Flood Risk Assessment for Planning

Prepared for:
Rex Construction Ltd

September 2023

Location:
8 Oatlands Road
Oxford
OX2 0ET

Our reference:
93326-Archanaeum-OatlandsRd

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Document Issue Record

Project:	Flood Risk Assessment for Planning
Client:	Rex Construction Ltd
Location:	8 Oatlands Road, Oxford OX2 0ET
Application:	Construction of a side and rear extension
Our reference:	93326-Archanaeum-OatlandsRd
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1. Key Facts

1.1 Flood Risk Posed:

- EA Flood Zones 2 and 3 (Medium & High Risk).
- The risk would appear to be predominantly fluvial and originate from the Seacourt Stream, approximately 166m west and 247m east of the site, the Bulstake Stream 319m south of the site and the River Thames 448m east of the site.
- The EA has provided modelled flood data from the Thames (Eynsham to Sandford) 2018. The information provided is from the Oxford Flood Alleviation Scheme mapping completed in March 2018
- Comparison of the EA modelled flood levels in the area of the proposed development and the lowest ground topography level within the area of the proposed development shows that this area could be inundated with 0.01m of flood water for the 1:100yr event, 0.23m for the 1:100yr +35%CC event and 0.25m for the 1:1000yr event.
- No EA formal flood defences in the area.
- Historical flooding occurred on the site in December 2002. This event was caused by the channel capacity being exceeded (no raised defences).
- Risk of pluvial flooding would appear to be “Very Low” to “Low”.
- Risk of groundwater, sewer surcharge or reservoir flooding would appear to be very low.

1.2 Flood Risk Mitigation:

- The development is considered to fit within the EA Standing Advice for domestic extensions.
- The proposed application is for a residential extension (to remain a single dwelling).
- Floor levels within the extension will be set no lower than existing adjacent floor levels.
- There will be no introduction of additional or separate units, no sub-division, and no intensification of usage.
- No new basements are proposed.
- Internal access will be maintained from the ground floor to the property's first floor.
- Flood proofing will be incorporated as appropriate.
- No unacceptable loss of floodplain storage.
- Due to the small scale of the development, existing drainage arrangements will be retained.

- The applicant will register with the free Environment Agency Floodline Warnings Direct service.

Assuming accordance with these flood risk management measures, Unda Consulting Limited consider the proposed application to be suitable in flood risk terms.

2. Introduction

Unda Consulting Limited have been appointed by Rex Construction Ltd (hereinafter referred to as "the applicant") to undertake a Site Specific Flood Risk Assessment (FRA) for Planning at 8 Oatlands Road, Oxford OX2 0ET (hereinafter referred to as "the site"). The FRA has been undertaken in accordance with the National Planning Policy Framework (NPPF) and the associated technical guidance, as well as relevant Local Policies.

The site appears to be located entirely within Flood Zones 2 and 3 as defined by the Environment Agency (EA) on their Flood Map for Planning. Under the National Planning Policy Framework (NPPF), a FRA is required if a proposed development:

- includes building or engineering works in Flood Zone 2 or 3;
- includes building or engineering works on land classified by the Environment Agency as having critical drainage problem;
- changes the use of land or buildings in a location at risk of flooding from rivers or the sea, or with critical drainage problems;
- changes the use of land or buildings in a way that increases the flood vulnerability of the development where it may be subject to other sources of flooding;
- is larger than 1 hectare.

The assessment should demonstrate to the Local Planning Authority (LPA) and EA how flood risk will be managed now and over the development's lifetime, taking climate change into account, and with regard to the vulnerability of its potential users.

- The objectives of a FRA to support a planning application are to establish:
- whether the proposed development is likely to be affected by current or future flooding from any source;
- whether it will increase flood risk elsewhere;
- whether the measures proposed to deal with these effects and risks are appropriate.

3. Existing Situation

3.1 Site Usage:

The site is currently occupied by a single residential dwelling. The site is understood to have lawful planning permission for residential use. The surrounding area is characterised by residential dwellings.

At the time of writing the report no existing plans were provided.

Figure 1: Aerial imagery of site and surrounding area (Source: Google Earth)

3.2 Topography:

Environment Agency LiDAR has been used to assess the topography across the site and wider area. Light Detection and Ranging (LIDAR) is an airborne mapping technique, which uses a laser to measure the distance between the aircraft and the ground surface. Up to 100,000 measurements per second are made of the ground, allowing highly detailed terrain models to be generated at high spatial resolutions. The EA's LIDAR data archive contains digital elevation data derived from surveys carried out by the EA's specialist remote sensing team. Accurate elevation data is available for over 70% of England. The LiDAR technique records an elevation accurate to +0.3m every 2m. This dataset is derived from a combination of our full dataset which has been merged and re-sampled to give the best possible coverage. The dataset can be supplied as a Digital Surface Model (DSM) produced from the signal returned to the LIDAR (which includes heights of

objects, such as vehicles, buildings and vegetation, as well as the terrain surface) or as a Digital Terrain Model (DTM) produced by removing objects from the Digital Surface Model. 1.0m horizontal resolution DTM LiDAR data has been used for the purposes of this study.

Data suggests that the ground topography on site ranges across the site from approximately 57.25mAOD to 57.45m AOD.

The ground topography in the area of the proposed development is approximately 57.40m AOD to 57.34m AOD.

3.3 Geography:

The British Geological Survey (BGS) Map indicates that the bedrock underlying the site is Oxford Clay Formation and West Walton Formation (undifferentiated) - Mudstone, with superficial deposits of Northmoor Sand and Gravel Member- Sand and Gravel.

4. Development Proposal

The proposed planning application is for the of a side and rear extension. The proposed increase in built footprint would be approximately 9.83m^2.

The proposed application is for a residential extension which does not exceed 250m^2. There will be no introduction of additional or separate units, no sub-division, and no intensification of usage. The property will remain a single dwelling. Internal access will be maintained from the ground floor to the first floor of the property. No new basements are proposed.

The proposed plans are provided in the report Appendix.

Figure 2: Proposed ground and first floor plan (Source: Archanaeum)

5. Assessment of Flood Risk

5.1 Flood Zones:

Within planning, Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's Flood Map for Planning (Rivers and Sea), available on the Environment Agency's website.

Flood Zone	Definition
Zone 1 **Low Probability**	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 **Medium Probability**	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a **High Probability**	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b **The Functional Floodplain**	This zone comprises land where water has to flow or be stored in times of flood. 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)

Table 1: Flood Zones

The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.

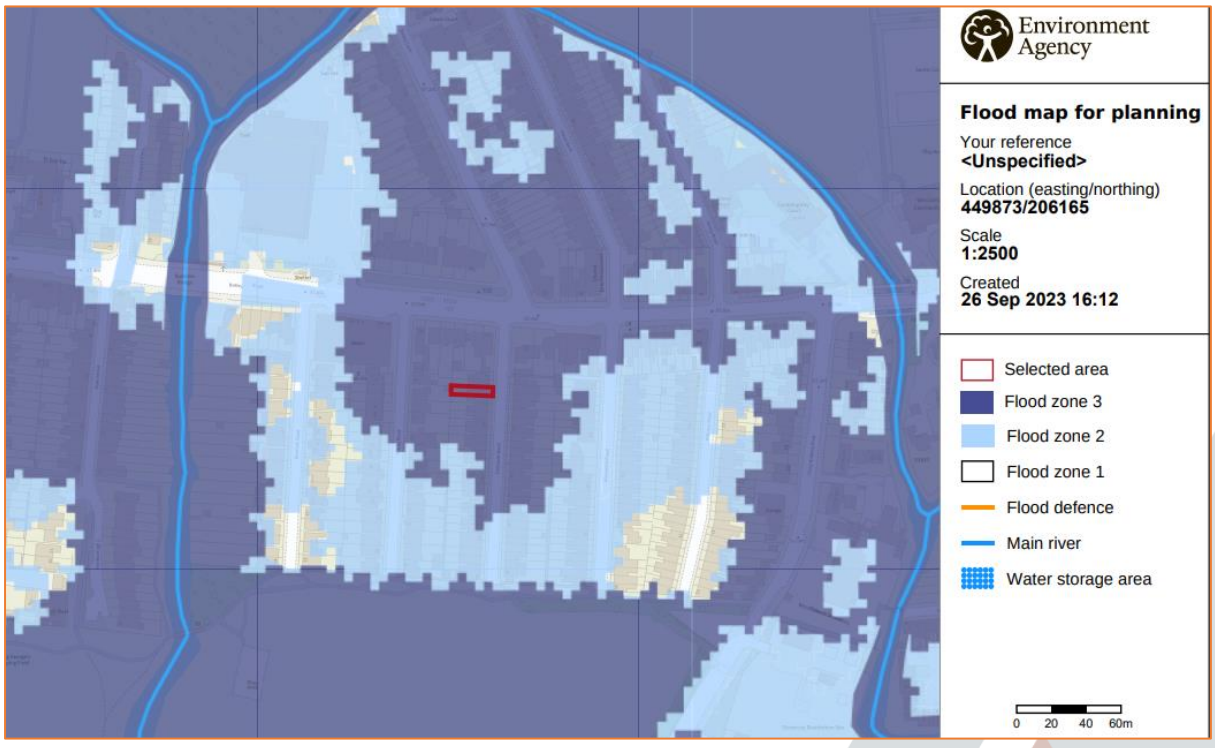


Figure 3: Environment Agency Flood Map for Planning (Rivers and Sea) (Source: EA)

The site is located partially within Flood Zone 3 (High Probability), which means it is defined as land having a 1:100 or greater annual probability of fluvial flooding, and partially within Flood Zone 2 (Medium Probability), which means it is defined as land having between a 1:100 and 1:1000 annual probability of fluvial flooding.

The risk would appear to be predominantly fluvial and originate from the Seacourt Stream, approximately 166m west and 247m east of the site, the Bulstake Stream 319m south of the site and the River Thames 448m east of the site.

5.2 Fluvial

5.2.1 River Thames and its tributaries

Seacourt Stream flows south past Wytham and under the A34 Oxford Ring Road. Near the site of the lost village of Seacourt Botley Stream branches off Seacourt Stream on its left bank, and flows 0.8 km to enter Bulstake Stream. Seacourt Stream then flows under Botley Road and enters Bulstake Stream near North Hinksey. Seacourt Stream is 12.7 km long and is classified as a Main River by the Environment Agency.

The River Thames is a river that flows through southern England, most notably through London. At 215 miles (346 km), it is the longest river entirely in England and the second longest in the United Kingdom, after the River Severn. The River Thames Stream is designated a Main River by the Environment Agency.

5.2.2 Detailed flood modelling:

The EA has provided modelled flood data from the Thames (Eynsham to Sandford) 2018. The information provided is from the Oxford Flood Alleviation Scheme mapping completed in March 2018. The project included updating the existing (2014) hydraulic model to support development of the outline FAS design. The study was carried out using 1D-2D modelling software (Flood modeller-Tuflow).

The site falls within Gloucestershire and the Vale Catchment, where the Central climate change allowance for the 2080's is a 26% increase in river flows. However, the Flood Mitigation Officer for Oxford City Council states;

> *"The suitable* [Climate Change] *allowance for the area is 26%, so in lieu of this being unavailable, 35%* [Climate Change allowance] *should be used."*

The following on site modelled flood levels in the area of the proposed development have been provided from the EA and compared to the lowest ground topography levels within the area of the proposed development:

Return Period	Modelled flood level in the area of the proposed development (m AOD)	Minimum topography level within the area of the proposed development (m AOD)	Max Flood depth (m)
1:100yr	57.35	57.34	0.01
1:100yr+35%	57.57	57.34	0.23
1:1000yr	57.59	57.34	0.25

Table 2: Modelled on-site flood levels compared to LiDAR topographic levels (Source: EA)

Comparison of the EA modelled flood levels in the area of the proposed development and the lowest ground topography level within the area of the proposed development shows that this area could be inundated with 0.01m of flood water for the 1:100yr event, 0.23m for the 1:100yr +35%CC event and 0.25m for the 1:1000yr event.

5.2.3 Flood defences:

Flood defences are structures which affect flow in times of flooding in order to reduce the risk water entering property. They generally fall into one of two categories; 'formal' or 'informal'.

A 'formal' flood defence is a structure which has been specifically built to control floodwater. It is maintained by its owner or statutory undertaker so that it remains in the necessary condition to function. In accordance with the Flood and Water Management Act, the Environment Agency has powers to construct and maintain defences to help against flooding.

An 'informal' defence is a structure that has not necessarily been built to control floodwater and is not maintained for this purpose. This includes road and rail embankments and other linear infrastructure (buildings and boundary walls) which may act as water retaining structures or create enclosures to form flood storage areas in addition to their primary function.

According to the Environment Agency, this location is not currently protected by any formal defences, and they do not currently have any flood alleviation works planned for the area.

5.2.4 Residual risk (breach or overtopping of flood defences):

Breaching of flood defences can cause rapid inundation of areas behind flood defences as flow in the river channel discharges through the breach. A breach can occur with little or no warning, although they are much more likely to concur with extreme river levels or tides when the stresses on flood defences are highest. Flood water flowing through a breach will normally discharge at a high velocity, rapidly filling up the areas behind the defences, resulting in significant damage to buildings and a high risk of loss of life. Breaches are most likely to occur in soft defences such as earth embankments although poorly maintained hard defences can also be a potential source of breach.

Overtopping of flood defences occurs when water levels exceed the protection level of raised flood defences. The worst case occurs when the fluvial or tidal levels exceed the defence level as this can lead to prolonged flooding. Less severe overtopping can occur when flood levels are below defence levels, but wave action causes cyclic overtopping, with intermittent discharge over the crest level of the defence. Flood defences are commonly designed with a freeboard to provide protection against overtopping from waves. The risk from overtopping due to exceedance of the flood defence level is much more significant than the risk posed by wave overtopping. Exceedance of the flood defence level can lead to prolonged and rapid flooding with properties immediately behind the defences at highest risk.

The site is not shown to benefit to any significant degree from the presence of flood defences.

5.2.5 Historical flood events:

The Environment Agency hold records that indicate the area historically flooded in December 2002 and July 2007.

The site is shown to be within the historic flood extent in December 2002. This event was caused by the channel capacity being exceeded (no raised defences).

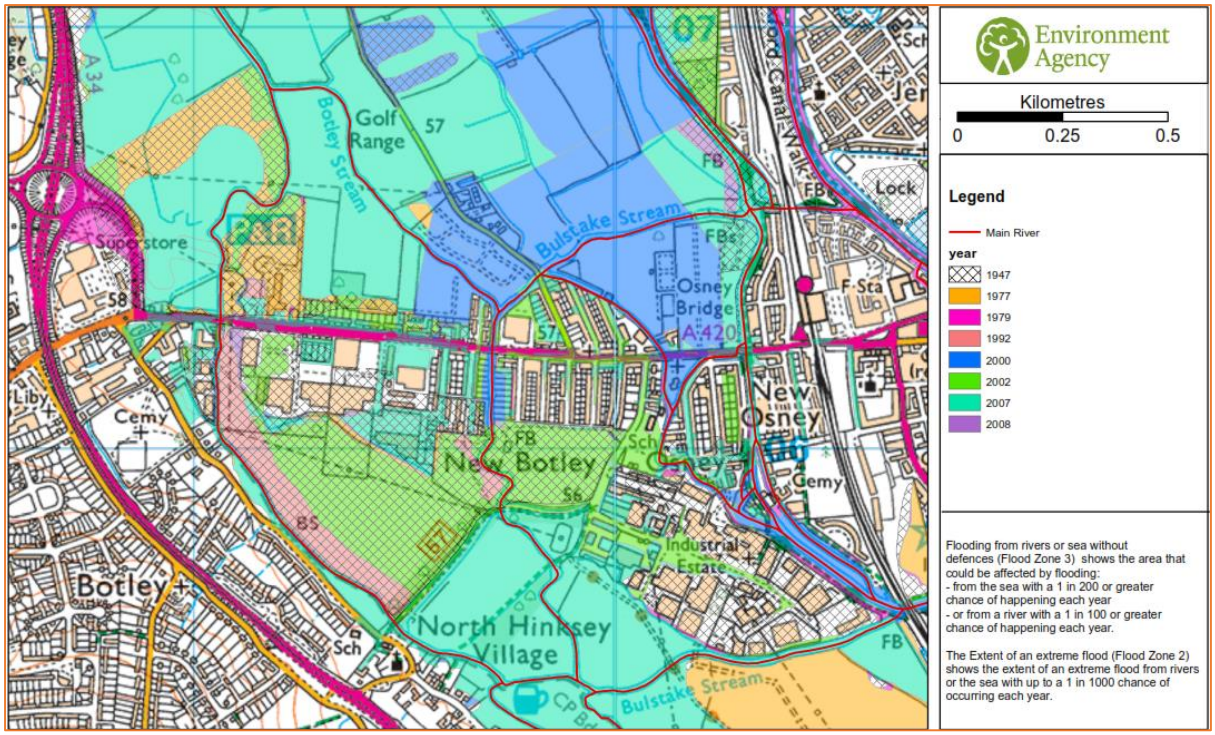


Figure 4: Historic Flood Map (Source: EA)

5.3 Pluvial (Surface Water):

Pluvial (surface water) flooding happens when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead.

In 2013 the EA, working with Lead Local Flood Authorities (LLFAs), produced an updated Flood Map for Surface Water. It is considered to represent a significant improvement on the previous surface water flood maps available, both in terms of method and representation of the risk of flooding. The modelling techniques and data used are considerably improved, and also incorporated locally produced mapping where this is available to represent features best modelled at a local scale.

The Flood Map for Surface Water assesses flooding scenarios as a result of rainfall with the following chance of occurring in any given year (annual probability of flooding is shown in brackets):

- High: Greater than or equal to 3.3% (1 in 30) chance in any given year (3.3%)
- 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

The mapping below shows the Risk of Flooding from Surface Water centred on the site. Please note that the EA to not consider this information suitable to be used to identify the risk to individual properties or sites. It is useful to raise awareness in areas which may be at risk and may require additional investigation.

The EA Surface Water Flood Map suggests that the entire site is located in an area at "Very Low" risk of flooding from surface water.

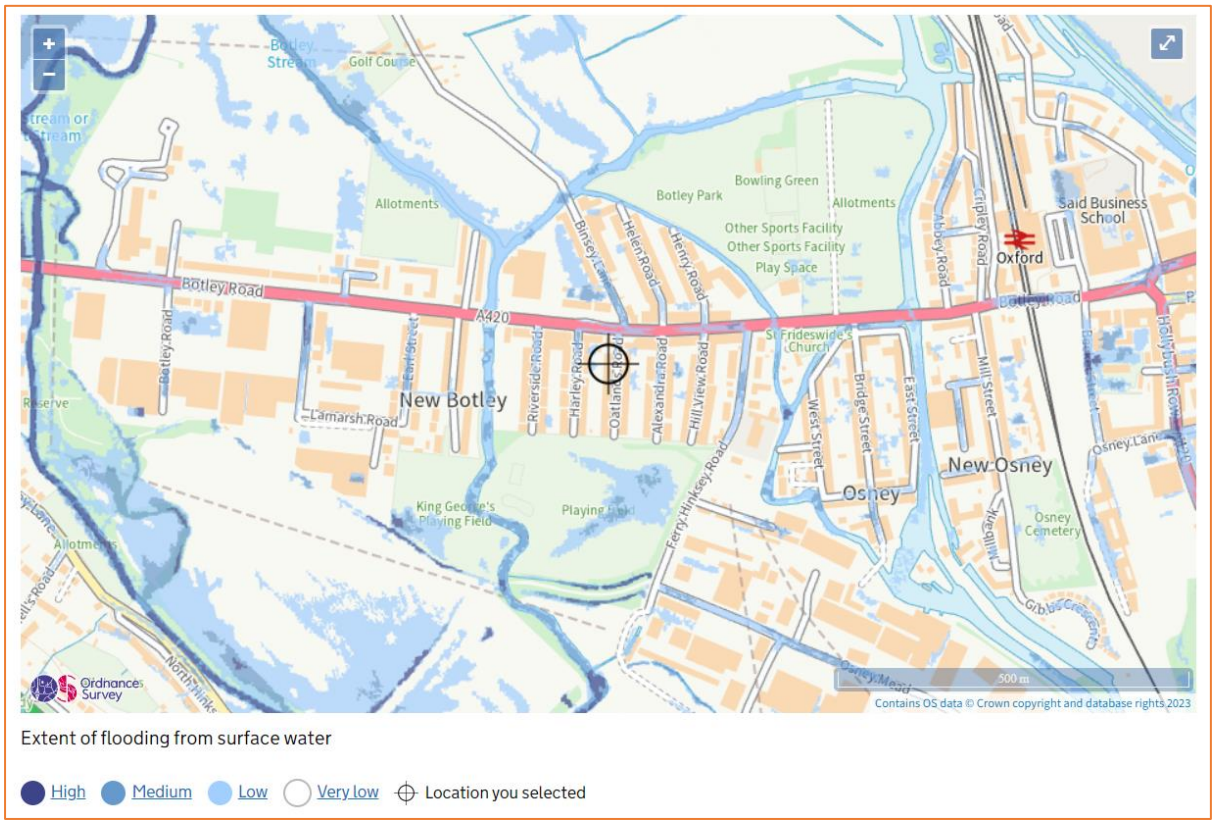


Figure 5: Extract from Environment Agency RoFSW map (Source: EA)

5.4 Groundwater:

Groundwater flooding occurs as a result of water rising up from the underlying rocks or from water flowing from abnormal springs. This tends to occur after much longer periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. Groundwater tends to flow from areas where the ground level is high, to areas where the ground level is low. In low-lying areas the water table is usually at shallower depths anyway, but during very wet periods, with all the additional groundwater flowing towards these areas, the water table can rise up to the surface causing groundwater flooding.

Groundwater flooding is most likely to occur in low-lying areas underlain by permeable rocks (aquifers). These may be extensive, regional aquifers, such as chalk or sandstone, or may be localised sands or river gravels in valley bottoms underlain by less permeable rocks. Groundwater flooding takes longer to dissipate because groundwater moves much more slowly than surface water and will take time to flow away underground.

According to the EA, flooding from groundwater is unlikely in this area. In addition, according to the Oxford City Council SFRA (November 2017) there are no Groundwater Registrar Locations in the vicinity of the site.

No further records of groundwater flooding on the site or the surrounding area have been provided.

5.5 Sewer Surcharge:

Sewer flooding occurs when the sewer network cannot cope with the volume of water that is entering it. It is often experienced during times of heavy rainfall when large amounts of surface water overwhelm the sewer network causing flooding. Temporary problems such as blockages, siltation, collapses and equipment or operational failures can also result in sewer flooding.

All Water Companies have a statutory obligation to maintain a register of properties/areas which have reported records of flooding from the public sewerage system, and this is shown on the DG5 Flood Register. This includes records of flooding from foul sewers, combined sewers and surface water sewers which are deemed to be public and therefore maintained by the Water Company. The DG5 register records of flood incidents resulting in both internal property flooding and external flooding incidents. Once a property is identified on the DG5 register, water companies can typically put funding in place to address the issues and hence enable the property to be removed from the register. It should be noted that flooding from land drainage, highway drainage, rivers/watercourses and private sewers is not recorded within the register.

No information has been provided to suggest that the site is susceptible to sewer surcharge flooding.

5.6 Other Sources:

Reservoirs with an impounded volume in excess of 25,000 cubic metres (measured above natural ground level) are governed by the Reservoirs Act and are listed on a register held by the Environment Agency. The site is inside the maximum inundation extent on the EA Reservoir Inundation Map. The EA also advise on their website that reservoir flooding is extremely unlikely. There has been no loss of life in the UK from reservoir flooding since 1925. All major reservoirs have to be inspected by specialist dam and reservoir Engineers. In accordance with the Reservoirs Act 1975 in England, these inspections are monitored and enforced by the EA themselves. The risk to the site from reservoir flooding is therefore minimal and is far lower than that relating to the potential for fluvial / tidal flooding to occur. The Environment Agency Reservoir Flood Map illustrated below, illustrates the largest area that might be flooded if the storage area were to fail and release the water it is designed to hold during a flood event.

Records of flooding from reservoirs and canals are erratic as there is no requirement for the Environment Agency to provide information on historic flooding from canals and raised reservoirs on plans. In particular, the NPPF does not require flood risk from canals and raised reservoirs to be shown on the Environment Agency flood zones.

Overflows from canals can be common as they are often fed by land drainage, and often do not have controlled overflow spillways. Occasionally, major bank breaches also occur, leading to rapid and deep flooding of adjacent land.

No further information has been provided to suggest the site is susceptible to from the failure of canals or other artificial infrastructure from the risk of flooding.

The Oxford City Council SFRA (November 2017) states that there is a risk to reservoir flooding however it has a low probability of occurrence and has not identified any historical occurrences of flooding or flood risk within the city limits.

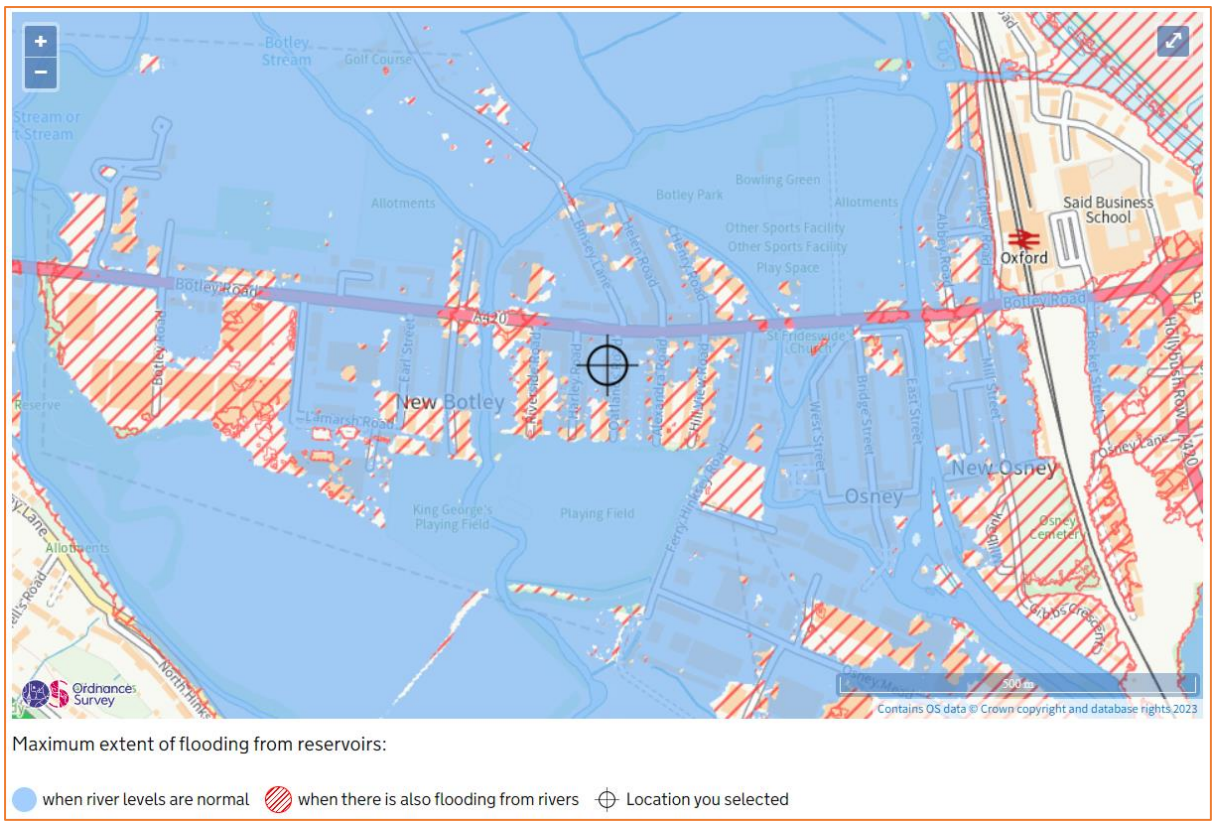


Figure 6: Extract from Environment Agency Risk of Flooding from Reservoirs Map (Source: EA)

6. Flood Risk Management

6.1 Vulnerability to flooding:

The NPPF classifies property usage by vulnerability to flooding.

The existing site usage is classified as ”more vulnerable” throughout, as it is a residential property. Post development, the site will remain “more vulnerable”, as the application is for the ground floor single storey rear extension.

Accordingly, it is considered that the vulnerability of the site as a whole has not increased post development. There will be no introduction of additional or separate units, no sub-division, and no intensification of usage.

6.2 EA Standing Advice:

The EA Standing Advice guidance is for domestic extensions and non-domestic extensions where the additional footprint created by the development does not exceed 250m^2. It should not be applied if an additional dwelling is being created, e.g. a self-contained annexe or additional commercial unit.

The proposed planning application is for the construction of a residential extension which does not exceed 250m^2. The development is considered to fit within the EA Standing Advice for domestic extensions.

6.3 Physical Design Measures:

The site lies entirely within Flood Zones 2 and 3 according to the EA Flood Map for planning (Rivers and the Sea).

Additionally, according to Environment Agency mapping, the site has been identified at “Very Low” Risk of Flooding from Surface Water.

Given that the proposed application is for an extension to the existing property (and will not introduce any additional or separate residential units), the applicant has confirmed that the finished floor level of the extension will be set no lower than the existing adjacent floor levels, internal access will be maintained from the ground floor to the first floor of the property. No new basements are proposed.

To help protect against flooding during extreme events, the applicant has agreed to implement flood resistant design measures into the extension, in consultation with the Local Authority building control department. These measures could include the following where possible:

- Solid concrete ground floor slab, with waterproof membrane;
- Waterproof screed used on ground floors;
- Closed-cell foam used in wall cavities;
- Waterproof ground floor internal render;

- External walls rendered resistant to flooding to at least 300mm above ground floor level;
- Exterior ventilation outlets, utility points and air bricks fitted with removable waterproof covers;
- Electrical incomer and meter situated at least 300mm above ground floor level;
- Boilers, control and water storage / immersion installed at least 300mm above ground floor level;
- Gas meter installed at least 300mm above ground floor level;
- Plumbing insulation of closed-cell design;
- Non-return valves fitted to all drain and sewer outlets;
- Manhole covers secured;
- Anti-syphon fitted to all toilets;
- Kitchen units of solid, water resistant material at ground floor level;
- Use of MDF carpentry (i.e. skirting, architrave, built-in storage) avoided at ground floor level;
- Stairs of solid hardwood construction with wood faces treated to resist water penetration at ground floor level.

6.4 Safe Escape and Flood Action Plan:

The NPPF requires a route of safe escape for all residents and users to be provided from new residential properties in Flood Zone 3. Safe escape is usually defined as being through slow moving flood water no deeper than 25cm during the 1:100 year fluvial plus allowance for climate change flood event.

However, it should be noted that the proposed application is for the extension of the existing property. No new units or additional dwellings will be created as part of the development. Safe escape is not a requirement under the EA Standing Advice guidance for extensions.

As such, site users should follow the flood warning and evacuation procedures outlined in the following section.

6.5 Flood Warning:

The EA is responsible for issuing flood warnings. Flood warnings are issued to the emergency services and local authorities. Both private individuals and organisations can sign-up to receive warnings via phone, text or email. This system of receiving warnings is currently voluntary.

Advice regarding severe flood warnings will generally be given during weather forecasts on local radio and TV. In the case of extreme events, warnings can also be disseminated via door to door visits by the police or locally appointed flood wardens.

The site lies within an Environment Agency Flood Warning/ Alert Area. The EA issue flood warnings/alerts to specific areas when flooding is expected. It is recommended that the applicant registers online with the free Environment Agency Floodline Warnings/Alert Direct service at www.gov.uk/sign-up-for-flood-warnings to receive flood warnings by phone, text or email.

The flood warning service has three types of warnings that will help you prepare for flooding and take action:

Flood Warning	Flood Alert	Flood Warning	Severe Flood Warning
			
What it means?	Flooding is possible. Be prepared.	Flooding is expected. Immediate action required.	Severe flooding. Danger to life.
When it's used?	Two hours to two days in advance of flooding.	Half an hour to one day in advance of flooding.	When flooding poses a significant threat to life.
What to do?	Be prepared to act on your flood plan. Prepare a flood kit of essential items. Monitor local water levels and the flood forecast on our website.	Move family, pets and valuables to a safe place. Turn off gas, electricity and water supplies if safe to do so. Put flood protection equipment in place.	Stay in a safe place with a means of escape. Be ready should you need to evacuate from your home. Co-operate with the emergency services. Call 999 if you are in immediate danger.

Table 3: EA Flood Warning Service

6.6 Flood Plan:

It is recommended that the applicant and future owners, occupiers and Landlords of the property prepare a flood plan to protect life and property during a flood event:

Before a flood:

- Find out if you are at risk of flooding.
- Find out if you can receive flood warnings.
- Prepare and keep a list of all your important contacts to hand or save them on your mobile phone.
- Think about what items you can move now and what you would want to move to safety during a flood such as pets, cars, furniture, and electrical equipment.
- Know how to turn off gas, electricity and water supplies.
- Prepare a flood kit of essential items and keep it handy. It can include copies of important documents, a torch, a battery-powered or wind-up radio, blankets and warm clothing, waterproofs, rubber gloves and a first aid kit including all essential medication.

- Consider buying flood protection products such as flood boards and airbrick covers to help reduce flood water getting into your property.

During a flood:

- Tune into your local radio station on a battery or wind-up radio.
- Fill jugs and saucepans with water.
- Grab your flood kit - if you have prepared one.
- Collect blankets, torch, first aid kit, medication and food.
- Move important documents, personal items, valuables, and lightweight belongings upstairs or to high shelves.
- Raise large items of furniture, or put them in large bags if you have them.
- Move people, outdoor belongings, cars and pets to higher ground.
- Switch off water, gas and electricity at mains when water is about to enter your home. Do not touch sources of electricity when standing in water.
- Fit flood protection products, if you have them, for example flood boards, airbrick covers, sandbags.
- Put plugs in sinks and baths. Weigh them down with a pillowcase or plastic bag filled with soil.
- If you do not have non-return valves fitted, plug water inlet pipes with towels or cloths.
- Move your family and pets upstairs or to a high place with a means of escape.
- Listen to the advice of the emergency service and evacuate if told to do so.
- Avoid walking or driving through flood water. Six inches of fast-flowing water can knock over an adult and two feet of water can move a car.

After a flood:

- If you have flooded, contact your insurance company as soon as possible.
- Take photographs and videos of your damaged property as a record for your insurance company.
- If you don't have insurance, contact your local authority for information on grants and charities that may help you.
- Flood water can contain sewage, chemicals and animal waste. Always wear waterproof outerwear, including gloves, wellington boots and a face mask.
- Have your electrics, central heating and water checked by qualified engineers before switching them back on.

6.7 Off-Site Impacts:

6.7.1 Fluvial floodplain storage:

The NPPF requires that where development is proposed in undefended areas of floodplain, which lie outside of the functional floodplain, the implications of ground raising operations for flood risk elsewhere needs to be considered. Raising existing ground levels may reduce the capacity of the floodplain to accommodate floodwater and increase the risk of flooding by either increasing the depth of flooding to existing properties at risk or by extending the floodplain to cover properties normally outside of the floodplain. Flood storage capacity can be maintained by lowering ground levels either within the curtilage of the development or elsewhere in the floodplain, in order to maintain at least the same volume of flood storage capacity within the floodplain.

In undefended tidal areas, raising ground levels is unlikely to impact on maximum tidal levels so the provision of compensatory storage should not be necessary.

For development in a defended flood risk area, the impact on residual flood risk to other properties needs to be considered. New development behind flood defences can increase the residual risk of flooding if the flood defences are breached or overtopped by changing the conveyance of the flow paths or by displacing flood water elsewhere. If the potential impact on residual risk is unacceptable then mitigation should be provided.

The site is situated in Flood Zones 2 and 3 when using the Environment Agency Flood Map for Planning (Rivers and Sea). The proposal is for a minor domestic extension, which fits within the EA Standing Advice. Accordingly, therefore there will be no unacceptable loss of floodplain storage.

In line with the requirements of the Flood Mitigation Officer for Oxford City Council;

> *"The suitable* [Climate Change] *allowance for the area is 26%, so in lieu of this being unavailable, 35%* [Climate Change allowance] *should be used."*

The total area of the proposed increase in built footprint caused by the extension is approximately 9.83m$^{2.}$ The maximum flood depth for the 1:100yr+35% is 0.23m, therefore there is a maximum loss of floodplain storage of 2.26m^3. Accordingly, therefore there will be no unacceptable loss of floodplain storage.

6.7.2 Surface Water Drainage:

The development will utilise Sustainable Urban Drainage (SuDs) design in accordance with the NPPF for Planning Applications hierarchy as follows:

1. Store rainwater for later use;
2. Infiltration techniques;
3. Attenuate rainwater by storing in tanks for gradual release;
4. Discharge rainwater direct into watercourse;
5. Discharge rainwater into surface water sewer;
6. Discharge rainwater into a combined sewer;
7. Attenuation of rainwater in ponds or open water features with controlled discharge into the local watercourse.

All surface water runoff generated by the proposed development up to 1:100 year rainfall event (plus climate change) will be stored on site, prior to being discharged.

Due to the scale of the development, a full Surface Water Drainage Strategy is not required at this stage of planning. The proposed development will utilise the existing drainage arrangements on site.

7. Sequential and Exception Test

The Sequential Test aims to ensure that development does not take place in areas at high risk of flooding when appropriate areas of lower risk are reasonably available.

The Sequential Test is applied to developments in areas identified as being at risk of any source of flooding now or in the future. The Sequential Test ensures that a sequential, risk-based approach is followed to steer new development to areas with the lowest risk of flooding, taking all sources of flood risk and climate change into account.

The sequential approach is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. This means avoiding, so far as possible, development in current and future medium and high flood risk areas considering all sources of flooding including areas at risk of surface water flooding. Other forms of flooding need to be treated consistently with river and tidal flooding in mapping probability and assessing vulnerability, so that the sequential approach can be applied across all areas of flood risk.

The site is situated in Flood Zones 2 and 3 when using the Environment Agency Flood Map for Planning (Rivers and Sea) and lies in an area at "Very Low" to risk from surface water flooding. The proposed development is considered to be 'more vulnerable' (residential), but the proposal is for a minor extension, and will not increase the vulnerability of the site or introduce any separate or additional units.

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	✗	✗	✗	✓

Table 4: Flood risk vulnerability and flood zone 'compatibility'

The Sequential and Exception Tests do not need to be applied to minor developments and changes of use (this application is for 'minor development' – a residential extension).

8. Discussion and Conclusions

Unda Consulting Limited have been appointed by Rex Construction Ltd to undertake a Site Specific Flood Risk Assessment (FRA) for Planning at 8 Oatlands Road, Oxford OX2 0ET. The FRA has been undertaken in accordance with the National Planning Policy Framework (NPPF) and the associated technical guidance, as well as relevant Local Policies.

This report presents our findings based on the readily available information and data relating to the site and surrounding drainage area.

The existing site usage is classified as ”more vulnerable” throughout, as it is a residential property. Post development, the site will remain “more vulnerable”, as the application is for the construction of a side and rear extension Accordingly, it is considered that the vulnerability of the site as a whole has not increased post development. There will be no introduction of additional or separate units, no sub-division, and no intensification of usage.

The site is located within Flood Zone 2 (Medium Probability), which means it is defined as land having between a 1 in 100 and 1 in 1,000 annual probability of river and sea flooding and Flood Zone 3 (High Probability), which means it is defined as land having at least a 1:100 annual probability of fluvial flooding.

The risk would appear to be predominantly fluvial and originate from the Seacourt Stream, approximately 166m west and 247m east of the site, the Bulstake Stream 319m south of the site and the River Thames 448m east of the site.

The EA has provided modelled flood data from the Thames (Eynsham to Sandford) 2018, the information provided is from the Oxford Flood Alleviation Scheme mapping completed in March 2018. The project included updating the existing (2014) hydraulic model to support development of the outline FAS design. The study was carried out using 1D-2D modelling software (Flood modeller-Tuflow).

The site falls within Gloucestershire and the Vale Catchment, where the Central climate change allowance for the 2080’s is a 26% increase in river flows. However, the Flood Mitigation Officer for Oxford City Council states;

> *“The suitable* [Climate Change] *allowance for the area is 26%, so in lieu of this being unavailable, 35%* [Climate Change allowance] *should be used.”*

Comparison of the EA modelled flood levels in the area of the proposed development and the lowest ground topography level within the area of the proposed development shows that this area could be inundated with 0.01m of flood water for the 1:100yr event, 0.23m for the 1:100yr +35%CC event and 0.25m for the 1:1000yr event.

According to the Environment Agency, this location is not currently protected by any formal defences, and they do not currently have any flood alleviation works planned for the area.

The Environment Agency hold records that indicate the area historically flooded in December 2002 and July 2007. The site is shown to be within the historic flood extent in December 2002. This event was caused by the channel capacity being exceeded (no raised defences).

The EA Surface Water Flood Map suggests that the entire site is located in an area at "Very Low" or "Low" risk of flooding from surface water.

No information has been provided to suggest that the site is susceptible to groundwater, sewer surcharge or reservoir flooding.

Safe escape is not a requirement under the EA Standing Advice guidance is for domestic extensions.

The development is considered to fit within the EA Standing Advice for domestic extensions.

The total area of the proposed increase in built footprint caused by the extension is approximately 9.83$m^{2.}$ The maximum flood depth for the 1:100yr+35% is 0.23m, therefore there is a maximum loss of floodplain storage of 2.26m^3. Accordingly, therefore there will be no unacceptable loss of floodplain storage.

The applicant has confirmed that:

- The development is considered to fit within the EA Standing Advice for domestic extensions.
- The proposed application is for a residential extension (to remain a single dwelling).
- Floor levels within the extension will be set no lower than existing adjacent floor levels.
- There will be no introduction of additional or separate units, no sub-division, and no intensification of usage.
- No new basements are proposed.
- Internal access will be maintained from the ground floor to the property's first floor.
- Flood proofing will be incorporated as appropriate.
- No unacceptable loss of floodplain storage.
- Due to the small scale of the development, existing drainage arrangements will be retained.
- The applicant will register with the free Environment Agency Floodline Warnings Direct service.

Assuming accordance with these flood risk management measures, Unda Consulting Limited consider the proposed application to be suitable in flood risk terms.

Appendix

- Site location and proposed plans.
- Environment Agency Flood Map for planning.

01 Site Loction Plan
1:1250 @ A3

North

NOTES:

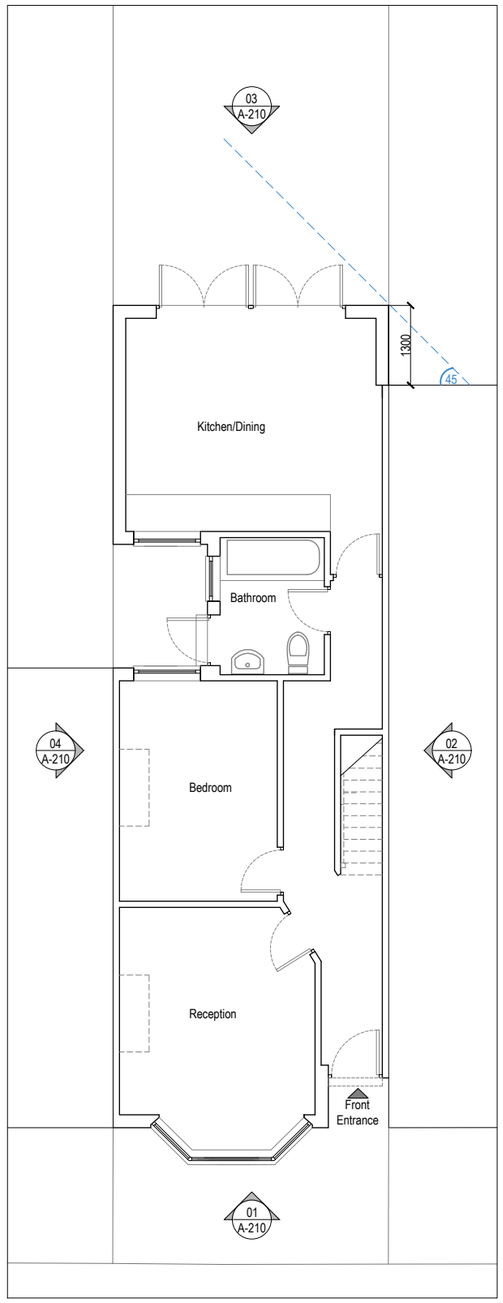
SCALE BAR 1:1250 — 0 12.5 25 50m

No.	Date	Issues and Revisions	By	Check	No.	Date	Issues and Revisions	By	Check
00	12/06/23	Issued to Council: Planning Submission	CB	CB					

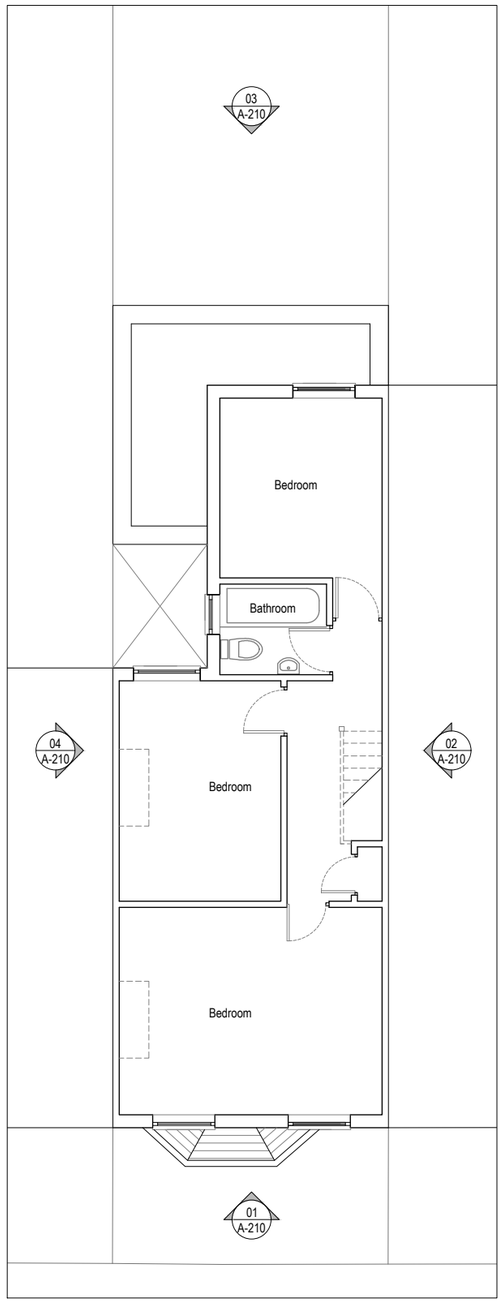
ARCHANÆUM
Co No: 10498892
www.archanaeum.com

Project Name:	OATLANDS ROAD
Project Number:	087
Status:	PLANNING
Description:	SITE LOCATION PLAN
Scale:	1:1250 @ A3

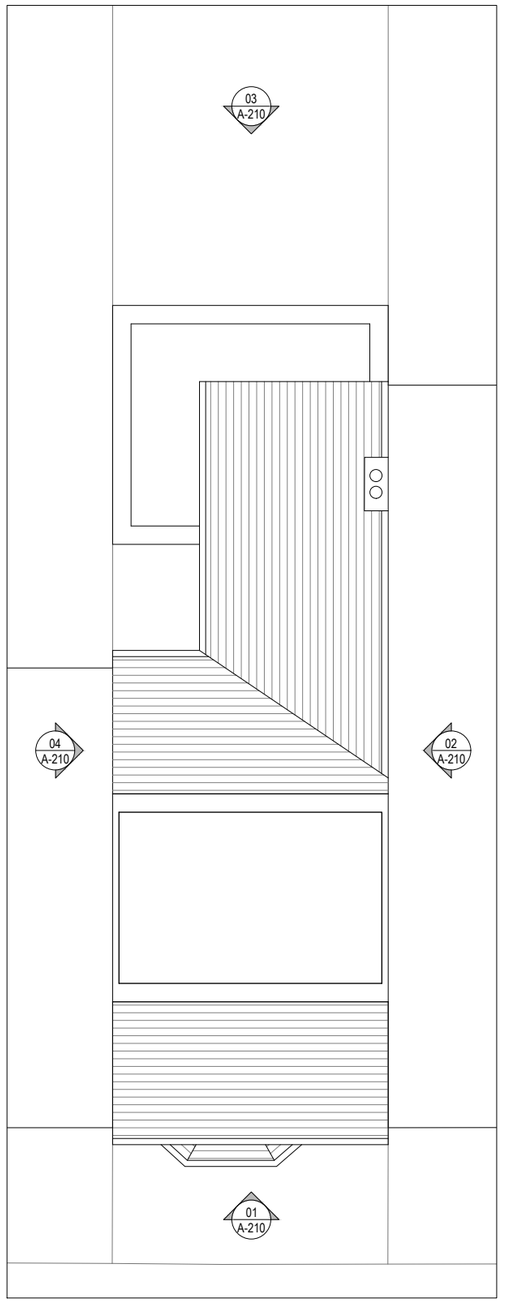
Drawing Number: 087_A-080 — Revision: 00



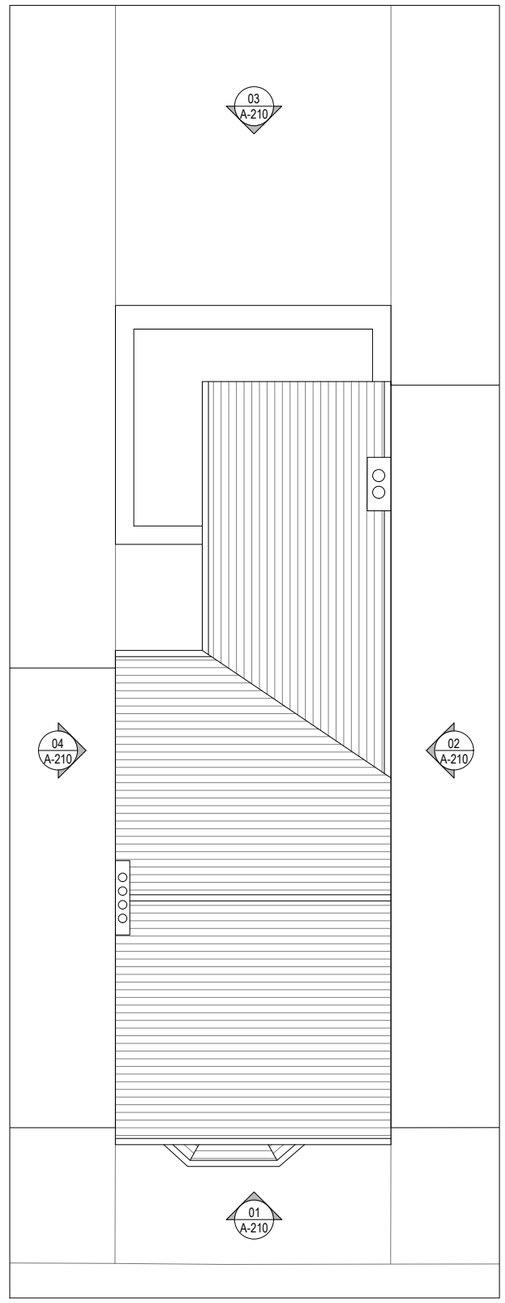
01 Proposed Ground Floor Plan
1:100 @ A3



02 Proposed First Floor Plan
1:100 @ A3



03 Proposed Loft Plan
1:100 @ A3



04 Proposed Roof Plan
1:100 @ A3

North

NOTES:

SCALE BAR 1:100 0 0.5 1 2.5 5m

No.	Date	Issues and Revisions	By	Check	No.	Date	Issues and Revisions	By	Check
02	25/08/23	Amendments to rear extension	CB	CB					
01	12/06/23	Issued to Council: Planning Submission	CB	CB					
00	08/06/23	Draft Issued to Client	CB	CB					

ARCHANÆUM
Co No: 10498892
www.archanaeum.com

Project Name: OATLANDS ROAD
Project Number: 087
Status: PLANNING
Description: PROPOSED FLOOR PLANS
Scale: 1:100 @ A3

Drawing Number: 087_A-110
Revision: 02

Flood map for planning

Your reference	Location (easting/northing)	Created
<Unspecified>	**449872/206161**	**18 Aug 2023 10:20**

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

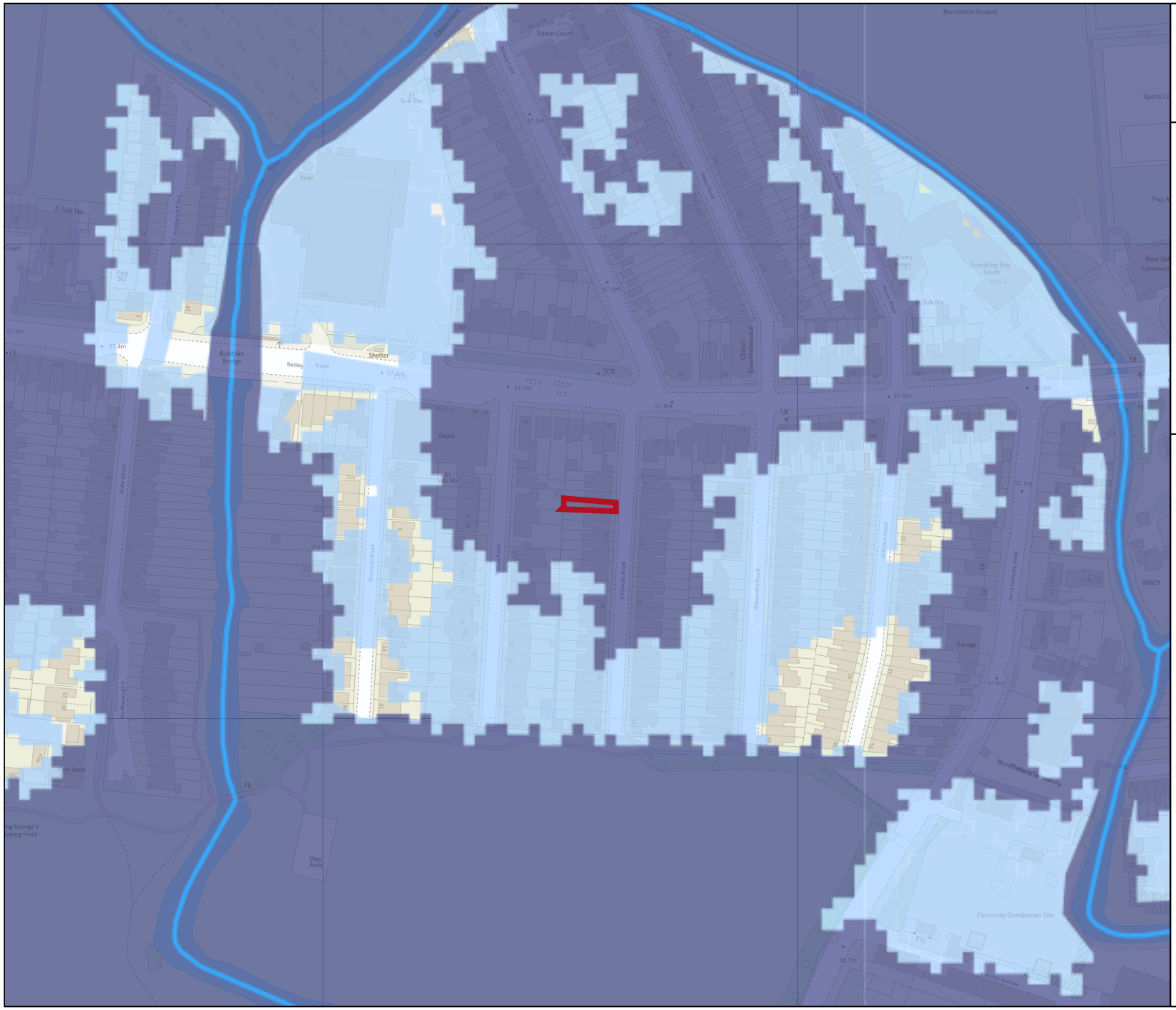
This means:

- 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)
449872/206161

Scale
1:2500

Created
18 Aug 2023 10:20

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

0 20 40 60m