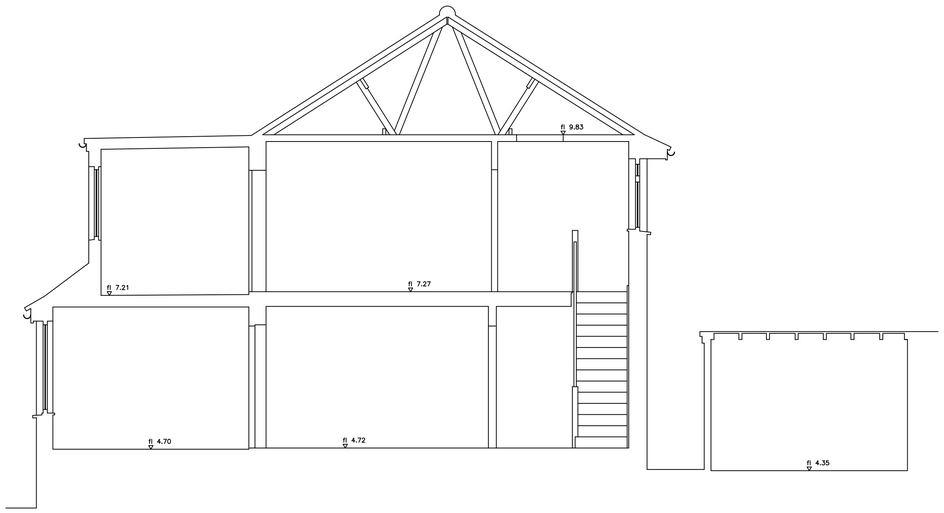
Client	RANDELL DESIGN GROUP
Project	18 FAIRFIELD ROAD, BOSHAM, PO18 8JH
Title	SECOND FLOOR/ROOF PLAN
Date	SEPTEMBER 2023
Scale	1:50@A1
Dwg No	102646 – 4
Surveyor	M.G
Checked	L.G

Revisions

TOPOGRAPHICAL (LAND) SURVEYORS / UTILITY SURVEYORS
BUILDING MEASUREMENT SURVEYORS / 3D LASER SCANNING



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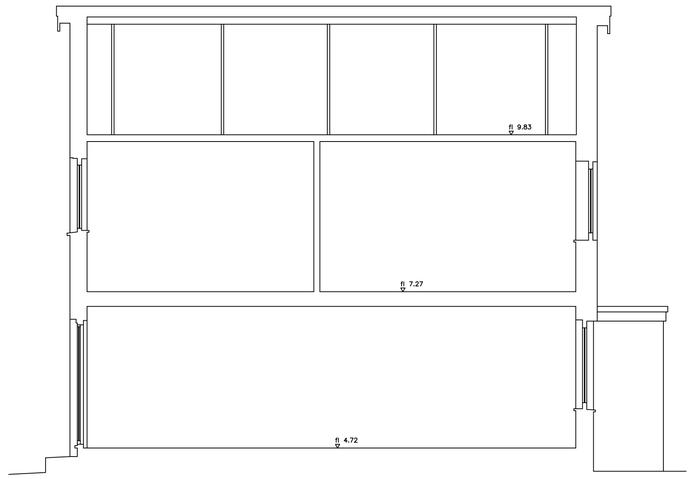
S E C T I O N A – A



Datum 0.00m

S E C T I O N B – B

NOTES

GENERAL NOTES :–

ALL LEVELS ARE IN METRES DERIVED FROM GPS TRANSFORMATION.

THIS DRAWING HAS BEEN PRODUCED WITH A PLOT SCALE ACCURACY OF 1:50

BUILDING SURVEY KEY :–

(1.23) – room height

f/b – floor boards

ø – pipe diameter
a/b – air brick
ab – alarm box
ah – arch head height
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bk – brick
conc – concrete
cr – cable riser
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e/mtr – electricity metre
elec – electricity
f/p – fire place
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fs – floor to sill height
g/mtr – gas metre
gr – gas riser
hd – hand dryer
htr – heater
hwt – hot water tank
ic – inspection cover
il – invert level
mh – manhole cover
OSBM – ordnance survey bench mark
q/tiles – quarry tiles
rad – radiator
rl – roof light
rwp – rain water pipe
sfc – soil filled chamber
sh – floor to sill height
sp – arch springing point height
sp – soil pipe
sus.c – suspended ceiling
svp – soil vent pipe
t.rail – heated towel rail
TBM – temporary bench mark
tl – threshold level
toc – top of cap
top – top of pipe
tot – top of tank
u/s – underside height
UTL – unable to lift
vp – vent pipe
wf – water fountain
wfc – water filled chamber
wp – waste pipe

SERVICES KEY :–

strip light
light
wall light
EML emergency light
spot light
pull cord
V vent/extractor
SW switch
LS light switch
FS fused switch
IS isolator switch
CS cooker switch
F fuse
BS blank socket
S single socket
D double socket
DS ceiling socket/fuse/switch
T thermostat
CA card access point (swipe card)
DR emergency door release
AK alarm keypad
IN intercom
ACP alarm control panel
SPK speaker
PROJ projector
CCTV closed circuit tv
sensor
NC network point
TV coaxial aerial
smoke detector
heat detector
fire alarm siren
FA fire brakeglass
BG fire sprinkler
fire blanket
water fire extinguisher
co2 fire extinguisher
powder fire extinguisher
fire extinguisher
FAP fire alarm control panel

NORTH POINT :–

SHEET LAYOUT :–

0 0.5 1 2 3 4 5

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Client	RANDELL DESIGN GROUP
Project	18 FAIRFIELD ROAD, BOSHAM, PO18 8JH
Title	SECTIONS
Date	SEPTEMBER 2023
Scale	1:50@A1
Dwg No	102646 – 5
Surveyor	M.G
Checked	L.G

Revisions

TOPOGRAPHICAL (LAND) SURVEYORS / UTILITY SURVEYORS
BUILDING MEASUREMENT SURVEYORS / 3D LASER SCANNING

Accredited Contractor
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THE SURVEY ASSOCIATION

EAST ELEVATION

NOTES

GENERAL NOTES :–

ALL LEVELS ARE IN METRES DERIVED FROM GPS TRANSFORMATION.

THIS DRAWING HAS BEEN PRODUCED WITH A PLOT SCALE ACCURACY OF 1:50

BUILDING SURVEY KEY :–

(1.23) – room height
f/b – floor boards
ø – pipe diameter
a/b – air brick
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bd – back drop
bk – brick
conc – concrete
cr – cable riser
db – fuse box
dh – door height
dp – depth
e/mtr – electricity metre
elec – electricity
f/p – fire place
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fl – floor level
fs – floor to sill height
g/mtr – gas metre
gr – gas riser
hd – hand dryer
htr – heater

hwt – hot water tank
ic – inspection cover
il – invert level
mh – manhole cover
OSBM – ordnance survey bench mark
q/tiles – quarry tiles
rad – radiator
rl – roof light
rwp – rain water pipe
sfc – soil filled chamber
sh – floor to sill height
sp – arch springing point height
sp – soil pipe
sus.c – suspended ceiling
svp – soil vent pipe
t.rail – heated towel rail
TBM – temporary bench mark
tl – threshold level
toc – top of cap
top – top of pipe
tot – top of tank
u/s – underside height
UTL – unable to lift
vp – vent pipe
wf – water fountain
wfc – water filled chamber
wp – waste pipe

SERVICES KEY :–

Symbol	Meaning	Symbol	Meaning
	strip light	AK	alarm keypad
	light	IN	intercom
	wall light	ACP	alarm control panel
EML	emergency light	SPK	speaker
	spot light	PROJ	projector
	pull cord	CCTV	closed circuit tv
V	vent/extractor		sensor
SW	switch	NC	network point
LS	light switch	TV	coaxial aerial
FS	fused switch	S	smoke detector
ISO	isolator switch	H	heat detector
C	cooker switch	FA	fire alarm siren
F	fuse	BG	fire brakeglass
B	blank socket		fire sprinkler
	single socket	B	fire blanket
	double socket	W	water fire extinguisher
cs	ceiling socket/fuse/switch	C	co2 fire extinguisher
T	thermostst	P	powder fire extinguisher
CA	card access point (swipe card)	F	fire extinguisher
DR	emergency door release	FAP	fire alarm control panel

NORTH POINT :–

SHEET LAYOUT :–

0 0.5 1 2 3 4 5

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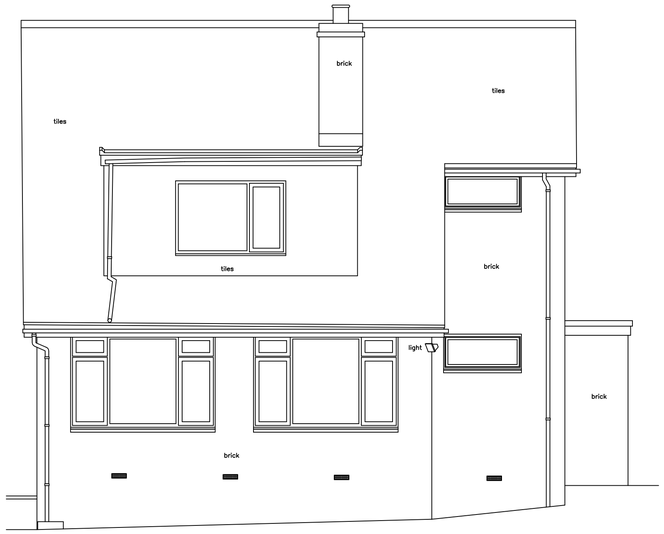
Client	RANDELL DESIGN GROUP
Project	18 FAIRFIELD ROAD, BOSHAM, PO18 8JH
Title	ELEVATIONS
Date	SEPTEMBER 2023
Scale	1:50@A1
Dwg No	102646 – 6
Surveyor	M.G
Checked	L.G

Revisions

TOPOGRAPHICAL (LAND) SURVEYORS / UTILITY SURVEYORS
BUILDING MEASUREMENT SURVEYORS / 3D LASER SCANNING

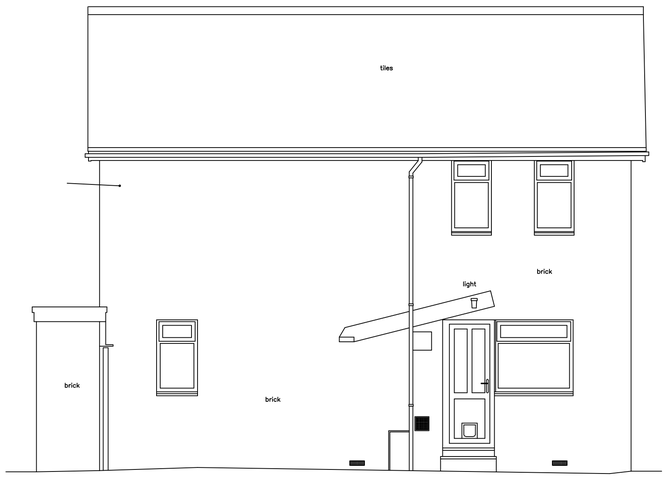


Datum 0.00m

SOUTH ELEVATION

Datum 0.00m

WEST ELEVATION



NORTH ELEVATION

NOTES

GENERAL NOTES :-

ALL LEVELS ARE IN METRES DERIVED FROM GPS TRANSFORMATION.

THIS DRAWING HAS BEEN PRODUCED WITH A PLOT SCALE ACCURACY OF 1:50

BUILDING SURVEY KEY :-

(1.23) – room height

f/b – floor boards

ø – pipe diameter
a/b – air brick
ab – alarm box
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bk – brick
conc – concrete
cr – cable riser
db – fuse box
dh – door height
dp – depth
e/mtr – electricity metre
elec – electricity
f/p – fire place
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fl – floor level
fs – floor to sill height
g/mtr – gas metre
gr – gas riser
hd – hand dryer
htr – heater
hwt – hot water tank
ic – inspection cover
il – invert level
mh – manhole cover
OSBM – ordnance survey bench mark
q/tiles – quarry tiles
rad – radiator
ri – roof light
rwp – rain water pipe
sfc – soil filled chamber
sh – floor to sill height
sp – arch springing point height
sp – soil pipe
sus.c – suspended ceiling
svp – soil vent pipe
T.rail – heated towel rail
TBM – temporary bench mark
tl – threshold level
toc – top of cap
top – top of pipe
tot – top of tank
u/s – underside height
UTL – unable to lift
vp – vent pipe
wf – water fountain
wfc – water filled chamber
wp – waste pipe

SERVICES KEY :-

- strip light
- light
- wall light
- EML – emergency light
- spot light
- pull cord
- V – vent/extractor
- switch
- SW – light switch
- LF – fused switch
- CS – isolator switch
- ISO – cooker switch
- C – fuse
- F – blank socket
- B – single socket
- double socket
- CR – ceiling socket/fuse/switch
- T – thermostat
- CA – card access point (swipe card)
- DR – emergency door release
- AK – alarm keypad
- IN – intercom
- ACP – alarm control panel
- SPK – speaker
- PROJ – projector
- CCTV – closed circuit tv
- sensor
- NC – network point
- TV – coaxial aerial
- S – smoke detector
- H – heat detector
- FA – fire alarm siren
- BG – fire brakeglass
- fire sprinkler
- fire blanket
- water fire extinguisher
- co2 fire extinguisher
- powder fire extinguisher
- fire extinguisher
- FAP – fire alarm control panel

NORTH POINT :-

SHEET LAYOUT :-

0 0.5 1 2 3 4 5

MIDLAND SURVEY LTD

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www.midlandsurvey.co.uk

Client	RANDELL DESIGN GROUP
Project	18 FAIRFIELD ROAD, BOSHAM, PO18 8JH
Title	ELEVATIONS
Date	SEPTEMBER 2023
Scale	1:50@A1
Dwg No	102646 – 7
Surveyor	M.G
Checked	L.G

Revisions

TOPOGRAPHICAL (LAND) SURVEYORS / UTILITY SURVEYORS
BUILDING MEASUREMENT SURVEYORS / 3D LASER SCANNING

Accredited Contractor

APPENDIX 2 – EA DATA

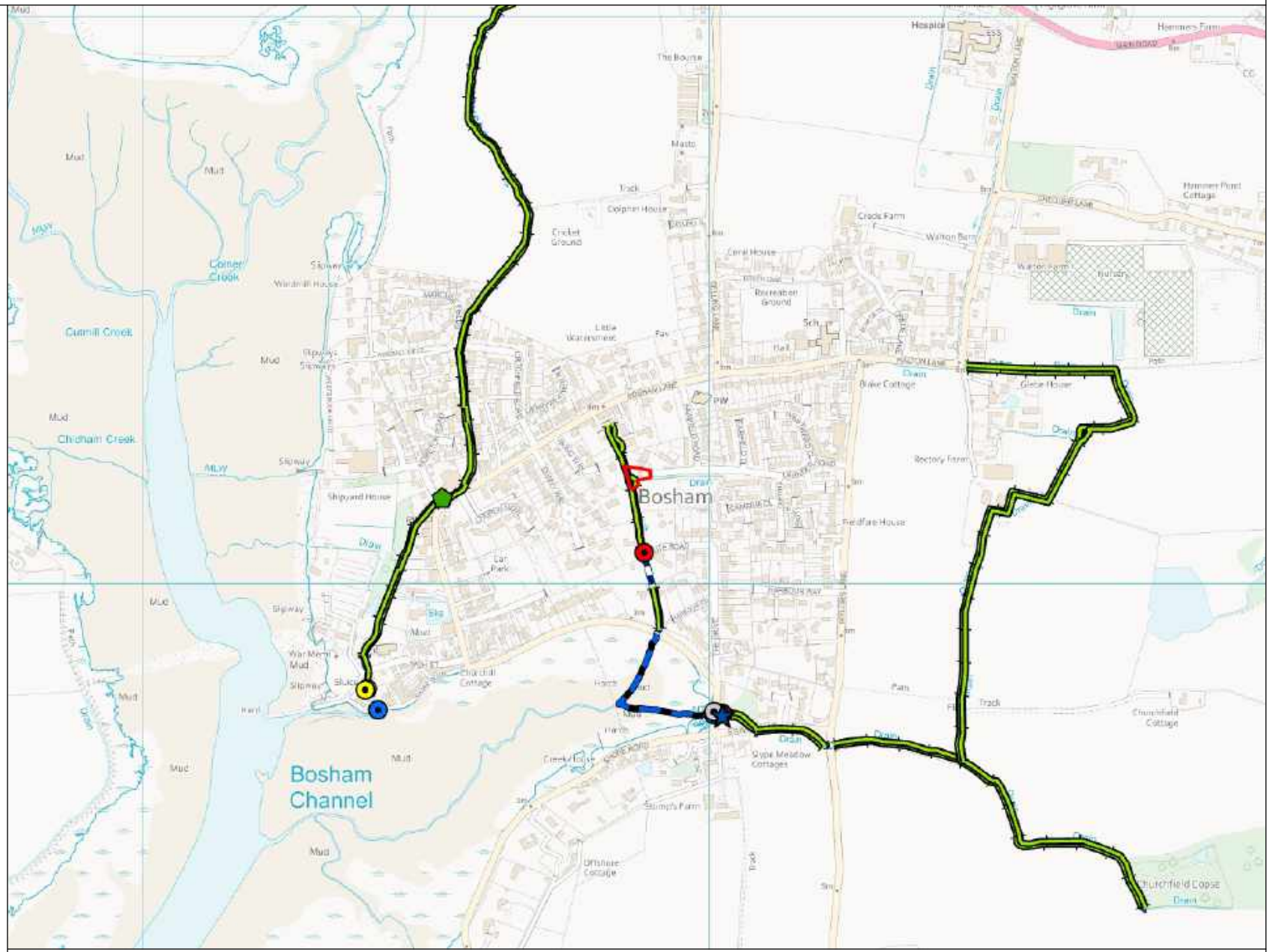
AIMS Flood Defences. Centred PO18 8JH. Created 11/01/2024.

Environment Agency

Legend

Please see page 2 for asset symbology

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



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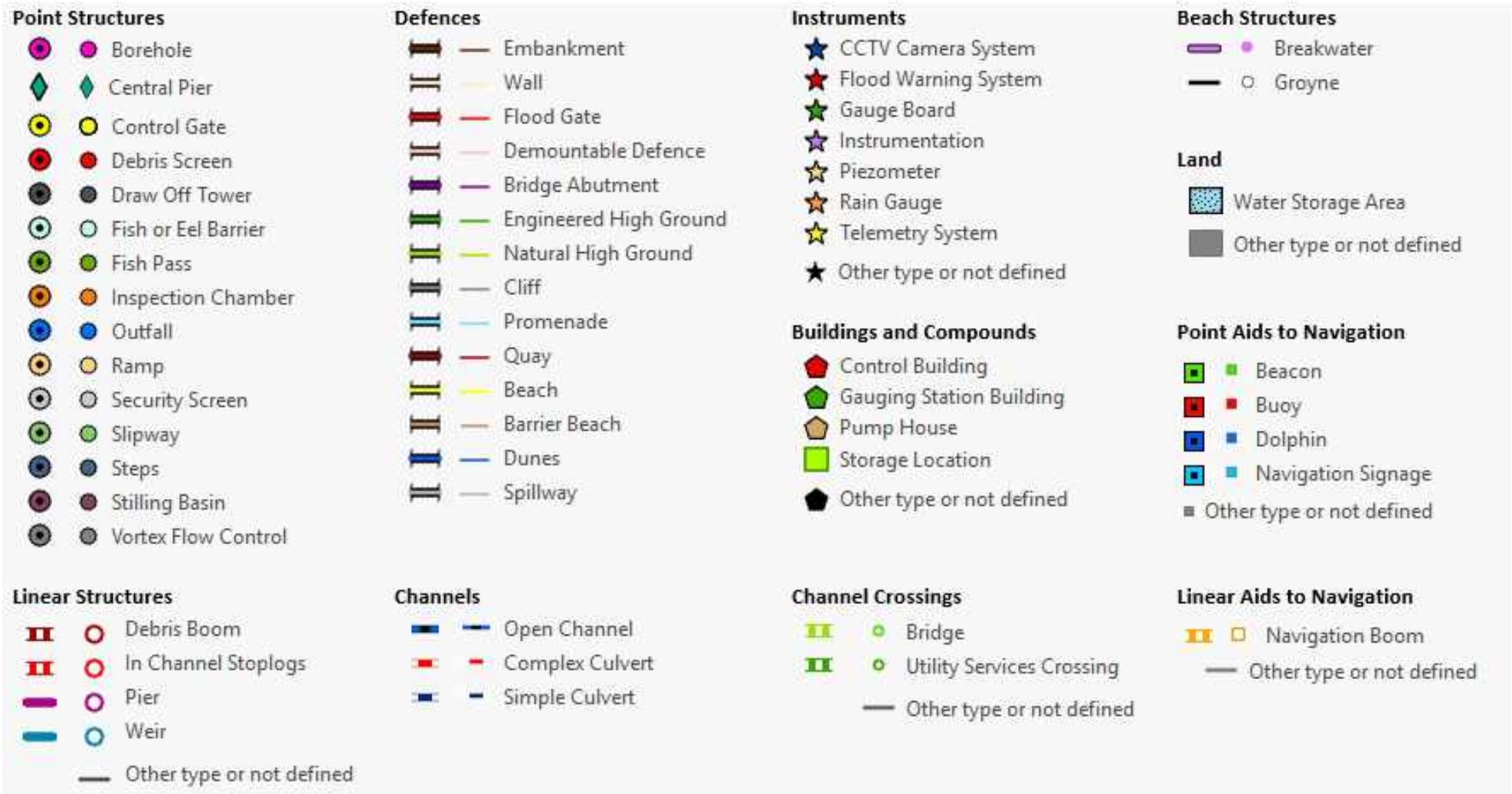
0 250

Metres

N W E S


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
Defences
Embankment
Wall
Flood Gate
Demountable Defence
Bridge Abutment
Engineered High Ground
Natural High Ground
Cliff
Promenade
Quay
Beach
Barrier Beach
Dunes
Spillway
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
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 Structures
Debris Boom
In Channel Stoplogs
Pier
Weir
Other type or not defined
Channels
Open Channel
Complex Culvert
Simple Culvert
Channel Crossings
Bridge
Utility Services Crossing
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: SSD339197
Date: 11/01/2024

Dear Ryan Hofman,

Enquiry Regarding Product 4 for Flood Risk Assessment for 18 Fairfield Road, Bosham, PO18 8JH.

Thank you for your enquiry which was received on 15 December 2023.

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 and 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 Fluvial modelling used was the Bosham Climate Change Allowance Update, completed by JBA Consulting in 2016. The Bosham Stream Model Improvements, completed by Hyder Consulting in 2012, were used for the basic Undefended Fluvial Modelling.

The Tidal modelling used was the Chichester District Council SFRA Coastal Modelling, which was completed by JBA Consulting in 2022.

Flood History
According to our records this site experienced flooding in December 1993 (Flood Event ID: 2001). The source of this flooding event was the Main River.

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, **Chichester District Council** for a more comprehensive flood history check.

FRA advisory text

Name	Product 4
Description	Detailed Flood Risk Assessment Map for **18 Fairfield Road, Bosham, PO18 8JH.**
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	*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.*
Attribution	Contains Environment Agency information © Environment Agency and/or database rights. Contains Ordnance Survey data © Crown copyright 2020 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,

Amy O'Donnell
Partnership and Strategic Overview West Sussex, Solent and South Downs
Environment Agency | Guildbourne House, Chatsworth Road, Worthing, West Sussex, BN11 1LD

Flood Map for Planning (Rivers and Sea). Centred PO18 8JH. Created 11/01/2024.

Environment Agency

1: 10,000

0 Metres 250

N W E S

Flood Map for Planning (Rivers & Sea)

- Defences
- Flood Storage Areas
- 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 occuring each year.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Flood map for planning

Your reference	Location (easting/northing)	Created
<Unspecified>	**480873/104187**	**15 Dec 2023 6:50**

Your selected location is in flood zone 3, an area with a high probability of flooding.

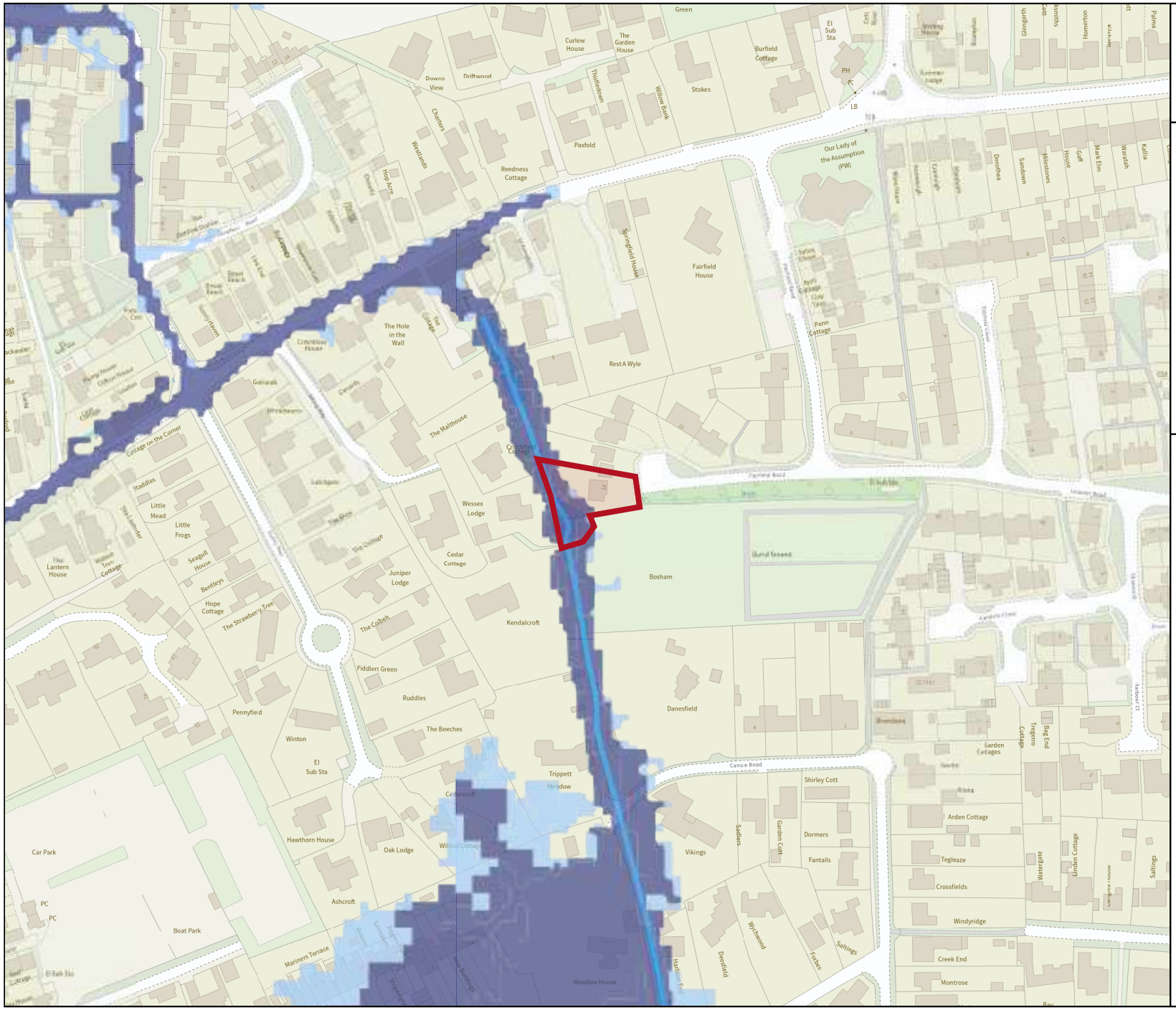
This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

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

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



Environment Agency

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
480873/104187

Scale
1:2500

Created
15 Dec 2023 6:50

- Selected area
- Flood zone 3
- 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.

FRA Site Boundary & Node Points. Centred PO18 8JH. Created 11/01/2024.

Environment Agency

N

Legend

- Site Nodes
- Site Boundary

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

Scale: 1:600

0 0.0125 0.025
Kilometers

Product 4 Flood Risk Data Requested by: CGS Civils

Site: 18 Fairfield Road, Bosham, PO18 8JH

Table 1: Water Levels: Fluvial Undefended

	NGR		Modelled Flood Levels in Metres AOD Undefended Annual Exceedance Probability		
Node Ref	Eastings	Northings	1% +CC (35%)	1% +CC (45%)	1% +CC (105%)
1	480854	104204	3.62	3.63	3.69
2	480893	104198	-	-	-
3	480877	104193	-	-	-
4	480894	104188	-	-	-
5	480862	104184	3.61	3.62	3.68
6	480868	104171	3.60	3.61	3.67

Table 2: Water Levels: Tidal Undefended

	NGR		Modelled Flood Levels in Metres AOD Undefended Annual Exceedance Probability		
Node Ref	Eastings	Northings	0.5%	0.5% (2121)*	0.1%
1	480854	104204	3.40	4.77	3.57
2	480893	104198	-	4.77	-
3	480877	104193	-	4.77	-
4	480894	104188	-	4.77	-
5	480862	104184	3.40	4.77	3.57
6	480868	104171	3.40	4.77	3.56

Table 3: Water Levels: Tidal Defended

	NGR		Modelled Flood Levels in Metres AOD Defended Annual Exceedance Probability		
Node Ref	Eastings	Northings	0.5%	0.5% (2121)*	0.1%
1	480854	104204	3.32	4.77	3.51
2	480893	104198	-	4.77	-
3	480877	104193	-	4.77	-
4	480894	104188	-	4.77	-
5	480862	104184	3.32	4.77	3.51
6	480868	104171	3.32	4.77	3.51

Table 4: Water Depths: Fluvial Undefended

	NGR		Modelled Flood Depths in Metres Undefended Annual Exceedance Probability		
Node Ref	Eastings	Northings	1% +CC (35%)	1% +CC (45%)	1% +CC (105%)
1	480854	104204	1.49	1.50	1.54
2	480893	104198	-	-	-
3	480877	104193	-	-	-
4	480894	104188	-	-	-
5	480862	104184	1.46	1.47	1.51
6	480868	104171	0.55	0.55	0.56

Table 5: Water Depths: Tidal Undefended

	NGR		Modelled Flood Depths in Metres Undefended Annual Exceedance Probability		
Node Ref	Eastings	Northings	0.5%	0.5% (2121)*	0.1%
1	480854	104204	0.20	1.62	0.37
2	480893	104198	-	0.54	-
3	480877	104193	-	0.68	-
4	480894	104188	-	0.72	-
5	480862	104184	0.12	1.57	0.31
6	480868	104171	0.07	1.43	0.20

Table 6: Water Depths: Tidal Defended

	NGR		Modelled Flood Depths in Metres Defended Annual Exceedance Probability		
Node Ref	Eastings	Northings	0.5%	0.5% (2121)*	0.1%
1	480854	104204	0.27	1.61	0.42
2	480893	104198	-	0.54	-
3	480877	104193	-	0.68	-
4	480894	104188	-	0.66	-
5	480862	104184	0.20	1.57	0.36
6	480868	104171	0.10	1.43	0.25

All levels taken from:
Tidal: Chichester District Council SFRA Coastal Modelling (2022) by JBA Consulting.
Fluvial: Bosham Climate Change Allowance Update (2016) by JBA Consulting.

Produced on: 11/01/2024

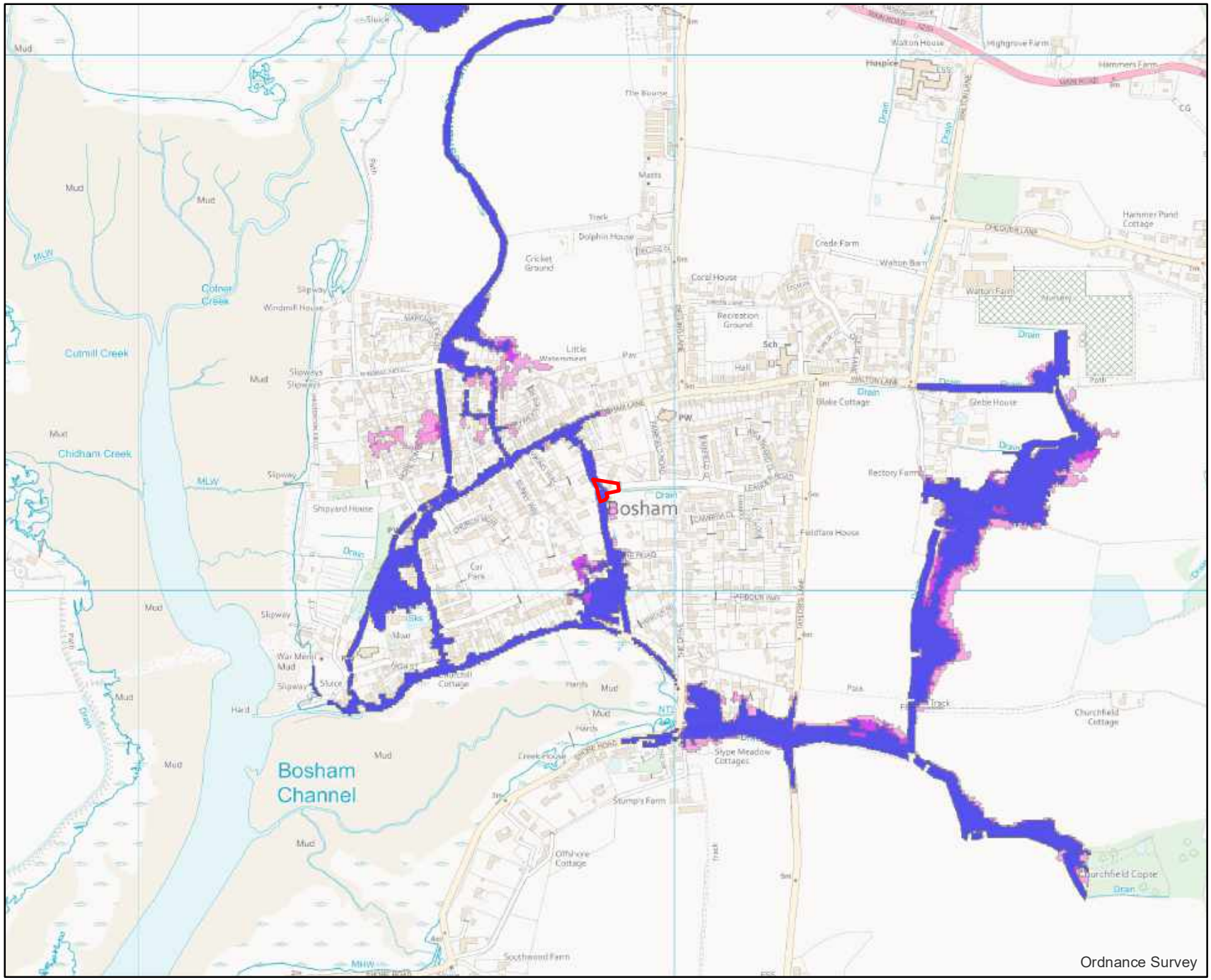
*** The flood risk data provided is based on existing EA hydraulic models with an allowance for climate change. Please note the climate change allowances provided are not up to date. These were updated on 27 July 2021.**

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.

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

Modelled Flood Outlines (Climate Change Undefended). Centred PO18 8JH. Created 11/01/2024.



Environment Agency

N

Legend

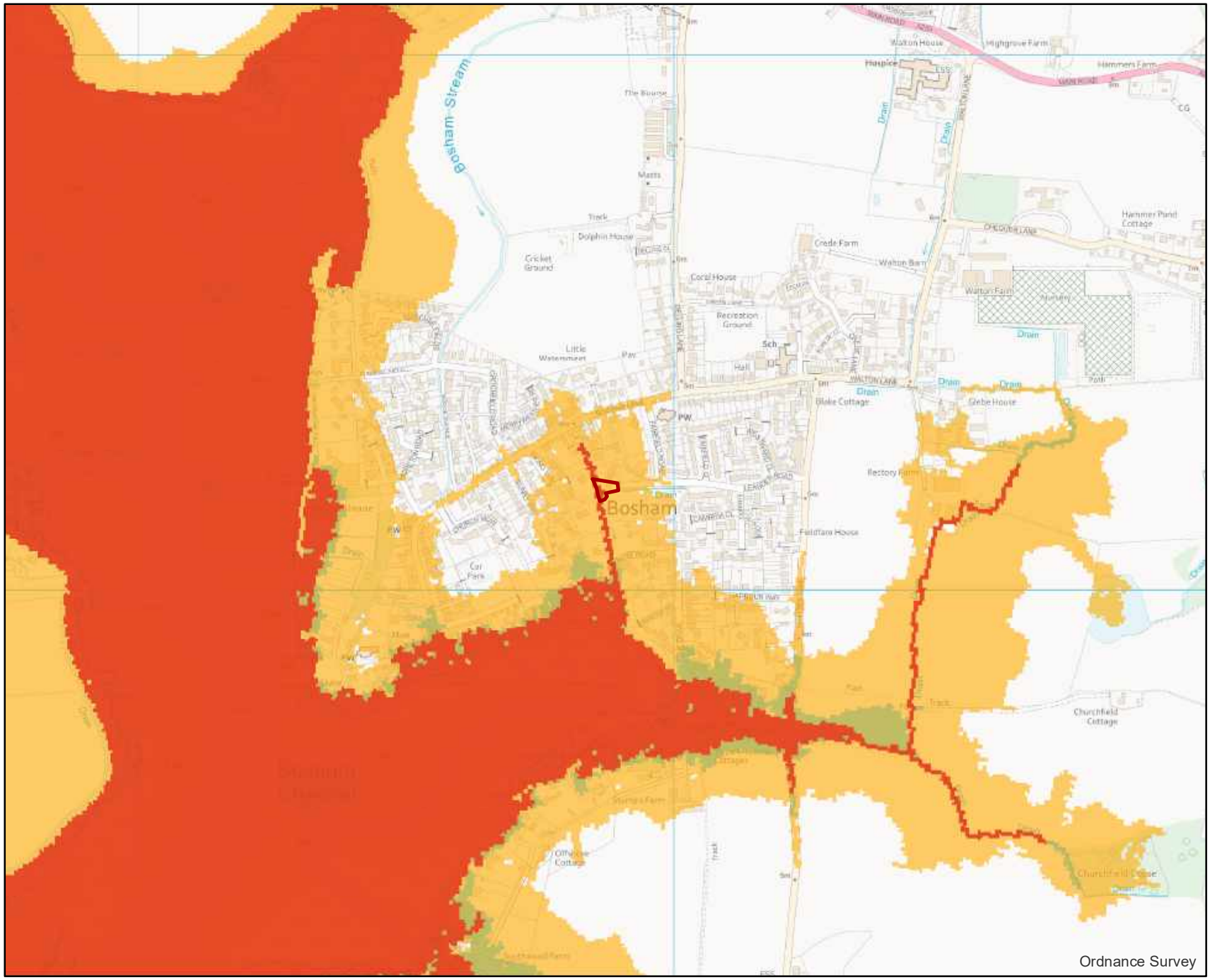
- Site Boundary
- 1% AEP +CC 35% Undefended Fluvial
- 1% AEP +CC 45% Undefended Fluvial
- 1% AEP +CC 105% Undefended Fluvial

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

Scale: 1:10,000

0 0.225 0.45
Kilometers

Modelled Flood Outlines (Defended Tidal). Centred PO18 8JH. Created 11/01/2024.



Environment Agency

N

Legend

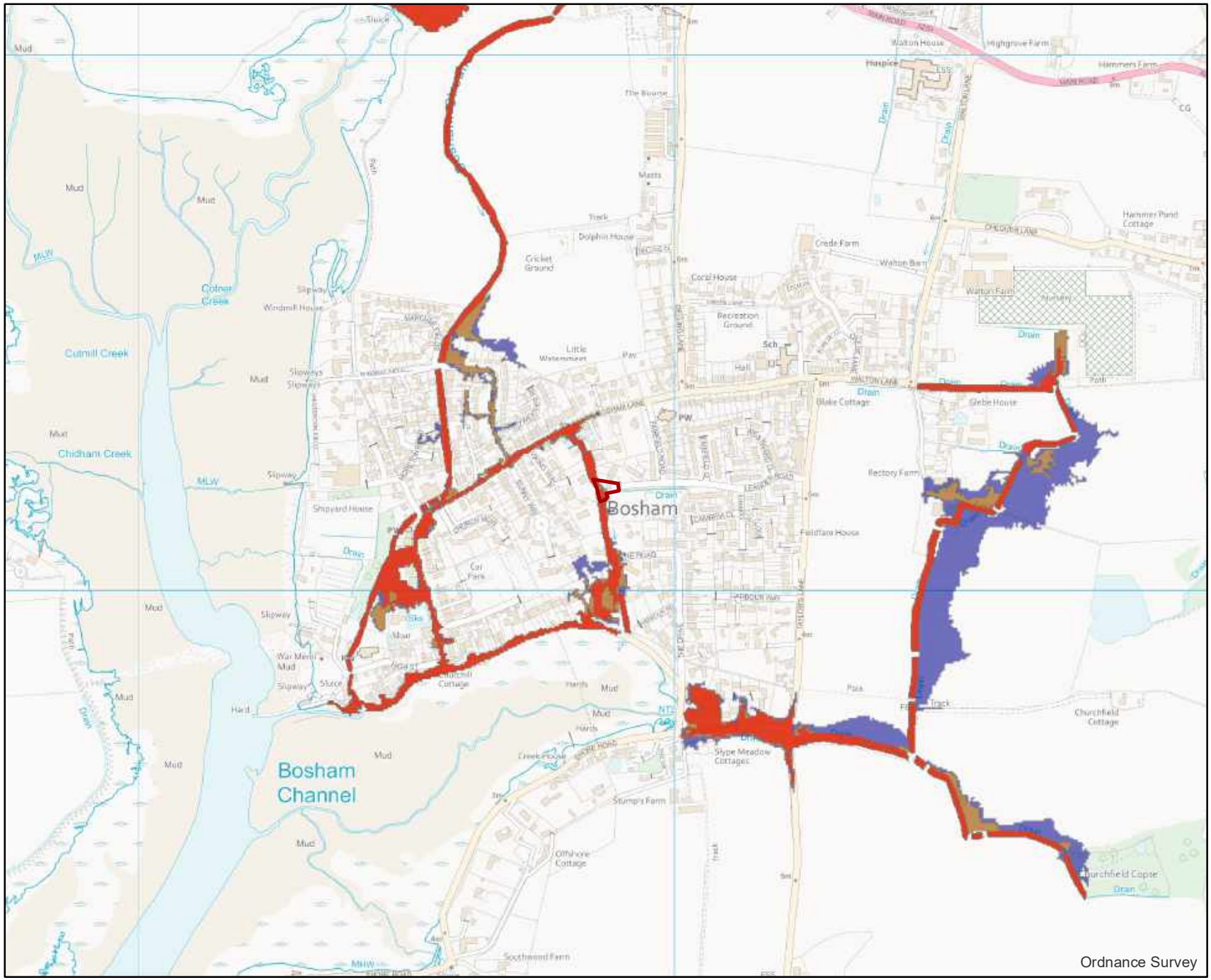
- Site Boundary
- 0.5% AEP (Defended Tidal)
- 0.5% AEP (2121) (Defended Tidal)
- 0.1% AEP (Defended Tidal)

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

Scale: 1:10,000

0 0.225 0.45
Kilometers

Modelled Flood Outlines (Undefended Fluvial). Centred PO18 8JH. Created 11/01/2024.



Environment Agency

N

Legend

- Site Boundary
- 5% AEP (Undefended Fluvial)
- 1% AEP (Undefended Fluvial)
- 0.1% AEP (Undefended Fluvial)

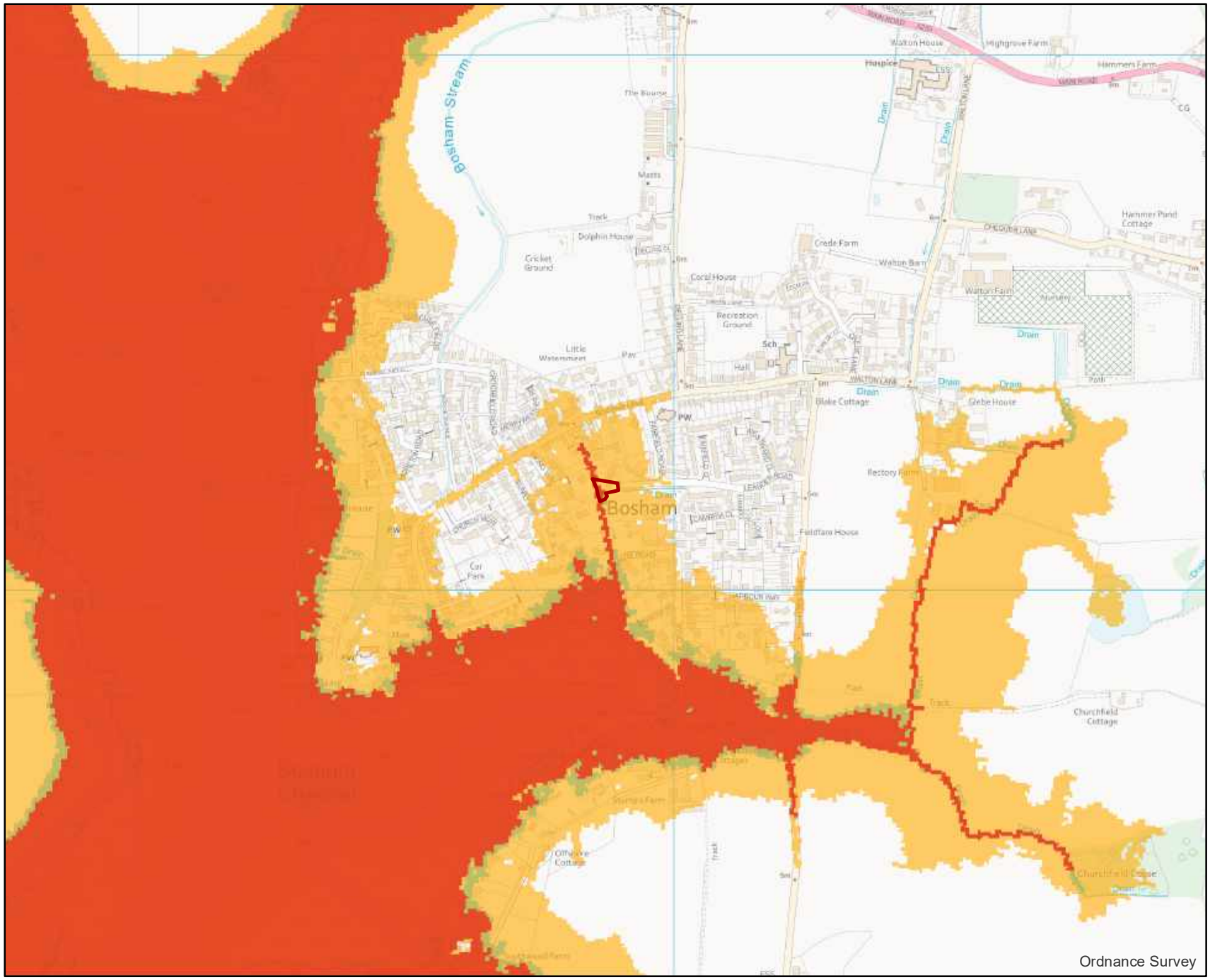
Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:10,000

0 0.225 0.45
Kilometers

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

Modelled Flood Outlines (Undefended Tidal). Centred PO18 8JH. Created 11/01/2024.



Environment Agency

N

Legend

- Site Boundary
- 0.5% AEP (Undefended Tidal)
- 0.5% AEP (2121) (Undefended Tidal)
- 0.1% AEP (Undefended Tidal)

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

Scale: 1:10,000

0 0.225 0.45
Kilometers

Recorded Flood Outlines. Centred PO18 8JH. Created 11/01/2024.

Environment Agency

Legend

All recorded flood outlines

1: 10,000

0 250

Metres

N W E S

Risk of flooding from Surface Water. Centred PO18 8JH. Created 11/01/2024.

Environment Agency

1: 10,000

0 Metres 250

N W E S

Likelihood of flooding from Surface Water

- High (>=3.3%)
- Medium (3.3% - 1%)
- Low (1% - 01%)
- Very Low
- Flood Extent 1 in 30
- Flood Extent 1 in 100
- Flood Extent 1 in 1000

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.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). E-mail: enquires@environment-agency.gov.uk

Solent & South Downs Area

Pre-application Advice Note

September 2019

This document sets out the environmental issues we will consider when providing our planning application consultation advice to Local Councils. It can be used by applicants, developers and consultants at the pre-planning stage.

Fluvial Flood Risk

Development must be safe and should not increase the risk of flooding.

You can view a site's flood zone on the Flood Map for Planning on our website: https://flood-map-for-planning.service.gov.uk

If your proposed development is located within flood zone 2 or 3 you should consult the Flood Risk and Coastal Change pages of the National Planning Policy Guidance (NPPG) http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/

Here you can determine whether the flood risk vulnerability of your proposed development and the flood zone are compatible. You can also establish if there are flood risk sequential test and exception test requirements for your proposed development. In the first instance we recommend the developer/applicant liaises with the Local Planning Authority (LPA) to undertake the Sequential Test in accordance with the National Planning Policy Framework (NPPF).

If your proposed development is located within flood zone 2 orf 3 and its vulnerability and flood zone are considered acceptable under the NPPG then a site specific Flood Risk Assessment (FRA) is required to support any subsequent planning application. This is required by paragraph 163 of the NPPF: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf

Guidance on the content of a site specific FRA can be found in the NPPG and online: https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications

More detailed flood risk modelling data is available to help you produce a FRA please contact our Customers and Engagement team at SSDenquiries@environment-agency.gov.uk.

Climate Change Allowances

On 19 February 2016, we published new guidance for planners and developers on how to use climate change allowances in a site-specific FRA: https://www.gov.uk/guidance/flood-risk-assessments-climatechange-allowances

Groundwater Quality

Development must not cause pollution to the water environment.

Source Protection Zones

We have defined Source Protection Zones (SPZs) for 2000 groundwater sources such as wells, boreholes and springs used across the country for public drinking water supply. These zones are more sensitive to contamination from activities that might cause pollution in the area. The closer the activity, the greater the risk.

SPZ1s are the areas designated as most at risk from contamination and development activities and in these areas we may consider it inappropriate for development to discharge foul or surface water into the ground.

To see if your proposed development is located within a Source Protection Zone, please use our online map: https://magic.defra.gov.uk/

Contaminated Land

The NPPF takes a precautionary approach to land contamination. Before the principle of development can be determined, land contamination should be investigated to see whether it could preclude certain development due to environmental risk or cost of remediation. Where contamination is known or suspected, a desk study, site investigation, remediation and other works may be required to enable safe development.

Pollution

If the proposed development use has the potential to pollute ground or surface water receptors then an assessment to establish whether the risk of pollution is acceptable or can be mitigated will be required within any planning application.

Foul Drainage

When drawing up wastewater treatment proposals for any development, the first presumption is to provide a system of foul drainage discharging into a public sewer to be treated at a public sewage treatment works (those provided and operated by the water and sewerage companies). This should be done in consultation with the sewerage company of the area prior to the submission of a formal planning application.

If connection to a public sewage treatment plant is not feasible, a package sewage treatment plant may be considered. If you would like further advice please call 03708 506 506.

Cemeteries

The development of new cemeteries in areas where groundwater vulnerability is high should be avoided, except where the thickness and nature of the unsaturated zone, or the impermeable formations beneath the site, protect groundwater; or where the long-term risk is mitigated by appropriate engineering methods.

Main Rivers

Ecology

In accordance with the National Planning Policy Framework (NPPF), any development proposal should avoid significant harm to biodiversity and seek to protect and enhance it. Opportunities to incorporate biodiversity in and around the development will be encouraged.

Your scheme should be designed with a naturalised buffer zone of at least 8 metres from the main river to protect and enhance the conservation value of the watercourse and ensure access for flood defence maintenance.

This buffer zone should be managed for the benefit of biodiversity for example by the planting of locally appropriate, UK native species. The buffer zone should be undisturbed by development with no fencing, footpaths or other structures. This buffer zone will help provide more space for flood waters, provide improved habitat for local biodiversity and allows access for any maintenance requirements.

To identify any Main Rivers in proximity to your proposed development please see our Main Rivers Consultation Map: http://apps.environment-agency.gov.uk/wiyby/151293.aspx

Culverting

The Environment Agency is likely to oppose culverting as it is damaging to the ecological integrity of the river channel and its corridor and acts as a barrier to the movement of wildlife, including fish and may also increase flood risk. If the proposal will impact an existing culvert the Environment Agency may oppose planning consent for development either over, or within 8 metres of an existing culvert. Wherever possible, existing culverts should be removed and the river channel and bankside habitat reinstated to restore the ecological continuity of the river channel and its corridor.

Water Framework Directive (WFD)

Any marine works below MHWS require an assessment of possible impacts on Water Framework Directive (WFD) . The assessment should include all elements of the works that fall within, or have the potential to affect, a WFD water body and any of the protected areas therein (including Bathing Waters and Shellfish Waters).

The WFD assessment should follow the 'Clearing the Waters for All' guidance available at https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters

Where appropriate, a WFD Assessment should assess any potential impacts and demonstrate that the required enhancements will be delivered. In some cases the requirements of a WFD assessment can be incorporated into an Environmental Impact Assessment (EIA). Any development that has the potential to cause deterioration in classification under WFD or that precludes the recommended actions from being delivered in the future is likely to be considered unacceptable to us.

Permits & Consents

Environmental Permitting Regulations

To see if your proposed development requires an Environmental Permit under the Environment Permitting Regulations please refer to our website: https://www.gov.uk/guidance/check-if-you-need-an-environmental-permit

From 6 April 2016 an Environmental Permit is required for any proposed works or structures, in, under, over or within 8 metres of the top of the bank of designated Main River, and within 16 metres of a tidal defence.

Ordinary Watercourse Consent

The prior written consent of the relevant Lead Local Flood Authority is required for the erection of any flow control structures, culverting or diversion of ordinary watercourses, including streams, land drains and ditches.

Marine Licence

A marine licence may be required for any activities at the mean high water spring tide up to the territorial limit.This also includes the waters of every estuary, river or channel where the tide flows at mean high water spring tide.

Any development must demonstrate how adverse impacts on migratory fish, bathing waters, shellfish waters, designated sites, protected and priority species and habitats will be avoided, minimised, mitigated and if necessary compensated for. Works within or affecting a Water Framework Directive (WFD) waterbody will need to demonstrate that compliance with WFD objectives will be achieved. 'Clearing the Waters for All' provides guidance on how the impacts on WFD should be addressed, and should be used when preparing an assessment, including the screening and scoping of activities. https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters

Further pre-application options

The information provided above details generic information which may or may not be applicable to your development. We are able to provide more detailed and bespoke advice and answer technical questions for a charged fee of £100 per person per hour +VAT.

If you are interested in finding out more about this service, please email:

planningssd@environment-agency.gov.uk

We can explain this service and provide you with a bespoke quote for further pre-application advice that you may require please see .gov - https://www.gov.uk/government/publications/pre- planning-application-enquiry-form-preliminary-opinion

Please note

Please note that the view expressed in this letter by the Environment Agency is in response to the enquiry only and does not represent our final view in relation to any future planning application made in relation to this site.

We reserve the right to change our position in relation to any such application.

As part of this preliminary response we have not technically reviewed any documents. This opinion is based on the information submitted and current planning policy and guidance.

If you have any questions please contact the Solent & South Downs Sustainable Places team:

planningssd@environment-agency.gov.uk

To make a request for data

Please submit your request for data to ssdenquiries@environment-agency.gov.uk. You should get the information within 20 working days. We will tell you when to expect the information if we need more time.

There are many datasets available online at www.data.gov.uk including flood maps, historic landfill, waste exemptions, consented discharges to controlled waters, and much more.