

## **ENVIRONMENT**

Bloor Homes Western  
Land South of Banbury Rise  
Banbury  
Flood Risk Assessment

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### Bloor Homes Western Land South of Banbury Rise Banbury Flood Risk Assessment

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## EXECUTIVE SUMMARY

This Flood Risk Assessment (FRA) has been prepared in accordance with the requirements set out in the National Planning Policy Framework (NPPF 2021) and the associated Planning Practice Guidance. It has been produced on behalf of Bloor Homes Western in respect of an outline planning application for a residential development comprising up to 250 dwellings (with up to 30% affordable housing), public open space, landscaping and associated supporting infrastructure. Means of vehicular access to be determined via Edinburgh Way, with additional pedestrian and cycle connections via Dover Avenue and Balmoral Avenue. Emergency access provision also via Balmoral Avenue. All other matters reserved. (approximate grid reference: SP 43419 40196).

This report demonstrates that the proposed development is not at significant flood risk, subject to the recommended flood mitigation strategies being implemented.

The site is shown to be located within Flood Zone 1 which is land defined as having a low probability of flooding from rivers or the sea. The nearest Flood Zone extents are located approximately 770m west of the site and are associated with the Sor Brook, a tributary of the River Cherwell, which is flowing in south easterly direction.

The site is predominately at a very low risk of pluvial flooding. There is a small, isolated area identified to be at a low risk of flooding (1 in 1000-year) in the east of the site on the boundary. However, this appears to be associated with runoff from the site itself, rather than from third party land. Therefore, it is not expected to represent a barrier to development.

Flood risk posed to the site by canals, reservoirs, sewers and groundwater is considered to be low.

The proposed development will increase the area of impermeable surfaces leading to potential increase in runoff. Further information on the drainage approach will be provided within the accompanying Sustainable Drainage Statement, reference WFB-BWB-ZZ-XX-RP-CD-0001\_SDS.

In compliance with the requirements of NPPF (2021), and subject to the mitigation measures proposed, the development could proceed without being subject to significant flood risk. Moreover, the development will not increase flood risk to the wider catchment area as a result of suitable management of surface water runoff discharging from the site.



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## 1. INTRODUCTION

- 1.1 This Flood Risk Assessment (FRA) has been prepared in accordance with the requirements set out in the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance. The FRA has been produced on behalf of Bloor Homes Western in respect of an outline planning application for a residential development comprising up to 250 dwellings (with up to 30% affordable housing), public open space, landscaping and associated supporting infrastructure. Means of vehicular access to be determined via Edinburgh Way, with additional pedestrian and cycle connections via Dover Avenue and Balmoral Avenue. Emergency access provision also via Balmoral Avenue. All other matters reserved.
- 1.2 This FRA is intended to support an outline planning application and, as such, the level of detail included is commensurate and subject to the nature of the proposals at the planning stage. Summary information is included as **Table 1.1**

**Table 1.1: Site Summary**

<b>Site Name</b>	Land South of Banbury Rise
<b>Location</b>	Banbury
<b>NGR (approx.)</b>	SP 43419 40196
<b>Application Site Area (ha)</b>	14.09ha
<b>Development Type</b>	Residential
<b>Flood Zone Classification</b>	Flood Zone 1
<b>NPPF Vulnerability</b>	More Vulnerable
<b>Anticipated Development Lifetime</b>	100 years
<b>Environment Agency Office</b>	Thames
<b>Lead Local Flood Authority</b>	Oxfordshire County Council
<b>Local Planning Authority</b>	Cherwell District Council

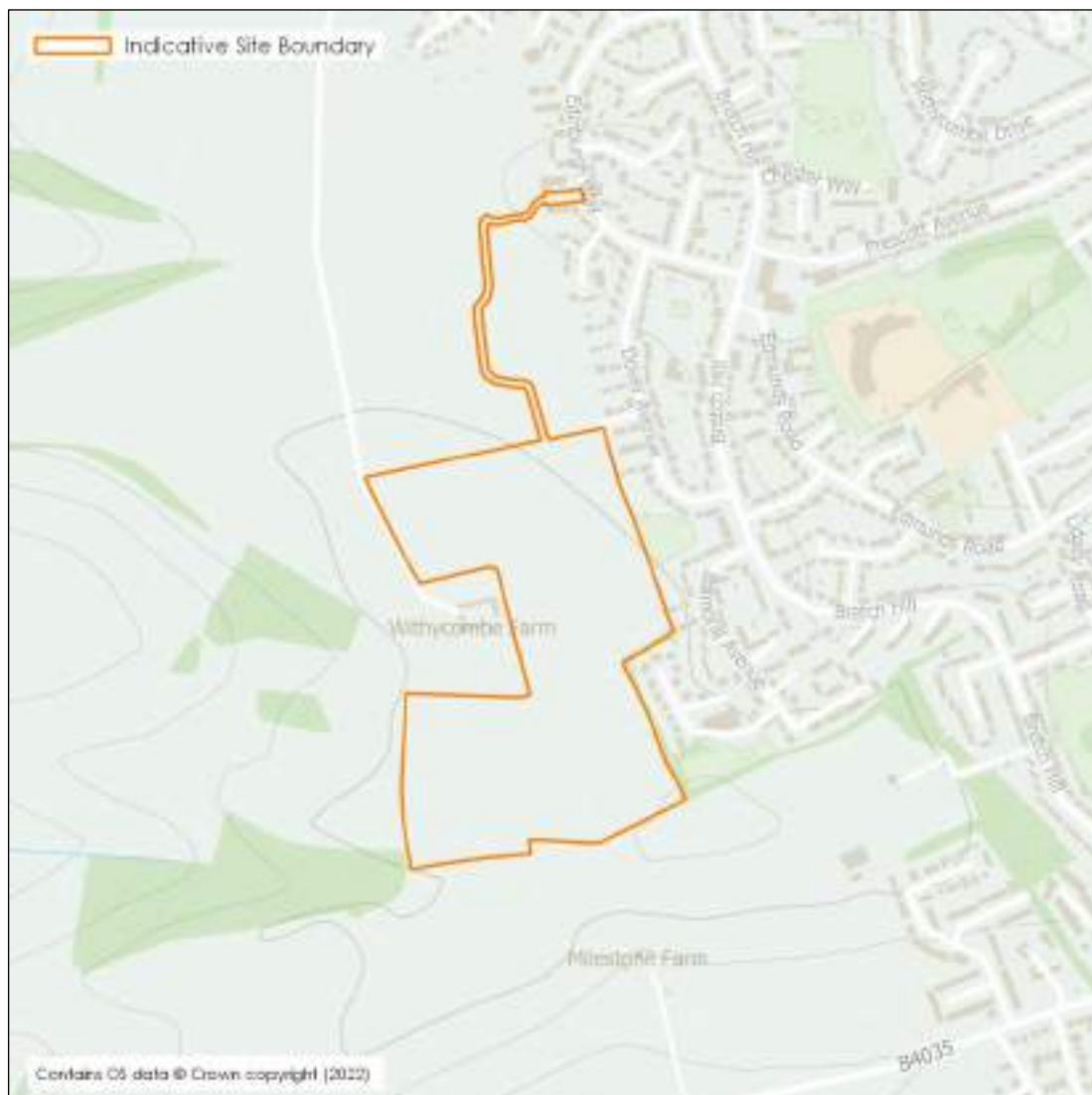
### Sources of Data

- Topographical Survey by Axis Surveys, reference 3877
- OS Explorer Series mapping
- Government Surface Water Flood Risk Maps
- Cherwell Level 1 & 2 Strategic Flood Risk Assessment
- Oxfordshire County Council Preliminary Flood Risk Assessment

- vi. Web Based Soil Mapping
- vii. Thames Water Sewer Records
- viii. British Geological Maps

### Existing Site

- 1.3 The site is located on the western extent of Banbury, Oxfordshire approximately 2km west of the town centre. The site is surrounded by residential development to the north and east (Balmoral Avenue and Edinburgh Way) and agricultural fields to the south and west (Withycombe Farm). Just south of the site is located a recently consented development which consists of around 49 residential dwellings (ref: 21/03644/OUT).
- 1.4 The site's location is illustrated within **Figure 1.1**.



**Figure 1.1: Site Location**

- 1.5 A topographical survey has been carried out and is included as **Appendix 1**. This shows the site to generally fall from the south-east of the site to the north-east with a maximum

level of approximately 161m Above Ordnance datum (AOD) in the south-east to a low point of approximately 148.10m AOD at the north eastern boundary.

### **Proposed Development**

- 1.6 The proposals are for a residential development comprising up to 250 dwellings (with up to 30% affordable housing), public open space, landscaping and associated supporting infrastructure. Means of vehicular access to be determined via Edinburgh Way, with additional pedestrian and cycle connections via Dover Avenue and Balmoral Avenue. Emergency access provision also via Balmoral Avenue. All other matters reserved. A proposed layout plan is included as **Appendix 2**.

## 2. FLOOD RISK PLANNING POLICY & GUIDANCE

### National Planning Policy Framework

- 2.1 The NPPF<sup>1</sup> sets out the Government's national policies on different aspects of land use planning in England in relation to flood risk. Planning Practice Guidance is also available online<sup>2</sup>.
- 2.2 The Planning Practice Guidance sets out the vulnerability to flooding of different land uses. It encourages development to be located in areas of lower flood risk where possible and stresses the importance of preventing increases in flood risk off site to the wider catchment area.
- 2.3 The Planning Practice Guidance also states that alternative sources of flooding, other than fluvial (river flooding), should be considered when preparing a Flood Risk Assessment.
- 2.4 The Planning Practice Guidance includes a series of tables that define Flood Zones (Table 1), the flood risk vulnerability classification of development land uses (Table 2) and 'compatibility' of development within the defined Flood Zones (Table 3). Table 2 and Table 3 are recreated within **Appendix 3** of this report for reference.
- 2.5 This Flood Risk Assessment is written in accordance with the NPPF and the Planning Practice Guidance.

### Flood Map for Planning

- 2.6 With particular reference to planning and development, the Flood Map for Planning identifies Flood Zones in accordance with Table 1 of the Planning Practice Guidance. Further details on the Flood Zone classifications are outlined in **Table 2.1**.

**Table 2.1: Flood Zone Classifications**

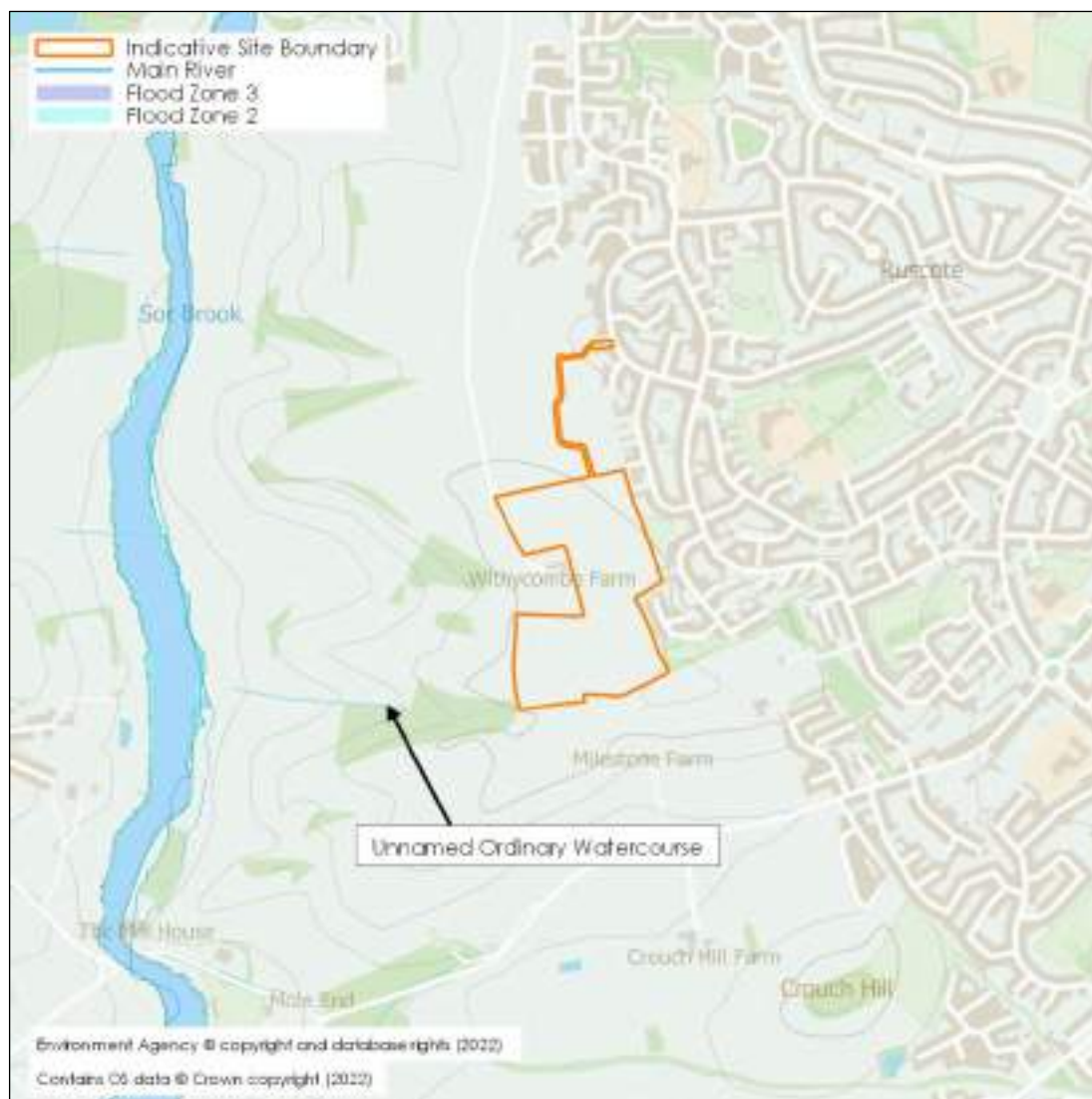
Flood Zone	Description
Flood Zone 1 (Low Probability)	Land having less than a 1 in 1000 annual probability of river or sea flooding (<0.1% Annual Exceedance Probability). All land outside of Flood Zone 2 and 3.
Flood Zone 2 (Medium Probability)	Land having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1% AEP); or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1% AEP).
Flood Zone 3a (High Probability)	Land having a 1 in 100 or greater annual probability of river flooding (>1% AEP); or land having a 1 in 200 or greater annual probability of flooding from the sea (>0.5% AEP). This is represented by "Flood Zone 3" on the Flood Map for Planning.

<sup>1</sup> Revised National Planning Policy Framework, Ministry of Housing, Communities & Local Government, amended 2021

<sup>2</sup> Planning Practice Guidance: <https://www.gov.uk/government/collections/planning-practice-guidance>

Flood Zone	Description
Flood Zone 3b (The Functional Floodplain)	Flood Zone 3b (The Functional Floodplain) is defined as land where water must flow or be stored in times of flood. This is not identified or separately distinguished from Zone 3a on the Flood Map for Planning.

2.7 The site is shown to be located within Flood Zone 1, as demonstrated in **Figure 2.1**.



**Figure 2.1: Flood Map for Planning**

### The Design Flood

- 2.8 The Planning Practice Guidance identifies that new developments should be designed to provide adequate flood risk management, mitigation, and resilience against the 'design flood' for their lifetime.
- 2.9 This is a flood event of a given annual flood probability, which is generally taken as fluvial (river) and surface water (pluvial) flooding likely to occur with a 1% annual probability

(a 1 in 100 chance each year), or tidal flooding with a 0.5% annual probability (1 in 200 chance each year), against which the suitability of a proposed development is assessed and mitigation measures, if any, are designed.

## Climate Change

### Peak River Flow

- 2.10 Predicted future changes in peak river flows caused by climate change are provided by the Environment Agency (EA)<sup>3</sup>, with a range of projections applied to regionalised 'River Basin Districts', which are further subdivided into Management Catchments.
- 2.11 The site falls within the Cherwell and Ray Management Catchment of the Thames River Basin District. **Table 2.2** identifies the relevant peak river flow climate change allowances from this Management Catchment.

**Table 2.2: Peak River Flow Climate Change Allowances for the Cherwell and Ray Management Catchment within the Thames River Basin District**

Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2125)
Upper End	24%	27%	49%
Higher Central	11%	10%	25%
Central	6%	4%	15%

- 2.12 When determining the appropriate allowance for use in a FRA the Flood Zone classification, flood risk vulnerability and the anticipated lifespan of the development should be considered. **Table 2.3** provides a matrix summarising the EA's guidance on determining the appropriate allowance(s).

**Table 2.3: Application of Appropriate Peak River Flow Climate Change Allowances**

Flood Zone	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
1	Use the central allowance where a location may fall within Flood Zone 2 or 3 in the future.				
2	Use the higher central allowance	Use the central allowance			
3a	Use the higher central allowance	Development should not be permitted	Use the central allowance		

<sup>3</sup> Environment Agency, Flood risk assessments: climate change allowances: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>



Flood Zone	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
3b	Use the higher central allowance	Development should not be permitted			Use the central allowance
If development is considered appropriate by the local authority when not in accordance with Flood Zone vulnerability categories, then it would be appropriate to use the higher central allowance.					

- 2.13 The site is located entirely within Flood Zone 1. The EA guidance does state that for a site in Flood Zone 1 and identified to be at risk in the future the Central allowance should be used. However, the distance of the site from watercourses, and the intervening topography, mean fluvial flood risk is not expected to be an issue for the site now or in the future. Therefore, the climate change allowances are not considered further within this report.

#### Peak Rainfall

- 2.14 Predicted future changes in peak rainfall intensity caused by climate change are provided by the EA<sup>4</sup>, with a range of projections applied to River Basin District Management Catchments.
- 2.15 The site falls within the Cherwell and Ray Management Catchment. **Table 2.4** identifies the relevant peak rainfall climate change allowances from this Management Catchment.

**Table 2.4: Peak Rainfall Climate Change Allowances for the Cherwell and Ray Management Catchment**

Allowance Category	Total potential change anticipated for the '2050s' epoch (2022 to 2060)		Total potential change anticipated for the '2070s' epoch (2061 to 2125)	
	1 in 30-Year	1 in 100-Year	1 in 30-Year	1 in 100-Year
Upper End	35%	40%	35%	40%
Central	20%	20%	25%	25%

- 2.16 The future increase in rainfall will need to be considered when designing a development to ensure its drainage system is sufficient to address the local surface water flood risk for its lifetime and that it does not increase flood risk elsewhere. The increase in rainfall may also need to be considered when assessing the flood risk from surface water runoff from surrounding urban and rural catchments where the vulnerability and scale of a development and severity of the present-day flood risk are significant.
- 2.17 When determining the appropriate allowance to assess, the catchment size, catchment urbanisation, and anticipated lifespan of the development should be considered. **Table**

<sup>4</sup> Environment Agency, Flood risk assessments: climate change allowances: Environment Agency, Flood risk assessments: climate change allowances: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

2.5 provides a matrix summarising the EA's guidance on determining the appropriate allowance(s).

**Table 2.5: Application of Appropriate Peak Rainfall Climate Change Allowances**

Area Assessed	Anticipated Development Life Span		
	up to 2060	between 2061 and 2100	up to or beyond 2100*
<p><b>Development Sites<sup>^</sup></b></p> <p>Assess the 1 in 30-year and 1 in 100-year storm events with the respective climate change allowance(s) applied.</p> <p>Development to be designed so that with the climate change allowance applied to the 1 in 100-year storm:</p> <ul style="list-style-type: none"><li>• there is no increase in flood risk elsewhere</li><li>• the development will be safe from surface water flooding</li></ul>	Use the Central Allowance for the 2050s	Use the Central Allowance for the 2070s <sup>+</sup>	Use the Upper End Allowance for the 2070s <sup>+</sup>
<p><b>Urban Catchments</b></p> <p>Assess the flood risk at the 1 in 30-year and 1 in 100-year storm events with the respective allowance(s) applied.</p>			
<p><b>Rural Catchments &lt;5km<sup>2</sup></b></p> <p>Assess the flood risk at the 1 in 30-year and 1 in 100-year storm events with the respective central climate change allowances applied.</p>			
<p><b>Rural Catchments &gt;5km<sup>2</sup></b></p>	Use the relevant peak river flow climate change allowance		

\*Includes all residential developments

<sup>^</sup>the Lead Local Flood Authority may have local standards that also need to be considered.

+unless the 2050s allowance is greater

- 2.18 The development site has an anticipated lifespan of 100 years. Therefore, the Central allowance for the '2070s' epoch will need to be considered in the design of the associated drainage infrastructure.

## Strategic Flood Risk Assessment

- 2.19 A Strategic Flood Risk Assessment (SFRA) is a study carried out by one or more local planning authorities to assess the risk to an area from flooding from all sources, now and in the future.
- 2.20 The Cherwell Level 1 SFRA<sup>5</sup> has been reviewed in the production of this FRA. The SFRA provides information specific to the site location in the form of fluvial, surface water and

<sup>5</sup> Level 1 Strategic Flood Risk Assessment (Cherwell District Council, May 2017)

groundwater flood risk mapping, as well as records of historical flooding. Information from the Level 1 SFRA will be referenced within **Section 3.0** where applicable.

- 2.21 The Cherwell Level 2 SFRA<sup>6</sup> was produced to facilitate the application of Sequential and Exception Tests to screen allocated development sites. The proposed application site is not referenced within the Level 2 SFRA.

### **Preliminary Flood Risk Assessment**

- 2.22 A Preliminary Flood Risk Assessment (PFRA) is an assessment of floods that have taken place in the past and floods that could take place in the future. It generally considers flooding from surface water runoff, groundwater and ordinary watercourses, and is prepared by the Lead Local Flood Authorities.
- 2.23 The Oxfordshire County Council PFRA<sup>7</sup> considers flooding from surface water runoff, groundwater, ordinary watercourses and canals. It also references the historical river flooding which occurred in the Oxfordshire area in Summer 2007. However, no historical instances of flooding at the site are referenced.

### **Local Flood Risk Management Strategy**

- 2.24 A Local Flood Risk Management Strategy (LFRMS) is prepared by a Lead Local Flood Authority to help understand and manage flood risk at a local level.
- 2.25 The LFRMS aims to ensure that the knowledge of local flood risk issues is communicated effectively so that they can be better managed. The LFRMS also aims to promote sustainable development and environmental protection.
- 2.26 The Oxfordshire County Council LFRMS<sup>8</sup> has been reviewed and will not be referenced within this report.

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<sup>6</sup> Level 2 Strategic Flood Risk Assessment (Cherwell District Council, May 2017)

<sup>7</sup> Preliminary Flood Risk Assessment (Oxfordshire County Council, June 2011)

<sup>8</sup> Local Flood Risk Management Strategy (Oxfordshire County Council, September 2014)

### 3. POTENTIAL SOURCES OF FLOOD RISK

- 3.1 Flooding can occur from a variety of sources, or combination of sources, which may be natural or artificial. **Table 3.1** below identifies the potential sources of flood risk to the site in its current condition, and the impacts which the development could have in the wider catchment, prior to mitigation. These are discussed in greater detail in the forthcoming section. The mitigation measures proposed to address flood risk issues and ensure the development is appropriate for its location are discussed within **Section 4.0**.

**Table 3.1: Pre-Mitigation Sources of Flood Risk**

Flood Source	Potential Risk				Description
	High	Medium	Low	None	
Fluvial			X		The site is located in Flood Zone 1.
			X		There is an ordinary watercourses in the vicinity of the site; however, the site is elevated above this UOW. Therefore, it is not expected to flood from this source.
Canals				X	The Oxford Canal is located approximately 2.4km east to the site. The contour data shows the site to be elevated 60m above the canal. Therefore, it is not expected to flood from this source.
Groundwater			X		The site is shown to fall within an area predicted to be at a low susceptibility to groundwater flooding.
Reservoirs and waterbodies			X		The site is shown to fall outside of the area at risk of reservoir failure.
Pluvial runoff			X		The site is predominately at a very low risk of pluvial flooding. There is a small, isolated area identified to be at a low risk of flooding (1 in 1000-year) on the eastern side of the site boundary
Sewers			X		The sewer network around the site may have limited capacity, which could be exceeded in an extreme storm event. Contour data has shown that in the event of exceedance by sewer flooding, flows are expected to be directed away from the site to the east of Balmoral Avenue.

Flood Source	Potential Risk				Description
	High	Medium	Low	None	
Effect of Development on Wider Catchment			X		Development will not result in impedance of pluvial and fluvial flow routes.
		X			The development will increase the area of impermeable surfaces leading to a potential increase in runoff.

### Fluvial Flood Risk

- 3.2 Flooding from watercourses occurs when flows exceed the capacity of the channel, or where a restrictive structure is encountered, which leads to water overtopping the banks into the floodplain. This process can be exacerbated when debris is mobilised by high flows and accumulates at structures.
- 3.3 The Cherwell Level 1 SFRA states that the largest fluvial flood event was recorded in 1998 in Banbury. The second largest fluvial flood event recorded in Banbury was in July 2007. The SFRA does not specifically refer to flooding at the site in either of these events.

#### Main Rivers

- 3.4 The site is shown to be located within Flood Zone 1, as illustrated within **Figure 2.1**, which is land defined as having a low probability of flooding from rivers or the sea. The nearest Flood Zone extents are located approximately 770m west of the site associated with the Sor Brook, a tributary of the River Cherwell, which flows in a south easterly direction.
- 3.5 1m LiDAR contour data shows the closest floodplain extents associated with the Sor Brook to lie at 108m AOD and the site is level 155m AOD. Therefore, given the distance from the Sor Brook, and the intervening topography, the flood risk from the Sor Brook is considered to be low.
- 3.6 The River Cherwell is located approximately 2.5km to the east of the site. The risk posed to the site from the River Cherwell is considered to be low, based upon the distance to the watercourse and levels at the site being approximately 70m above the watercourse.

#### Unnamed Ordinary Watercourse

- 3.7 An unnamed Ordinary Watercourse (UOW) is shown to be located approximately 360m south-west to the site; however, the site is shown to be elevated 20m above this UOW.
- 3.8 Overall, there is considered to be a low risk posed to the site from fluvial sources.

## **Flood Risk from Canals**

- 3.9 The Canal and River Trust (CRT) generally maintains canal levels using reservoirs, feeders and boreholes and manages water levels by transferring it within the canal system.
- 3.10 Water in a canal is typically maintained at predetermined levels by control weirs. When rainfall or other water enters the canal, the water level rises and flows out over the weir. If the level continues rising it will reach the level of the storm weirs. The control weirs and storm weirs are normally designed to take the water that legally enters the canal under normal conditions. However, it is possible for unexpected water to enter the canal or for the weirs to become obstructed. In such instances the increased water levels could result in water overtopping the towpath and flowing onto the surrounding land.
- 3.11 Flooding can also occur where a canal is impounded above surrounding ground levels and the retaining structure fails.
- 3.12 The Oxford Canal is located approximately 2.4km east to the site, adjacent to the River Cherwell. The Cherwell Level 1 SFRA records canal flooding in Banbury in July 2007. The contour data shows the site to be elevated 60m above the canal.
- 3.13 Owing to the intervening distance and topography, the canal is not considered to pose a risk to the site.

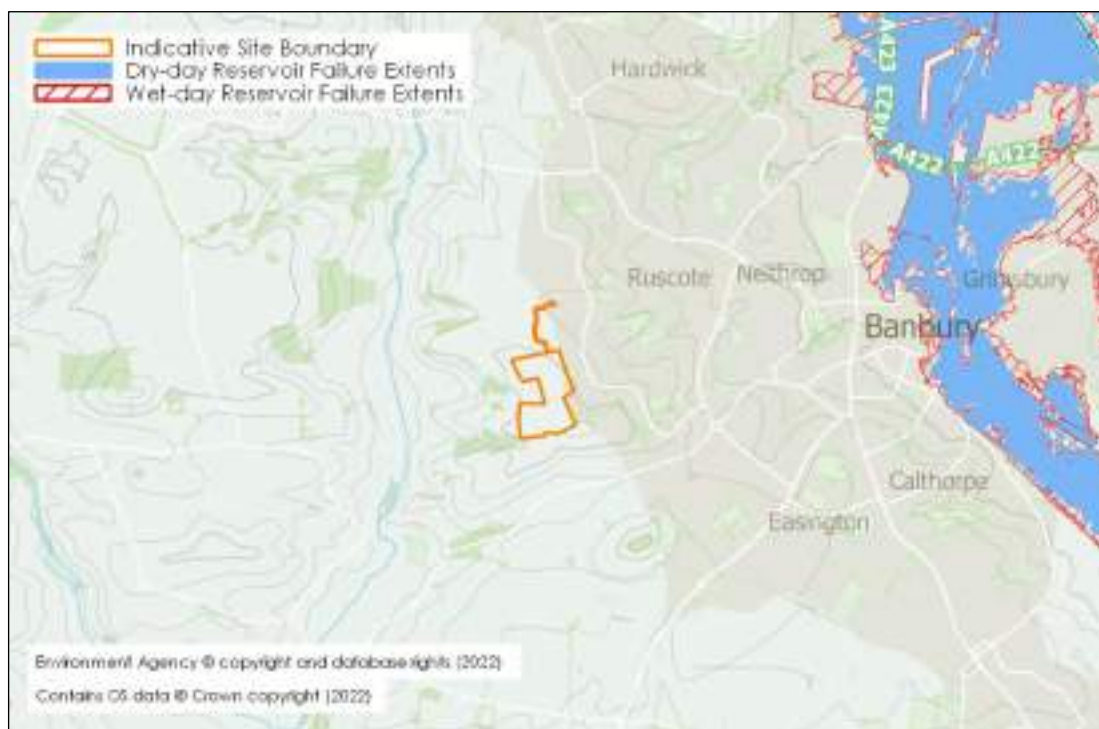
## **Groundwater Flood Risk**

- 3.14 Groundwater flooding occurs when the water table rises above ground elevations, or it rises to depths containing basement level development. It is most likely to happen in low lying areas underlain by permeable geology. This is most common on regional scale chalk aquifers, but there may also be a risk on sandstone and limestone aquifers or on thick deposits of sands and gravels underlain by less permeable strata such as that in a river valley.
- 3.15 British Geological Survey (BGS) mapping shows that there are no superficial deposits located within the vicinity of the site. The sites bedrock geology is shown to be predominately underlain by Marlstone Rock Formation - Ferruginous Limestone and Ironstone. However, south of the site mapping shows the site to be underlain by four different bedrocks: 'Whitby Mudstone Formation – Mudstone', 'Northampton Sand Formation - Sandstone, Limestone and Ironstone', 'Horsehay Sand Formation – Sandstone' and 'Chipping Norton Limestone Formation - Limestone, Ooidal'. In the north-west corner of the site just off Edinburgh Way the sites bedrock is underlain by Dyrham Formation – Siltstone And Mudstone, Interbedded.
- 3.16 The EA designates the geology within the site to be a Secondary A Aquifer meaning they comprise permeable layers that can support local water supplies and may form an important source of base flow to rivers.
- 3.17 Mapping of the groundwater susceptibility contained within the Cherwell Level 1 SFRA highlights that the site is at a 'low' susceptibility to groundwater flooding.

- 3.18 Reviewing online records, there are no BGS borehole logs within the site. The nearest record of a borehole log is located approximately 80m south-west of the site. However, this log did not record groundwater strike.
- 3.19 The overall flood risk from groundwater sources is considered to be low.

### Flood Risk from Reservoirs & Large Waterbodies

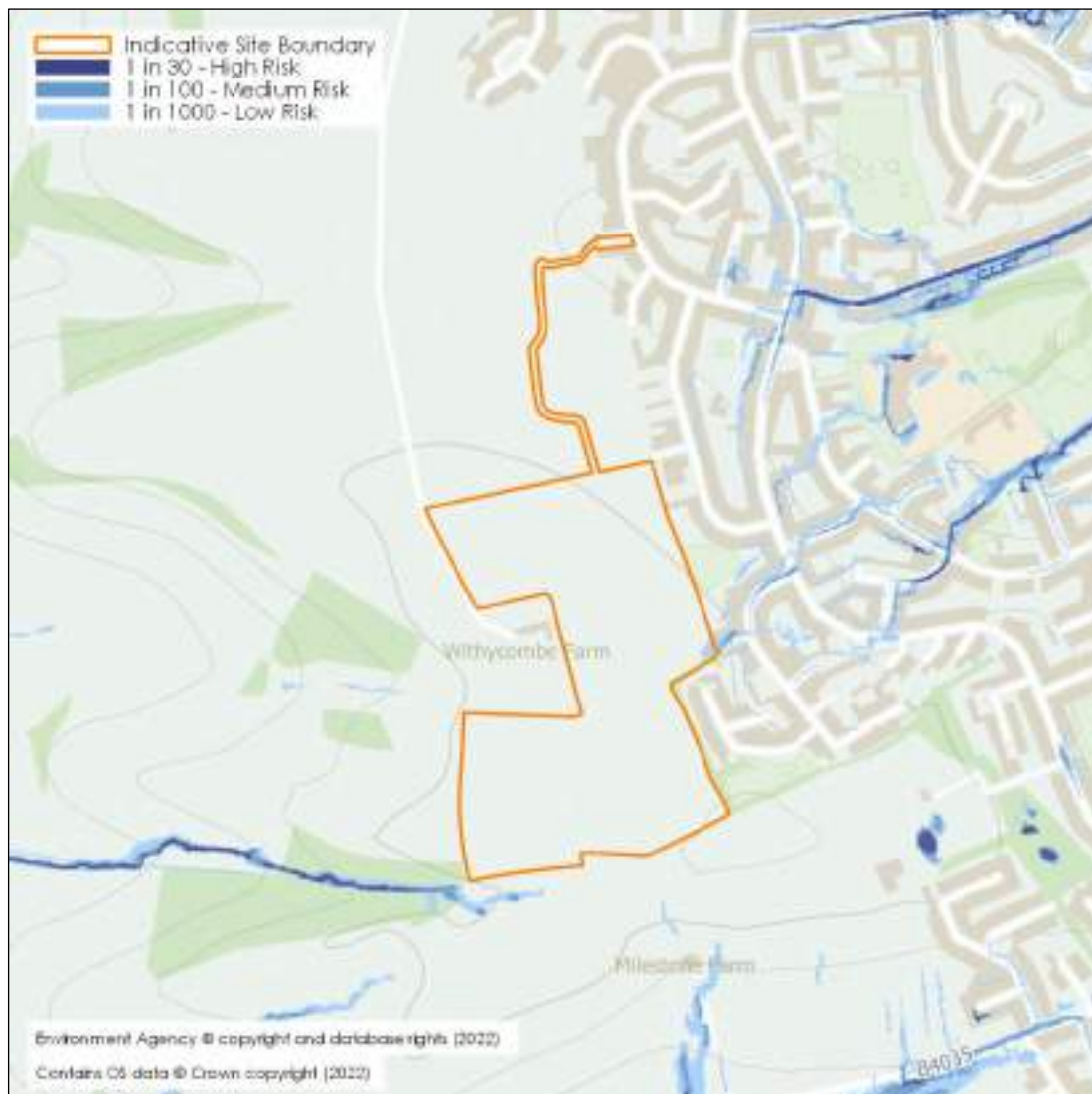
- 3.20 Flooding can occur from large waterbodies or reservoirs if they are impounded above the surrounding ground levels or are used to retain water in times of flood. Although unlikely, reservoirs and large waterbodies could overtop or breach leading to rapid inundation of the downstream floodplain.
- 3.21 To help identify this risk, reservoir failure flood risk mapping has been prepared by the EA. This shows the largest area that might be flooded if a reservoir were to fail and release the water it holds. The map shown below as **Figure 3.1** displays a worst-case scenario and is only intended as a guide.
- 3.22 There are two flooding scenarios shown on the reservoir flood maps: a 'dry-day' and a 'wet-day'. The dry-day scenario predicts the flooding that would occur if the dam or reservoir failed when rivers are at normal levels. The wet-day scenario predicts how much worse the flooding might be if a river is already experiencing an extreme flood.
- 3.23 The mapping demonstrates that the site lies outside the reservoir flood extents.
- 3.24 The overall risk posed to the site from the reservoir or large waterbodies is, therefore, considered to be low.



**Figure 3.1: Reservoir Failure Flood Risk Map**

## Pluvial Flood Risk

- 3.25 Pluvial flooding can occur during prolonged or intense storm events when the infiltration potential of soils, or the capacity of drainage infrastructure is overwhelmed leading to the accumulation of surface water and the generation of overland flow routes.
- 3.26 Risk of flooding from surface water mapping has been prepared by the EA. This shows the potential flooding which could occur 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. An extract from the mapping is included as **Figure 3.2**.



**Figure 3.2: Surface Water Flood Risk Map**

- 3.27 As shown in **Figure 3.2**, the site is predominately at a very low risk of pluvial flooding. There is a small, isolated area identified to be at a low risk of flooding (1 in 1000-year) in the east of the site on the boundary. However, this appears to be associated with runoff from the site itself, rather than from third party land. Therefore, it is not expected to represent a barrier to development.



- 3.28 Overall, the site is shown to be at a low risk of flooding from pluvial sources.

### **Flood Risk from Sewers**

- 3.29 Sewer flooding can occur when the capacity of the infrastructure is exceeded by excessive flows, or as a result of a reduction in capacity due to collapse or blockage, or if the downstream system becomes surcharged. This can lead to the sewers flooding onto the surrounding ground via manholes and gullies, which can generate overland flows.
- 3.30 The local sewerage undertaker is Thames Water and a copy of their asset plan is included as **Appendix 4**. There are no public sewer assets shown to be located within the site and north of the site and it anticipated that there is no private sewer network area due to the greenfield nature of the site.
- 3.31 The records show the presence of public sewers within Balmoral Avenue to the east. A 225mm - 300mm public surface water sewer and a 150mm public foul sewer is shown within Balmoral Avenue to east of the site. Depth to invert of these sewers is circa 1.6m – 3.2m.
- 3.32 Contour data shows that in the event of exceedance by sewer flooding, flows are expected to be directed away from the site to the east of Balmoral Avenue.
- 3.33 Overall, the risk of flooding from sewer sources is considered to be low. Mitigation measures for any residential risk outlined in **Section 4**.

### **Effect of Development on Wider Catchment**

#### Development Land Use/Drainage Considerations

- 3.34 The proposed development will increase the area of impermeable surfaces leading to a potential increase in runoff. Appropriate mitigation measures are outlined in **Section 4**.

## **4. FLOOD RISK MITIGATION**

- 4.1 **Section 3.0** has identified the sources of flooding which could potentially pose a risk to the site and the proposed development. This section of the FRA sets out the mitigation measures which are to be incorporated within the proposed development to address and reduce the risk of flooding to within acceptable levels.

### **Development Levels**

- 4.2 Where possible, it is recommended that development levels are raised 150mm above immediately surrounding ground levels to mitigate the residual risk of flooding from groundwater, surface water and sewer flooding.
- 4.3 Ground levels should be profiled to encourage pluvial runoff and overland flows away from the built development and towards the nearest drainage point.

### **Safe Access and Egress**

- 4.4 As it is located in Flood Zone 1, and at low risk from other sources of flooding, safe access and egress is available via Edinburgh Way.

### **Surface Water Drainage**

- 4.5 To mitigate the development's impact on the current runoff regime it is proposed to incorporate surface water attenuation and storage as part of the development proposals.
- 4.6 In brief, the development will continue to infiltrate surface water storage in the form of infiltration basins with capacity for the 1 in 100-year storm with an 40% allowance for climate change.
- 4.7 The development should be designed with exceedance in mind and the road network used to convey excess overland flows towards the attenuation points.
- 4.8 Further information on the drainage approach is provided within the accompanying Sustainable Drainage Statement, reference WFB-BWB-ZZ-XX-CD-0001\_SDS.

### **Foul Water Drainage**

- 4.9 It is proposed to drain used water from the development separately to surface water.
- 4.10 Further information on the drainage approach is provided within the accompanying Sustainable Drainage Statement, reference WFB-BWB-ZZ-XX-CD-0001\_SDS.

## 5. CONCLUSIONS AND RECOMMENDATIONS

- 5.1 This FRA has been prepared in accordance with requirements set out in the NPPF and the associated Planning Practice Guidance. The FRA has been produced on behalf of Bloor Homes Western in respect of an outline planning application for a residential development comprising up to 250 dwellings (with up to 30% affordable housing), public open space, landscaping and associated supporting infrastructure. Means of vehicular access to be determined via Edinburgh Way, with additional pedestrian and cycle connections via Dover Avenue and Balmoral Avenue. Emergency access provision also via Balmoral Avenue. All other matters reserved.
- 5.2 This FRA is intended to support an outline planning application and as such the level of detail included is commensurate and subject to the nature of the proposals at the planning stage.
- 5.3 This report demonstrates that the proposed development is not at significant flood risk, subject to the recommended flood mitigation strategies being implemented. The identified risks and mitigation measures are summarised within **Table 5.1**:

**Table 5.1: Summary of Flood Risk Assessment**

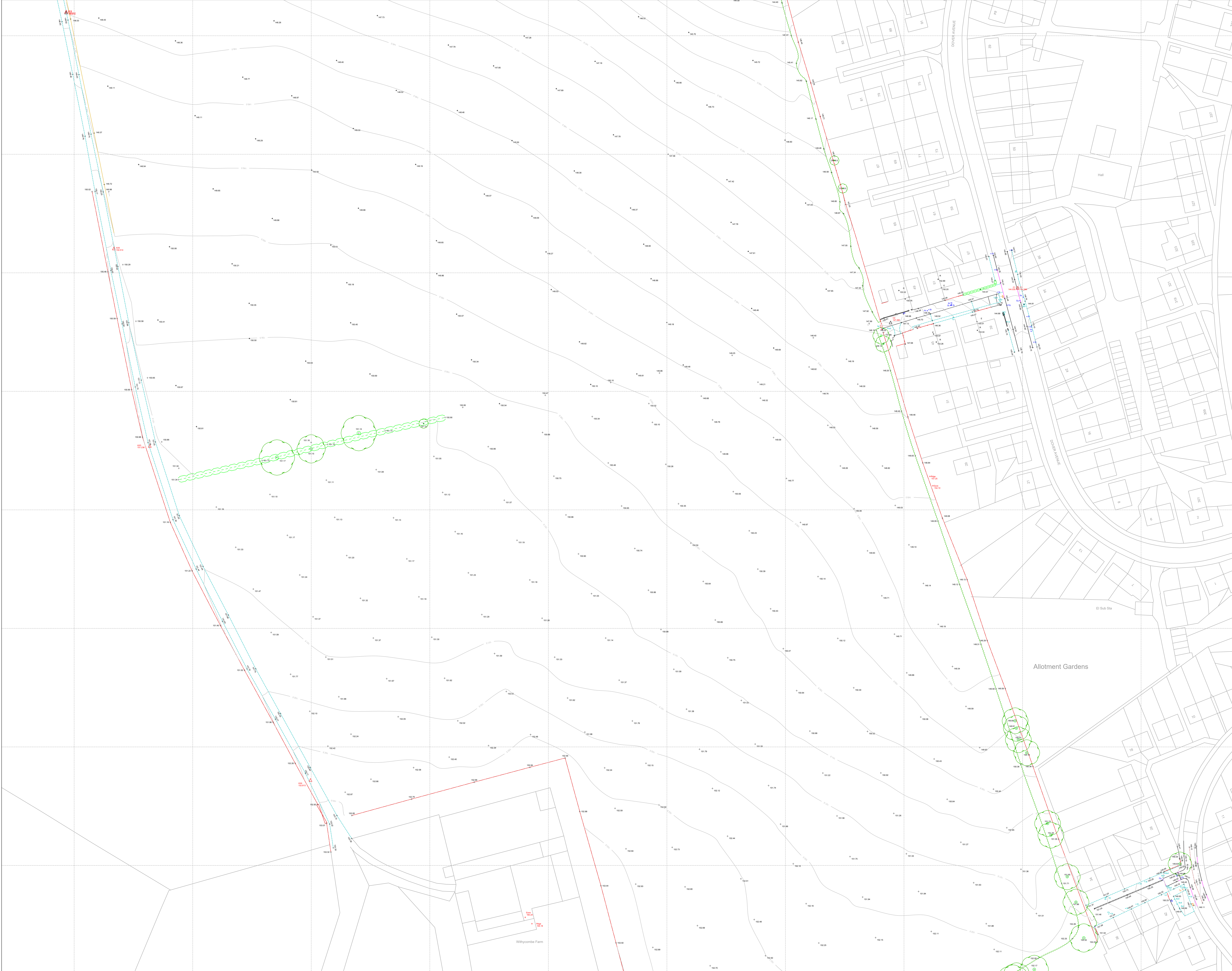
Flood Source	Risk & Proposed Mitigation Measures
Sewers, Pluvial, Groundwater	<p>Finished floor levels of the proposed development should be raised a minimum of 150mm above surrounding ground levels to mitigate any residual risk of flooding, including from sewer sources.</p> <p>Ground levels should be profiled to encourage pluvial runoff and overland flows away from the built development and towards the nearest drainage point.</p>
Other Flood Risk Sources	A review of reservoir and canal sources has also been undertaken, the risk posed from these sources is such that specific mitigation is not considered necessary.
Impact of the Development	<p>To mitigate the development's impact on the current runoff regime it is proposed to incorporate surface water attenuation and storage as part of the development proposals.</p> <p>In brief, the development will continue to infiltrate surface water storage in the form of infiltration basins with capacity for the 1 in 100-year storm with an 40% allowance for climate change. It is proposed to drain used water from the development separately to surface water.</p>
This summary should be read in conjunction with BWB's full report. It reflects an assessment of the Site based on information received by BWB at the time of production.	

- 5.4 In compliance with the requirements of NPPF, and subject to the mitigation measures proposed, the development could proceed without being subject to significant flood risk. Moreover, the development will not increase flood risk to the wider catchment area as a result of suitable management of surface water runoff discharging from the site.

## ***APPENDICES***

## **Appendix 1: Topographical Survey**





LEGEND			
Building	Overhead Cable	IC	Inspection chamber
Wall	Concrete edge	Ph	Pipe insert
Kell line	Yarned edge	Gy	Gully
Line marking	Cross edge	Dr	Down pipe
Drip built	Crossed/Overhang	Ph	Pipe above ground
Centre line	Veget	M	Manhole
Bank Top	Bank Bottom	WL	Water level
		Fl	Flaglight
		L	Lamp post
		T	Tree / Bush / Spring
		U	Utility post
		Area of Undergrowth	
		Hedge	
		Ridge Level	
		Even Level	
		Flat Roof Level	
		Gate	
		Interruption	
		Iron Railings	
		Wire Mesh	
		Post & Rail	
		Post & Wire	
		Chain Link	
		Wooden Panels	
		Concrete Panels	
		Steel Palisade	
		IC	Inspection chamber
		Ph	Pipe insert
		Gy	Gully
		Dr	Down pipe
		Ph	Pipe above ground
		M	Manhole
		WL	Water level
		Fl	Flaglight
		L	Lamp post
		T	Tree / Bush / Spring
		U	Utility post
		Area of Undergrowth	
		Hedge	
		Ridge Level	
		Even Level	
		Flat Roof Level	
		Gate	
		Interruption	
		Iron Railings	
		Wire Mesh	
		Post & Rail	
		Post & Wire	
		Chain Link	
		Wooden Panels	
		Concrete Panels	
		Steel Palisade	

**NOTES**

This plan should only be used for the original purpose. Axis Surveys accepts no responsibility for this plan if applied to any party other than the original client. Do not scale, all dimensions should be checked on site prior to design and construction.

Drainage information (where applicable) has been visually inspected from the surface and therefore no allowance has been made for any sub-surface entry into manholes, chambers or voids. Therefore any details relating to depths, sizes, etc will be approximate only.

The contractor is to check and verify all building and site dimensions, levels and sewer invert levels at construction points before work starts.

Should there be any conflict between the details indicated on this drawing and those indicated on other drawings, the engineer should be informed prior to construction or site.

It is important to note that the same accuracies implied by the plotting scale are equally applicable to digital data supplied for CAD.

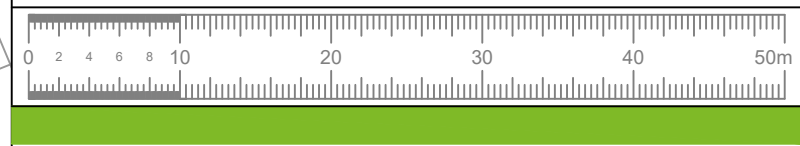
Every effort is made to identify all visible above ground features, however it is should be borne in mind that there may be items obscured at the time of survey.

Visible features in the vicinity of the boundaries, as shown on this survey may not represent the extent of legally conveyed ownership.

THE SURVEY HAS BEEN ORIENTATED TO THE ORDNANCE SURVEY (O.S.) NATIONAL GRID (OSGB36) VIA A GLOBAL POSITION SYSTEM (GPS) AND THE O.S. ACTIVE NETWORK (OS AN).

A TRUE OSGB36 COORDINATE HAS BEEN ESTABLISHED NEAR TO THE SITE CENTRE VIA A TRANSFORMATION USING THE OSTN02 & OSGB02 TRANSFORMATION MODELS. THE SURVEY HAS BEEN CORRELATED TO THIS POINT AND A FURTHER ONE OR MORE OSGB36 POINTS ESTABLISHED TO CREATE A TRUE O.S. BEARING FOR ANGLE ORIENTATION.

SURVEY STATION INFORMATION			
Station	Easting	Northing	Level
AX1	443246.356	240124.895	151.487
AX2	443250.391	240125.213	154.843
AX3	443181.893	240426.785	151.238
AX4	443249.650	240285.855	152.813
AX5	443186.782	240510.069	150.514





01283 550969  
info@axis-surveys.com

www.axis-surveys.com

Launce House, First Avenue, Cambrum 100  
Barton-on-Trent, DE14 2WH

CLIENT	Bloor Homes Western		
PROJECT	Land at Withercombe Farm Banbury		
TITLE	Topographical Survey		
SCALE	1:500	DATE	July 2021
DRAWN	JL	CHECKED	LB
REF NO.	3877 (2/32)	STATUS	FINAL
		SHEET	1 of 2



LEGEND			
	Buildings		Cable/Cables
	Access		Concentrator
	Line marking		Conduit
	Drop leads		Cable/Cables
	Central line		Conduit
	Branch line		Conduit
	Station and Name		Conduit
	Time / Rate / Spelling		Conduit
	Area of Underground		Conduit
	Hedge		Conduit
	Ridge Lead		Conduit
	Event Lead		Conduit
	Flat Road Lead		Conduit
	Gate		Conduit
	Interconnection		Conduit
	Building		Conduit
	Wine Mark		Conduit
	Post & Rail		Conduit
	Post & Wire		Conduit
	Wooden Poles		Conduit
	Concrete Poles		Conduit
	Steel Poles		Conduit
	Map		Conduit
	IC		Conduit
	Inspection chamber		Conduit
	Roll		Conduit
	Aluminium Board		Conduit
	Yard pipe		Conduit
	Yard pipe		Conduit
	On ground		Conduit
	Letter box		Conduit
	Line		Conduit
	Line		Conduit
	Line		Conduit
	Line		Conduit
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	Line		Conduit</

NOTES

Drainage information (where applicable) has been visually inspected from the surface and therefore no allowance has been made for any sub surface entry into marshlands, chambers or voids. Therefore any details relating to depths, sizes, ETC will be approximate only.

The contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work starts.

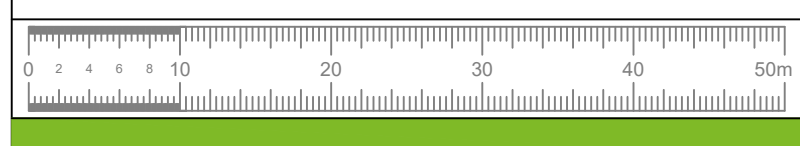
Should there be any conflict between the details indicated on this drawing and those indicated on other drawings, the engineer should be informed prior to construction on site.

It is important to note that the same accuracies implied by the plotting scale are equally applicable to digital data supplied for CAD

THIS SURVEY HAS BEEN ORIENTATED TO THE ORDINANCE SURVEY (O.S.) NATIONAL GRID (OSGB36) VIA A GLOBAL POSITION SYSTEM (GPS) AND THE O.S. ACTIVE NETWORK (JOS NET).

A TRUE OSGB36 COORDINATE HAS BEEN ESTABLISHED NEAR TO THE SITE CENTER USING A TRANSFORMATION USING THE OSTN02 & GEOTRANS TRANSFORMATION MODELS. THE SURVEY HAS BEEN CORRELATED TO THIS POINT AND A FURTHER ONE OR MORE OSGB36 POINTS ESTABLISHED TO CREATE A TRUE O.S. BEARING FOR ANGLE ORIENTATION.

SURVEY STATION INFORMATION			
Station	Easting	Northing	Level
AX1	443246.306	240124.895	151.487
AX2	443395.391	240128.213	154.843
AX3	443181.883	240426.785	151.236
AX4	443249.680	240285.855	152.813
AX5	443166.762	240510.069	150.514



**www.axis-surveys.com**

CLIENT Bloor Homes Western

PROJECT

Land at Withycombe Farm  
Banbury

TITLE	Topographical Survey
-------	----------------------

SCALE @A0	1:500	DATE	July 2021
DRAWN	JL	CHECKED	LB
REF NO.	3877 (2632)	STATUS FINAL	SHEET 2 of 2



## **Appendix 2: Layout Plan**







### **Appendix 3: NPPF Flood risk Vulnerability and Flood Zone Compatibility**

### Flood Risk Vulnerability Classifications (recreated from the NPPF Planning Practise Guidance)

Vulnerability Classification	Description
Essential infrastructure	<ul style="list-style-type: none"> <li>• Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.</li> <li>• Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including infrastructure for electricity supply including generation, storage and distribution systems; including electricity generating power stations, grid and primary substations storage; and water treatment works that need to remain operational in times of flood.</li> <li>• Wind turbines.</li> <li>• Solar farms.</li> </ul>
Highly Vulnerable	<ul style="list-style-type: none"> <li>• Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding.</li> <li>• Emergency dispersal points.</li> <li>• Basement dwellings.</li> <li>• Caravans, mobile homes and park homes intended for permanent residential use.</li> <li>• 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'.)</li> </ul>
More Vulnerable	<ul style="list-style-type: none"> <li>• Hospitals</li> <li>• Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.</li> <li>• Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.</li> <li>• Non-residential uses for health services, nurseries and educational establishments.</li> <li>• Landfill* and sites used for waste management facilities for hazardous waste.</li> <li>• Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.</li> </ul>
Less Vulnerable	<ul style="list-style-type: none"> <li>• Police, ambulance and fire stations which are not required to be operational during flooding.</li> <li>• 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.</li> <li>• Land and buildings used for agriculture and forestry.</li> <li>• Waste treatment (except landfill* and hazardous waste facilities).</li> <li>• Minerals working and processing (except for sand and gravel working).</li> <li>• Water treatment works which do not need to remain operational during times of flood.</li> <li>• Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.</li> <li>• Car parks.</li> </ul>
Water-Compatible Development	<ul style="list-style-type: none"> <li>• Flood control infrastructure.</li> <li>• Water transmission infrastructure and pumping stations.</li> <li>• Sewage transmission infrastructure and pumping stations.</li> <li>• Sand and gravel working.</li> <li>• Docks, marinas and wharves.</li> <li>• Navigation facilities.</li> <li>• Ministry of Defence installations.</li> <li>• Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.</li> <li>• Water-based recreation (excluding sleeping accommodation).</li> <li>• Lifeguard and coastguard stations.</li> <li>• Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.</li> <li>• Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.</li> </ul>

### Flood Zone Compatibility (recreated from the NPPF Planning Practise Guidance)

Flood Zone	Vulnerability Classification				
	Essential infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Flood Zone 1 (Low Probability)	Development is appropriate	Development is appropriate	Development is appropriate	Development is appropriate	Development is appropriate
Flood Zone 2 (Medium Probability)	Development is appropriate	<p>To be deemed appropriate an exception test is required to demonstrate:</p> <ul style="list-style-type: none"> <li>The development will be safe for its life time without increasing flood risk elsewhere, and where possible reduce overall flood risk</li> <li>the sustainability benefits of the development to the community outweigh the flood risk.</li> </ul>	Development is appropriate	Development is appropriate	Development is appropriate
Flood Zone 3a (High Probability)	<p>To be deemed appropriate an exception test is required to demonstrate:</p> <ul style="list-style-type: none"> <li>The development will be safe for its life time without increasing flood risk elsewhere, and where possible reduce overall flood risk</li> </ul> <p>the sustainability benefits of the development to the community outweigh the flood risk.</p> <p>Additionally, essential infrastructure should be designed and constructed to remain operational and safe in times of flood.</p>	Development should not be permitted	<p>To be deemed appropriate an exception test is required to demonstrate:</p> <ul style="list-style-type: none"> <li>The development will be safe for its life time without increasing flood risk elsewhere, and where possible reduce overall flood risk</li> <li>the sustainability benefits of the development to the community outweigh the flood risk.</li> </ul>	Development is appropriate	Development is appropriate

Flood Zone	Vulnerability Classification				
	Essential infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Flood Zone 3b (The Functional Floodplain)	<p>To be deemed appropriate an exception test is required to demonstrate:</p> <ul style="list-style-type: none"> <li>• The development will be safe for its life time without increasing flood risk elsewhere, and where possible reduce overall flood risk</li> <li>• the sustainability benefits of the development to the community outweigh the flood risk.</li> </ul> <p>Additionally, development should be designed and constructed to:</p> <ul style="list-style-type: none"> <li>• remain operational and safe for users in times of flood;</li> <li>• result in no net loss of floodplain storage;</li> <li>• not impede water flows and not increase flood risk elsewhere.</li> </ul>	Development should not be permitted	Development should not be permitted	Development should not be permitted	<p>Development is appropriate if designed and constructed to:</p> <ul style="list-style-type: none"> <li>• remain operational and safe for users in times of flood;</li> <li>• result in no net loss of floodplain storage;</li> <li>• not impede water flows and not increase flood risk elsewhere.</li> </ul>

## **Appendix 4: Sewer Records**

BWB Consulting Limited  
5th Floor, Waterfront House Waterfront House

NOTTINGHAM  
NG2 3DQ

**Search address supplied**      Withycombe Farm  
1  
Balmoral Avenue  
Banbury  
OX16 0JU

**Your reference**                      BMP2135

**Our reference**                      ALS/ALS Standard/2022\_4585444

**Search date**                          10 February 2022

## Knowledge of features below the surface is essential for every development

The benefits of this knowledge not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility of any development.

Did you know that Thames Water Property Searches can also provide a variety of utility searches including a more comprehensive view of utility providers' assets (across up to 35-45 different providers), as well as more focused searches relating to specific major utility companies such as National Grid (gas and electric).

Contact us to find out more.



Thames Water Utilities Ltd  
Property Searches, PO Box 3189, Slough SL1 4WW  
DX 151280 Slough 13



[searches@thameswater.co.uk](mailto:searches@thameswater.co.uk)  
[www.thameswater-propertysearches.co.uk](http://www.thameswater-propertysearches.co.uk)



0800 009 4540

**Search address supplied:** Withycombe Farm, 1, Balmoral Avenue, Banbury, OX16 0JU

Dear Sir / Madam

**An Asset Location Search is recommended when undertaking a site development.** It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This search provides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

## **Contact Us**

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0800 009 4540, or use the address below:

Thames Water Utilities Ltd  
Property Searches  
PO Box 3189  
Slough  
SL1 4WW

Email: [searches@thameswater.co.uk](mailto:searches@thameswater.co.uk)

Web: [www.thameswater-propertysearches.co.uk](http://www.thameswater-propertysearches.co.uk)



## **Waste Water Services**

**Please provide a copy extract from the public sewer map.**

The following quartiles have been printed as they fall within Thames' sewerage area:

SP4340SE  
SP4339NE

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

The following quartiles have not been printed as they contain no assets:

SP4339NW  
SP4340SW

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

## **Clean Water Services**

**Please provide a copy extract from the public water main map.**

The following quartiles have been printed as they fall within Thames' water area:

SP4339NW  
SP4340SE  
SP4340SW  
SP4339NE

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and pressure test to be carried out for a fee.

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

### **Payment for this Search**

A charge will be added to your suppliers account.

## **Further contacts:**

### **Waste Water queries**

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)  
Thames Water  
Clearwater Court  
Vastern Road  
Reading  
RG1 8DB

Tel: 0800 009 3921  
Email: [developer.services@thameswater.co.uk](mailto:developer.services@thameswater.co.uk)

### **Clean Water queries**

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)  
Thames Water  
Clearwater Court  
Vastern Road  
Reading  
RG1 8DB

Tel: 0800 009 3921  
Email: [developer.services@thameswater.co.uk](mailto:developer.services@thameswater.co.uk)



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 443750,240250

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.