Shropshire Council Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables

<table>
<tr><td rowspan="5">Site details</td><td>Site Code</td><td colspan="4">SHR173</td></tr>
<tr><td>Address</td><td colspan="4">Land at Ellesmere Road</td></tr>
<tr><td>Area</td><td colspan="4">23.30 hectares</td></tr>
<tr><td>Current land use</td><td colspan="4">Greenfield</td></tr>
<tr><td>Proposed land use</td><td colspan="4">Residential</td></tr>
<tr><td rowspan="5">Sources of flood risk</td><td>Location of site within catchment</td><td colspan="4">The site is located within the upper-middle catchment of the River Severn just north of Shrewsbury and the River Severn.
The site is located on an area of high ground approximately 10m higher than surrounding levels and slopes north-west towards a series of unnamed watercourses and drains which flow south, around the high ground and into the River Severn. The drains form a ‘loop’ from the River Severn, with the Coton Hill, Mount Pleasant and Greenfields areas of Shrewsbury situated within this loop.</td></tr>
<tr><td>Existing drainage features</td><td colspan="4">An unnamed drain flows westward along the northern boundary of the site and crosses the site boundary in the north-west, before flowing south into the River Severn. The drain is impounded between the Ellesmere Road and the railway line. To the east of the site (east of Ellesmere Road), the watercourse is named the Bagley Brook, which also flows south and into the Severn.</td></tr>
<tr><td rowspan="5">Fluvial</td><td colspan="4">Proportion of site at risk</td></tr>
<tr><td>FZ3b</td><td>FZ3a</td><td>FZ2</td><td>FZ1</td></tr>
<tr><td>7%</td><td>8%</td><td>13%</td><td>87%</td></tr>
<tr><td colspan="4">Highest zone of risk (Risk of Flooding from Rivers and Sea)</td></tr>
<tr><td colspan="4">High</td></tr>
<tr><td colspan="5">The % Flood Zones quoted show the % of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone, e.g. FZ2 includes the FZ3 %. FZ1 is the remaining area outside FZ2 (FZ2 + FZ1 = 100%)</td></tr>
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<tr><td rowspan="8"></td><td></td><td colspan="3">Available data:
The Flood Zone data is based on the 2020 Environment Agency River Severn Modelling Study Phase 1. The results have been signed off by the Environment Agency, but as the project is still ongoing, there are still aspects which could be subject to change in Phase 2.
The results are defended; Flood Zones 2 and 3a should be undefended. However, the location of the defences in Shrewsbury are unlikely to have an impact at the site and the defended FZ2 is slightly larger than the previous modelling work, hence showing the results in this assessment.
When the undefended runs become available in Phase 2, the Flood Zone extents should be checked, in addition to considering the impact of the argaes upstream with regards to storage and how these natural features impact the undefended model runs.
Flood characteristics:
Fluvial flood risk to the site is associated with the unnamed watercourse that flows through the north-west of the site. The extents of all Flood Zones extend away from the channel into the north western area of the site. Flood Zone 3 is confined to the north-western corner of the site where the topography is confined, and ground levels rise away from the floodplain. This area is the deepest area of flooding due to confined floodplain topography, with depths up to 3.64m in the 100-year event.
Flood Zone 2 encroaches into the north-eastern boundary of the site.
A small area of the site in the northwest corner is covered by the Environment Agency's Risk of Flooding from Rivers and Sea mapping. This area primarily falls within the zone of medium risk, with a probability of flooding in a year from 1%-3.3%, with a small area at high risk where probability of flooding in a year exceeds 3.3%.</td></tr>
<tr><td rowspan="7">Surface Water</td><td colspan="3">Proportion of site at risk (RoFfSW)</td></tr>
<tr><td>30-year</td><td>100-year</td><td>1,000-year</td></tr>
<tr><td>3%</td><td>3%</td><td>4%</td></tr>
<tr><td colspan="3">Max depths (m)</td></tr>
<tr><td><0.3 - 0.9</td><td><0.3 - 0.9</td><td>0.3 - 0.9</td></tr>
<tr><td colspan="3">Max velocity (m/s)</td></tr>
<tr><td><0.25</td><td><0.25</td><td><0.25 - >0.25</td></tr>
<tr><td colspan="3">The % SW extents quoted show the % of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 100-year includes the 30-year %)</td></tr>
</table>

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	Address	Land at Ellesmere Road
	Area	23.30 hectares
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		Description of surface water flow paths: For the 30-year event, there are two areas of ponding, one in the north-west associated with the unnamed watercourse and one in the south associated with a residential structure. The 1 in 100-year event affects the same two areas as the 1 in 30-year but also affects an isolated area in the east of the site. The 1 in 1,000-year event also affected the three previously identified areas but also a small portion in the centre of the site and a small area on the central western boundary. The surface water risk in the north-west is due to a flow path associated with the unnamed river. The remaining areas of surface water flooding in the central, eastern, southern and western areas of the site are due to isolated depressions resulting in surface water ponding. In the 30-year and 100-year surface water event, depths range between <300mm up to 900mm. However, in the 1,000-year event flood depths range from <300mm to >900mm, this increase in depth is associated with isolated surface water ponding in the south only. The velocities for the site remain at <0.25m/s for the 30-year and 100-year event; however, in the 1,000-year event the velocity in the southern part of the site increase to <0.25m/s - >0.25m/s following local topography predominantly in a south-west direction. The increase in speed is associated with the increase in flood depth in the southern area.
	Reservoir	The north-western section of the site is affected by reservoir flooding. Flood depths range between <0.3m and >2m with speeds of between <0.5m/s up to 2m/s.
	Flood history	The Shropshire Level 1 SFRA highlights Shrewsbury as an area where there have been a number of historical flooding events, including fluvial, pluvial and sewer flooding events. There is one record of fluvial flooding on the 23rd of May 2018 affecting the north-west corner of the site associated with the unnamed watercourse. February 2014 saw the highest levels ever recorded at the Castle Foregate gauge on the Bagley Brook. The highest level recorded at the Severn Welsh Bridge gauge was in November 2000. Evidence of flooding incidents from the February 2020 flooding event in Shropshire show that one flooding incident occurred within 200m of the southern tip of the site, with another incident occurring within approximately 400m of the south-west site boundary.

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Flood risk management infrastructure	**Defences**	**Defence Type**	**Standard of Protection**	**Condition**
		-	-	-
		This site is not protected by any formal flood defences, though there are formal flood defences in Shrewsbury.		
	Residual risk	A culvert is located directly north-west of the site where the unnamed drain flows underneath the railway line and a second directly north-east at Ellesmere Road. If these structures became blocked, there is potential for increased surface water and fluvial flooding in the north-western area of the site and Ellesmere Road to the east. This stretch of watercourse is impounded between the Ellesmere Road and the railway line, so any impact of blockage at the railway line would cause water to back up along the site's northern boundary. However, the local topography will limit the extent of the flooding into the site. The potential for blockage may need to be considered in a site-specific assessment.		
Emergency planning	**Flood warning**	The site is covered by the Environment Agency's Flood Alert and Flood Warning Service.		
	Access and egress	Safe access and egress to the site is available via Ellesmere Road in all fluvial and surface water scenarios, as the road is raised. Access for emergency vehicles will also be possible off Ellesmere Road, with the preferred route north of the site, rather than into Shrewsbury where the risk from the Severn is high. Access is possible up to the 100-year +35% climate change event, at which point Ellesmere Road is compromised and access may be an issue in the 100-year plus 70% climate change extent. Access along Berwick Road should be avoided as flood risk extends across this access route.		

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Climate Change	**Implications for the site**	• Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard and frequency of both fluvial and surface water flooding. • The detailed 2019-2020 fluvial hydraulic model of the River Severn was used to model the 2080s climate change scenarios for the 100-year (+25%), 100-year (+35%) and a 100-year (+70%) events. The results revealed the northern boundary was affected during the 100-year +25% climate change scenario with a slight increase for 100-year +35% climate change scenario. The results of the 100-year +70% showed a further increase in extent along the northern boundary but also an increase in flooding in the southern most section of the site. Access to the site may need to be reviewed under such events. • Climate change also needs to be considered for surface water events; at the site-specific stage, the 100-year +40% event is considered as part of surface water drainage strategies, or surface water modelling. • The current day 1,000-year surface water extent provides an indication of the likely increase in extent of the more frequent events. This would require a detailed FRA to assess the site layout and design. • Developers should consider SuDS strategies to reduce the impacts of climate change from surface water in a detailed site-specific FRA.
Cumulative Impact of development within the catchment	**Level of risk**	**Catchment** / **Level of risk** North Shrewsbury / High This development site covers 2.4% of the North Shrewsbury catchment, a sub-catchment of the River Severn. The site lies close to the catchment outlet. This catchment has been identified as one of those that has a high sensitivity to the cumulative impacts of any development within the catchment due to evidence of a number of historic flooding events within the catchment and existing communities at risk of surface water flooding in the 100-year event.
	Recommendations	It is estimated that 1171m^3 of long-term storage in addition to storage to capture the 100-year plus climate change event would need to be compensated for at this site to maintain current greenfield runoff rates. However, drainage control needs to be considered at a strategic catchment scale to ensure that the release of storm waters from this site do not coincide with hydrograph peaks travelling from the rural upper catchment. Refer to Section 9 of the main Level 2 SFRA for more information on the cumulative impact assessment and policy recommendations in this catchment.

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Requirements for drainage control and impact mitigation	**Broad scale assessment of possible SuDS**	• Geology at the site consists of:
		  ○ Bedrock – Kinnerton sandstone Formation (Sedimentary).
		  ○ Superficial – Predominantly Glaciofluvial Deposits, with Till Deposits in the north and Alluvium in the north-west corner of the site.
		• The site is not located within any Environment Agency designated Source Protection Zone.
		• Most source control techniques are likely to be suitable. Mapping suggests that permeable paving may have to use non-infiltrating systems given the possible risk from groundwater. Mapping also suggests that slopes may be unsuitable for selective source control techniques.
		• Mapping suggests that there is a high risk of groundwater flooding at this location, therefore it is likely infiltration techniques will not be suitable. This should be confirmed via site investigations to assess the potential for infiltration.
		• Detention features are unlikely to be feasible as mapping suggests mean site slopes are > 5%. Feasibility of such options should be assessed as part of a site-specific assessment. If this feature is feasible a liner maybe required to prevent the egress of groundwater.
		• Filtration systems are unlikely to be feasible as mapping suggests mean site slopes are > 5%. Feasibility of such options should be assessed as part of a site-specific assessment. If this feature is feasible it should be located where the depth to the water table is >1m, additionally a liner maybe required to prevent the egress of groundwater.
		• All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. A liner maybe required to prevent the egress of groundwater.
		• The site is not designated by the Environment Agency as previously being a landfill site.
		• Developers should refer to Shropshire Council's 'Surface Water Management: Interim Guidance for Developers' and 'SuDS requirements for new developments' webpage as well as the Level 1 SFRA, for information on suitable types of SuDS, the management train and opportunities and constraints in site master-planning.

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NPPF and planning implications	**Exception Test requirements**	The Local Authority have carried out the Sequential Test in line with national guidance. The Sequential Test will need to be passed before the Exception Test is applied. Residential development is classified as 'More Vulnerable'. It is anticipated that proposed development will be sequentially located within Flood Zone 1. The Exception test will need to be applied if: • More Vulnerable and Essential Infrastructure development is located in FZ3a and for Highly Vulnerable development located in FZ2. • Highly Vulnerable infrastructure should not be permitted within FZ3a and FZ3b. • More Vulnerable and Less Vulnerable Infrastructure should not be permitted within FZ3b.

	Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:** • 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. • All sources of flooding, particularly the risk of surface water and groundwater flooding, should be considered as part of a site-specific Flood Risk Assessment. • Any FRA should be carried out in line with the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance; Shropshire Council's Local Plan policies, and the LLFA's 'Surface Water Management: Interim Guidance for Developers' and 'SuDS requirements for new developments' webpage. • Consultation with the Local Authority, Local Lead Flood Authority and the Environment Agency should be undertaken at an early stage. • The development should be designed using a sequential approach. Development should be steered away from areas of fluvial flood risk and surface water flow routes, preserving these spaces as green infrastructure. Development must be in line with Table 3: flood risk vulnerability and flood zone compatibility of the NPPG. • Development in FZ3b should be avoided unless appropriate use can be demonstrated in line with NPPF. • Development in FZ3 may require floodplain compensation and this should be confirmed with the EA at FRA stage. **Guidance for site design and making development safe:** • The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG). • Safe access and egress will need to be demonstrated in the 1 in 100-year plus climate change fluvial and rainfall events, using the depth, velocity and hazard outputs. Raising of access routes must not impact on surface water flow routes. Consideration should be given to the siting of access points with respect to areas of surface water flood risk. • Resilience measures will be required if buildings are situated in the flood risk area. Raising Finished Floor Levels above the design event may remove the need for resilience measures. • The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, to ensure that runoff from the development is not increased by placing development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure there is no increase in runoff beyond the current greenfield rates. • On site attenuation schemes would need to be tested against the unnamed watercourse to ensure flows are not exacerbated downstream within the catchment. • 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. Assessment for runoff should include allowance for climate change effects. • Betterment on the existing site runoff rate should be sought to ensure that there is no increase in surface water flood risk elsewhere. Ideally, surface water runoff should be fully attenuated to the greenfield rate. • Developers should refer to Shropshire Local Development Framework: Adopted Core Strategy (Policy CS18) and the Level 1 SFRA for information on SuDS.

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		• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:
		  ○ Reducing volume and rate of runoff
		  ○ Relocating development to zones with lower flood risk
		  ○ Creating space for flooding.
		
		• 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.

Key messages		The flood risk element of the Exception Test is likely to be passed if: • Development is limited to the 87% of the site located outside of the Environment Agency's Flood Zone 2 and 3. These Flood Zones cover the area of the site along the northern boundary. • Areas in Flood Zone 2 are used for the least vulnerable parts of the development in accordance with Table 2 in the NPPF. No residential development is permitted in Flood Zone 3 and no development at all is permitted in Flood Zone 3b. • If flood mitigation measures are implemented then they are tested to ensure that they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another) • Space for green infrastructure should be considered in the areas of highest flood risk to the north. • Safe access and egress routes must not be in the areas of high surface water risk or the 100-year fluvial design flood event (taking into account climate change). • This site lies within a catchment identified as high risk of cumulative impact of development. It is important to incorporate long-term storage capacity on this site to ensure current greenfield runoff rates are maintained. Refer to Section 9 in the main SFRA for specific policy recommendations related to this site and its wider catchment. Refer to the detailed 'guidance for developers' section for further information on the measures that are appropriate for this site.

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Mapping Information		
Flood Zones		The Flood Zone data is based on the 2020 Environment Agency River Severn Modelling Study Phase 1. The results have been signed off by the Environment Agency, but as the project is still ongoing, there are still aspects which could be subject to change in Phase 2. The results are defended; Flood Zones 2 and 3a should be undefended. However, the location of the defences in Shrewsbury are unlikely to have an impact at the site and the defended FZ2 is slightly larger than the previous modelling work, hence showing the results in this assessment. When the undefended runs become available in Phase 2, the Flood Zone extents should be checked, in addition to considering the impact of the argaes upstream with regards to storage and how these natural features impact the undefended model runs.
Climate change		Climate change was based on the 2020 Environment Agency River Severn Modelling Study Phase 1. The 100-year model flow was upscaled for the 2080s epoch for the Severn basin, increasing by +25%, +35% and +70% It should be noted that these results are considered 'draft' and have not been signed off by the Environment Agency. Developers should obtain latest results and confirm risk once Phase 2 of the Severn modelling study has been published.
Fluvial depth, velocity and hazard mapping		The 100-year modelled outputs have been used to assess depth, velocity and hazard from the 2019-2020 DRAFT River Severn modelling study Phase 1 model.
Surface Water		The Risk of Flooding from Surface Water has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping		The surface water depth, velocity and hazard mapping for the 1 in 100-year event (considered to be medium risk) is taken Environment Agency's Risk of Flooding from Surface Water.