

# Mapping

## Tewkesbury Borough Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables



<b>Site details</b>	<b>Site Code</b>	Land at allotments off A435, Bishops Cleeve			
	<b>Area</b>	3.91 hectares			
	<b>Current land use</b>	Brownfield			
	<b>Proposed land use</b>	Housing			
<b>Sources of flood risk</b>	<b>Existing drainage features</b>	<p>The Dean Brook flows from south-east to north west along the northern edge of the site boundary. At the north-western corner of the site an unnamed watercourse joins the Dean Brook.</p> <p>Just upstream of the site, the Dean Brook is culverted and comes out of culvert on the western side of the A435, at the north-eastern corner of the site.</p>			
	<b>Fluvial</b>	<b>Proportion of site at risk</b>			
		<b>FZ3b</b>	<b>FZ3a</b>	<b>FZ2</b>	<b>FZ1</b>
		0%*	0%*	0%*	100%*
		-**	3%**	13%**	87%**
	<p>*Based on the 2010 1D-2D Bishops Cleeve model  **Based on the Environment Agency's Flood Zones</p> <p>The EA's Flood Zones show that the northern part of the site is at risk of flooding along the Dean Brook; however, these Flood Zones are very conservative. 1D-2D modelling of Bishops Cleeve from the previous SFRA shows that the 100-year (FZ3a) and 1,000-year (FZ2) extents are well confined to the channel and do not pose a risk to the site.</p> <p>The majority of the site is not at fluvial flood risk either from the EA's Flood Zones or the Flood Zones derived from modelling, as the site is largely located on higher ground, and the topography in the vicinity of the channel is confined.</p> <p>Developers should seek advice from the EA and Gloucestershire County Council as LLFA, to determine which Flood Zones to consider at this site, any hydraulic modelling requirements at FRA stage for the site, as well as any opportunities to steer development away from the small area shown to be at fluvial risk in the EA's Flood Zones.</p>				
	<b>Surface Water</b>	<b>Proportion of site at risk (RoFfSW)</b>			
<b>30-year</b>		<b>100-year</b>	<b>1,000-year</b>		
<1%		<1%	2%		
<p>Surface water flooding in all events is restricted to the northern boundary of the site, along the Dean Brook. The surface water extents only slightly encroach into the site boundary, most prominently in the north-western corner of the site.</p>					
<b>Reservoir</b>	The site is not shown to be at risk of reservoir flooding.				
<b>Flood history</b>	The Environment Agency's historic flood map and recorded flood outlines shows the northern part of the site having flooded in July 2007.				
<b>Flood risk management infrastructure</b>	<b>Defences</b>	<b>Defence Type</b>	<b>Standard of Protection</b>	<b>Condition</b>	
		-	-	-	
		This site is not protected by any formal flood defences.			

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	<b>Residual risk</b>	There is potential for the culvert immediately upstream (east) of the site to block and cause flood water to encroach into the eastern site boundary. The potential for this should be considered at site-specific assessment level.		
<b>Emergency planning</b>	<b>Flood warning</b>	The site is not covered by the Environment Agency's Flood Warning Service; however, the northern part of the site along the Dean Brook is covered by the Rivers in North Gloucestershire (031WAF212) Flood Alert Area.		
	<b>Access and egress</b>	Dry access and egress from the site via the A435 and Sapphire Road is available all fluvial events and the 30-year surface water event. Dry access and egress is still available in the 100-year and 1,000-year events; however, the surrounding road network to the north and south of the site has the potential to become inundated, restricting access to the site for emergency vehicles.		
<b>Climate Change</b>	<b>Climate change allowances for '2080s'</b>	<b>River Basin District</b>	<b>Higher Central</b>	<b>Upper End</b>
		Severn	35%	70%
	<b>% of site at risk</b>		0%	0%
	<b>Implications for the site</b>	The climate change extents have been derived using the 2010 Bishops Cleeve 1D-2D model and have been compared with the Flood Zones created from this model. Climate change extents increase slightly when compared against FZ3a. The upper end allowance is comparable with FZ2. As the site is affected by surface water flooding from the 30-year event along the northern boundary of the site, and along the unnamed drain south-west of the boundary, climate change may also increase the extent, depth and frequency of surface water flooding within the site.		

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<b>Requirements for drainage control and impact mitigation</b>	<b>Broad scale assessment of possible SuDS</b>	<ul style="list-style-type: none"> <li>• Geology at the site consists of: <ul style="list-style-type: none"> <li>○ Bedrock – Mudstone, siltstone, limestone and sandstone</li> <li>○ Superficial – Sand and gravel</li> </ul> </li> <li>• The site is not located within Groundwater Source Protection Zone.</li> <li>• Source control techniques are likely to be suitable for this site.</li> <li>• Mapping suggest groundwater flooding is unlikely to be an issue at the site, as such infiltration techniques may be suitable.</li> <li>• Detention features may be feasible providing site slopes are &lt;5% at the location of the detention feature.</li> <li>• Filtration systems are probably suitable providing site slopes are &lt;5% and the depth to the water table is &gt;1m. If the site has contamination issues, then a liner will be required.</li> <li>• All forms of conveyance features are likely to be suitable. Where slopes are &gt;5%, features should follow contours or utilise check dams to slow flows.</li> <li>• The site is not designated by the Environment Agency as previously being a landfill site.</li> </ul>
<b>NPPF and planning implications</b>	<b>Exception Test requirements</b>	<p>The Sequential Test will need to be passed before the Exception Test is applied.</p> <p>The Exception Test will need to be applied if:</p> <ul style="list-style-type: none"> <li>• More Vulnerable and Essential Infrastructure development is located in FZ3a and for Highly Vulnerable development located in FZ2.</li> <li>• Highly Vulnerable infrastructure should not be permitted within FZ3a and FZ3b.</li> <li>• More Vulnerable and Less Vulnerable Infrastructure should not be permitted within FZ3b.</li> <li>• Essential Infrastructure in Flood Zone 3b will require the Exception Test.</li> </ul>

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	<b>Requirements and guidance for site-specific Flood Risk Assessment</b>	<ul style="list-style-type: none"> <li>• At the planning application stage, a site-specific Flood Risk Assessment will be required if any development is located within Flood Zones 2 or 3 or is greater than one hectare. Other sources of flooding should also be considered.</li> <li>• Consultation with the Local Authority, Local Lead Flood Authority and the Environment Agency should be undertaken at an early stage.</li> <li>• Developers should seek advice from the EA and Gloucestershire County Council as LLFA, to determine which Flood Zones to consider at this site, any hydraulic modelling requirements at FRA stage for the site, as well as any opportunities to steer development away from the small area shown to be at fluvial risk in the EA's Flood Zones.</li> <li>• Resilience measures will be required if buildings are situated in the flood risk area along the northern site boundary. Raising Finished Floor Levels above the design event may remove the need for resilience measures.</li> <li>• Onsite attenuation schemes would need to be tested against the hydrograph of the Dean Brook to the north of the site to ensure flows are not exacerbated downstream within the catchment.</li> <li>• Developers should ensure that the greenfield run off rate to be used for the design of Attenuation Storage for all storms up to a 1% (1 in 100) annual probability plus 70% allowance for climate change, shall be the 1 in 1-year greenfield runoff rate calculated by using ReFH2 for the whole catchment.</li> <li>• New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.</li> <li>• Assess the flood risk posed by the unnamed ordinary watercourses to the north of the site and to the south-west of the site.</li> <li>• Assessment for runoff should include allowance for climate change effects.</li> <li>• Safe access and egress will need to be demonstrated.</li> <li>• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:             <ul style="list-style-type: none"> <li>○ Reducing volume and rate of runoff</li> <li>○ Relocating development to zones with lower flood risk</li> <li>○ Creating space for flooding.</li> </ul> </li> <li>• Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development and consider using Flood Zones 2 and 3 as public open space.</li> </ul>

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<b>Mapping Information</b>		
<b>Flood Zones</b>	The Environment Agency Flood Zones 2, 3a are based on the EA's Flood Map for Planning. Flood Zones are also shown that have been derived from 1D-2D modelling techniques from the 2010 Bishops Cleeve model.	
<b>Climate change</b>	The climate change allowances for the '2080's were modelled using the Bishops Cleeve 1D-2D modelling for the purposes of the SFRA. The mapping provides a strategic assessment of climate change risk – developers should undertake detailed modelling of climate change allowances as part of a site-specific FRA.	
<b>Surface Water</b>	The Risk of Flooding from Surface Water has been used to define areas at risk from surface water flooding.	
<b>Depth, velocity and hazard mapping</b>	Depth, velocity and hazard mapping for the 1 in 100-year event (Flood Zone 3a) have been taken from the 2010 Bishops Cleeve 1D-2D model.	