



Cypress Farm

Flood Risk Assessment

- Householder development - Extension

Job Number: 1310.1

Date	Version	Notes/Amendments
March 2023	1	Issued for Information

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Acronyms	
AOD	Above Ordnance Datum
CIRIA	Construction Industry Research and Information Association
EA	Environment Agency
FRA	Flood Risk Assessment
NPPF	National Planning Policy Framework
PPG	Planning Practice Guidance

Introduction

Flume Consulting Engineers have been appointed to undertake a Flood Risk Assessment (FRA) for the proposed development at Cypress Farm, Wick Lane, Wick St Lawrence, Weston-super-Mare, BS22 7YR.

This FRA has been carried out in accordance with the National Planning Policy Framework (NPPF) and the Planning Practice Guidance 'Flood Risk and Coastal Change'. This FRA also incorporates advice and guidance from the Environment Agency (EA), the Strategic Flood Risk Assessment (SFRA) produced by North Somerset Council¹ and CIRIA documents.

The EA's indicative floodplain map shows that the site is located in Flood Zone 3, in an area which benefits from flood defences. Our assessment will therefore focus on the flood risk to the site from watercourses from a breach in defences or from overtopping.

¹ <https://www.n-somerset.gov.uk/my-services/planning-building-control/planning-advice/supporting-documents/assessments/flood-risk-assessment>

Site Description and Location

The application site comprises a two storey dwelling on an existing residential plot. The adjacent land is used as a touring caravan site for 15 caravans. On the northern boundary, the site abuts Cypress Farm. Pedestrian and Vehicular access is from the east of the site.

The site postcode is BS22 7YR and the OS grid reference is ST 36474 65333.

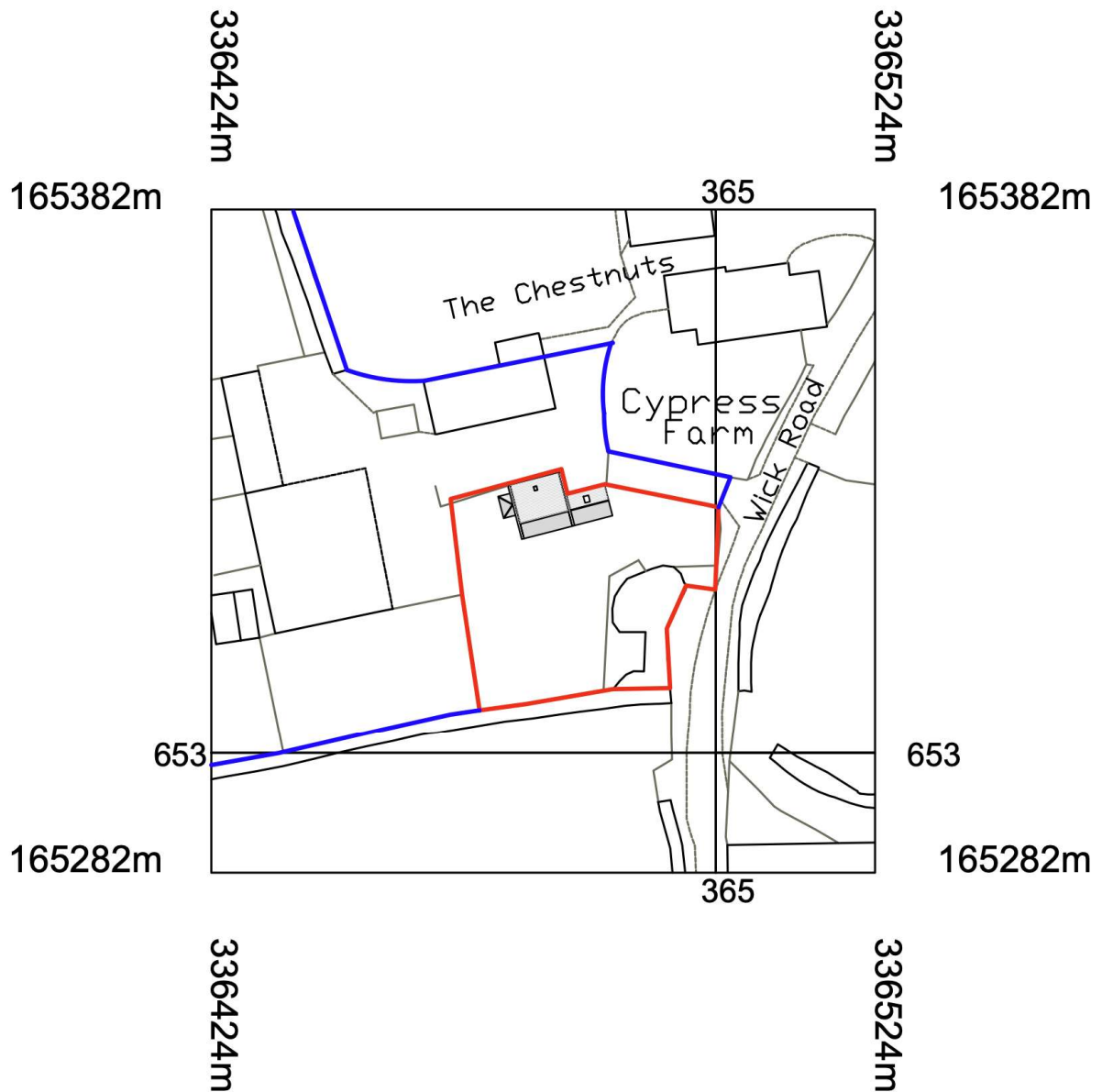


FIGURE 1. SITE LOCATION

Development Proposal

The development proposals include the side extensions to the main dwelling (Figure 2).

The proposed development will be accessed via Wick Road. Pedestrian access will be maintained and remain unchanged from the existing case.

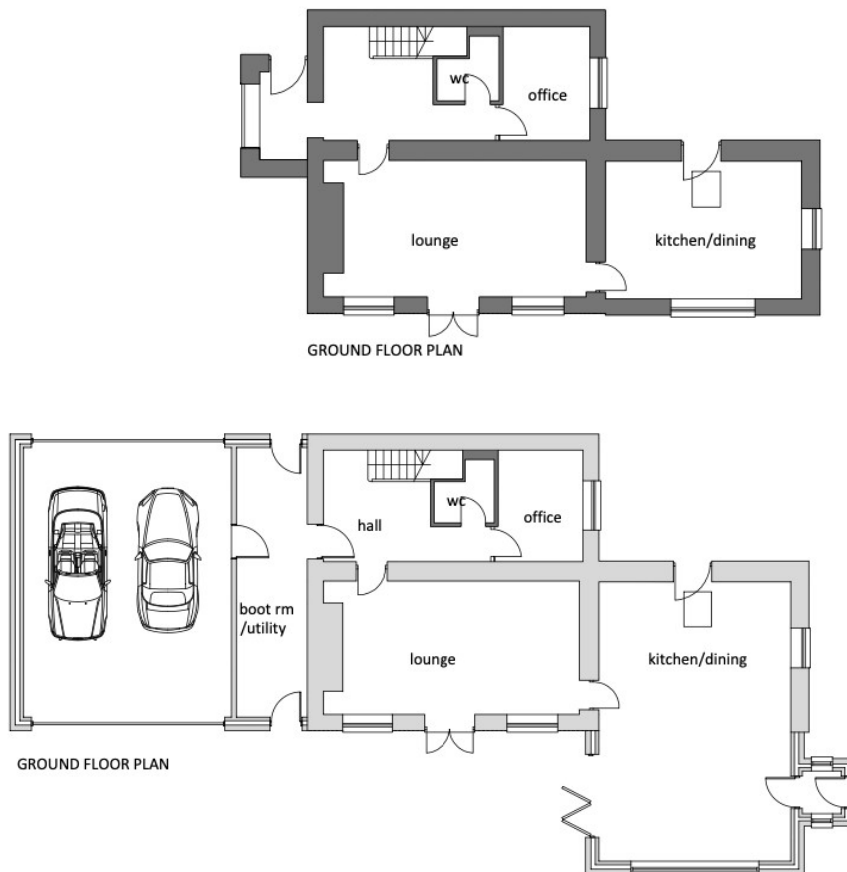


FIGURE 2. EXISTING AND PROPOSED PLANS

Flood Risk Assessment

The National Planning Policy Framework states that minor developments such as extensions, are unlikely to raise significant flood risk issues. The NPPF refers applications to the EA's 'Standing Advice' for further guidance.

Flood Risk from Watercourses

The EA's indicative floodplain map shows that the site is located in a defended region of Flood Zone 3 and is at risk of flooding from the sea, and as such the Local Planning Authority has requested a site specific Flood Risk Assessment be carried out. Land in this flood zone is assessed as having annual probability of river flooding greater than 1%. The EA's indicative fluvial/tidal flood risk maps, Figure 3, suggest that the site is located in an area which benefits from flood defences. Furthermore, the EA's website notes that not all flood defences are shown on these maps.

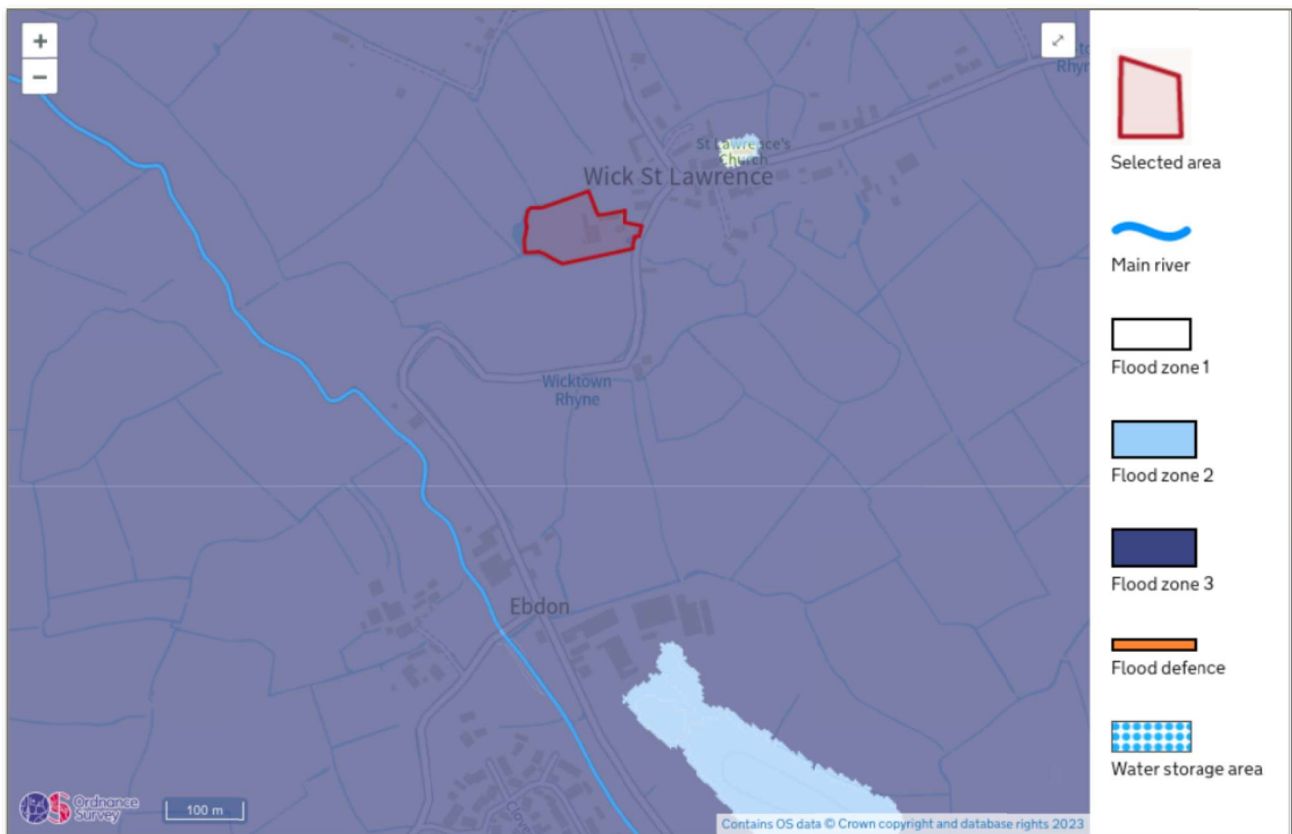


FIGURE 3. ENVIRONMENT AGENCY FLOOD RISK FROM RIVERS OR SEA MAP (GOV.UK, 2023)

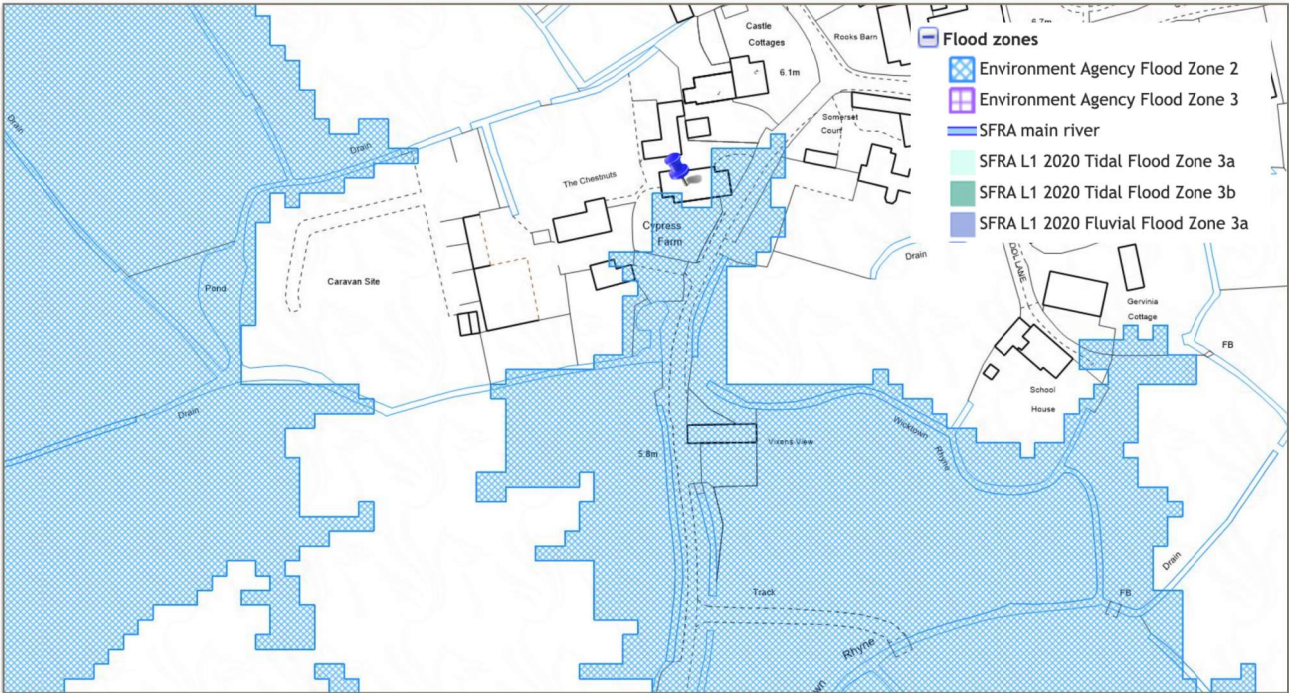


FIGURE 4. EA FLOOD ZONE 2 EXTENTS (MAP.N-SOMERSET.GOV.UK)

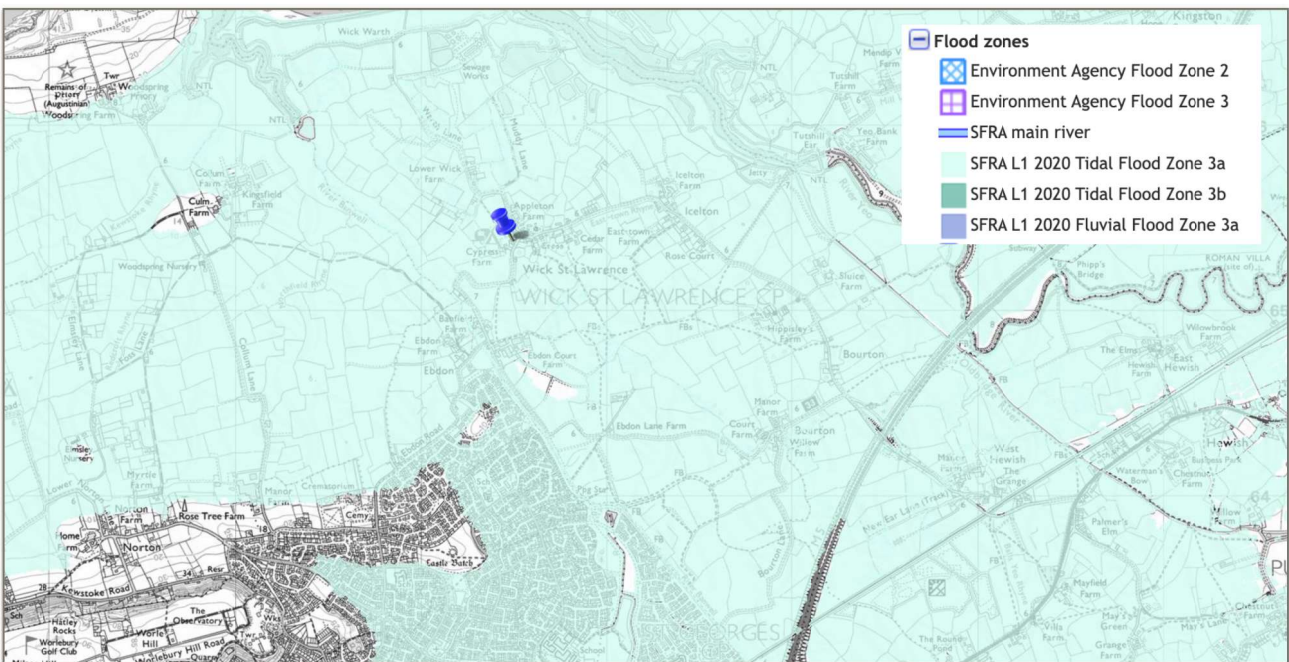


FIGURE 5. SFRA L1 2020 TIDAL FLOOD ZONE 3A EXTENTS (MAP.N-SOMERSET.GOV.UK)

Although the site is not subject to Fluvial flooding (the subject building resides just outside of the extents), Tidal flood risk is extensive (Figure 5). However, at present the North Somerset is defended against predicted events up to and including the 0.1% Annual Exceedance Probability (AEP) tide level.

Flume requested the latest Product 4 flood level information from the EA to incorporate these into this FRA. The EA provided these levels and associated flood maps, which are summarised below:

Coastal/tidal flood levels and depths

The tables below show the maximum modelled tidal flood levels and depths for defended (actual situation) and undefended (natural floodplain) scenarios taken from our 2020 Woodspring Bay modelling. The annual exceedance probability (AEP) is given. For the undefended scenarios the 0.5% (1 in 200 year return period) and 0.1% (1 in 1000 year return period) annual exceedance probability (AEP) is given.

Defended		
<u>AEP</u>	<u>Maximum depth (metres)</u>	<u>Maximum level (mAOD)</u>
0.1%	0.00	0.00
0.5%	0.00	0.00
0.5% with 2068 CC	0.00	0.00
0.5% with 2118 CC	2.66	7.68

NB 0.00 (m or mAOD) indicates the data does not reach the site.

Undefended		
<u>AEP</u>	<u>Maximum depth (metres)</u>	<u>Maximum level (mAOD)</u>
0.5%	2.98	7.98
0.1%	3.42	8.42

Because the development benefits from flood defences up to the 0.5% AEP including the 2068 climate change allowance, a review on the impact of breach or overtopping is required as part of this assessment. The EA and local government are committed to upgrading the UK flood defences to ensure that they are upgraded in line with the new climate projections as part of the Flood and Coastal Erosion Risk Management (FCERM) Capital Schemes.

Sequential and Exception Test

The Sequential Test

In accordance with the NPPF, before planning permission can be granted the risk-based Sequential Test should be applied and accepted. This needs to be done for those developments in Zone 2 or 3, and for all but *minor* developments². The Planning Practice Guidance (PPG) “Flood Risk & Coastal Change” states that *“The Sequential Test does not need to be applied for individual developments on sites which have been allocated in development plans through the Sequential Test, or for applications for minor development or change of use”*.

The Exception Test

PPG goes on further to say *“the Exception Test does not need to be applied to minor developments and changes of use”*.

As this development constitutes a minor development (partial extension) and change of use, the Sequential and Exception Tests do not need to be applied to this development.

² National Planning Policy Framework (para.164) and associated Technical Guidance (para.10)

Flood Risk from Groundwater

A ground investigation report was not available at the time of writing this report. The British Geological Survey (BGS) Map shows that superficial deposits of Tidal Flat Deposits - Clay, Silt And Sand, underlay the site. Mercia Mudstone Group - Mudstone And Halite-stone, forms the bedrock geology.

The SFRA's 'Areas Susceptible to Groundwater Flooding' map (Figure 6) indicates that *“no risk is anticipated at present”* regarding groundwater flooding to the site or the surrounding area.

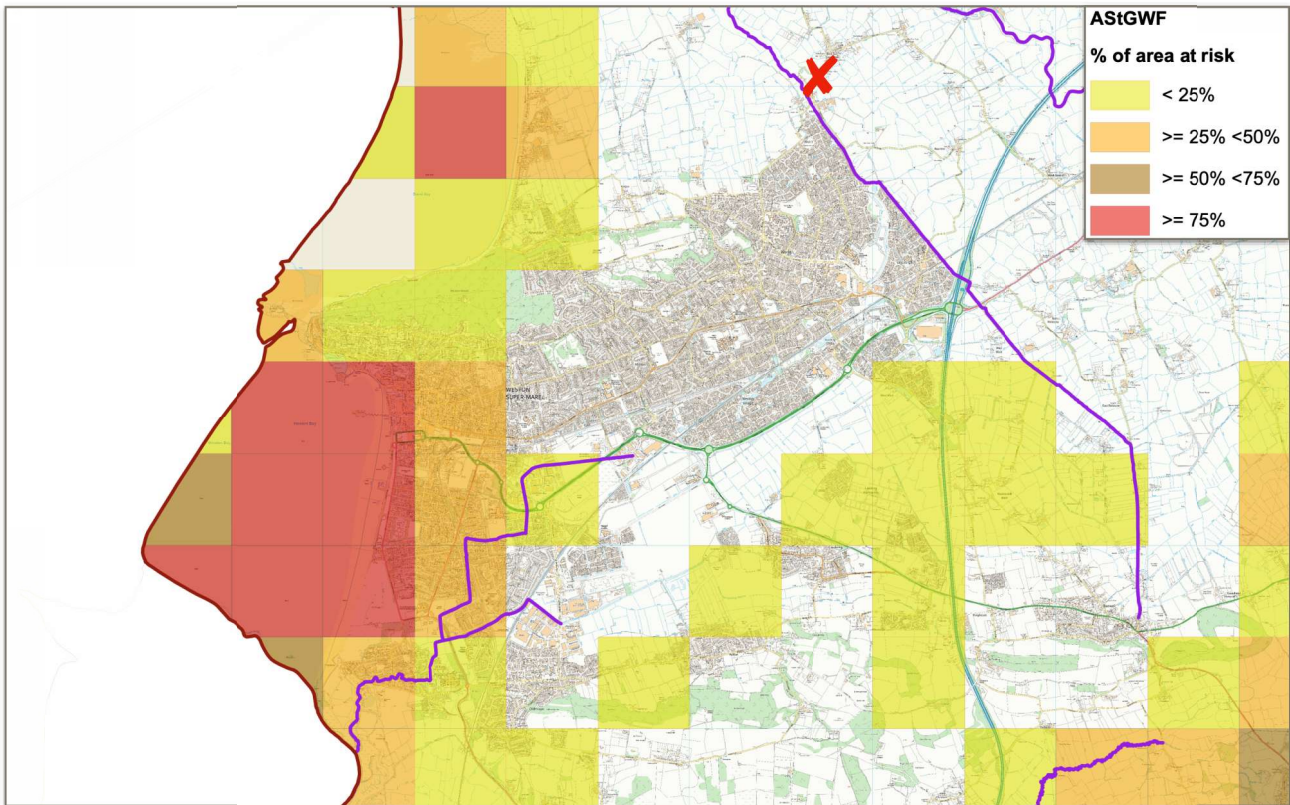


FIGURE 6. SFRA'S AREAS SUSCEPTIBLE TO GROUNDWATER FLOODING MAP

Any adjustment in external proposed levels will be designed to ensure surface water is directed away from building thresholds, should groundwater migrate to surface level. Therefore, the likelihood of groundwater flooding is considered to be low risk. Therefore, the likelihood of groundwater flooding is considered to be low risk.

Flood Risk from Surface Water and Overland Flows

Surface water flooding occurs when intense rainfall is unable to infiltrate into the ground or overwhelms the drainage system. This surface water runs across the surface of the ground causing flooding. Overland flows can also be generated by burst water mains, failed dams and any failure in a system storing or transferring water.

The EA's indicative Surface Water Flooding Map, Figure 7, shows that the site is at *very low* risk of surface water flooding.

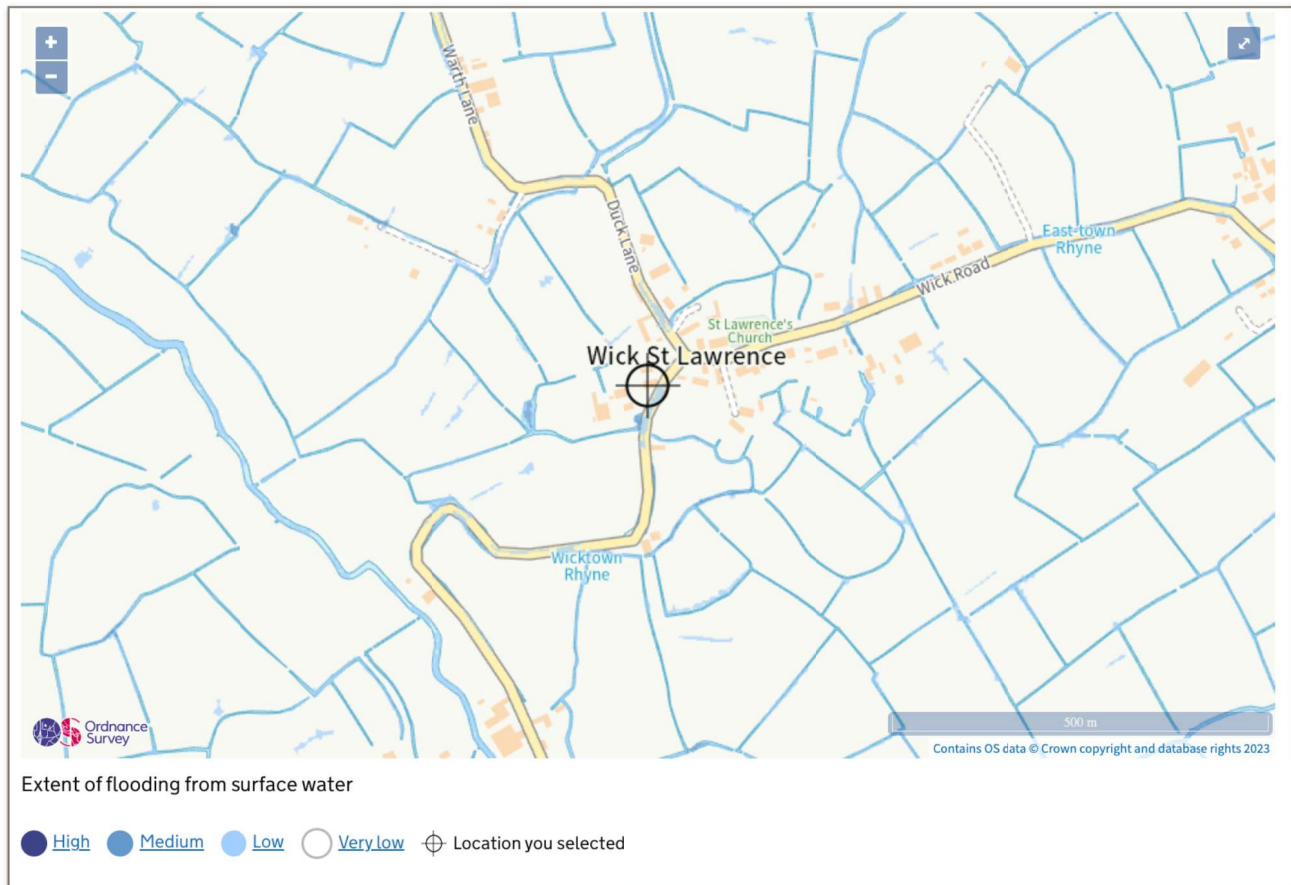


FIGURE 7. ENVIRONMENT AGENCY FLOOD RISK FROM SURFACE WATER MAP (GOV.UK, 2023)

Very Low risk means that each year this area has a chance of flooding less than 0.1% Annual Exceedance Period (AEP). The map also shows that only the areas outside the proposed site area are at risk of flooding in the 1 in 100-year (1%) storm event. Furthermore, ground levels on site will be encouraged to fall away from the building thresholds and positively drained.

Therefore, the likelihood of surface water flooding is considered to be low risk.

Flood Risk from Reservoir Failure

The EA's information states that reservoir flooding is extremely unlikely to happen and there has been no loss of life in the UK from reservoir flooding since 1925. The Reservoir Act of 1975 ensures that reservoirs are inspected regularly and essential safety work is carried out.

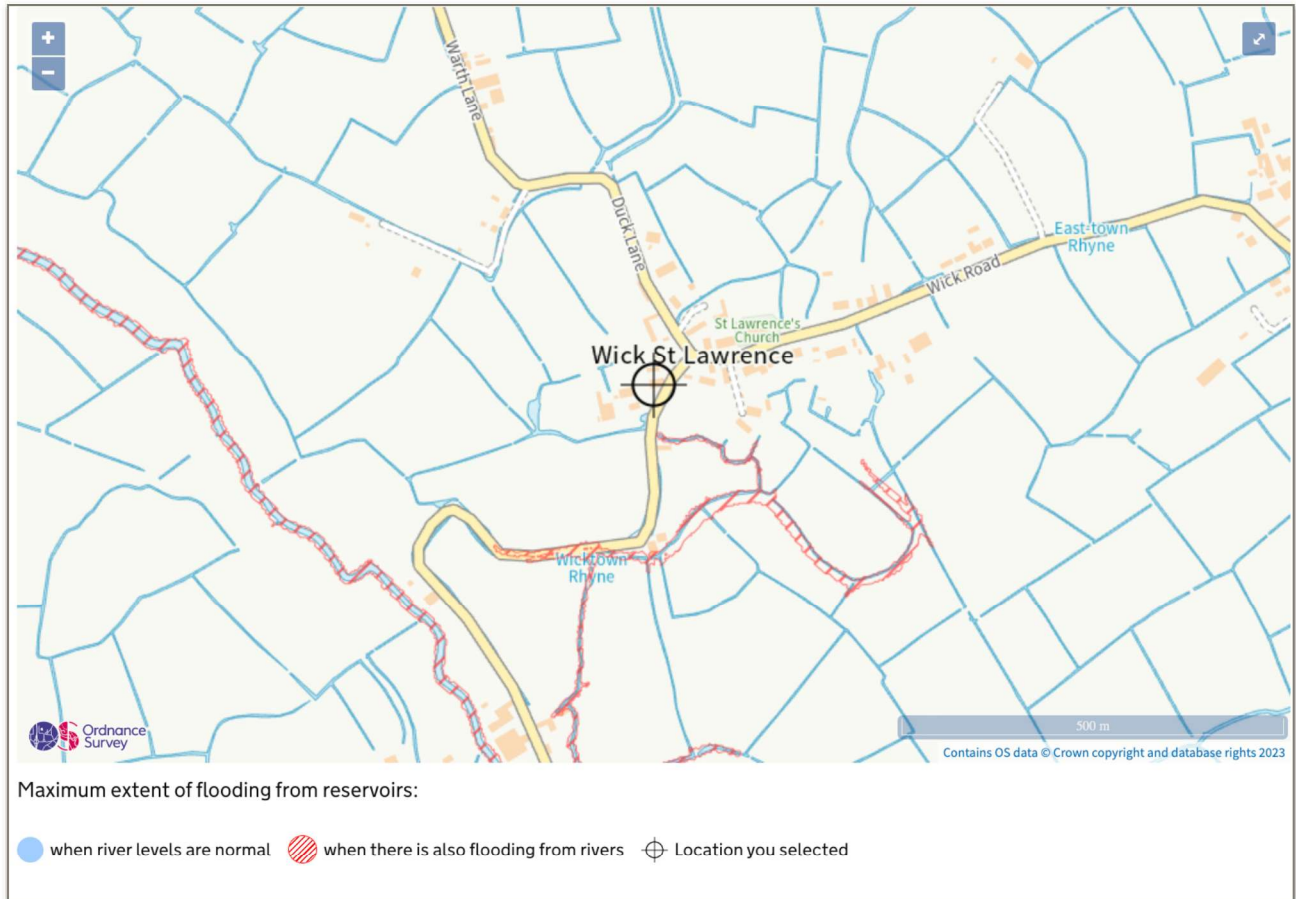


FIGURE 8. ENVIRONMENT AGENCY FLOOD RISK FROM RESERVOIRS MAP (GOV.UK, 2023)

Figure 8 shows that there is no flood risk associated with Reservoir Failure for the proposed site.

Flood Risk from Infrastructure Failure

Although the development benefits from flood defences in the area, the flood defences reduce but do not eliminate the flood risk, as the risk of a breach or overtopping remains. With any man-made structure there is a possibility of failure, and that flood water will inundate the site. Therefore, a residual risk will remain.

History of Flooding

The EA's flood maps indicates that the site is not subject to inundation as a result of a breach in defences (Figure 9).

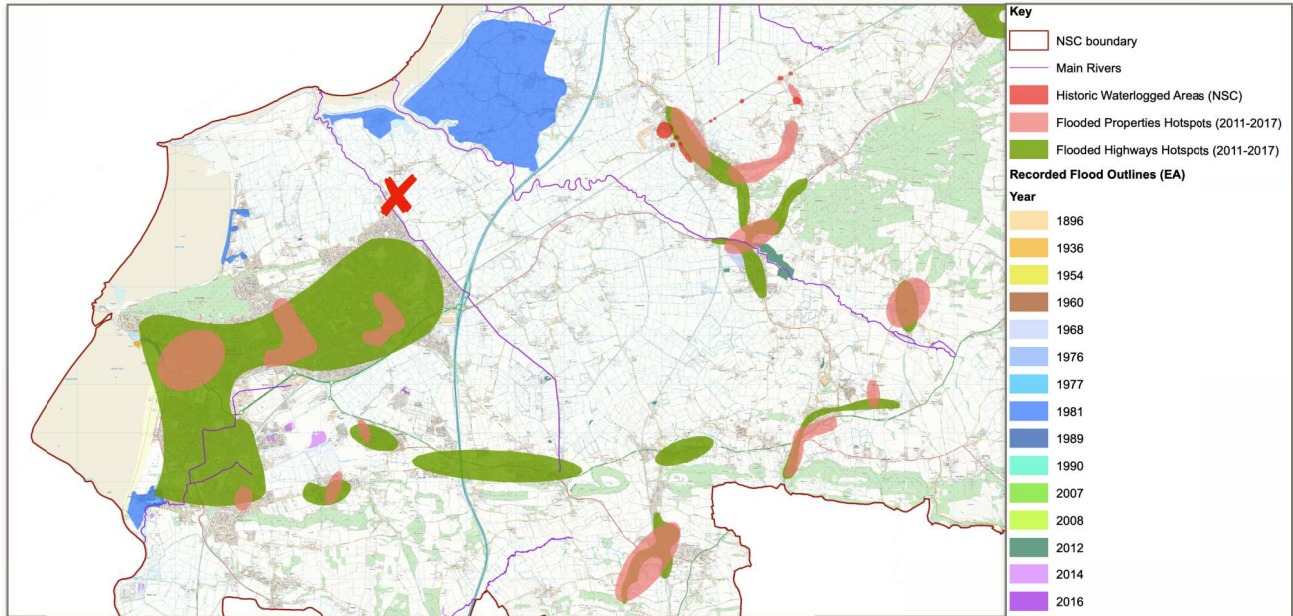


FIGURE 9. HISTORIC FLOOD INFORMATION DTM (SFRA, 2020)

Overtopping (including allowance for climate change)

Despite defences, mapping presented in the latest EA Product 4 flood information suggests that sea level rise resulting from climate change, would result in overtopping of these defences. A 1 in 200, 0.5% AEP flood including climate change for the developments potential 100 year design life, should therefore be assessed.

Defended		
<i>AEP</i>	<i>Maximum depth (metres)</i>	<i>Maximum level (mAOD)</i>
0.1%	0.00	0.00
0.5%	0.00	0.00
0.5% with 2068 CC	0.00	0.00
0.5% with 2118 CC	2.66	7.68

A 1 in 200 (0.5%) tidal event plus climate change to 2118, indicated above, illustrates flood depths from 2.66m deep. Low laying areas being the areas subject to increased flood depths.

According to PPG, the design flood event “is a flood event of a given annual flood probability, which is generally taken as:

- I. fluvial (river) flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year), or;
 - II. tidal flooding with a 0.5% annual probability (1 in 200 chance each year),
- against which the suitability of a proposed development is assessed and mitigation measures, if any, are designed.”

The development is protected from flooding for the design flood event (1 in 200 year return period). However, the implications of the climate change allowances (assuming no future raising of defences are carried out) should also be considered. Flume have utilised the latest LiDAR datasets to accurately assess the approximate FFLs of the building, to compare with the flood levels on site, and to propose the design finished floor level.



FIGURE 10. LIDAR DATASETS DTM (DEFRA, 2022)

Reviewing the LiDAR level information against the flood depths (Figure 10), for the proposed site indicates the possible range of ground levels in this area are approximately 6.00m AOD. However, this does not appear to correspond with the expected flood depths within the proposed development (2.66m according to the EA’s information). Considering the worst-case flood event (0.5% AEP 2118 CC), the flood level within the proposed development is estimated to be 7.68m AOD, and therefore, it should be achievable to set ground floor FFLs at a minimum of 6.387m AOD (as outlined in the Flood Mitigation Chapter); flood depths in the 0.5% with 2118 CC return period are not expected to be as deep as shown in the EA’s information. It should be stated that the existing building is currently a residential building (More Vulnerable). The proposals are to change this use, but this will not impact the vulnerability classification for the development.

Sewer Flooding

The latest SFRA released in 2020 does not provide data in relation to sewer flooding. However, Wessex Water was able to provide information regarding sewer flooding events over the past ten years (2006-2016) on a broad scale showing only 1 instance of external flooding within the postcode - Figure 11. The information was provided on postal area basis; no specific information was provided as Wessex Water consider that providing customer's addresses is not in accordance with data protection requirements.

Postcode	Internal Flooding	External Flooding	Total
BS20 0	-	11	11
BS20 6	2	4	6
BS20 7	1	-	1
BS20 8	-	4	4
BS21 6	1	6	7
BS21 7	1	1	2
BS22 6	3	8	11
BS22 7	-	1	1
BS22 8	4	15	19
BS22 9	-	11	11
BS23 2	-	3	3
BS23 4	1	-	1
BS24 0	5	5	10
BS24 6	9	-	9
BS24 7	-	17	17
BS24 8	5	14	19
BS24 9	4	1	5
BS25 1	3	9	12
BS25 5	-	3	3
BS29 6	-	2	2
BS40 5	15	44	59
BS40 8	-	1	1
BS41 8	2	-	2
BS41 9	1	1	2
BS48 1	-	2	2
BS48 2	3	9	12
BS48 3	1	4	5
BS48 4	-	2	2
BS49 4	1	15	16
BS49 5	5	5	10
Total	67	198	265

FIGURE 11. NUMBER OF PROPERTIES FLOODED BY OVERLOADED SEWERS OVER THE LAST 10 YEARS (SFRA, 2016)

Flood Mitigation Measures

The proposals are for a change of use to the existing building, and therefore, according to the EA's Standing Advice³, finished floor levels should be a minimum of whichever is higher of 300mm above the:

- I. *average ground level of the site - approximately 6.087m AOD.*
- II. *adjacent road level to the building - 5.481m AOD*
- III. *estimated river or sea flood level - 7.680m AOD*

As the proposals are for a change of use and extension, it is not possible to meet point (III) noted above. Given the proposals are for minor development, the EA's Standing Advice applies. As part of the EA's Standing Advice, it states the following:

"If you cannot raise floor levels to meet the minimum requirement, you will need to:

- *raise them as much as possible*
- *consider moving vulnerable uses to upper floors*
- *include extra flood resistance and resilience measures"*

In consideration of these points, the applicant will respond in the following ways to meet these requirements:

(If you cannot raise floor levels to meet the minimum requirement, you will need to)

- *raise them as much as possible*

The FFL of the ground floor extension will remain the same as the existing ground floor FFLs. These proposals are in accordance with the EA's Standing Advice, which states that floor levels within the proposed development should be set no lower than existing levels, and flood proofing should be incorporated in order to protect the extension from flooding.

- *consider moving vulnerable uses to upper floors*

Sleeping accommodation has been situated in the upper floors.

- *include extra flood resistance and resilience measures*

The applicant/developer will ensure additional flood resistance and resilience measures are incorporated in the design.

In addition, it is recommended that external ground levels immediately outside the building entrance are set to fall away from the building thresholds, ensuring the minimisation of storm water ingress. If this is not possible, channel drainage along the building thresholds at the entrance should be introduced to positively drain overland flows.

If not already listed, it is recommended that the property is registered with the EA's Flood Warning Service. If you are unsure and/or you wish to register for this free service please contact Floodline Warning Service. Floodline is a free service operated by the EA that provides flood warnings direct to occupants by

³ <https://www.gov.uk/guidance/flood-risk-assessment-standing-advice>

telephone, mobile phone etc. The EA is responsible for monitoring flood events and for issuing warnings to people in properties and businesses at risk of flooding.

To further reinforce the flood resilience of the building, any new construction works at ground level should include an appropriate damp proof membrane. All drainage systems should be routinely maintained to reduce the risk of blockage and surface water flood risk.

Conclusions

The EA's flood risk from watercourses and sea map shows that the site is in a defended region of Flood Zone 3. The NPPF states that minor developments such as change of use, are unlikely to raise significant flood risk issues.

The actual risk of fluvial and tidal flooding is low, as the flood defences currently protect and will continue to protect the site in the future. However, a residual risk remains from overtopping.

According to the Product 4 Information released by the EA, the development resides outside the 1 in 1000 year return period flood extents.

The FFL of the ground floor extension will remain the same as the existing ground floor FFLs. These proposals are in accordance with the EA's Standing Advice, which states that floor levels within the proposed development should be set no lower than existing levels, and flood proofing should be incorporated in order to protect the extension from flooding. Sleeping accommodation has also been situated in the upper floors of the building, also in accordance with the EA's Standing Advice.

A betterment can be provided in comparison to the existing development by the use of flood mitigating design measures, and the implementation of a formalised warning and evacuation / 'safe haven' procedure. Appropriate mitigation and adequate warning and evacuation procedures can be maintained for the lifetime of the development. If not already listed, it is recommended that the property is registered with the EA's Flood Warning Service.

The proposals will not increase the impermeable areas on the site. It will therefore not increase the flood risk from surface water, as there will be no increase in the surface water run-off rate or volumes.

The FRA has further demonstrated that the proposed development has an acceptable flood risk within the terms and requirements of the NPPF and accompanying technical guidance.

Note:

This report has been prepared for the purposes of submitting for planning to the local planning authority for review in relation to the associated Flood Risk for the proposed development, and uses the most up-to-date information available to us at the time. It should not be relied upon by anyone else or used for any other purpose. This report is confidential to our Client; it should only be shown to others with their permission. We retain copyright of this report which should only be reproduced with our permission.

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Date	20 April 2023	20 April 2023	20 April 2023

Appendix A - Flood Level Information