FLOOD RISK ASSESSMENT

Old Oak Cottage, Sill Bridge Lane, Waltham St Lawrence, Berkshire, RG10 0NT

April 2023

Client
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CONTRACT

This report describes work commissioned by Mr and Mrs Ritchie.

DISCLAIMER

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It should be noted that this report has been prepared in accordance with Environment Agency guidance and requirements current at time of issue. Pike Smith and Kemp Rural accepts no responsibility or liability arising out of changes in requirements in the period intervening final issue of the document and submission by the Client.

EXECUTIVE SUMMARY

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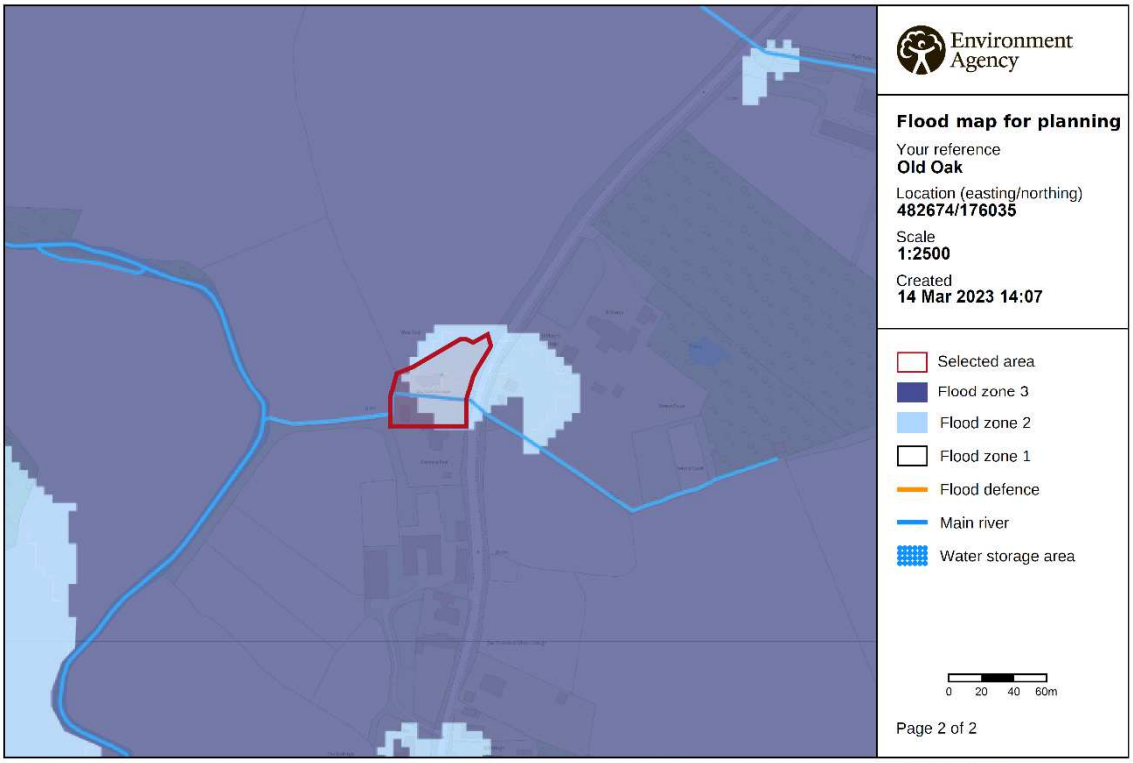
This Flood Risk Assessment (FRA) report was commissioned by Mr and Mrs Ritchie to inform and guide design considerations for an application for a single storey first floor rear extension and a single storey ground floor side extension at Old Oak Cottage.

This FRA considers potential flooding of the site from overtopping or breaching of the Twyford Brook, which is located to the west of the site during high precipitation events and from surface water. Information in relation to historic and predicted flooding at the site is primarily taken from data provided by the Environment Agency (EA).

An analysis of the potential flood mechanisms affecting the site has been undertaken as part of this assessment. The primary flood risk at the site is posed by the Twyford Brook. EA flood level data, which is attached and shown below, indicates that the property (outlined in red) is located within Flood Zones 2 and 3a, with the proposal site situated within Flood Zone 2.

Figure 1: Environment Agency Flood Map



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1.0 INTRODUCTION

1.1 Terms of Reference

This Flood Risk Assessment (FRA) report was prepared by Pike Smith & Kemp Rural to accompany a full planning application for a single storey first floor extension to the rear of the existing residential dwelling and a single storey ground floor extension to the side of the existing residential dwelling.

The purpose of this report is to establish the flood risk to the site from all potential sources and, where possible, to propose suitable mitigation methods to reduce any risks to an acceptable level. It aims to make an assessment of whether the development will be safe for its lifetime, taking into account climate change and the vulnerability of its users, without increasing flood risk elsewhere.

The FRA assesses flood risk to the site from tidal, fluvial, surface water, groundwater, sewers and artificial sources. The FRA has been produced in accordance with the National Planning Policy Framework (NPPF) (2021) and its supporting guidance.

1.2 Statement of Authority

This report and assessment has been prepared and reviewed by qualified chartered surveyors.

1.3 Approach to the Assessment

Consideration has been given to the sources and extent of tidal / coastal and fluvial flooding at the site, as well as flooding to the site from pluvial sources, infrastructure failure, overland flow and ponding of localised rainfall within the site. Stakeholders who hold data relating to flooding events in the area were contacted, and information gathered from responses received is incorporated in the following assessment.

The following research has been undertaken as part of the FRA:

- Desktop assessment of topographical, hydrological and hydrogeological setting through review of the information sourced from the British Geological Survey (BGS), the Environment Agency (EA) and the Ordnance Survey (OS);
- Review of publicly available flood risk mapping provided by the EA;
- Review of the Preliminary Flood Risk Assessment (PFRA) and Level 1 Strategic Flood Risk Assessment (SFRA) produced by the LLFA outlining flood risk from various sources within the borough.

2.0 LEGISLATIVE AND POLICY CONTEXT

2.1 Legislative Context

The Flood and Water Management Act was introduced in 2010. The Act defines the role of the lead local flood authority (LLFA) for an area. All LLFA are required to develop, maintain, apply and monitor a strategy for local flood risk management in its area, called “local flood risk management strategy”.

Alongside the Act, Flood Risk Regulations (2009) outline the roles and responsibilities of the various authorities, which include preparing Flood Risk Management Plans and identifying how significant flood risks are to be mitigated.

2.2 Policy Context

2.2.1 National Planning Policy Framework (2021)

The NPPF (2021) sets out the government’s planning policies for England and how these are expected to be applied. It also provides a set of guidelines and philosophy with which local planning authorities (LPAs) can build their own unique policies to appropriately regulate development within their jurisdictions.

The NPPF and the supporting guidance, Planning Practice Guidance (PPG) – Flood Risk and Coastal Change Guidance, ensures the risk of flooding to sites is considered at all stages through the planning process.

Specifically, Section 14 of the NPPF, entitled “Meeting the challenge of climate change, flooding and coastal change” deals with flood risk. The following paragraphs are therefore relevant to this proposal:

Paragraph 159

Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.

Paragraph 161
All plans should apply a sequential, risk-based approach to the location of development – taking into account all sources of flood risk and the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property. They should do this, and manage any residential risk, by:

a) Applying the sequential test and then, if necessary, the exception test as set out below;
b) Safeguarding land from development that is required, or likely to be required, for current or future flood management;
c) Using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding, (making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management); and
d) Where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to relocate development, including housing, to more sustainable locations.

Paragraph 167
When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment[55]. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

a) Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;
b) The development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;
c) It incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;
d) Any residual risk can be safely managed; and
e) Safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

Paragraph 168
Applications for some minor development and changes of use should not be subject to the sequential or exception tests but should still meet the requirement for site-specific flood risk assessments set out in footnote 55.

Paragraph 169
Major development should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

a) Take account of advice from the lead local flood authority;
b) Have appropriate proposed minimum operational standards;
c) Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
d) Where possible, provide multifunctional benefits.

[55] A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

2.2.2 Local Planning Policy

The Royal Borough of Windsor and Maidenhead (RBWM) Borough Local Plan 2013-2033 provides the framework to guide the future development of the RBWM. The following policy is therefore relevant to this proposal:

Policy NR1
Managing Flood Risk and Waterways

1. Flood zones are defined in the National Planning Practice Guidance and the Council's Strategic Flood Risk Assessment (Level 1). Within designated Flood Zones 2 and 3 (and also in Flood Zone 1 on sites of 1 hectare or more in size and in other circumstances as set out in the NPPF) development proposals will only be supported where an appropriate flood risk assessment has been carried out and it has been demonstrated

that development is located and designed to ensure that flood risk from all sources of flooding is acceptable in planning terms.

2. *The sequential test is required for all development in areas at risk of flooding, except for proposed developments on sites allocated in this Plan or in a made Neighbourhood Plan which accord with the provisions of those Plans so far as material to the application. In applying this test, development proposals should show how they have had regard to:*
   a. *The availability of suitable alternative sites in areas of lower flood risk*
   b. *The vulnerability of the proposed use and the Flood Zone designation*
   c. *The present and future flood risk*
   d. *The scale of potential consequences*
   e. *Site evacuation plan in the event of potential flooding.*

   Only water compatible uses and essential infrastructure development will be supported in the area defined as functional floodplain. The exception test will still apply.

3. *The sequential approach should be followed by developers for all development so that the most vulnerable development is located in the lowest risk flood areas within a site, taking account of all sources of flood risk.*

4. *Development proposals should include an assessment of the impact of climate change using appropriate climate change allowances over the lifetime of the development so that future flood risk is taken into account.*

5. *In all cases, development should not itself, or cumulatively with other development, materially:*
   a. *Impede the flow of flood water*
   b. *Reduce the capacity of the floodplain to store water*
   c. *Increase the number of people, property or infrastructure at risk of flooding*
   d. *Cause new or exacerbate existing flooding problems, either on the proposal site or elsewhere*
   e. *Reduce the waterway's viability as an ecological network or habitat for notable species of flora or fauna*

2.2.3 RBWM Strategic Flood Risk Assessment (Level 1)

RBWM has also produced a Level 1 Strategic Flood Risk Assessment (SFRA) which provides background information on flood risk and flood risk policy in RBWM. The SFRA also sets out the requirements and guidance for assessing flood risk for site-specific development proposals, as set out below:

1 – All Proposed Development

All proposed development must ensure that:

- *The surface water drainage system is designed to achieve a positive reduction in flood risk within the Royal Borough.*
- *Sustainable drainage techniques are employed to ensure surface water runoff from the proposed development does not exceed greenfield runoff rates and volumes.*
  - *For brownfield sites where it is not feasible to restrict runoff to the greenfield rate and volume, the proposed development must deliver an improvement on the existing conditions that is as close as feasibly possible to the rate and volume associated with the greenfield site.*
- *All sources of flood risk to and from the proposed development are assessed and mitigated for. Development may contribute to an increase in flood risk elsewhere if not carefully mitigated.*
- *Safe access and egress can be provided from the proposed development to an area outside of the 1% AEP plus climate change flood extent. The route should be on publicly accessible/permissible land to allow safe access and egress along the entirety of the route by all.*
- *A minimum 8m buffer zone is provided to 'top of bank' within sites immediately adjoining a river corridor. This relates to both open waterways and culverted waterway corridors in accordance with the Environment Agency's Living on the Edge guidance.*
- *The proposed development does not result in an increase in maximum flood level within adjoining properties. This may be achieved by ensuring that the existing building footprint is not increased, that overland flow routes are not truncated by buildings and/or infrastructure, or hydraulically linked compensatory storage is provided within the site (or upstream).*
- *Where existing buildings are being retained, seek that their refurbishment increases their resilience/resistance to flooding.*

- *Opportunities to recreate river corridors and wetland habitats in urban areas are explored, ensuring that space for water, habitat, wildlife and recreation is designed into the proposed development. Opportunities to work with partners to assess the viability of land swapping in those areas where there is a risk of flooding should be explored where possible.*
- *Reinstate the natural open waterway within existing culverted reaches wherever possible.*

2.2.4 Local Flood Risk Management Strategy

As the Lead Local Flood Authority (LLFA), RBWM has also produced a Local Flood Risk Management Strategy focusing on *"local flood risk resulting from surface water, groundwater and ordinary watercourse flooding, as well as assess the interaction with Main River flooding. The strategy will also explain how the Royal Borough will manage this flood risk, both now and in the future."*

The guidance for developers as set out within the LFRMS states that:

"Developers are responsible for properly considering flood risk to ensure occupants of new developments are not at risk, and flood risk is not increased elsewhere. Developers must undertake a robust assessment of the flood risk using the best available data in order to accurately characterise the risk and mitigate this risk where necessary. As the Local Planning Authority and LLFA, the Royal Borough of Windsor and Maidenhead will work to address flood risk and development."

3.0 DETAILS OF THE SITE

3.1 Site Details

The proposal site is centred at national grid reference SU 82669 76034, being approximately 5.9 miles to the south west of Maidenhead and 6.7 miles north of Bracknell.

Specifically, the proposal relates to an application for a single storey first floor rear extension and a single storey ground floor side extension at Old Oak Cottage, Sill Bridge Lane, Waltham St Lawrence, Berkshire, RG10 0NT. The property extends in total to 0.56 acres comprising of the existing residential dwelling, outbuilding and garden.

A site plan is attached and an aerial photo identifying the subject land is shown below.

3.2 Proposal for the Site

Porch, single storey first floor rear extension and single storey ground floor side extension.

3.3 Site access

Access to the site is via the existing gated entrance off the adopted highway known as Sill Bridge Lane.

3.4 Local planning authority

The site falls within the administration area of the Royal Borough of Windsor and Maidenhead in terms of the planning process.

3.5 Lead local flood authority

The Royal Borough of Windsor and Maidenhead is also the Lead Local Flood Authority (LLFA).

3.6 Flood zone

For planning purposes, the property is located within Flood Zones 2 and 3a however the proposal site is located entirely within Flood Zone 2 as defined by the Environment Agency and LLFA. A plan of the RBWM Level 1 SFRA is shown in **Appendix 1**. The property does not benefit from an EA approved flood defence.

3.7 Site and Surrounding Land Uses

3.7.1 Site Current Land Use
The proposal site is currently used for lawful residential purposes.

3.7.2 Surrounding Land Uses
A description of current land uses surrounding the boundaries of the site is given below in Table 1.

Table 1: Summary of surrounding land uses

Boundary	Land Use Description	
	Immediately Adjacent (within 0-25m)	**General Local Area (i.e. within 25-250m)**
Northern	EQUESTRIAN	EQUESTRIAN
Eastern	SILL BRIDGE LANE	RESIDENTIAL
Southern	RESIDENTIAL	RESIDENTIAL
Western	AGRICULTURAL	AGRICULTURAL

3.8 Hydrology

The nearest main watercourse is the Twyford Brook which runs east to west. The Twyford Brook itself is a tributary of the River Loddon which connects to the River Thames.

There is a drainage ditch running west to east off the Twyford Brook and through the subject property however we understand this has been piped and is therefore not an open ditch.

3.9 Geology

Data from the British Geological Survey indicates that the bedrock geology is characterised as Lambeth Group – clay, silt and sand. Sedimentary bedrock formed between 59.2 and 47.8 million years ago during the Palaeogene period.

3.10 Topography

The existing ground levels surrounding the dwelling range from 36.93 mAOD to 37.20 mAOD with the existing FFL levels being 37.40m AOD. The proposed ground floor finished floor levels of the extensions will match the existing FFL.

4.0 SEQUENTIAL TEST & EXCEPTION TEST

4.1 The Sequential Test

The Sequential Test aims to steer developments and redevelopments to areas of lower flood risk. The test compares the proposed development site with other available sites, in terms of flood risk, to aid the steering process. The Sequential Test is not required if the proposed development is a minor development or if it involves a change of use unless the development is a caravan, camping chalet, mobile home or park home site.

Minor development means:

- Minor non-residential extensions: industrial/commercial/leisure etc extensions with a footprint less than 250 sq.m.
- Alterations: development that does not increase the size of buildings e.g. alterations to external appearance.
- Householder development: For example sheds, garages, games rooms etc within the curtilage of the existing dwelling itself. This definition excludes any proposed development that would create a separate dwelling within the curtilage of the existing dwelling e.g. subdivision of houses into flats.

The proposal does not fall into any of the categories above and therefore the Sequential Test is required.

Flood risk is categorised as low probability, medium probability or high probability, or more commonly as Flood Zone 1, Flood Zone 2 or Flood Zone 3. Table 1 of the Planning Practice Guidance Flood Risk and Coastal Change defines each Flood Zone, as set out below:

Zone 1 – Low Probability

Definition
Land having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b)

Zone 2 – Medium Probability

Definition
Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. (Land shown in light blue on the Flood Map)

Zone 3a – High Probability

Definition
Land having a 1% or greater annual probability of river flooding; or land having a 0.5% or greater annual probability of sea. (Land shown in dark blue on the Flood Map)

Zone 3b – The Functional Floodplain

Definition
This zone comprises land where what from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise:

- *Land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or*
- *Land that is designed to flood (such as a flood attenuation scheme), even if it would only flood more extreme events (such as 0.1% annual probability flooding).*

Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Having regard to the Environment Agency flood maps and the RBWM SFRA, the proposed development is situated within Flood Zone 2, being a Medium Probability area.

The Sequential Test has been carried out. The proposal relates to extensions to the existing residential dwelling and hence the site area is fixed. As such the proposed development cannot be located elsewhere.

4.2 The Exception Test

If alternative sites of lower flood risk are not available, then the proposed development may require an Exception Test to be granted planning permission. Where the Exception Test is required, it should be applied as soon as possible to all local development document allocations for developments and all planning applications other than for minor developments. All three elements of the Exception Test have to be passed before development is allocated or permitted. For the Exception Test to be passed:

- It must demonstrate that the development provides wider sustainability benefits to the community that outweigh the risk of a flood, informed by an SFRA where one has been prepared.
- The development should be on developable, previously-developed land or, if it is not there are no reasonable alternative sites on developable previously-developed land; and
- An FRA must demonstrate that the development will be safe, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

Annex 3 of the NPPF sets out the development flood vulnerability classifications, as shown below:

Essential Infrastructure

- *Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk*
- *Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood*
- *Wind turbines*

Highly Vulnerable

- *Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding*
- *Emergency dispersal points*
- *Basement dwellings*
- *Caravans, mobile homes and park homes intended for permanent residential use*
- *Installations requiring hazardous substances consent (where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure')*

More Vulnerable

- *Hospitals*
- *Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels*
- *Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels*
- *Non-residential uses for health services, nurseries and educations establishments*
- *Landfill* and sites used for waste management facilities for hazardous waste*
- *Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan*

Less Vulnerable

- *Police, ambulance and fire stations which are not required to be operational during flooding*
- *Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure*
- *Land and buildings used for agriculture and forestry*
- *Waste treatment (except landfill* and hazardous waste facilities)*
- *Minerals working and processing (except for sand and gravel working)*
- *Water treatment works which do not need to remain operational during times of flood*
- *Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place*
- *Car parks*

Water-Compatible Development

- *Flood control infrastructure*
- *Water transmission infrastructure and pumping stations*
- *Sewage transmission infrastructure and pumping stations*
- *Sand and gravel working*
- *Docks, marinas and wharves*
- *Navigation facilities*

- *Ministry of Defence installations*
- *Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location*
- *Water-based recreation (excluding sleeping accommodation)*
- *Lifeguard and coastguard stations*
- *Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms*
- *Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan*

**Landfill is as defined in Schedule 10 of the Environmental Permitting (England and Wales) Regulations 2010*

The proposal relates to a single storey first floor rear extension and single storey ground floor side extension and as such, having regard to the flood vulnerability classifications set out within Annex 3 of the NPPF, is considered to be "More Vulnerable" development.

Table 2 of the PPG Flood Risk and Coastal Change details which flood risk vulnerability classifications are appropriate within each Flood Zone, as set out below:

Table 2: NPPF flood zone vulnerability compatibility (source: PPG Flood Risk and Coastal Change)

Flood Zones	**Flood Risk Vulnerability Classification**				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a	Exception Test required	✗	Exception Test required	✓	✓
Zone 3b	Exception Test required	✗	✗	✗	✓

Key:
✓ Development is appropriate
✗ Development should not be permitted

Having regard to Table 2: Flood risk vulnerability and flood zone 'compatibility', this confirms that "More Vulnerable" development is appropriate development within Flood Zone 2 and further confirms there is no requirement to undertake an Exception Test.

5.0 SITE SPECIFIC FLOOD RISK ANALYSIS

The PFRA and Level 1 SFRA produced by the LLFA and maps from the EA provide information regarding historic flooding events and incidents as well as predictions of flood extents and depths during extreme rainfall events.

5.1 Fluvial (River) and Tidal (Sea) Flood Risk

5.1.1 Mechanisms for Fluvial Flooding

Fluvial, or river flooding, occurs when excessive rainfall over an extended period of time or heavy snow melt causes a river to exceed its capacity. The damage from a fluvial flood can be widespread as the overflow may affect downstream tributaries, overtopping defences and flooding nearby inhabited areas. Fluvial flooding consists of two main types.

- Overbank flooding – this occurs when water rises steadily and overflows over the edges of a river or stream
- Flash flooding – this is characterised by an intense, high velocity torrent of water that occurs in existing river channel with little to no notice. Flash floods are very dangerous and destructive not only because of the force of the water, but also the hurtling debris that is often swept up in the flow

5.1.2 Definition of EA Modelled Fluvial Flood Risk Zone

Fluvial flood risk is assessed using flooding maps produced by the Environment Agency. These maps use available historic data and hydraulic modelling to define zones of flood risk. The maps allow a site to be defined in terms of its flood zone (e.g. 1,2,3) and in terms of the overall flood risk (very low, low, medium or high). It is important to note that any existing flood defences are not taken into account within the models or the maps.

As set out previously the EA fluvial flood zones are defined as follows:

- Flood Zone 1: Less than 1 in 1000 (0.1%) annual probability flooding;
- Flood Zone 2: Between 1 in 100 and 1 in 1000 annual probability of flooding;
- Flood Zone 3: Greater than 1 in 100 annual probability of fluvial flooding.

Flood zone 3 is split into two sub-categories (3a and 3b) by LLFAs depending on whether the land is considered to be a functional flood plain (i.e. an important storage area for flood waters in extreme events):

- Flood Zone 3a: Greater than 1 in 100 annual probability of fluvial flooding and/or greater than 1 in 200 annual probability of tidal flooding;
- Flood Zone 3b: functional flood plain (definition specific to the LLFA). Less than a 1 in 20 annual probability of fluvial and/or tidal flooding.

5.1.3 Main Potential Sources of Local Fluvial Flooding
The nearest potential source of fluvial flooding to the site is the Twyford Brook.

5.1.4 Designated Fluvial Flood Risk Zone for the Site
The proposal site is located within Flood Zone 2 as defined by the Environment Agency and the LLFA indicating that there is a between 1 in 100 and 1 in 1000 annual probability of flooding.

5.1.5 Long Term Fluvial Flood Risk Considering Flood Defences
The EA's long-term flood risk maps give an indication of the actual risk associated with flooding after taking into account the effect of any flood defences in the area. Copies of maps for the site, which are available in **Appendix 2**, indicate that the long-term risk from fluvial flooding to the property are medium to high, with the location of the site being at High Risk.

5.1.6 Mechanisms for Tidal Flooding
Tidal flooding may be described simply as the inundation of low-lying coastal areas by the sea, or the overtopping or breaching of sea defences. Tidal flooding may be caused by seasonal high tides, storm surges and where increase in water level above the astronomical tide level is created by strong on shore winds or by storm driven wave action.

5.1.7 Definition of EA Tidal Flood Risk Zones
As with fluvial flood risk, tidal flood risk is assessed using flooding maps produced by the Environment Agency. The difference is in the probability return periods used to define tidal flood zones. The EA tidal flood zones are defined as:

- Flood Zone 1: Less than 1 in 1000 (0.1%) annual probability flooding;
- Flood Zone 2: Between 1 in 200 and 1 in 1000 annual probability of tidal flooding;
- Flood Zone 3: Greater than 1 in 200 annual probability of tidal flooding.

5.1.8 Potential Sources of Tidal Flooding
The site is over 75km away from any coastline or estuarine system. The SFRA states that the area is not within a tidal influence zone.

5.1.9 Flood Defences
The site does not benefit from any formal flood defences nor are we aware that the EA has any flood alleviation works planned for the area.

5.1.10 Climate Change – EA Modelled Predictions of Fluvial and Tidal Flood Levels and Extends
The EA JFLOW dataset, which is presented in **Appendix 3**, provides modelled flood depths and levels from flood node points close to the site. The nearest nodes to the application site is Flood Point 1 which is summarised in Table 3 below;

Table 3: EA JFLOW modelled flood levels for different return periods and scenarios

Grid Cell Reference	Maximum Levels (mAOD)		
	1% annual probability	1% annual probability +(20%)	0.1% annual probability
Flood Point 1	37.06	37.06	37.17

The ground levels on site range from 36.93 mAOD to 37.20 mAOD.

It is proposed that the finished ground floor level of the side extension and part rear extension will match the existing finished floor levels of 37.40 mAOD and hence will be at least 0.34m above a 1% annual probability plus 20% flood event and at least 0.23m above a 0.1% annual probability flood event.

5.2 Pluvial (Surface Water) Flood Risk

A pluvial, or surface water flood, is caused when heavy rainfall creates a flood event independent of an overflowing water body. Surface water flooding occurs when high intensity rainfall leads to run-off which flows over the ground surface, causing ponding in low-lying areas when the precipitation rate or overland flow rate is greater than the rate of infiltration, or returns into watercourses. Surface water flooding can be exacerbated when the underlying soil and geology is saturated (as a result of prolonged precipitation or a high-water table) or when the drainage network has insufficient capacity.

5.2.1 Mechanisms of Pluvial Flooding
The chief mechanisms for surface water flooding can be divided into the following categories:

- Runoff from high topography;
- Localised surface water runoff – as a result of localised ponding of surface water;
- Sewer flooding – areas where extensive and deep surface water flooding is likely to be influenced by sewer flooding. Where the sewer network has reached capacity, and surcharged, this will exacerbate the flood risk in these areas;
- Low lying areas – areas such as underpasses, subways and lowered roads beneath railway lines are more susceptible to surface water flooding;
- Railway cuttings – railway infrastructure cut into the natural geological formations can cause extra surface run-off and pooling disrupting service and potentially affecting adjacent structures;
- Railway embankments – discrete surface water flooding locations along the up-stream side of the raised network rail embankments where water flows are interrupted and ponding can occur;
- Failure of artificial sources (i.e. man-made structures) such as canals and reservoirs.

5.2.2 Main Potential Sources of Local Pluvial Flooding
The main potential source of pluvial flooding to the site is considered to be surface water ponding and flooding associated with heavy rainfall.

Having regard to the EA flood maps, as shown in **Appendix 4**, the proposal site is considered to be at low risk of pluvial flooding.

5.2.3 Records of Historic Pluvial Flooding Incidents
The EA recorded and historic flood outlines mapping do not show any records of pluvial flooding on or in the vicinity of the site.

Examination of the LLFAs Level 1 SFRA revealed no evidence of records of pluvial flooding on or in the vicinity of the site. It should be noted that the area is primarily agricultural and as such sewer surcharging is highly unlikely to be an issue.

A map showing the location of surface water flooding incidents is available in **Appendix 5**.

5.2.4 Surface Water Flood Risk from Artificial Sources (Reservoirs and Canals)
An examination of OS mapping and the EA's mapping revealed no indications of significant reservoirs or canals in the area of the site.

The EA's reservoir flood risk map indicated that the site does not lie within an area at risk of reservoir flooding, as shown in **Appendix 6**.

5.2.5 Sewer Flooding
The site is not located within a Critical Drainage Area.

A map showing recorded incidents of sewer flooding is available in **Appendix 5**.

5.3 Risk of Flooding from Multiple Sources (ROFMS)

Data taken from the Environment Agency gives an indication of the overall flood risk from fluvial, tidal and surface water sources considering the presence of river defences. This map indicated that the overall risk across the site and surrounding area is classified as low.

5.4 Groundwater Flood Risk

Groundwater flooding occurs when water rises from the underlying aquifer at the location of a spring – where the underlying impermeable geology meets the ground surface. This tends to occur after much longer periods of intense precipitation, in often low-lying areas where the water table is likely to be at a shallow depth. Groundwater flooding is known to occur in areas underlain by principal aquifers, although increasingly it is also being associated with more localised floodplain sands and gravels. A high groundwater table also has the potential to exacerbate the risk of surface water and fluvial flooding by reducing rainfall infiltration capacity, and to increase the risk of sewer flooding through sewer/groundwater interactions.

5.4.1 Historic Records of Groundwater Flooding
No records of historic groundwater flooding incidents were identified.

5.5 Critical Drainage Area

A Critical Drainage Area maybe be defined as "a discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather, thereby affecting people, property or local infrastructure". A CDA is defined in the Town and Country Planning (General Development Procedure) (Amendment) (No. 2) (England) Order 2006 as "an area within Flood Zone 1 which has critical drainage problems and which has been notified…[to]… the local planning authority by the Environment Agency".

The site does not lie within a Critical Drainage Area.

5 POTENTIAL IMPACTS OF THE DEVELOPMENT OF LOCAL FLOOD RISK

6.1 Potential Impacts on Local Flood Risk

The proposal seeks permission to erect a porch to the front elevation to replace the existing canopy as well as a single storey first floor rear extension and a single storey ground floor side extension. The existing dwelling extends to a footprint of 116 sq.m.. The proposal will increase the existing footprint by 27.13 sq.m.

As part of application 22/02165/CPD, 3 no. side extensions where confirmed as being Class A Permitted Development which, if built, would increase the footprint from the existing 116 sq.m. to 53.78 sq.m.

As such the extensions proposed as part of this application are of a lesser footprint than the extensions "deemed to be permitted" as part of 22/02165/CPD. The Applicant is offering up their Class A Permitted Development Rights should this application be permitted. The proposal would therefore have a lesser impact on local flood risk than if the Applicant were to proceed with building out the "permitted" extensions.

6.2 Impacts on Flood Storage

6.2.1 Changes to Impermeable Area and Building Footprint

The proposal will result in a decrease in impermeable areas when compared with the extensions "deemed permissible" as part of 22/02165/CPD and therefore this proposal is considered to have a beneficial impact upon flood storage.

6.3 Impacts on Flood Flow Routes

The extensions proposed as part of this application are of a lesser footprint than the extensions "deemed permissible" as part of 22/02165/CPD. As such the proposal will not alter any flood flow paths when compared with the "permitted" extensions.

6 FLOOD RISK MITIGATION MEASURES

7.1 SuDS

The Department for Communities and Local Government's (DCLG) Planning Practice Guidance and Planning System (PPGPS) states that developers and Local Authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques.

As such, developers have to implement a SuDS strategy in line with the drainage hierarchy, as outlined below, to reduce surface water discharges from the site.

- *Store rainwater for later use;*
- *Use infiltration techniques, such as porous surfaces in non-clay areas;*
- *Attenuate rainwater in ponds or open water features for gradual release;*
- *Attenuate rainwater by storing in tanks or sealed water features for gradual release;*
- *Discharge directly to a water course;*
- *Discharge rainwater directly to a surface water sewer/drain;*
- *Discharge to a combined sewer;*
- *Development must maximise attenuation levels, achieving greenfield rates where possible;*
- *All new car parks and hard standing areas should be rainwater permeable with no run-off directed into the sewer network;*
- *All flat roofs should be green or brown roofs to contribute to reducing surface water run-off.*

As set out above, the proposal will not result in any increase to surface water run-off and hence the existing drainage of surface water run-off is sufficient.

7.2 Flood Resilience

Flood resilient construction uses methods and materials to reduce the impact from a flood, ensuring that structural integrity is maintained, and the drying out and cleaning required, following inundation and before reoccupation, is minimised.

7.2.1 Flood Resilience Measures

In terms of achieving resilience, there are two main strategies, whose applicability is dependent on the water depth the property is subjected to. These are:

- 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);
- Water entry strategy – 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).

Having regard to the proposed finished floor level of the side extension which will be at least 0.34m above a 1% annual probability plus 20% flood event and at least 0.23m above a 0.1% annual probability flood event, there is not a need to consider water exclusion strategies.

7.3 Emergency Plan

The dangers associated with flood water to people are possible injury and/or death. This can occur as a result of drowning or being carried along by the waters into hard objects or vice versa.

The risk to life is largely a function of the depth and velocity of the floodwater as it crosses the floodplain. Fast flowing deep water that contains debris would represent the greatest hazard.

The assessment of danger to people from walking in floodwater is described in the Flood Risks to People guidance documents (FD2321_TR1 and FD2321_TR2) by DEFRA/EA. Danger can be estimated by the simple formula:

$$HR = d \times (v + 0.5) + DF$$

Where, HR = (flood) hazard rating; d = depth of flooding (m); v = velocity of floodwaters (m/sec); and DF = debris factor.

The scoring methodology and calculation matrix for this is summarised in **Appendix 7.**

The use of a flood emergency plan is unnecessary for the proposed change of use due to it being classified as a "Water Compatible" classification in Flood Zone 1.

7.3.1 EA Flood Warnings Direct Service Subscription

Despite there being no need to implement a flood emergency plan, the applicants will subscribe to the EA Flood Warnings Direct Service which is a free service offered by the EA providing flood warnings direct to people by telephone, mobile, email, SMS text message and fax. The EA aims to provide 2 hours' notice of floods, day or night, allowing timely evacuation of the site.

The agency operates a 24-hour telephone service on 0345 988 1188 that provides frequently updated flood warnings and associated floodplain information. In addition, this information can also be found at https://fws.environment-agency.gov.uk/app/olr/home along with recommendations on what steps should be taken to prepare for floods, what to do when warnings are issued and how best to cope with the aftermath of floods.

7.3.2 Safe Egress

Safe egress can be achieved via the existing driveway, onto Sill Bridge Lane and south onto School Road.

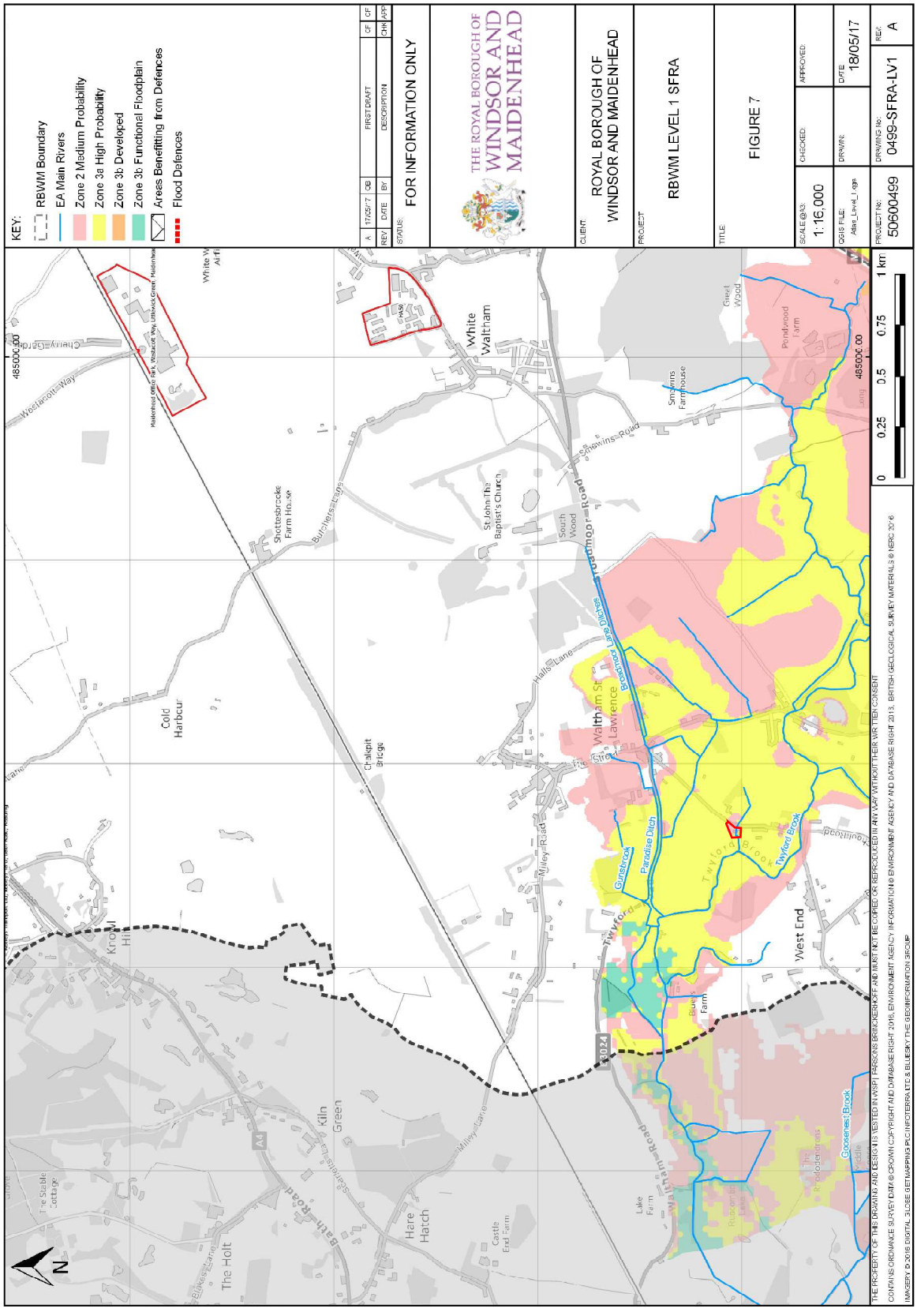
8.0 CONCLUSIONS AND RECOMMENDATIONS

This assessment has considered the potential risks to the application site associated with flooding from fluvial, tidal, surface water, artificial and groundwater sources and the potential impacts of climate change.

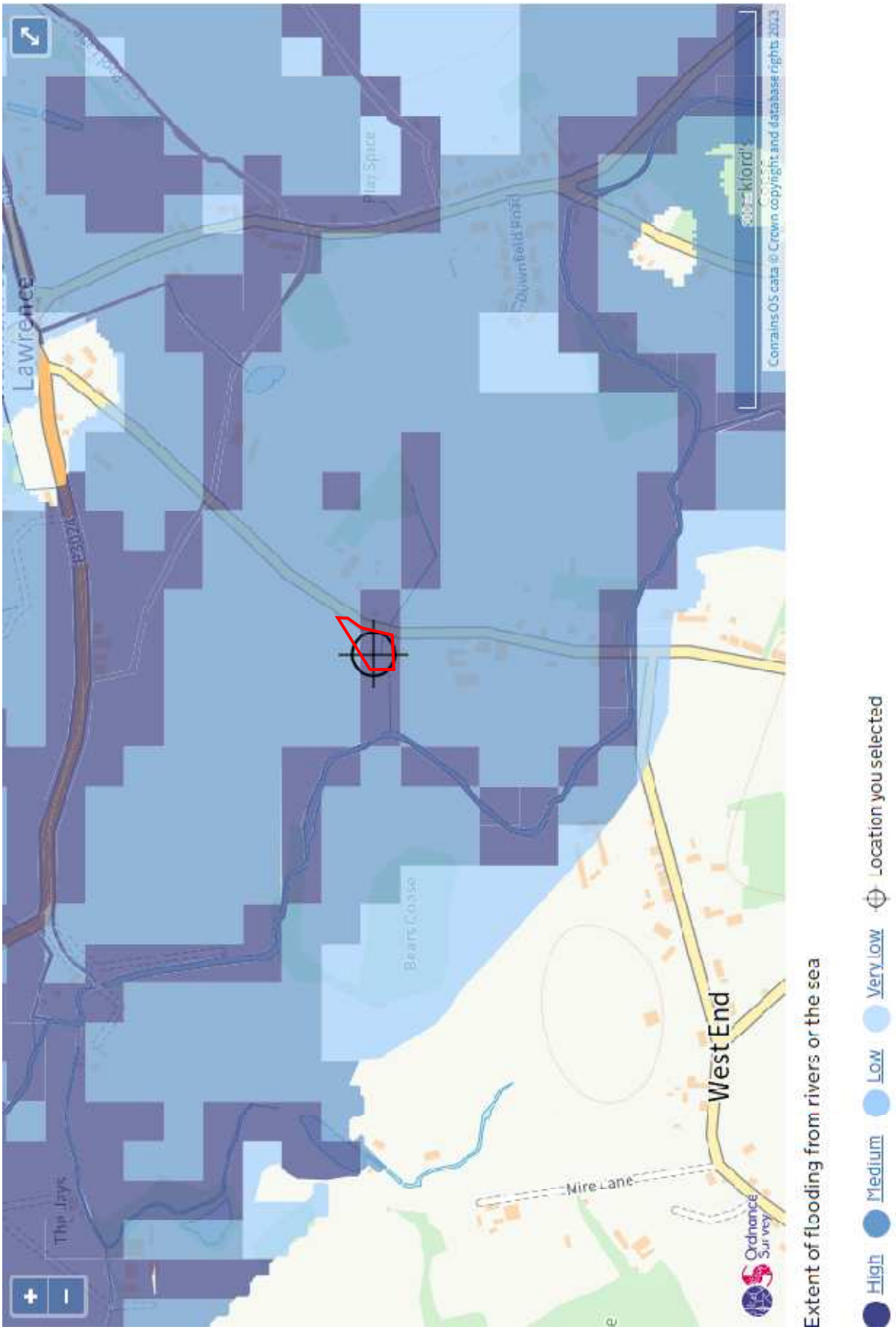
A review of LLFA's PFRA and SFRA as well as data provided by the EA was undertaken. The main findings of the review and assessment are provided below:

- The proposal site is located within Flood Zone 2 and therefore is considered to be at medium risk of flooding.
- Having regard to the flood risk vulnerability classifications set out within Annex 3 of the NPPF, the proposal is classified as "More Vulnerable" development and is therefore considered to be acceptable within Flood Zone 2.
- The main source of potential flooding to the site is the Twyford Brook which is located approximately 90m to the west of the proposal site.
- The proposal site is considered to be at low risk of surface water flooding.
- The proposal site does not lie within an area at risk of reservoir flooding.
- The proposal site does not lie within a Critical Drainage Area.
- A sequential test has been carried out and due to the nature of the proposal, the proposal cannot be located elsewhere.
- As set out above, the proposal is considered to be acceptable in Flood Zone 2 and therefore there is no requirement for an exception test to be undertaken.
- The proposal will not result in any increase in surface water run-off when compared with the extent of extension deemed permissible which the Applicant could implement should they wish.

APPENDIX 1 – RBWM LEVEL 1 SFRA FLOOD ZONE MAP

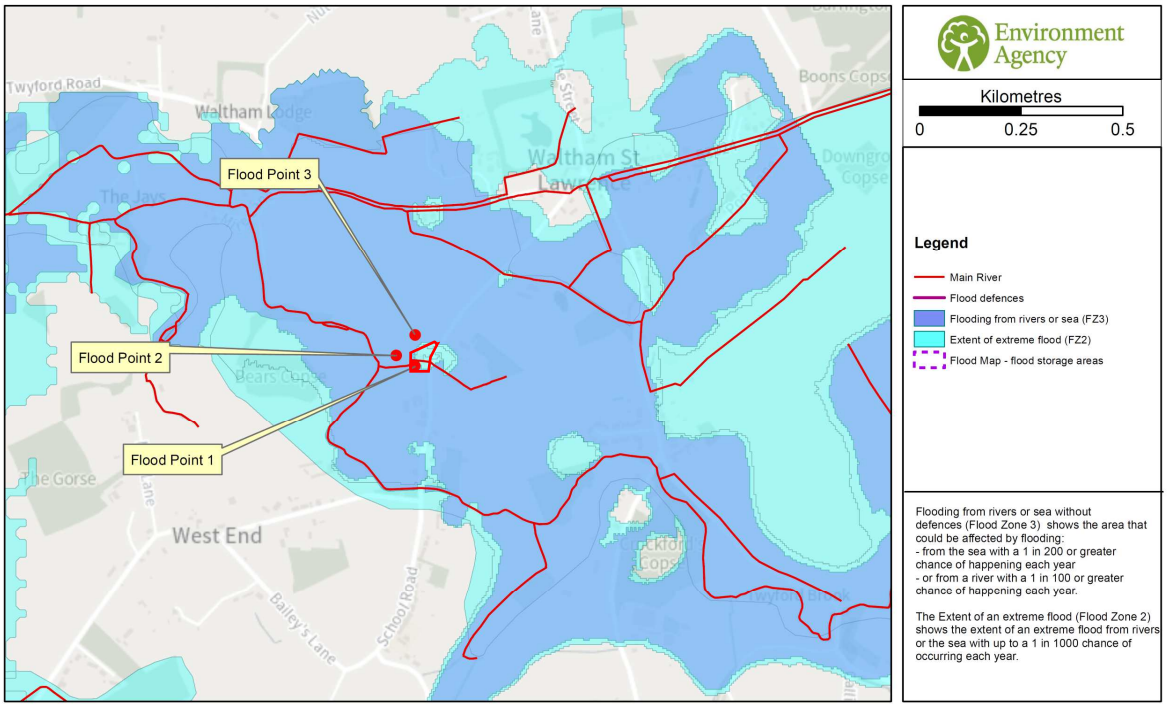


APPENDIX 2 – EA LONG TERM FLUVIAL FLOOD RISK MAP



APPENDIX 3 – EA JFLOW DATASET

Flood Map for Planning centred on RG10 0NT
Created on 21/02/2023 REF: THM294345



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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

Environment Agency

National generalised (JFLOW) flood levels **THM294345**

The modelled flood levels for the closest most appropriate points for your site that are provided below:

Grid cell reference	Easting	Northing	Maximum Depths (m)		
			1% annual probability	1% annual probability + (20%)	0.1% annual probability
Flood Point 1	482654	176013	0.13	0.13	0.24
Flood Point 2	482608	176036	0.85	0.85	0.98
Flood Point 3	482655	176088	0.37	0.40	0.46

Grid cell reference	Easting	Northing	Maximum Levels (mAOD)		
			1% annual probability	1% annual probability + (20%)	0.1% annual probability
Flood Point 1	482654	176013	37.06	37.06	37.17
Flood Point 2	482608	176036	36.95	36.95	37.08
Flood Point 3	482655	176088	36.89	36.92	36.98

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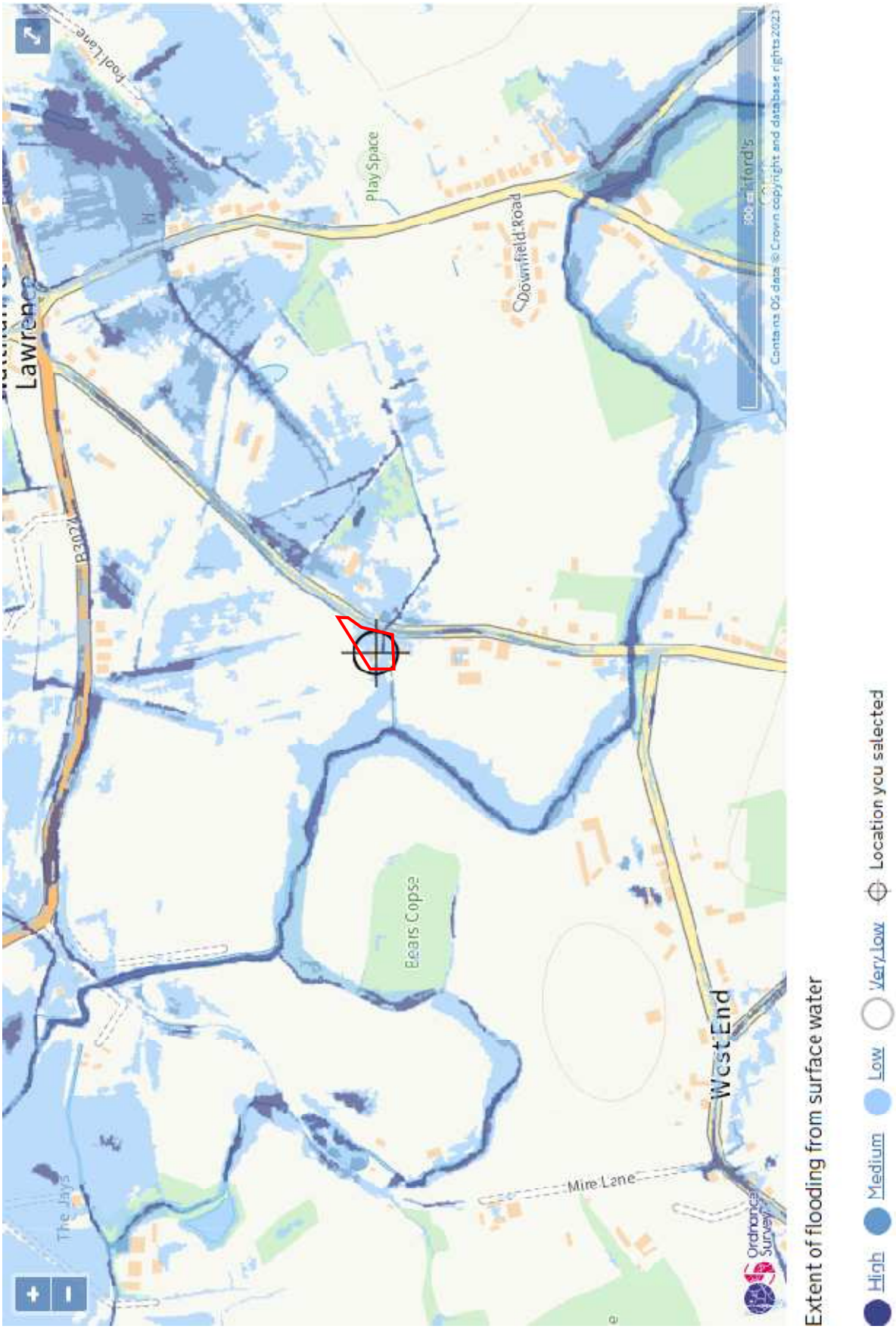
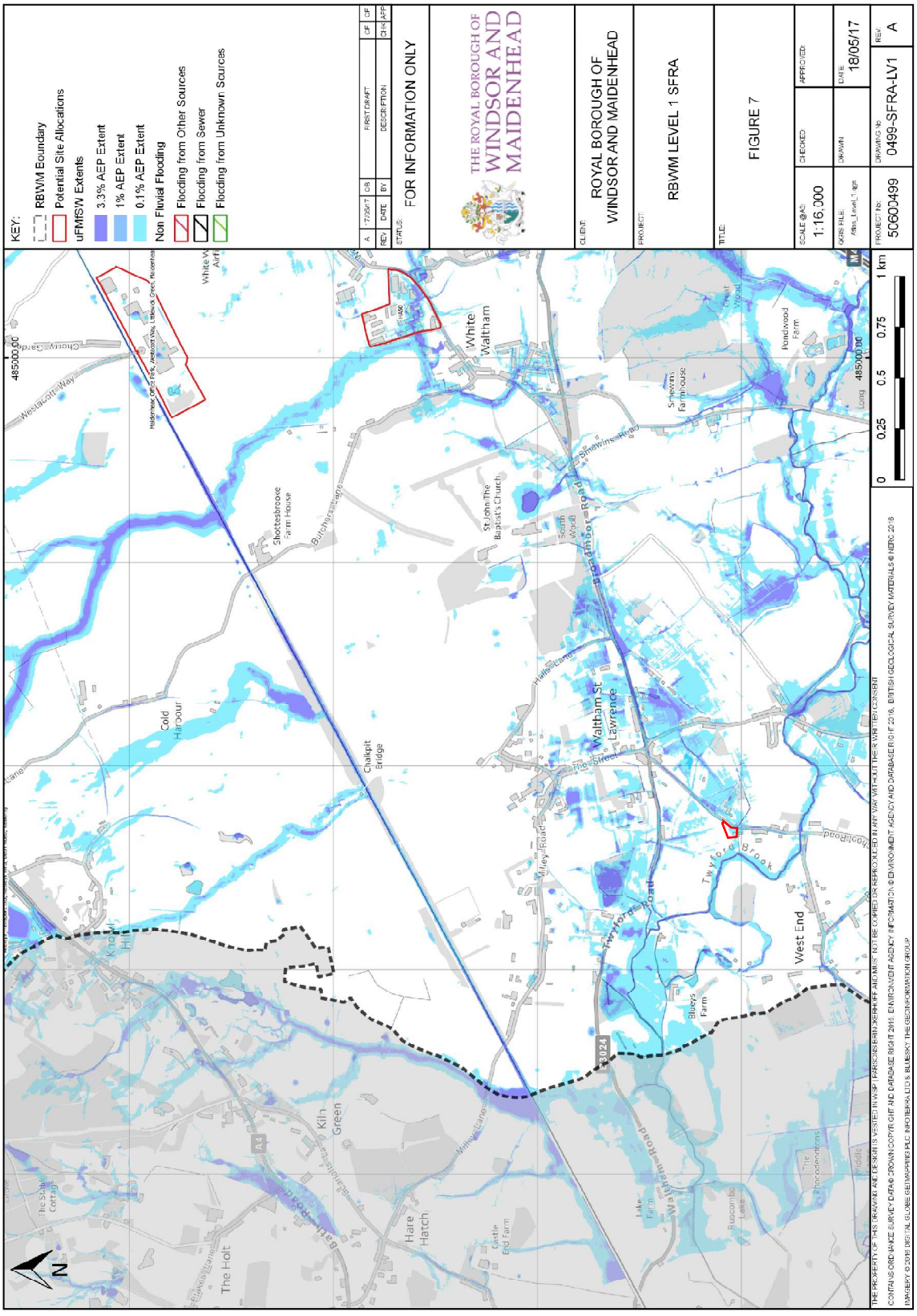
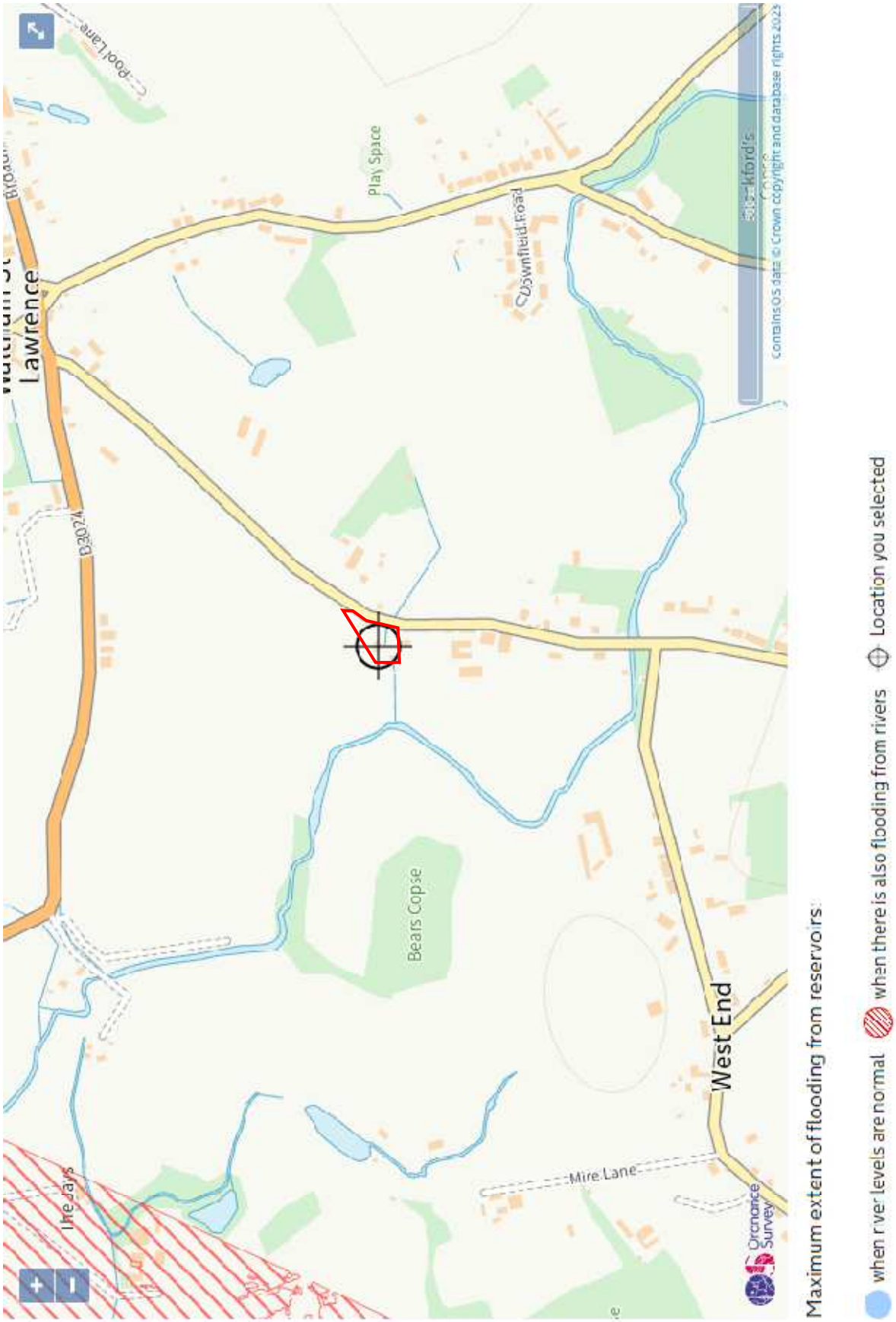
APPENDIX 4 – EA PLUVIAL FLOOD RISK MAP



APPENDIX 5 – LLFA MAP SHOWING FLOOD EVENTS FROM DIFFERENT SOURCES



APPENDIX 6 – EA RESERVOIR FLOOD RISK MAP



APPENDIX 7 – CALCULATION OF FLOOD HAZARD RATING

Table 5: Flood Hazard Rating Scores – based on DF score of 0

Depth/Velocity	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50
0.0	0.13	0.25	0.38	0.50	0.63	0.75	0.88	1.00	1.13	1.25
0.5	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50
1.0	0.38	0.75	1.13	1.50	1.88	2.25	2.63	3.00	3.38	3.75
1.5	0.5	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
2.0	0.63	1.25	1.88	2.50	3.13	3.75	438	5.00	5.63	6.25
2.5	0.75	1.50	2.25	3.00	3.75	4.50	5.25	6.00	6.75	7.50
3.0	0.88	1.75	2.63	3.50	4.38	5.25	6.13	7.00	7.88	8.75
3.5	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
4.0	1.13	2.25	3.38	4.50	5.63	6.75	7.88	9.00	10.13	11.25
4.5	1.25	2.50	3.75	5.00	6.25	7.50	8.75	10.00	11.25	12.50
5.0	1.38	2.75	4.13	5.50	6.88	8.25	9.63	11.00	12.38	13.75

Table 6: Summary of Scores

	Score From	Score To	Flood Hazard	Description
	<0.75	0.75	Low	Exercise Caution
Class 1	0.75	1.5	Moderate	Danger for Some
Class 2	1.5	2.5	Significant	Danger for Most
Class 3	2.5	20.0	Extreme	Danger for All

Table 7: Values of Debris Factor for different flood depths

Depths	Pasture/Arable Land	Woodland	Urban
0 to 0.25	0	0	0
0.25 to 0.75	0.5	1	1
d > 0.75 and/or v > 2	0.5	1	1

- The “danger to some” category includes vulnerable groups such as children, the elderly and infirm. “Danger: Flood zone with deep or fast flowing water”
- The “danger to most” category includes the general public.
- The “danger to all” category includes the emergency services.

A flood emergency plan is considered to be an acceptable way of managing flood risk where the flood hazard has been given a “very low hazard” rating. In some instances, flood emergency plans may also be acceptable where the rating is “danger for some”. However, it is unlikely to be an acceptable way of managing residual flood risk where the hazard to people classification is “danger for most” or “danger for all”.