

Prepared for:
Michael Skehin

October 2022

Our reference:
91977-Skehin-TheWarren

Location:
Plot on The Warren
Caversham
Reading
RG4 7TH



Document Issue Record

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Location: Plot on The Warren, Caversham, Reading, RG4 7TH
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Lead Consultant: Mrs Emma Jeffery
Authorisation: Mr Edward Bouet

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Southpoint, Old Brighton Road, Gatwick, West Sussex, RH11 0PR

+44 (0) 1293 214 444

www.unda.co.uk

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1. Key Facts

1.1 Flood Risk Posed:

- EA Flood Zones 2 and 3 (Medium and High Risk).
- Fluvial flood risk originating from River Thames.
- Modelled flood levels and extents have been requested from the Environment Agency
- There is also existing development on site, and therefore the site is considered to be partially within Flood Zone 3b (Functional Floodplain), and partially within Flood Zone 3b 'Developed' and therefore considered equivalent to Flood Zone 3a for planning purposes.
- History of flooding at the site.
- According to Environment Agency data, there are no Flood Storage Areas located in close proximity to the site.
- The EA Risk of Flooding from Surface Water Map suggests that the site lies within an area of "Very Low" to "Low" risk of flooding from surface water.
- Risk of groundwater and sewer surcharge flooding would appear to be low.

1.2 Flood Risk Mitigation:

- The lower ground floor level will be set at least 39.22mAOD – at least 300mm above the 1:100 year flood level with 35% allowance for climate change.
- There will be no fluvial floodplain displacement on site post development, the entire proposed building will be constructed on floodable voids covering the entire built footprint. There will be no other land raising or non-floodable built footprint construction below the modelled 1:100 year flood level including climate change on site.
- Safe escape from the site can be provided.
- Internal access will be maintained from the lower ground floor to the above floors of the development.
- Flood proofing of the property will be incorporated as appropriate.
- 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 Michael Skehin (hereinafter referred to as “the applicant”) to undertake a Flood Risk Assessment at Plot on The Warren, Caversham, Reading, RG4 7TH. (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.

The site would appear to be located within Flood Zones 2 & 3 as defined by the Environment Agency (EA) on their online Flood Map for Planning. Under the National Planning Policy Framework (NPPF), an 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.

- 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 located on the north side of the River Thames.

A map showing the site location is presented below in Figure 1.



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

3.2 Topography:

A topographical site survey has been provided, which shows site levels range between 36.96mAOD and 41.81mAOD, with the site sloping generally down from north to south – towards the River Thames.

There is an existing bank / edge of slope at the top (north) of the site, where the existing buildings are located. In this area site levels range between 38.05mAOD and 41.81mAOD.

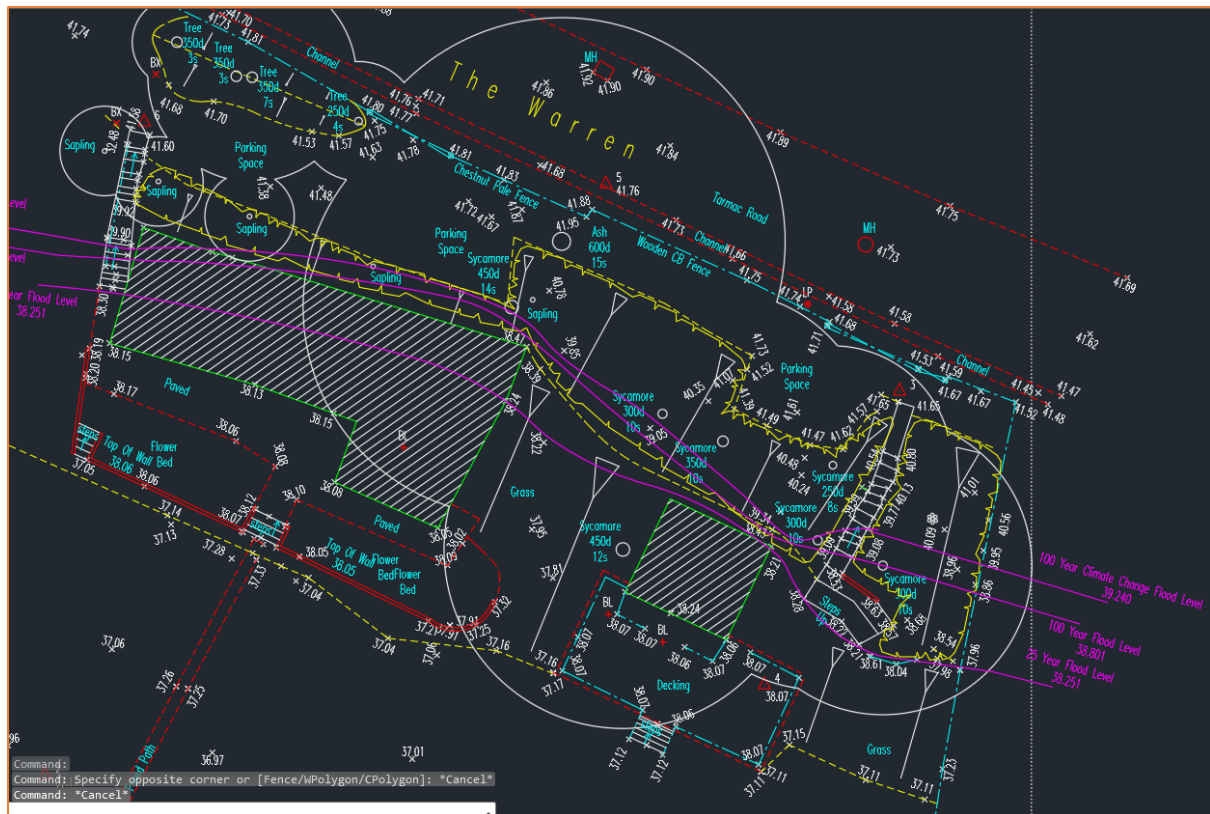


Figure 2: Extract from topographical site survey

3.4 Geology and Soil:

The British Geological Survey (BGS) Map indicates that the bedrock underlying the site is Seaford Chalk Formation and Newhaven Chalk Formation (undifferentiated) – Chalk. The Superficial Deposits recorded at the site are Alluvium – Clay, Silt, Sand and Gravel.

The soil type taken from the UK Soil Observatory website are intermediate-shallow soils from Chalk soil parent material, with a chalky, silty loam soil texture.

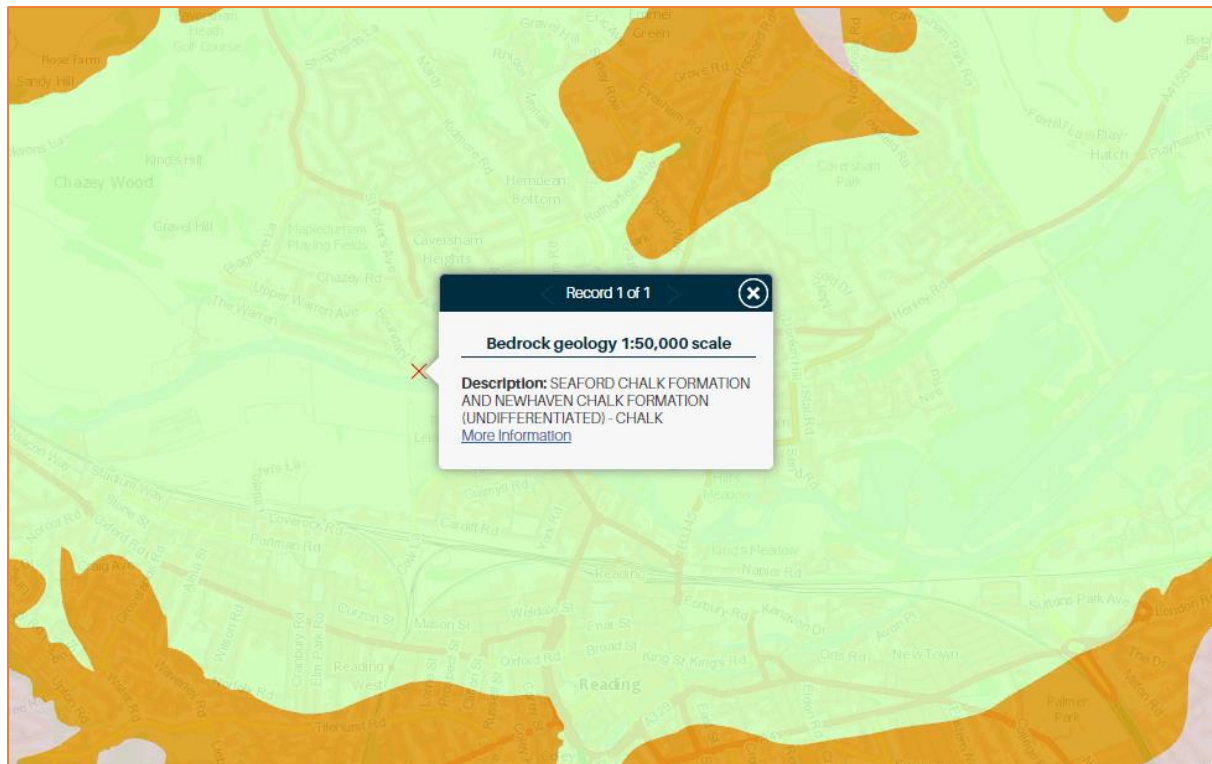


Figure 3: Local bedrock geology (Source: BGS)

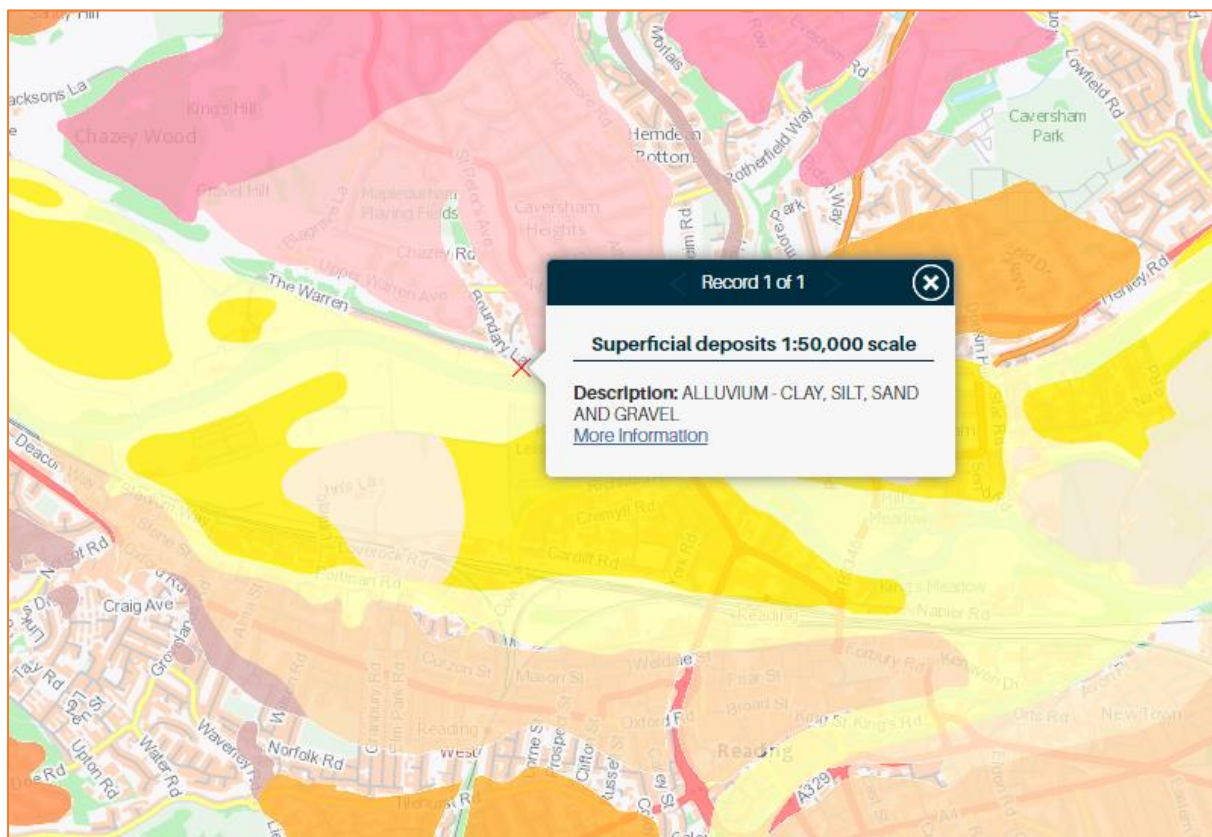


Figure 4: Local superficial deposits (Source: BGS)

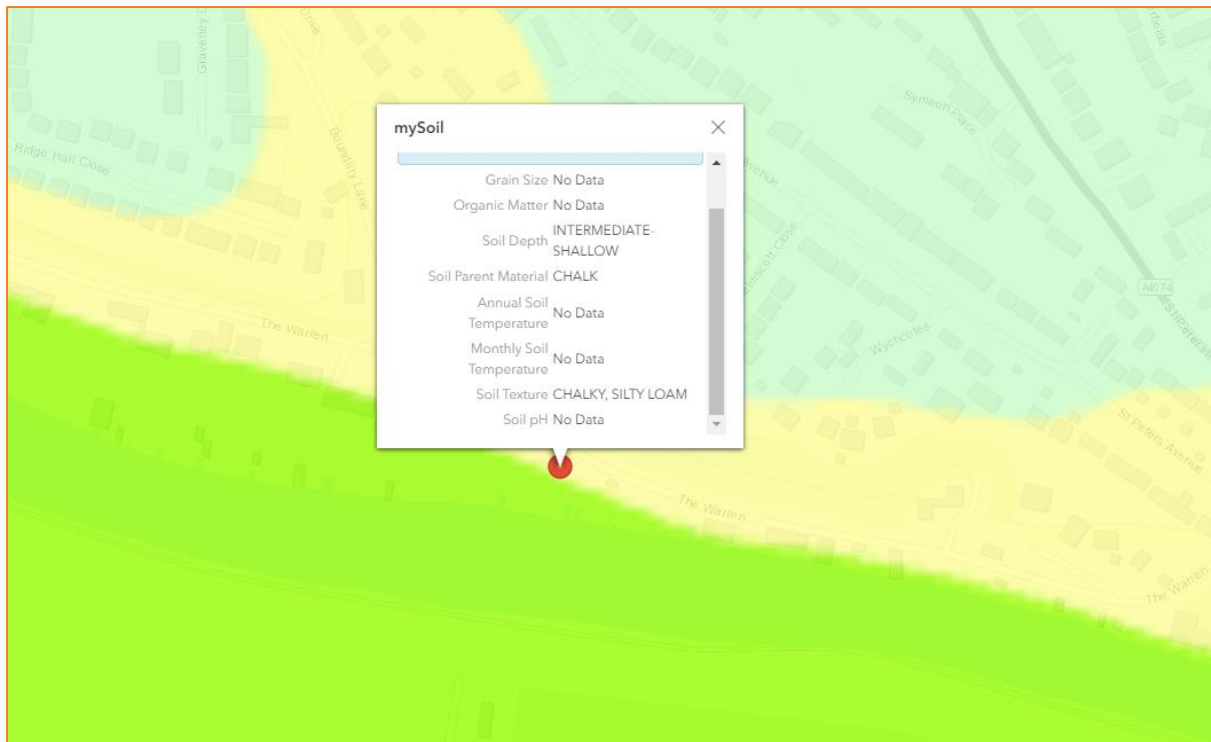


Figure 5: Local soil types (Source: UKSO)

4. Development Proposal

The proposed application is for a residential dwelling.

Proposed plans are provided within the report Appendix.



Figure 6: Proposed site plan (Source: Atelier Guy)

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 online 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.

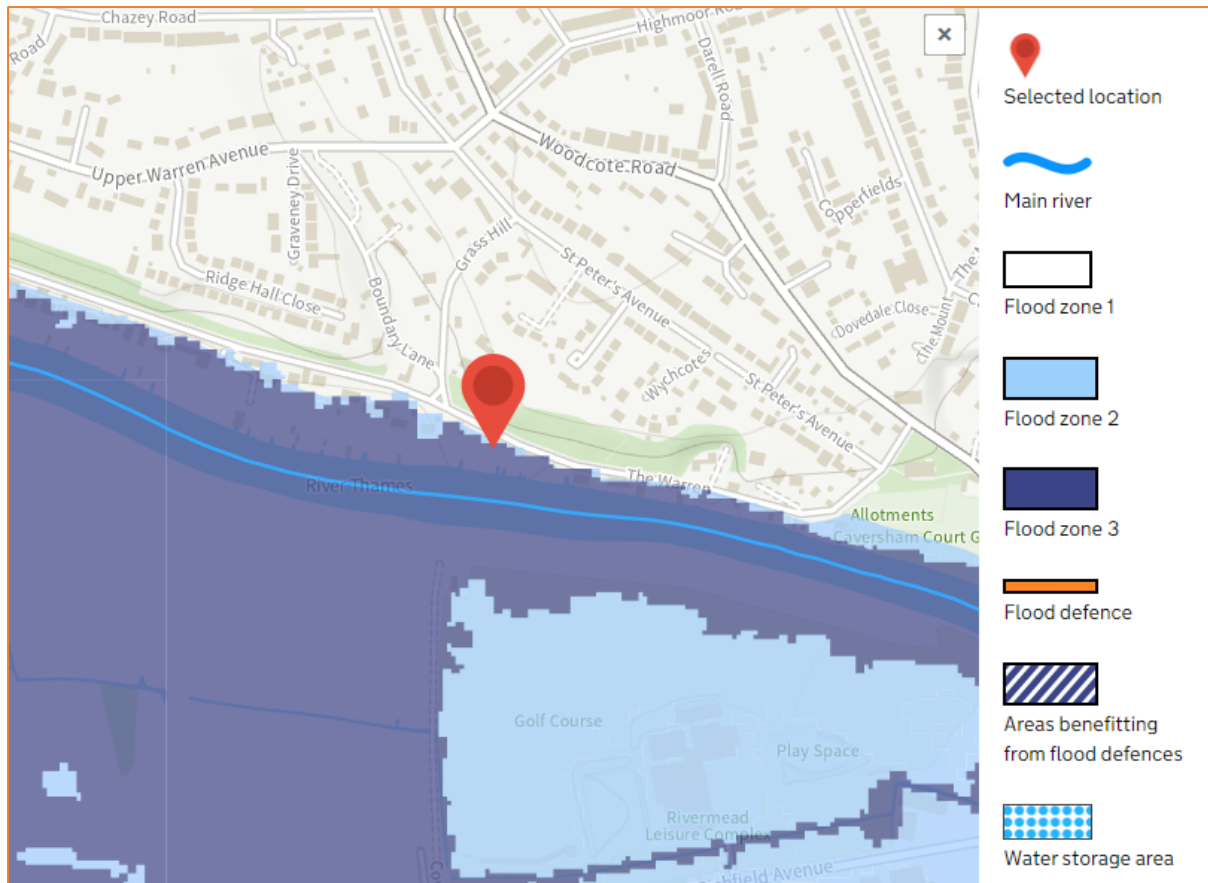


Figure 7: Environment Agency Online Flood Map for Planning (Rivers and Sea) (Source: EA)

The site is located partially 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 (Medium Probability), which means it is defined as land having at least a 1:100 annual probability of fluvial flooding.

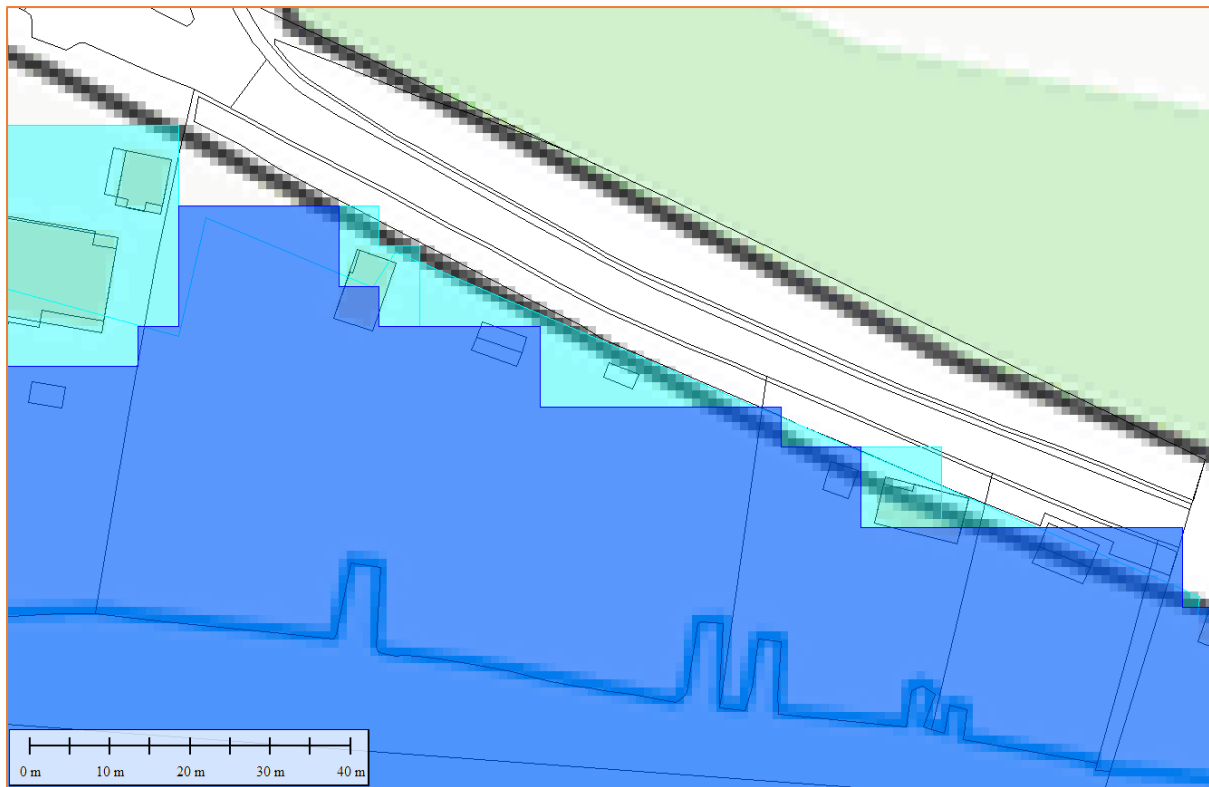


Figure 8: Environment Agency Flood Zone 2 and 3 outlines at the site (Source: EA)

The risk would appear to be potential fluvial flood risk, from the Upper River Thames which is located to the south of the site.

5.2 Fluvial (Upper River Thames):

The River Thames is a river that flows through southern England. It is the longest river entirely in England and the second longest in the United Kingdom, after the River Severn. While it is best known for flowing through London, the river also flows alongside other towns and cities, including Oxford, Reading, Henley-on-Thames and Windsor.

The Thames rises in the Cotswolds Hill at Thameshead in the West of England; and flows in a west-east direction to the Estuary and the Atlantic Ocean off the East Coast.

The River Thames is 215 miles in total length from source to sea and is located in the Thames Catchment which is also known as the Thames River Basin and includes 4,994 square miles across most of south eastern and western England.

The river gives its name to three informal areas: the Thames Valley, a region of England around the river between Oxford and West London; the Thames Gateway; and the greatly overlapping Thames Estuary around the tidal Thames to the east of London and including the waterway itself.

The River Thames is classified as a 'Main River' by the Environment Agency.

5.2.1 Modelled flood levels and extents:

Modelled flood levels and extents have been requested from the Environment Agency for use within this report. The EA has provided modelled flood data from the Thames (Sandford to Mapledurham) 2018 flood model. The information provided is from the Abingdon Flood Schemes

mapping completed in June 2017. The previous model 1D model was updated to a 1D-2D model (Flood modeller-Tuflow). The updated model will also be used to assess downstream effects due to flood alleviation options in Oxford and Abingdon.

The site is shown to be partially within the 1:20 year, 1:100 year and 1:1000 year modelled flood extents.

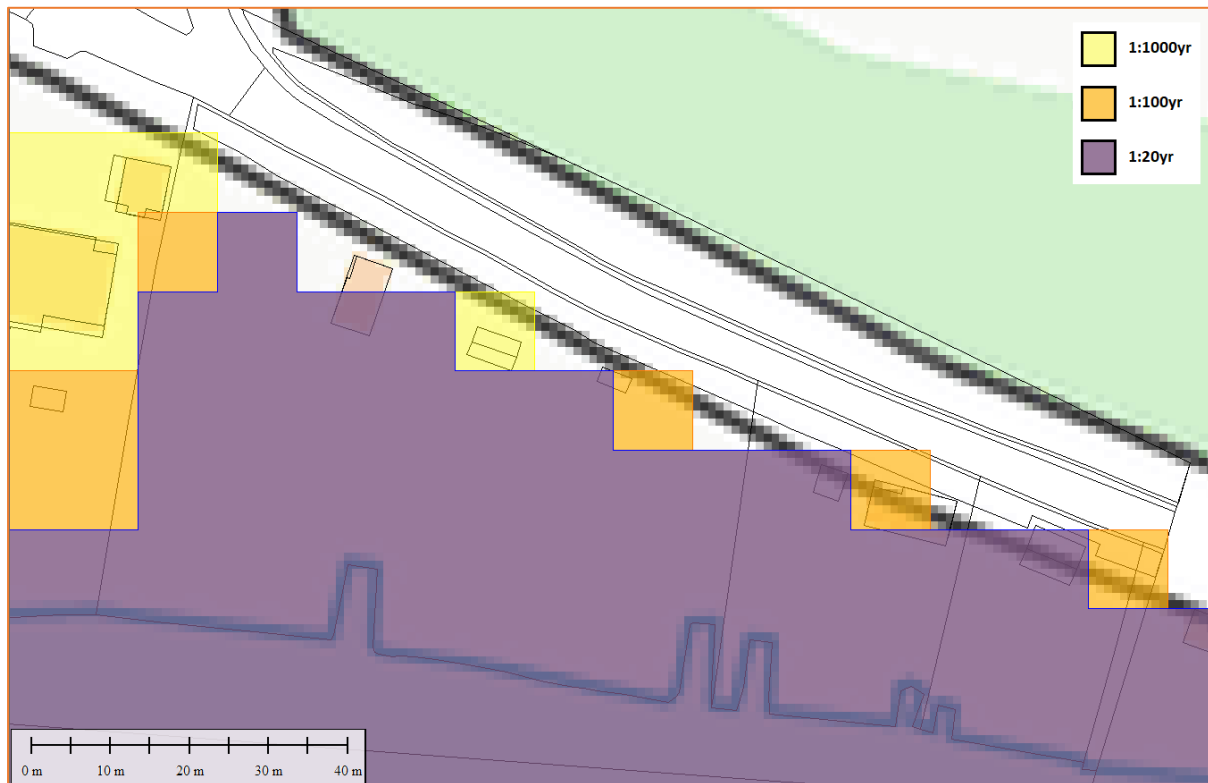


Figure 9: Modelled flood extents (Source: EA)

The site is located partially within Flood Zones 2 and 3, and is classified as “more vulnerable” (residential). The Flood Risk Assessments: climate change allowances guidance – updated May 2022, states that the Central climate change allowance should normally be applied. The site is however shown to be partially within the modelled 1:30 year extent – and therefore partially within Flood Zone 3b. The Flood Risk Assessments: climate change allowances guidance states that the Higher Central climate change allowance should be applied for “more vulnerable” development within Flood Zone 3b.

The site falls within the Thames and South Chilterns Management Catchment, where the Central climate change allowance for the 2080's is a 31% increase in river flows, and the Higher Central climate change allowance for the 2080's is a 43% increase in river flows.

The Thames (Sandford to Mapledurham) 2018 flood model includes the 1:100 year +35% climate change and 1:100 year +70% climate change scenarios.

Modelled scenario	Modelled flood level
1:30 year	38.02mAOD
1:100 year	38.45mAOD
1:1000 year	39.14mAOD
1:100 year +35% climate change	38.92mAOD
1:100 year +70% climate change	39.25mAOD

Table 2: Modelled on-site flood levels (Source: EA)

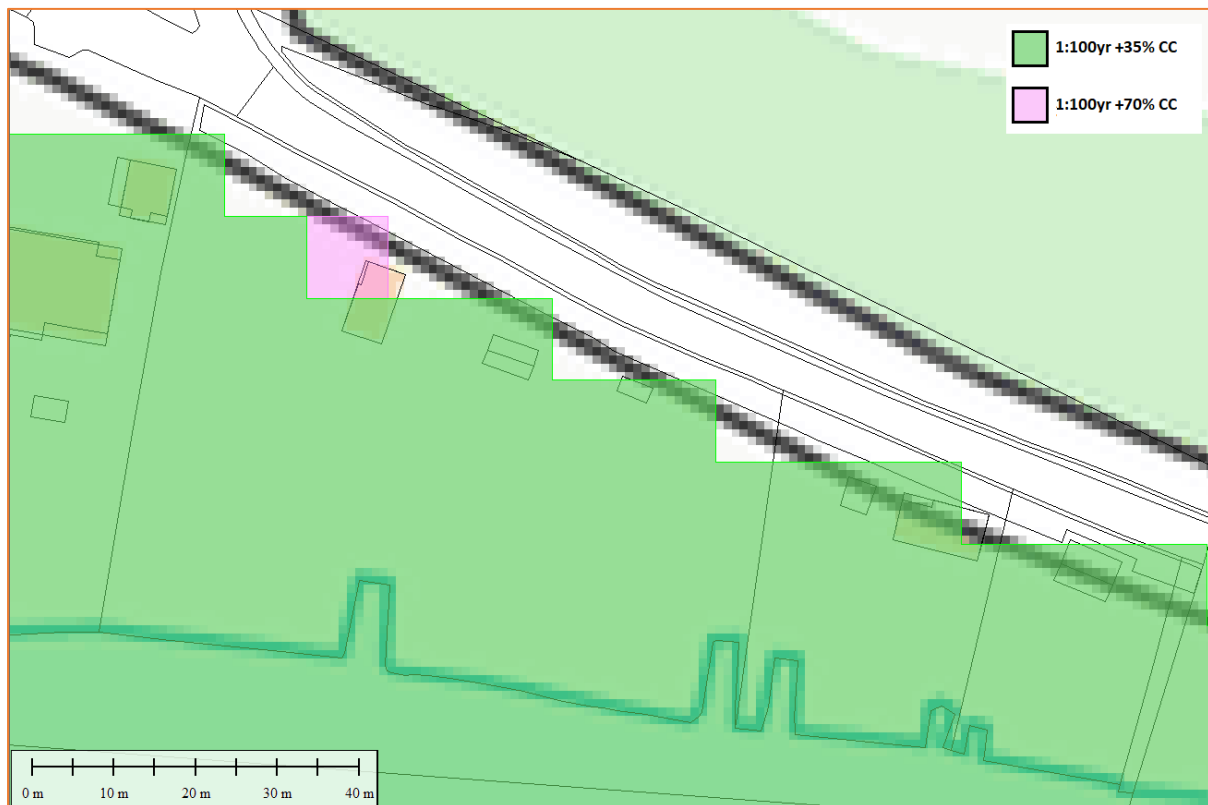


Figure 10: Modelled flood extents including allowance for climate change (Source: EA)

Comparison of the modelled flood levels provided with topographic site levels (38.05mAOD to 41.81mAOD in the northern part of the site, where the existing buildings are located) shows that this portion of the site is entirely above the modelled 1:30 year level, but partially below the other modelled flood levels provided.

5.2.2 Functional Floodplain:

This zone comprises land where water is required to flow or be stored in times of flood. The functional floodplain designation encompasses land which would flood with an annual probability of 1 in 30 or greater in any year; and includes areas of land required for water conveyance routes.

According to the Reading Borough Council Level 1 Strategic Flood Risk Assessment (RBC SFRA), June 2017, Flood Zone 3b is defined as:

Flood Zone 3b = 'Land where water has to flow or be stored in times of flood' (see below)

The extent of Flood Zone 3b has been defined by land having a 1 in 20 (5%) or greater annual probability of river flooding. Flood Zone 3b has been further delineated into two sub-categories (to be considered on a site specific basis):

- o **Flood Zone 3b - 'Developed'** - refers to areas of 'previously developed land', which are to be considered equivalent to Flood Zone 3a sites for planning purposes, and;

- o **Flood Zone 3b - 'Functional Floodplain'** - areas of existing open space where water has to flow or be stored in times of flood.

The site is partially located within the 1:30 year flood extent, however comparison of the modelled 1:30 year flood level (38.02mAOD) with topographic site levels (38.05mAOD to 41.81mAOD in the northern part of the site, where the existing buildings are located) shows that this portion of the site is entirely above the modelled 1:30 year level.

There is also existing development on site, and therefore the site is considered to be partially within Flood Zone 3b (Functional Floodplain), and partially within Flood Zone 3b 'Developed' and therefore considered equivalent to Flood Zone 3a for planning purposes.



Figure 11: Photographs of existing development on site (Source: Berkshire Developments)

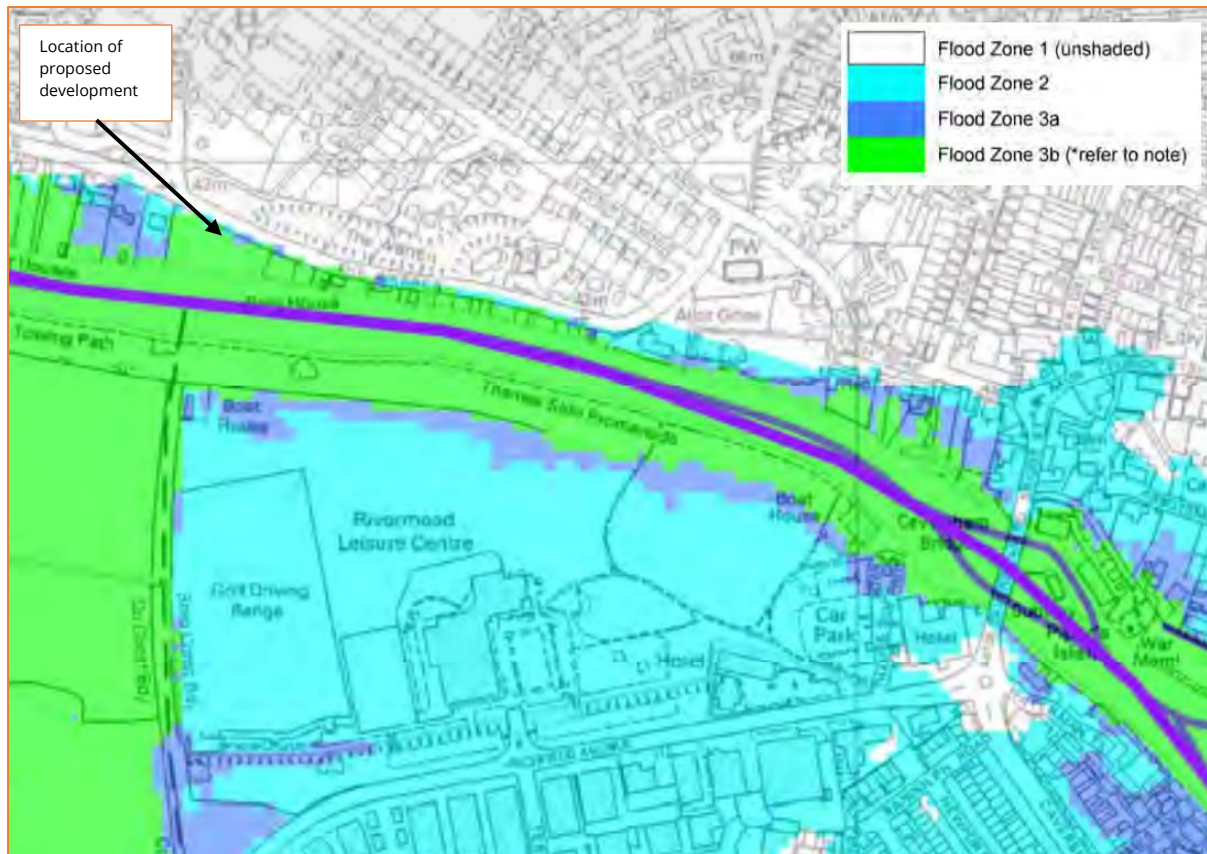


Figure 12: Extract from Flood Zone Map (Source: RBC SFRA)

5.2.3 Flood Storage Areas:

Flood Storage Areas are areas that act as a balancing reservoir, storage basin or balancing pond. Their purpose is to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel. It may also delay the timing of a flood peak so that its volume is discharged over a longer time interval. Flood storage areas do not completely remove the chance of flooding and can be overtopped or fail in extreme weather conditions.

According to Environment Agency data, there are no Flood Storage Areas located in close proximity to the site.

5.2.4 Flood Defences

A flood defence or EA Asset is any man-made or natural feature – such as a raised defence, retaining structure, channel, pumping station or culvert – that performs a flood defence or land drainage function.

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

5.2.5 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.

5.2.6 Historical flood events:

According to the EA historical fluvial flooding has occurred in the surrounding area in 1947, 1977, 2000, 2002/3, 2007 and 2013-14. These events were caused by channel capacity exceeded (no raised defences).

No other records of flooding at the site are shown in the Reading SFRA.

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

Please note that the EA do 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 Risk of Flooding from Surface Water Map suggests that the site lies within an area of "Very Low" to "Low" risk of flooding from surface water.

The Lead Local Flood Authority which covers the site is Reading Council.

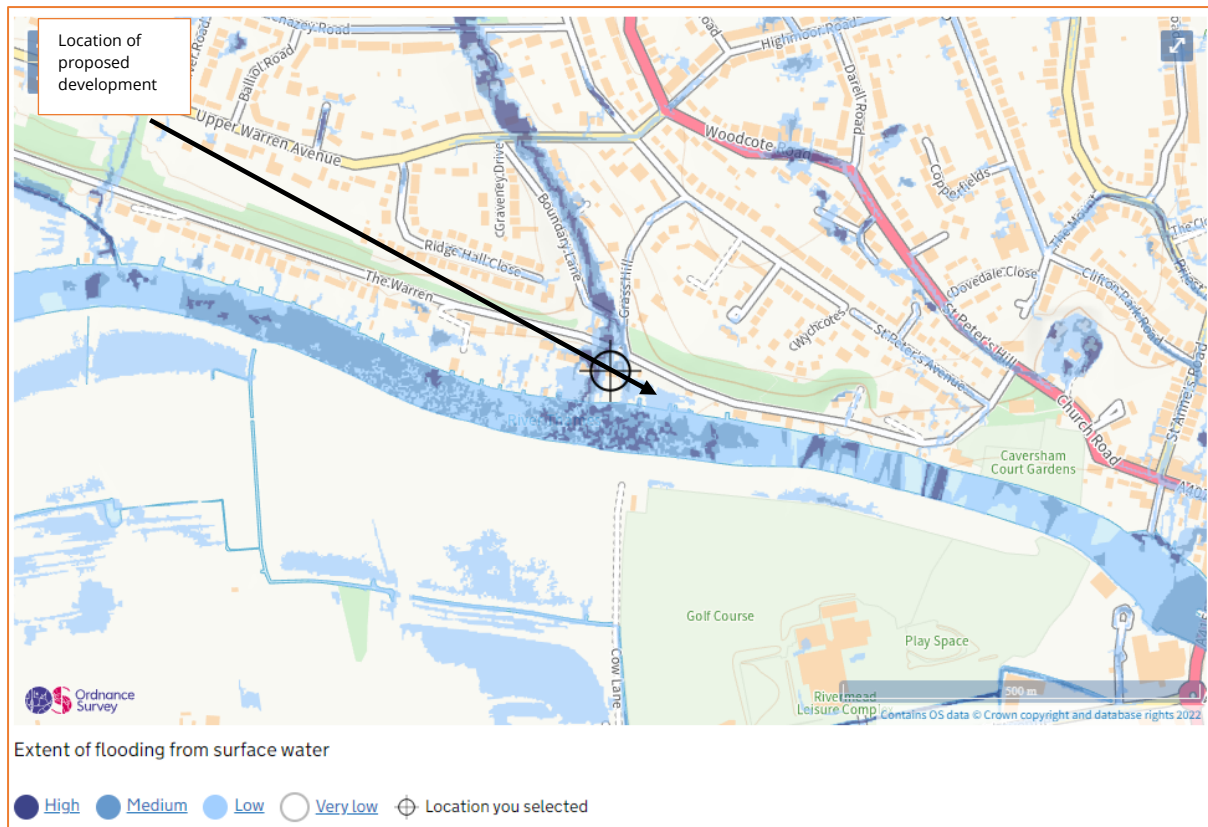


Figure 13: Extract from EA Surface Water Flood Map (Source: EA)

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 Reading Borough Council Level 1 Strategic Flood Risk Assessment (RBC SFRA), June 2017 no information has been provided to suggest that the site has been affected by groundwater flooding previously.

The SFRA shows the site to fall within an area of between 25% and 50% area susceptible to groundwater flooding. The site is shown to be over a major bedrock aquifer of high permeability.

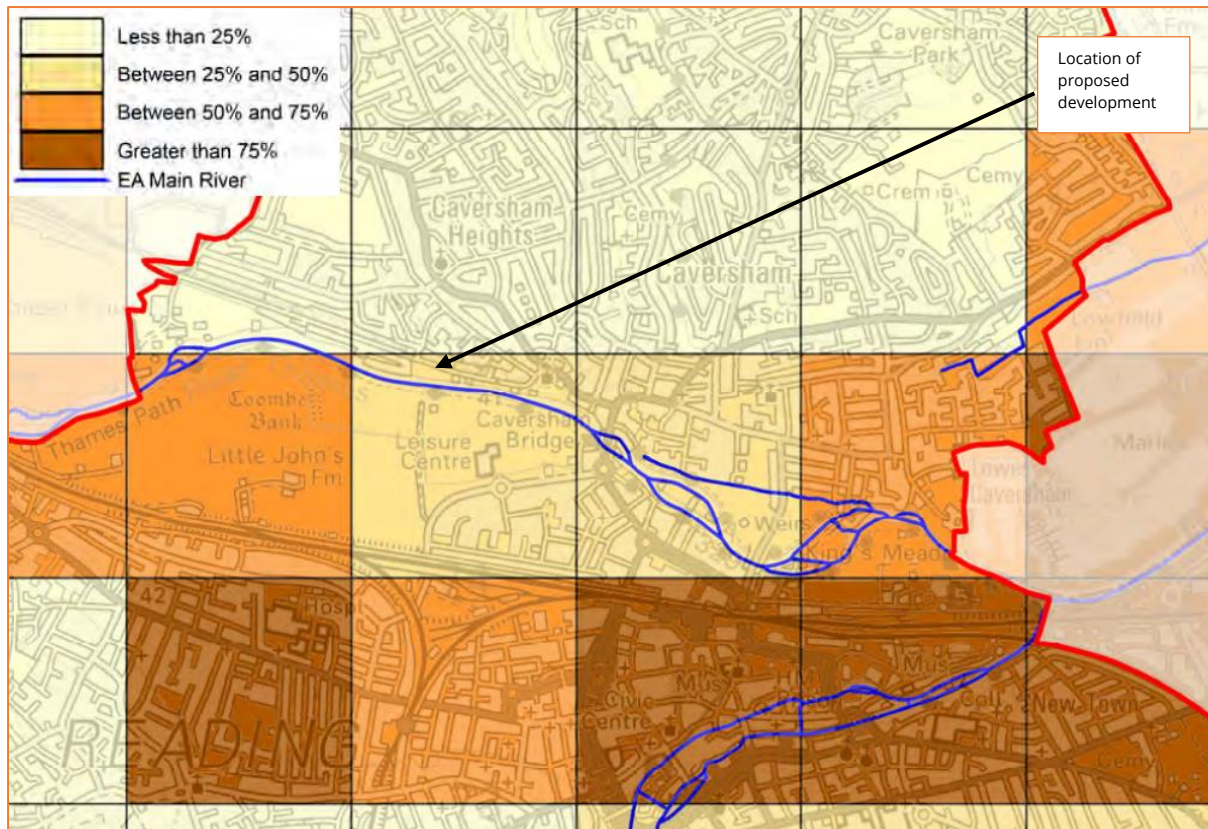


Figure 14: Extract from RBC Historic Flood Records (Source: RBC SFRA)

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 has flooded from sewer surcharge flooding previously.

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 located inside of the maximum inundation extent on the EA Reservoir Inundation Map, when there is also flooding from rivers. 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 information has been provided to suggest that the site is susceptible to flooding from other sources.

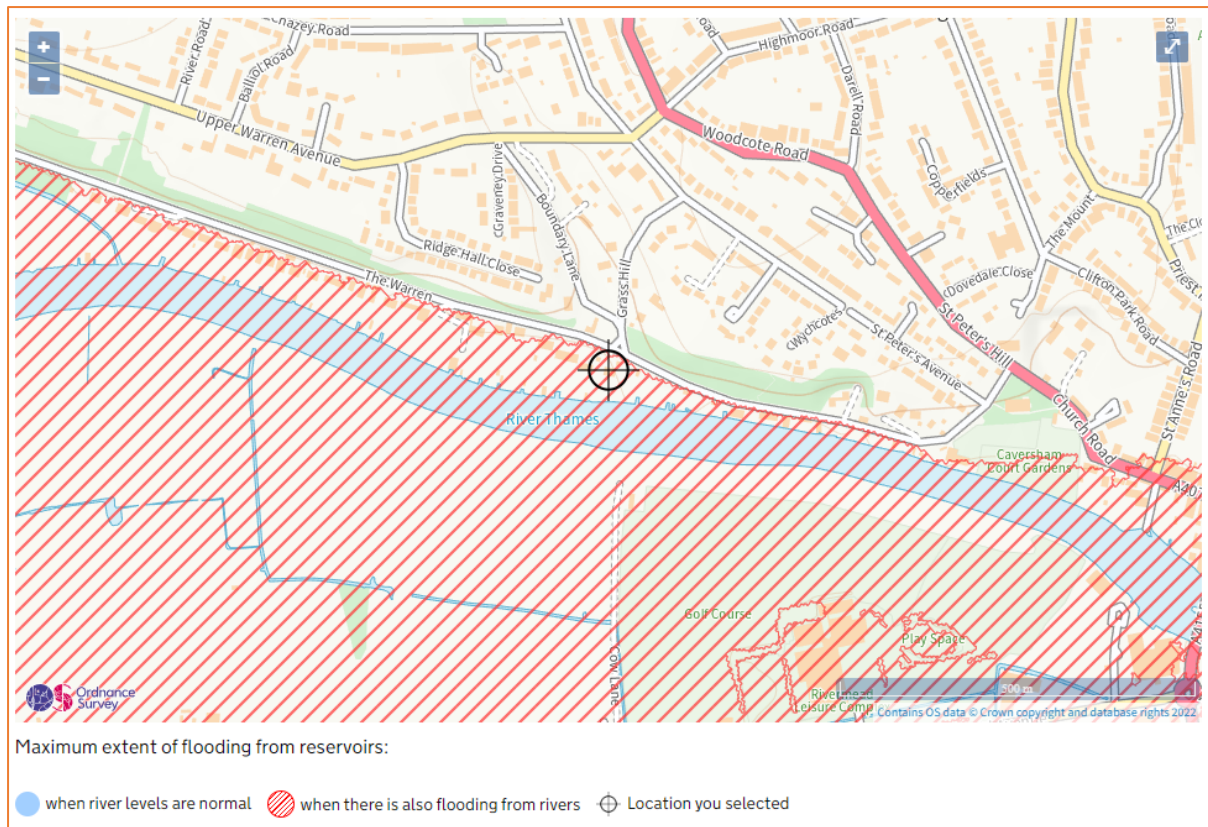


Figure 15: Extract from EA Reservoir Flood Map (Source: EA)

6. Flood Risk Management

6.1 Vulnerability to flooding:

The NPPF classifies property usage by vulnerability to flooding.

The proposed development is a new residential dwelling, which is classified as "more vulnerable" under the NPPF.

Accordingly, it is considered that the vulnerability of the site as a whole will increase post development.

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 250m². It should not be applied if an additional dwelling is being created, e.g. a self-contained annexe or additional commercial unit.

The proposed development is for the Construction of a residential dwelling.

6.3 Physical Design Measures:

The NPPF requires new residential floor levels to be set at least 300mm above the suitable modelled 1:100 with allowance for climate change modelled flood level.

As such, the applicant has agreed to raise the finished lower ground floor level to at least 39.22mAOD (300mm above the 1:100 year plus 35% climate change flood level). It is understood that the finished floor level will in fact be set at 39.25mAOD (330mm above the design flood level).

Internal access will be maintained from the lower ground to the ground floor of the development.

To help protect against flooding during extreme events, the applicant has agreed to implement flood resistant design measures into the development. These measures can include the following:

- Solid (concrete) lower ground floor;
- Closed-cell foam used in wall cavities;
- Waterproof lower ground floor internal render;
- External walls rendered resistant to flooding to ground floor level;
- Exterior ventilation outlets, utility points and air bricks fitted with removable waterproof covers;
- Lower ground floor electrical main ring run from ground floor level; and on separately switched circuit from ground floor;
- Electrical incomer and meter situated at ground floor level or above;
- Boilers, control and water storage / immersion installed at ground floor level or above;
- Gas meter installed at ground floor level or above;

- 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;
- Use of MDF carpentry (i.e. skirting, architrave, built-in storage) avoided at lower ground floor level;
- Stairs of solid hardwood construction with wood faces treated to resist water penetration.

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.

Comparison of the modelled 1:100 year +35% climate change flood level (38.92mAOD) with topographic site levels shows that The Warren is entirely above the design flood level. As such, safe escape as per the requirement of the NPPF can be provided.

Safe escape will be provided by a flood warning and evacuation plan. The applicant has agreed to implement a flood warning and evacuation plan post development, and subscribe to the EA's flood warning service.

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 applicant has agreed to subscribe to the EA's flood warning service.

The EA issue flood warnings/alerts to specific areas when flooding is expected. The site lies within the River Thames at Reading and Caversham, and River Thames from Scours Lane, Reading to Caversham Lakes Flood Warning Area.

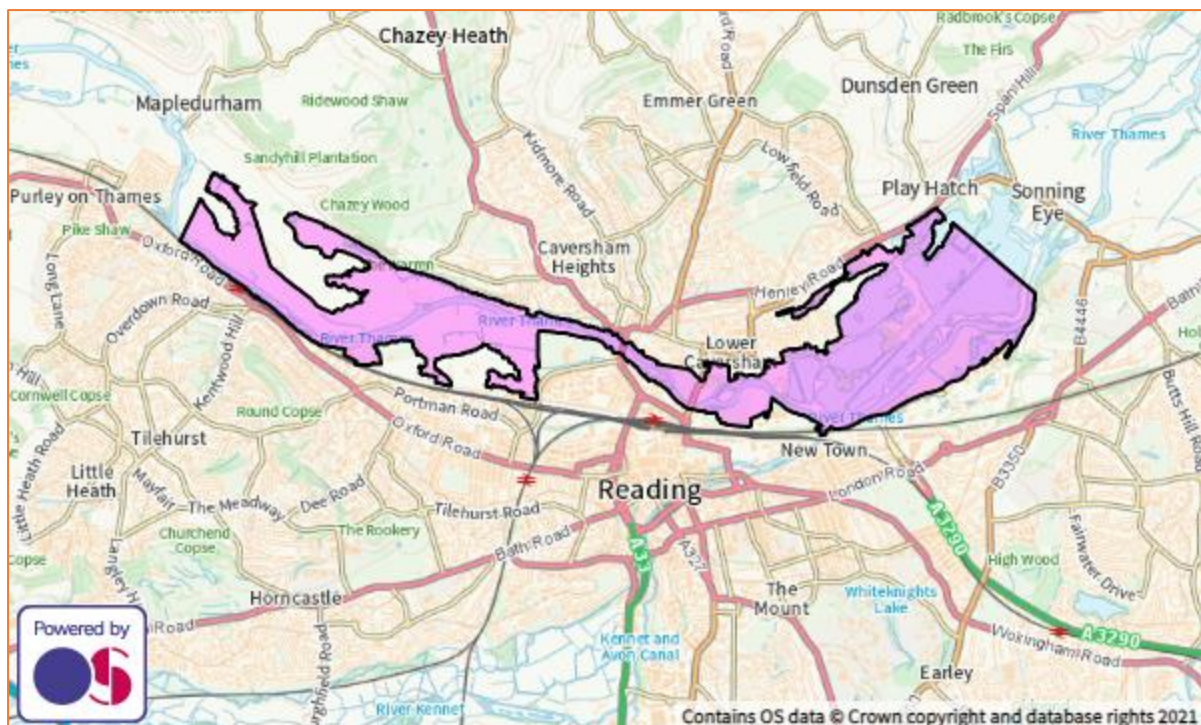


Figure 16: Extract from Environment Agency River Thames from Scours Lane, Reading to Caversham Lakes Flood Warning Area Map (Source: Gov.uk)

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

6.5 Off-Site Impacts:

6.5.1 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.

Based on the plans provided, the Lower Ground Floor constructed on stilts / voids. The top of the void (or the bottom of the floor slab) will be at least 38.92mAOD, and the steps down from the Lower Ground Floor will be open and of floodable construction.

There will be no other land raising or non-floodable built footprint construction below the modelled 1:100 year flood level including climate change on site (38.92mAOD).

Any new fencing on site should be of hit-and-miss design (not close board) to allow free passage of floodwaters across the site.

The entire building will be constructed on floodable voids covering the entire built footprint.

The specification for the void openings is:

- The openings will be at least 1m wide at every opening;
- The minimum height of the openings will be from existing ground level to the modelled 1:100 year flood level with 35% allowance for climate change (a top of void level of 38.92mAOD);
- There will be an opening at least every 5m, on all sides of the building;
- Vertical bars can be installed at 100mm centres if required for security.

We see no reason that the void should become blocked or ineffective provided it is (i) constructed to the aforementioned guidelines as part of a planning condition, and (ii) appropriately managed and maintained.

It is recommended that the design and maintenance of the void is secured through inclusion in the deeds of the property such that it remains accessible and clear for the lifetime of the development.

The voids will be constructed in accordance with the aforementioned criteria.

As such the development will provide a significant betterment with regard to flood storage post development.

6.5.2 Surface Water Drainage:

The development will utilise Sustainable drainage systems (SuDS) design in accordance with the NPPF for Planning Applications and the drainage 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.

Due to the scale of the development, a full Surface Water Drainage Strategy is not required at this stage of planning.

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 site is situated in Flood Zones 3 and 2 when using the Environment Agency Flood Map for Planning (Rivers and Sea). The proposed development is considered to be 'more vulnerable' (residential).

Based on the definitions within the Reading SFRA, while part of the site is shown to be within Flood Zone 3b (Functional Floodplain), the location of the proposed house is entirely outside of this extent and will not be located within Flood Zone 3b.

The site is considered to be partially within Flood Zone 3b (Functional Floodplain), and partially within Flood Zone 3b 'Developed' and therefore considered equivalent to Flood Zone 3a for planning purposes.

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	X	Exception Test required	✓	✓
Zone 3b	Exception Test required	X	X	X	✓

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

Using the table above, the proposed application is considered to be suitable within Flood Zone 3, subject to passing the Sequential and Exception Tests.

8. Discussion and Conclusions

Unda Consulting Limited have been appointed by Michael Skehin (hereinafter referred to as “the applicant”) to undertake a Flood Risk Assessment at Plot on The Warren, Caversham, Reading, RG4 7TH. (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.

The site is located on the north side of the River Thames. The proposed application is for a residential dwelling.

The site is located partially 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 (Medium 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 potential fluvial flood risk, from the Upper River Thames which is located to the south of the site.

Modelled flood levels and extents have been requested from the Environment Agency for use within this report. The EA has provided modelled flood data from the Thames (Sandford to Mapledurham) 2018 flood model. The information provided is from the Abingdon Flood Schemes mapping completed in June 2017. The previous model 1D model was updated to a 1D-2D model (Flood modeller-Tuflow). The updated model will also be used to assess downstream effects due to flood alleviation options in Oxford and Abingdon.

The site is shown to be partially within the 1:20 year, 1:100 year and 1:1000 year modelled flood extents.

The site is located partially within Flood Zones 2 and 3, and is classified as “more vulnerable” (residential). The Flood Risk Assessments: climate change allowances guidance – updated May 2022, states that the Central climate change allowance should normally be applied. The site is however shown to be partially within the modelled 1:20 year extent – and therefore partially within Flood Zone 3b. The Flood Risk Assessments: climate change allowances guidance states that the Higher Central climate change allowance should be applied for “more vulnerable” development within Flood Zone 3b.

The site falls within the Thames and South Chilterns Management Catchment, where the Central climate change allowance for the 2080's is a 31% increase in river flows, and the Higher Central climate change allowance for the 2080's is a 43% increase in river flows.

The Thames (Sandford to Mapledurham) 2018 flood model includes the 1:100 year +35% climate change and 1:100 year +70% climate change scenarios.

The site is partially located within the 1:20 year flood extent, however comparison of the modelled 1:20 year flood level (37.90mAOD) with topographic site levels (mAOD to mAOD) shows that the site is partially above the modelled 1:20 year flood level.

There is also existing development on site, and therefore the site is considered to be partially within Flood Zone 3b (Functional Floodplain), and partially within Flood Zone 3b ‘Developed’ and

therefore considered equivalent to Flood Zone 3a for planning purposes based on the definitions within the Reading SFRA.

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

According to the EA historical fluvial flooding has occurred in the surrounding area in 1947, 1977, 2000, 2002/3, 2007 and 2013-14. These events were caused by channel capacity exceeded (no raised defences). No other records of flooding at the site are shown in the Reading SFRA.

The EA Risk of Flooding from Surface Water Map suggests that the site lies within an area of "Very Low" to "Low" risk of flooding from surface water.

According to the Reading Borough Council Level 1 Strategic Flood Risk Assessment (RBC SFRA), June 2017 no information has been provided to suggest that the site has been affected by groundwater flooding previously. The SFRA shows the site to fall within an area of between 25% and 50% area susceptible to groundwater flooding. The site is shown to be over a major bedrock aquifer of high permeability.

No information has been provided to suggest that the site has flooded from sewer surcharge flooding previously.

Due to the scale of the development, a full Surface Water Drainage Strategy is not required at this stage of planning.

Post development there will be no unacceptable loss of floodplain storage or increase in run-off from the site.

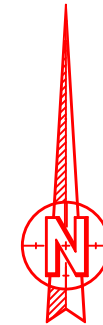
The applicant has confirmed that:

- The lower ground floor level will be set at least 39.22mAOD – at least 300mm above the 1:100 year flood level with 35% allowance for climate change.
- There will be no fluvial floodplain displacement on site post development, the entire proposed building will be constructed on floodable voids covering the entire built footprint. There will be no other land raising or non-floodable built footprint construction below the modelled 1:100 year flood level including climate change on site.
- Safe escape from the site can be provided.
- Internal access will be maintained from the lower ground floor to the above floors of the development.
- Flood proofing of the property will be incorporated as appropriate.
- 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

- Plans and drawings.

4704005

LAND & MEASURED BUILDING SURVEYS
52, Windermere Road
Reading, Berkshire. RG2 7HR
Tel: 01189 871966 Mob: 07970 457986
Email: pjhiroberts@btinternet.com

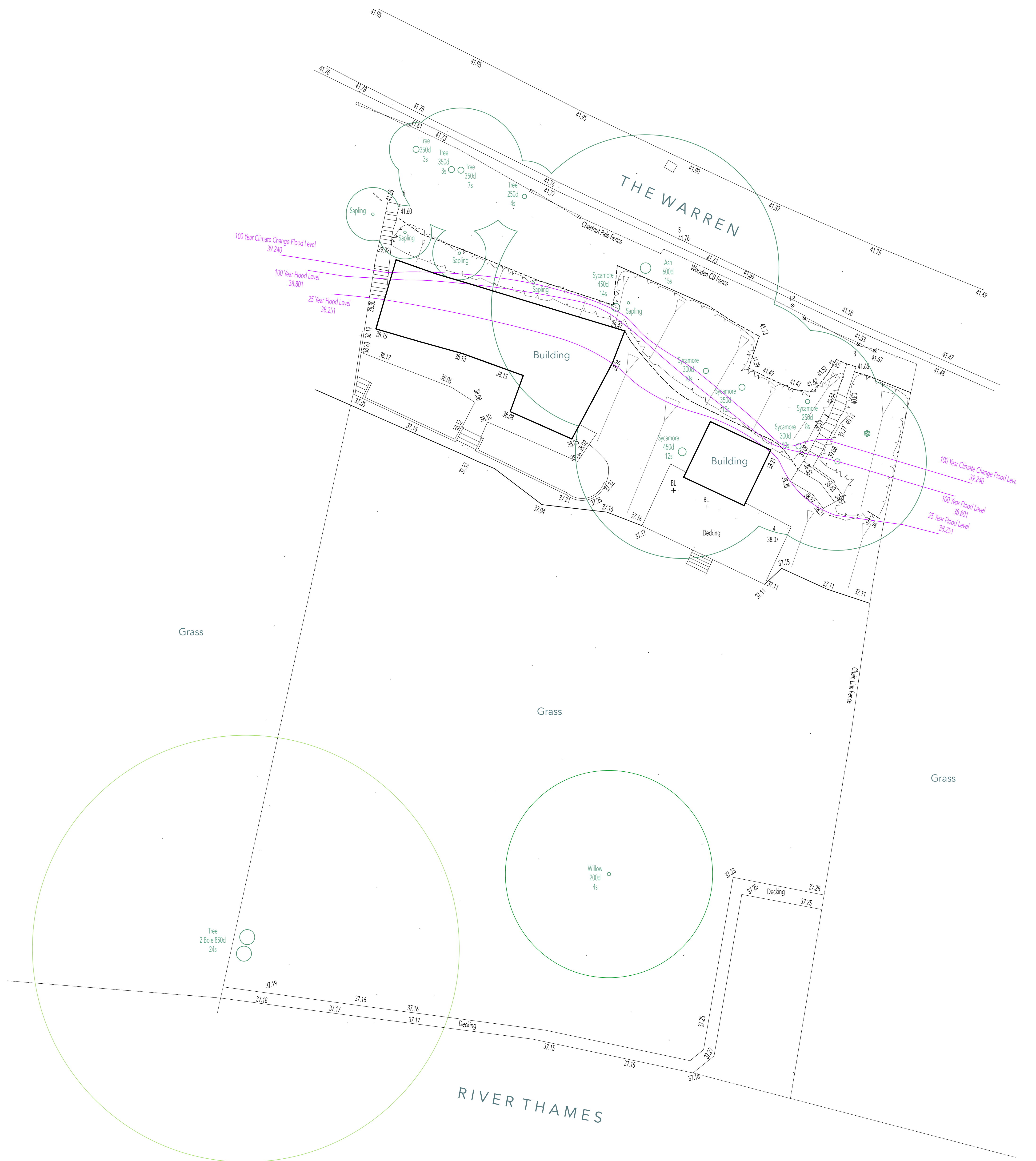
Survey Notes

Drawing No.

XXX

Plotted	HP600	Issued	XX/XX/
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Plotted	HP600	Issued	XX/XX/
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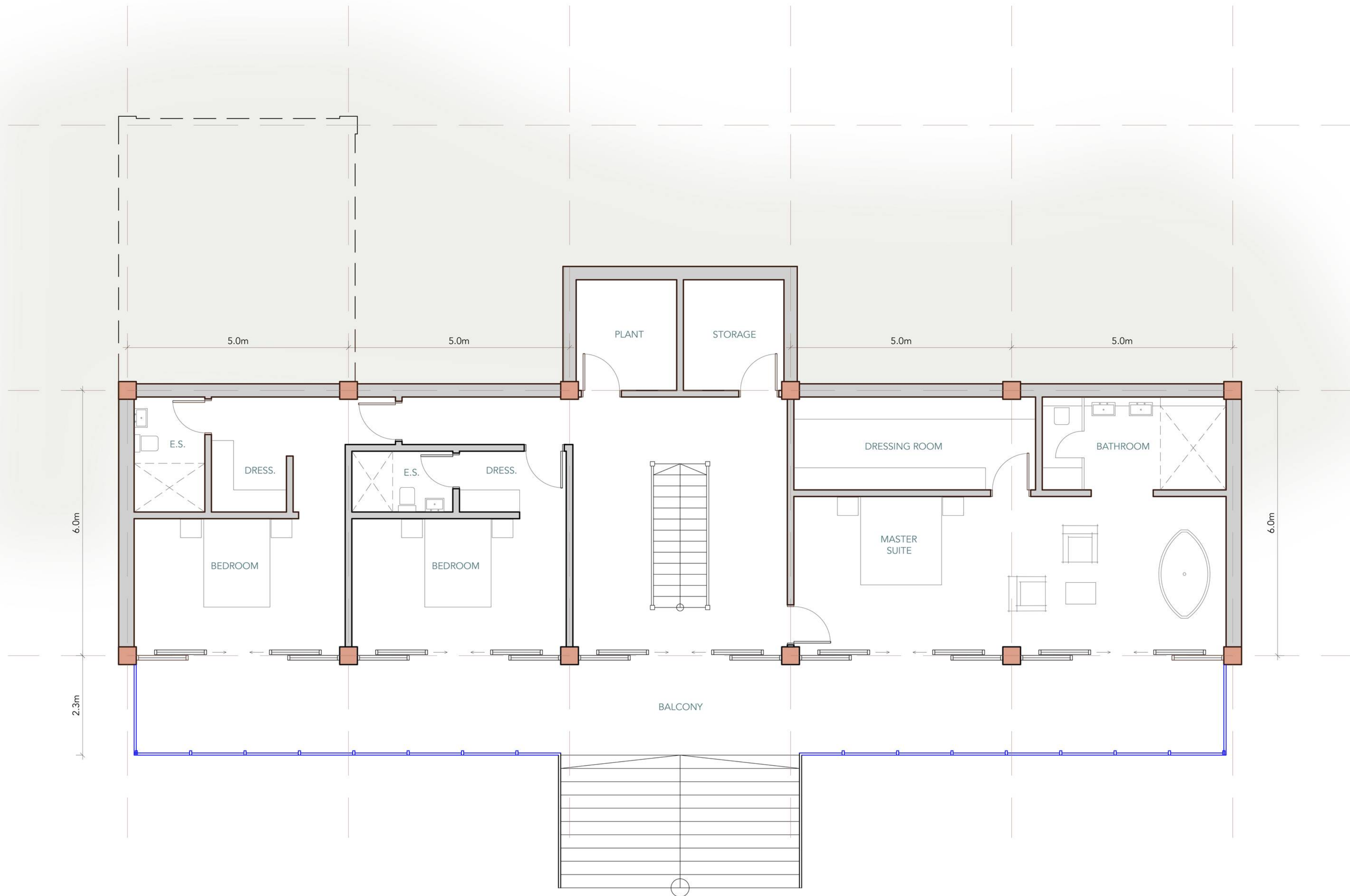


0 1 2 3 4 5 6 7 8 9 10

REF : 22.009 DWG : 01 SCALE : 1 TO 100 A1 DRAWN : 17OCT22 STATUS : PLANNING

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AREAS

GROUND FLOOR : 167 SQ. METERS (INCLUDING STAIRS, EXCLUDING BALCONY)
LOWER GROUND FLOOR : : 153 SQ. METERS (INCLUDING STAIRS, EXCLUDING BALCONY)

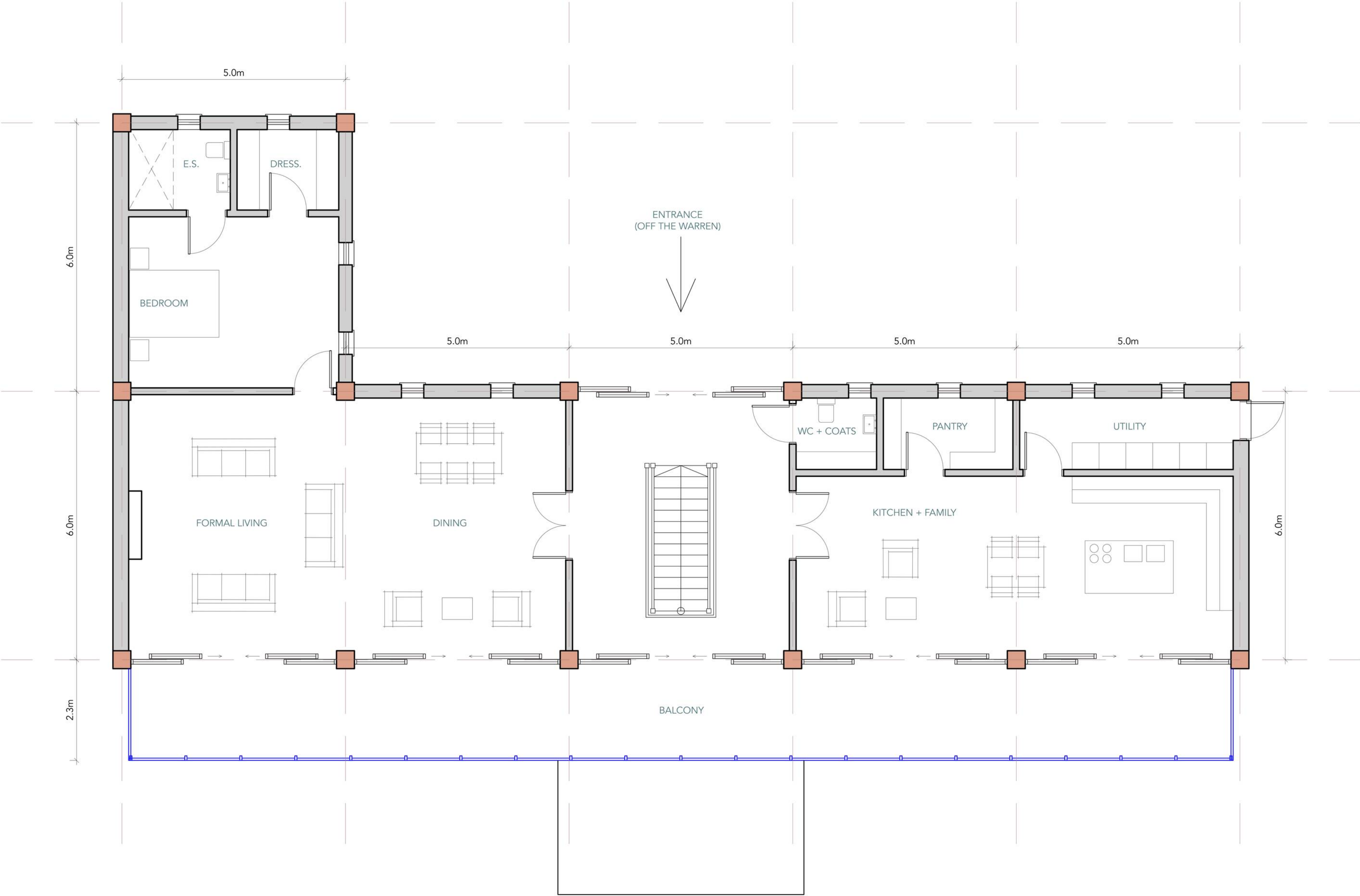
TOTAL - 320 SQ. METERS (3450 sq ft APPROX)



0 1 2 3 4 5

REF : 22.009 DWG : 04 SCALE : 1 TO 50 A1 DRAWN : 05JUL22 STATUS : PLANNING

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AREAS

GROUND FLOOR : 167 SQ. METERS (INCLUDING STAIRS, EXCLUDING BALCONY)
LOWER GROUND FLOOR : : 153 SQ. METERS (INCLUDING STAIRS, EXCLUDING BALCONY)
TOTAL - 320 SQ. METERS (3450 sq ft APPROX)



REF : 22.009 DWG : 03 SCALE : 1 TO 50 A1 DRAWN : 05JUL22 STATUS : PLANNING

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