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 6</td></tr>
<tr><td>Address</td><td colspan="4">Meriden Road</td></tr>
<tr><td>Area</td><td colspan="4">5.5 Hectares</td></tr>
<tr><td>Current Land Use</td><td colspan="4">Greenfield/Agricultural and Industrial</td></tr>
<tr><td>Proposed Land Use</td><td colspan="4">Residential</td></tr>
<tr><td rowspan="6">Sources of flood risk</td><td>Location of site within catchment</td><td colspan="4">The site is in the Blythe from the Patrick Bridge to River Tame catchment. The River Blythe is located approximately 400m to the east of the site and flows in a northernly direction.</td></tr>
<tr><td>Existing drainage features</td><td colspan="4">The site is located approximately 400m west of the River Blythe, this Main River flows in a northernly direction under Meriden Road via Patricks Bridge.
There are no watercourses within the site boundary, however there are unnamed tributaries of the River Blythe located to the north and east of the site.
The northern unnamed watercourse flows in a north easterly direction from The Crescent. It is culverted under Meriden Road to the north and joins the River Blythe approximately 300m downstream of Patricks Bridge.
There is a network of unnamed watercourses to the east of the site, associated with a secondary channel of the River Blythe. The secondary channel re-joins the River Blythe at Patricks Bridge.</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>1.78%</td><td>1.82%</td><td>1.84%</td><td>98.16%</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 Boundary – Medium to 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>
<tr><td colspan="5">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.
Once survey data has been collected for Patricks Brick, it will be embedded into the strategic model. Major changes to the flood extents and depths discussed in the table are not anticipated as a result of this update.
Flood Characteristics:
The strategic 2D modelling shows that the northern portion of the site is impacted by a fluvial flow path associated with the unnamed watercourse to the north of the site. Flood extents associated with the River Blythe do not reach the site but are located to the east of the site.
The flow path impacting the northern portion of the site begins to the west at The Crescent. This flow path then extends northwards along the western boundary towards Meriden Road and the northern portion of the site. There is very little variation in flood extent between the 20 year, 100 year and 1000 year modelled flood events in the vicinity of the site.
In the 20 year event, flood depths in the northern portion of the site could reach approximately 0.2m in depth. In the 100 and 1000 year events, flood depths increase to just over 0.2m in some areas across the northern site boundary. Fluvial flooding on the northern boundary may impact access and egress to and from Meriden Road but flood depths are likely to be below 0.3m in all events.
The connectivity of the unnamed drain to the north west of the proposed site has been assumed based on OS mapping and LIDAR. It is recommended that this is reviewed as part of a future detailed site-specific assessment.</td></tr>
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Surface Water

Proportion of site at risk (RoFfSW)		
30-year High Risk	**100-year Medium Risk**	**1,000-year Low Risk**
0.3%	1.3%	3.1%
Max depths (m)		
<0.3m	0.3 – 0.9m	0.3 – 0.9m
Max velocity (m/s)		
<0.25	>0.25	>0.25

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 %).

Description of surface water flow paths:

The northern portion of the site is affected by surface water flooding to a greater extent than the southern portion, where only minor areas of surface water pooling are modelled in the lower risk events.

In the 30 year event, two small areas of surface water pooling are modelling on the northern site boundary. A small portion of this extends down the edge of Meriden Road to the east of the site. During this event, flood depths are largely below 0.3m, with isolated areas just outside the site boundary modelled as reaching 0.3 to 0.9m in depth.

In the 100 year event, more extensive surface water flooding is seen along the northern site boundary and Meriden Road. During this event, flood depths are again largely below 0.3m, with isolated areas on the site boundary reaching 0.3 to 0.9m in depth.

In the 1000 year event, there is a flow path that runs northwards along the western boundary and across the northern portion of the site. Surface water flood extents within the site itself are not significantly larger than in the 100 year event, however larger areas could have depths of 0.3 to 0.9m. Surface water flooding is also seen along Meriden Road where is passes the northern site boundary. Flood depths are largely below 0.3m but access and egress to the site could still be impacted. Two small areas of isolated surface water ponding are also seen in the south of the site during this event.

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 eastern portion of the site has a >= 50% <75% susceptibility to groundwater flood emergence from superficial deposits. • The south western portion of the site has a < 25% 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.

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	Flood History	There are no records of historic flooding from the Environment Agency within the recorded flood outlines dataset or historic flooding dataset. Flood history information provided by SMBC also shows no record of historic flooding on or around the vicinity the site. However, SMBC reports that there is a history of flooding along the highway around Patricks Bridge. No flood incidents were recorded in the vicinity of the site by Severn Trent Water. The floodplain of the Blythe upstream of Patricks Bridge has been observed in flood conditions near to the site.		
Flood risk management infrastructure	**Defences**	**Defence Type**	**Standard of Protection**	**Condition**
		-	-	-
		This site is not protected by any formal flood defences. However, the Environment Agency spatial flood defences dataset (AIMS data), shows that there are embankments/raised ground along both banks of the River Blythe, approximately 400m to the east of the site. The identified embankments are likely to prove some fluvial flood defence for the site. Survey and assessment of these banks would be required as part of a site specific FRA to determine the standard of protection they provide.		
	Residual risk	There are several culverts located on the watercourses to the north and east of the site that could become blocked during a flood event. If these structures were to become blocked, there is potential for increased surface water and fluvial flooding across the northern portion of the site. JScreen, culvert blockage modelling software, was used in 2016 to look at the impact of culvert blockages on flood risk across the site. In the unblocked scenario, the River Blythe flood extents are located just to the east of the site boundary. In the blocked scenario, flood extents are seen across the northern portion of the site, however there is little variation between the 30, 100 and 1000 year extents. The risk of culvert blockage needs further assessment based on site topographical and asset survey at a site specific FRA stage.		
Emergency planning	**Flood warning**	The site is not covered by an Environment Agency Flood Warning or Alert area. However, the River Blythe in Warwickshire Flood Alert area (033WAF302) is located directly along the eastern site boundary.		
	Access and Egress	The site is only accessible from Meriden Road (B4102) which runs along the northern boundary. Travelling east, Meriden Road crosses the River Blythe via Patricks Bridge and travelling west the road accesses to Hampton in Arden. During flood events in the past, Meriden Road has been closed by the Council near Patricks Bridge which has impeded access from Hampton in Arden towards Meriden. Access and egress to the site could be challenging as it involves crossing this formal flow path to reach Meriden Road. It may be necessary to develop a formal channel across the entrance to the site, providing a bridge for site access. As there are uncertainties around topography and culvert information, detailed modelling and options testing will be required as part of the site specific FRA. Fluvial flooding is modelled across the northern portion of the site. In the 20 year event, flood depths in the northern portion of the site could reach approximately 0.2m in depth. In the 100 and 1000 year events, flood depths increase to just over 0.2m in some areas across the northern site boundary. Fluvial flooding on the northern boundary may impact access and egress to and from Meriden Road, but flood depths are likely to be below 0.3m in all events. The Risk of Flooding from Surface Water dataset shows that the northern portion of the site and Meriden Road are affected by flooding during the 30, 100 and 1000 year events to different extents. Surface water flooding could therefore affect access and egress to the site.		

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		In the 30 year event, two small areas of surface water flooding are seen in the north of the site and along the edge of Meriden Road. During this event flood depths are largely shown to be below 0.3m. In the 100 year event, surface water flooding is seen across the entirety of the northern extent. Flood depths are largely below 0.3m but flooding could reach 0.3 – 0.9m in some parts of this crucial access area. In the 1000 year event, as well as surface water flooding in the northern portion of the site, flooding is modelled along a large section of Meriden Road. Although flooding remains largely below 0.3m in depth during this event, access and egress are likely to be impacted. 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 surrounded unnamed watercourse and surface water flooding across the site and access road to the north. • As part of the Level 2 SFRA, 2D strategic modelling has been completed for the watercourses surrounding 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%). In the northern portion of the site, 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, 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. • The current day 1,000-year surface water extent provides an indication of the likely increase in extent of the more frequent events. Surface water flood extents are likely to increase slightly in the northern portion of the site and a small amount of flooding in the south may occur. More significantly, flooding along Meriden Road is likely to increase with climate change, potentially affecting access and egress. This would require a detailed FRA to assess the site layout and design. • Developers should consider SuDS strategies to help 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: Arden Sandstone Formation - Sandstone, Siltstone And Mudstone. • Superficial: None Recorded Soils at the site consist of: • Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils The site is not located within an EA designated Source Protection Zone. The site is also not designated by the Environment Agency as previously being a landfill site.

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		In the south western portion of the site: • All forms of source control are likely to be suitable. • Infiltration likely to be suitable. Mapping suggests a low risk of ground water flooding however, site investigations should be carried out to assess potential for drainage by infiltration. • Mapping suggests that the site slopes are suitable for all forms of detention. • All filtration techniques are likely to be suitable. If the site has contamination issues; a liner will be required. • 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. If the site has contamination issues; a liner will be required. In the eastern portion of the 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 due to the site potential groundwater flooding. • 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 outside Flood Zone 3. As the northern portion of the site is contained within Flood Zone 3 and residential development is proposed, 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 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 from 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. • Access and egress to the site could be challenging as it involves crossing this formal flow path to reach Meriden Road. It may be necessary to develop a formal channel across the entrance to the site, providing a bridge for site access. As there are uncertainties around topography and culvert information, detailed modelling and options testing will be required as part of the site specific FRA. • Resilience measures will be required if buildings are situated at flood risk. 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.

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		• 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 appropriate and sustainable option. • 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 take into account 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 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: • New development is limited to the 98.16% of the site located within fluvial Flood Zone 1. • 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). • An integrated flood risk management and sustainable drainage solution is implemented. • 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. • The site is accessed from Meriden Road to the North. There are areas of both fluvial and surface water flood risk along the northern site boundary with Meriden Road. Although flood depths are not shown to be significant, flooding could impact access and egress to and from Meriden Road. It may be necessary to develop a formal channel across the entrance to the site, providing a bridge for site access. As there are uncertainties around topography and culvert information, detailed modelling and options testing will be required as part of the site specific FRA. Refer to the detailed 'guidance for developers' section for further information on the measures that are appropriate for this site.

Mapping Information

The key datasets used to make planning recommendations regarding this site were the strategic 2D modelling outputs and the Risk of Flooding from Surface Water map. 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 connectivity of the unnamed drain to the north west of the proposed site is based on OS mapping and LIDAR. It is recommended that this is reviewed as part of a future detailed 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.
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	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.