Solihull Metropolitan Borough Council Level 2 Strategic Flood Risk Assessment Flood Risk Assessment Detailed Site Summary Table

<table>
<tr><td rowspan="5">Site details</td><td>Site Code</td><td colspan="4">Site 10</td></tr>
<tr><td>Address</td><td colspan="4">West of Meriden</td></tr>
<tr><td>Area</td><td colspan="4">3.7 Hectares</td></tr>
<tr><td>Current Land Use</td><td colspan="4">Greenfield & Residential</td></tr>
<tr><td>Proposed Land Use</td><td colspan="4">Residential</td></tr>
<tr><td rowspan="11">Sources of flood risk</td><td>Location of site within catchment</td><td colspan="4">The site is located within the River Blythe catchment. An unnamed tributary of the River Blythe flows along the northern site boundary.</td></tr>
<tr><td>Existing drainage features</td><td colspan="4">The upstream extent of an unnamed tributary of the River Blythe flows along the northern boundary of the site. This watercourse flows in a westerly direction towards its confluence with the Blythe, approximately 2km to the west of the site.
The unnamed watercourse is culverted in two locations on the northern site boundary as it flows under two roads, both named Maxstoke Lane. These roads are located along the eastern and western site boundaries.
An existing pond is located in the western portion of the site.</td></tr>
<tr><td rowspan="6">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>0.1%</td><td>1.3%</td><td>1.9%</td><td>98.1%</td></tr>
<tr><td colspan="4">Highest Zone of Risk (Risk of Flooding from Rivers and Sea)</td></tr>
<tr><td colspan="4">Majority of site - Very Low
Northern Site Boundary - Medium to High</td></tr>
<tr><td colspan="4">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>
<tr><td colspan="4">Available Data:
As part of the Level 2 SFRA, 2D strategic modelling has been completed for the watercourses associated with this site using TUFLOW. Limitations of the strategic modelling are discussed in the SFRA Strategic Modelling Report and summarised in the Mapping Information section at the end of this table.
Survey data, including upstream dimensions and invert levels for the two culverts located to the north of the site, have been collected and embedded into the strategic model.
Flood Characteristics:
The strategic 2D modelling shows that that majority of the site is at very low fluvial flood risk, with only the northern at fluvial flood risk.
In the 20 year event, fluvial flooding is seen along the northern boundary and barely impacts the site itself. Slightly wider flood extents are seen upstream of the first Maxstoke Lane culvert to the east.
In the 100 and 1000 year events, flood extents in the vicinity of the site are similar to those seen in the 20 year event. A very small area of fluvial flooding is seen within the northern site boundary in these events, extending south westwards along the western boundary.</td></tr>
<tr><td rowspan="6">Surface Water</td><td colspan="4">Proportion of site at risk (Meriden SW Mapping Study)</td></tr>
<tr><td colspan="2">30-year
High Risk</td><td>100-year
Medium Risk</td><td>1,000-year
Low Risk</td></tr>
<tr><td colspan="2">1.2%</td><td>1.5%</td><td>2.4%</td></tr>
<tr><td colspan="4">Max depths (m)</td></tr>
<tr><td colspan="2">0.3 – 0.9m</td><td>0.3 – 0.9m</td><td>0.3 – 0.9m</td></tr>
<tr><td colspan="4">Max velocity (m/s)</td></tr>
<tr><td colspan="2">>0.25</td><td>>0.25</td><td>>0.25</td></tr>
<tr><td colspan="4">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>
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		Available Data: In May 2020, surface water modelling was undertaken for three areas in Solihull, in line with the 2019 Environment Agency requirements for updating the National Risk of Flooding from Surface Water map. An existing surface water model for Meriden was updated as part of this study and outputs have been used to better understand surface water flood risk at this site. It should be noted that no LiDAR data was available for the study area and topography is based on 2m photogrammetric data. **Description of surface water flow paths:** There is one main surface water flow path associated with the unnamed watercourse which flows along the northern site boundary and hence the mapping is likely to be picking up the natural floodplain. In the 30 year event, surface water flooding is only shown along the northern site boundary. Flood depths are largely below 0.6m in depth within the site boundary. Surface water flooding is also seen on Maxstoke Lane to the east and west and along Birmingham Road to the south although extents are minor and depths below 0.1m. In the 100 and 1000 year events, extents within the site are largely the same as in the 30 year event. There are several very small areas of isolated surface water flooding shown within the site boundary in both these events. On the road network surrounding the site, extents are slightly greater, but depths remain below 0.1m.		
	Reservoir	The site is not shown to be at risk of reservoir flooding from the available online maps.		
	Groundwater	The Environment Agency Areas Susceptible to Groundwater Flooding dataset, provided as 1km grid squares, shows the susceptibility of an area to groundwater flood emergence. The following comments can be made about groundwater flood risk: • The entirety of the site has a >= 25% <50% susceptibility to groundwater flood emergence from superficial deposits. This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site specific FRA stage.		
	Flood History	The Environment Agency, Severn Trent Water and SMBC historic flooding datasets show that there are no recorded incidents of historic flooding in the vicinity of the site.		
Flood risk management infrastructure	**Defences**	**Defence Type**	**Standard of Protection**	**Condition**
		-	-	-
		This site is not protected by any formal flood defences.		
	Residual Risk	There are two culverts located on the northern site boundary where the unnamed watercourse flows under the two roads named Maxstoke Lane. If these structures were to become blocked, there is potential for increased surface water and fluvial flooding across the site. The potential for blockage will need to be considered in any future site-specific assessment. JScreen, culvert blockage modelling software, was used in 2016 to look at the impact of culvert blockages on flood risk across the site. The flood extents in both the blocked and unblocked scenarios are greater than in the strategic 2D modelling. This is likely to be because:		

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		• The estimated channel capacity of the broadscale 2D modelling is the 2 year event, whereas JScreen estimates capacity based on the available structure data. For example, the capacity of a pipe will be less than the 2 year flow, meaning that flood extents are greater upstream from JScreen. • Hydrology inputs from AutoFEH may have generated slightly different flows that have been used within the JScreen modelling. In both the unblocked and blocked scenarios, flooding is shown along the western portion of the north site boundary and through the west of the site.
Emergency planning	**Flood warning**	The site is not covered by an Environment Agency Flood Warning or Alert area.
	Access and Egress	The site is bounded by Maxstoke Lane along the eastern and north western boundary. Birmingham Road (B4104) is also located along the south western site boundary. There is an existing access road in the eastern corner of the site from Maxstoke Lane. In terms of fluvial flood risk, access and egress should not be affected in any event as flooding is only shown along the northern site boundary. In terms of surface water flood risk, the road network around the site is shown to be affected by surface water flooding to some extent in each event. In the 30 year event, surface water flooding is shown along the unnamed watercourse and mapping is likely to be picking up the natural floodplain. Access and egress to and from Maxstoke Lane is therefore unlikely to be affected. In the 100 year event, some surface water flooding is seen along Maxstoke Lane to the east and Birmingham Road to the south west, however flood depths are likely to be below 0.3m. In the 1000 year event, surface water flood extents are more significant along Maxstoke Lane to the east and west and Birmingham Road. Despite extents being greater, flood depths are still shown to be below 0.3m in all locations. It would preferable to access the site from the existing access road in the eastern corner of the site, travelling south towards Fillongley Road. The southern corner of the site could also be accessed from Birmingham Road. Both roads are shown to be affected by surface water flooding, but extents depths are shown to be below 0.3m and extents are narrow. The depths, velocities, hazards, durations and speeds of onset of surface water and fluvial flooding along access/ egress routes should be investigated further in a site-specific assessment, to confirm whether access for emergency vehicles could still be obtained.
Climate Change	**Implications for the site**	• Increased storm intensity and frequency as a result of climate change may increase the extent, depth, velocity, hazard and frequency of fluvial flooding from the unnamed watercourses and surface water flooding across the site. • As part of the Level 2 SFRA, 2D strategic modelling has been completed for the watercourses covering this site using TUFLOW, including allowances for climate change. For the 1 in 100 year event, the 2080s period was used, and all three allowance categories were modelled (20%, 30% & 50%). Within the site boundary, there is very little change in the 100 year flood extent when climate change allowances are applied, suggesting that there is low sensitivity to climate change. • As part of a site-specific Flood Risk Assessment, the latest EA climate change allowances will need to be considered in a detailed hydraulic model, to confirm the impact in the site. • Climate change also needs to be considered for surface water events; at the site-specific stage. The 100-year event with a 40% allowance for climate change should be considered as part of surface water drainage strategies, or surface water modelling.

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		The current day 1,000-year surface water extent provides an indication of the likely increase in extent of the more frequent events. In the 1000 year event, surface water flooding is shown across the site. This is not seen in the 30 and 100 year events, suggesting that surface water flooding could have a much greater impact on the site in the future due to the impact of climate change. • The impact of climate change on surface water flood risk will require a detailed FRA to assess the site layout and design. • Developers should consider SuDS strategies to manage the impacts of climate change from surface water in a detailed site-specific FRA.
Requirements for drainage control and impact mitigation	**Broad scale assessment of possible SuDS**	Geology at the site consists of: • Bedrock: Sidmouth Mudstone Formation • Superficial: Glaciofluvial Terrace Deposits – Partial Coverage Soils at the site consist of: • Northern Area: Slightly acid loamy and clayey soils with impeded drainage • Southern Area: Loamy soils with naturally high groundwater The site is not located within an EA designated Source Protection Zone and is also not designated by the EA as previously being a landfill site. • 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. • Infiltration may be suitable. Mapping suggests a medium risk of groundwater flooding and underlying soils may be permeable. Further site investigation should be carried out to assess potential for drainage by infiltration. If infiltration is suitable it should be avoided in areas where the depth to the water table is <1m. • Mapping suggests that the site slopes are suitable for all forms of detention. A liner maybe required to prevent the egress of groundwater. • All filtration techniques are likely to be suitable. 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. • Site masterplans should be designed to ensure space is made for above ground SuDS features. • Developers should refer to Solihull Metropolitan Borough Council's **Guide to SuDS and Drainage in Solihull** document 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.
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. As the north boundary of the site is at fluvial flood risk and the site is proposed for residential development, 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 is not be permitted within FZ3a and FZ3b. • More Vulnerable and Less Vulnerable Infrastructure should not be permitted within FZ3b.

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	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 it is greater than one hectare. • The site-specific FRA should be carried out in line with the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance; Solihull Council's Local Plan policies, and the LLFA's **Guide to SuDS and Drainage in Solihull**. • Consultation with the Local Authority, Local Lead Flood Authority and the Environment Agency should be undertaken at an early stage. • All sources of flooding, particularly the risk of fluvial, surface water and groundwater flooding, should be considered as part of a site-specific flood risk assessment. • A detailed hydraulic model will be required to confirm both fluvial and surface water flood risk and flow paths, FZ3b and climate change extents, using channel, asset and topographic survey. The residual risk from culvert blockage should be assessed and suitable mitigation proposed. • 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 100 year event with allowance for climate change may remove the need for resilience measures. • Culverting should be avoided where at all possible and limited to short lengths for essential infrastructure. The need to ensure both fluvial and surface water flows can pass through the site is essential. • Deculverting of any watercourse assets is also considered a priority. • The impact of culvert blockage needs to be fully assessed. Any new culverts proposed as part of access improvements will need to be designed to ensure they do not increase flood risk up or downstream and will require a Land Drainage Consent outside of the planning process from the LLFA. • If existing culverts are to be kept, a full CCTV condition survey is required to ensure the culvert will be sound for the lifetime of the proposed development. Improvements should be sought, such as trash screens compliant with the latest Environment Agency guidance and relining where this is an appropriate and sustainable option.

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		• For any culverts (old or new), the developer must set out who is adopting and maintaining those culverts throughout the lifetime of the development. The design of the development must consider the residual risk of blockage e.g. properties should not be placed in the area that could flood if a culvert blocks and the exceedance flows from such an event should be built into the site masterplan. • 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 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 current greenfield rates. • **Areas at risk from fluvial and surface water flooding should ideally be integrated into green infrastructure, which presents wider opportunities to improve biodiversity and amenity as well as climate change adaptation. An integrated flood risk management and sustainable drainage scheme for the site is advised.** This needs to be modelled to inform the design to ensure that surface water overland flows or fluvial flooding do not overwhelm sustainable drainage features. • New developments 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 on the brownfield areas of the site to ensure that there is no increase in surface water flood risk elsewhere. Surface water runoff must be fully attenuated to the greenfield rate. • Developers should refer to **SMBC's Guide to SuDS and Drainage in Solihull** and the Level 1 SFRA for background information on SuDS.

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Key Messages		The flood risk element of the Exception Test is likely to be passed if: • Development is limited to the 98.1% of the site located outside of the Environment Agency's Flood Zone 2 and 3. • Areas in Flood Zone 1 and then 2 are used for the least vulnerable parts of the development in accordance with Table 2 in the NPPF. • 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. • New developments 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. Surface water runoff must be fully attenuated to the greenfield rate. • 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). It would preferable to access the site from the existing access road in the eastern corner of the site, travelling south towards Fillongley Road. The southern corner of the site could also be accessed from Birmingham Road. Both roads are shown to be affected by surface water flooding, but extents depths are shown to be below 0.3m and extents are narrow. 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

The key datasets used to make planning recommendations regarding this site were the strategic 2D modelling outputs and the 2020 Meriden Surface Water Mapping Study. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 2 and 3 have been taken from strategic 2D modelling completed as part of the Level 2 SFRA. It is recommended that a more detailed hydraulic model is constructed at the site-specific Flood Risk Assessment stage, to confirm flood risk. The entire site is covered by the IHM DTM and as such basic assumptions have been applied to stamp features into the DTM for this assessment. There is potential that features within the floodplain are misaligned or not accurately represented by the dataset as it is strategic in nature. Assumptions regarding the connectivity of the watercourse (e.g. culvert inlet levels) also have a degree of uncertainty as they are based on the IHM dataset. It is recommended that at site stage flood risk should be assessed via a detailed site-specific assessment including topographical and asset survey with further information on the channel and floodplain features to help better understand the flood mechanisms of the area.
Climate change	Climate change was modelled as part of Level 2 SFRA strategic 2D modelling. However, it is recommended that the latest EA's climate change allowances are modelled in a detailed hydraulic model as part of a site-specific Flood Risk Assessment.
Fluvial depth, velocity and hazard mapping	Fluvial depth, velocity and hazard mapping has been taken from the strategic 2D modelling completed as part of the Level 2 SFRA. This should be explored further at site-specific stage.
Surface Water	In 2020, surface water modelling was undertaken for three areas in Solihull in line with the 2019 Environment Agency requirements for updating the National Risk of Flooding from Surface Water map. An existing surface water model for Meriden was updated as part of this study and outputs have been used to better understand surface water flood risk at this site. It should be noted that no LiDAR data was available for the study area and topography is based on 2m photogrammetric data.
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 from the 2020 Meriden Surface Water Mapping Study.