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 12</td></tr>
<tr><td>Address</td><td colspan="4">South of Dog Kennel Lane</td></tr>
<tr><td>Area</td><td colspan="4">47 Hectares</td></tr>
<tr><td>Current Land Use</td><td colspan="4">Greenfield/Agricultural, Residential</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">This elongated site is located to the east of Dickens Heath, to the south of Dog Kennel Lane and Stratford Road (A34). The site is located in the River Blythe catchment. The Mount Brook, a tributary of the River Blythe, flows in a south easterly direction around the south western corner of the site.</td></tr>
<tr><td>Existing drainage features</td><td colspan="4">The upstream extent of the Mount Brook is located to the west of the site. This watercourse flows in a easterly direction around the south western corner of the site and then flows southwards towards its confluence with the River Blythe, approximately 1.2km to the south in Cheswick Green.
The Stratford-Upon-Avon Canal is located approximately 500m to the west of the site.</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>0%</td><td>0%</td><td>0%</td><td>100%</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
South western site corner adjacent to the Mount Brook - 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:
An existing model of the River Blythe, including the Mount Brook, was available for this assessment. It was initially recommended to update the hydrology and re-run the model to produce updated flood risk datasets for the site. However, investigations have found that longer gauge records are required to update the hydrology. Therefore, the existing River Blythe model has been re-run as part of this Level 2 SFRA.
Flood Characteristics:
Fluvial flood risk is shown in the south western corner of the site, where the Mount Brook flows in a easterly direction along a portion of the southern site boundary. Flood extents reach the existing pond located just to the north of the Mount Brook in all events but do not extend any further north than this feature.
In the 30 year event, flood extents are shown across Tanworth Road to the west of the site and within the south western corner of the site. Floods depths could reach between 0.1 and 0.5m in some areas. Isolated areas, mainly along the channel, could reach greater than 0.5m in depth.
In the 100 year event, flood extents are only marginally greater within the site boundary. Upstream and downstream of the site, flooding is shown to be more extensive during this event. Flood depths increase slightly compared to the 30 year event.
In the 1000 year event, flood depths within the site again do not increase by a significant amount. However, flooding upstream and downstream of the site is more extensive. Flood depths increase compared to the 100 year event, but depths on the site do not exceed 0.5m, apart from in isolated areas within the channel itself.</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**
0.6%	1.0%	3.2%
Max depths (m)		
0.3 – 0.9m	0.3 – 0.9m	>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:

There is one main surface water flow path associated with the Mount Brook in the south western corner of the site and hence the mapping is likely to be picking up the natural floodplain of this watercourse. There are several small areas of surface water flooding seen across the site, which appear to follow the existing field boundaries present in many locations.

In the 30 year event, a narrow band of surface water flooding is seen along the channel in the south western corner of the site and across the existing pond adjacent to the watercourse. Some isolated areas of flooding are also seen along the existing field boundaries to the south of Stratford Road. Flooding in the 30 year event could reach 0.3 to 0.9m in depth.

In the 100 year event, some additional areas of isolated pooling are seen around the watercourse in the south western corner of the site. A small flow path is seen to the north of the 3 ponds that are located just outside the southern site boundary, flood depths are shown to be less than 0.3m. Flooding is shown to increase in extent to the south of Stratford Road along the field boundaries. Flooding in the 100 year event could reach 0.3 to 0.9m in depth in the locations described.

In the 1000 year event, surface water flooding is more extensive along the length of the watercourse, but flood depths are largely shown to be less than 0.3m with isolated areas of deeper flood water. The flow path to the north of the 3 ponds is more extensive but flood depths remain below 0.3m. To the south of Stratford Road, additional field boundaries are shown to be affected by flooding, but extents remain narrow.

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 northern site boundary and the eastern end of the site has a >= 50% <75% susceptibility to groundwater flood emergence from superficial deposits. • The southern site boundary 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.

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	Flood History	There are no records of historic flooding within the Environment Agency's recorded flood outlines dataset or historic flooding dataset. Severn Trent Water datasets also show no record of historic flooding. No flood incidents have been recorded by the Canal and River Trust on the Stratford-Upon-Avon Canal to the west of the site. Although the datasets provided by SMBC show no record of flood within or around the site, there are records of historic flooding in Cheswick green, just downstream 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 is a bridge over the Mount Brook located adjacent to the south western corner of the site. If this structure was to become blocked, there is potential for increased surface water and fluvial flooding across the east 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, fluvial flooding impacts the south western corner of the site and existing pond located to the north of the watercourse. In the blocked scenario, flood extents do no increase significantly compared to the unblocked flood scenario. It is recommended that the potential for blockage on all structures affecting the site should be considered as part of any future site-specific assessment.		
Emergency planning	**Flood warning**	The south western corner of the site is contained within the River Blythe in Warwickshire Flood Alert area. This contains Low-lying land and roads between Cheswick Green and Blyth End		
	Access and Egress	The site could be accessed from Tanworth Lane along the western boundary or Dog Kennel Lane and Stratford Road (A34) along the northern boundary. In terms of fluvial flood risk, a small portion of Tanworth Lane, located adjacent to the south western corner of the site, may be impacted by flooding from the Mount Brook in all events. In the 30 year event, flood depths on this portion of road could reach approximately 0.25m in depth. In the 100 and 100 year events, flood depths could reach approximately 0.4 and 0.5m in depth respectively. In terms of surface water flood risk, Tanworth Lane, Dog Kennel Lane and Stratford Road are all impacted by surface water flooding to different extents. In the 30 year event, small and isolated areas of surface water flooding are seen on Tanworth Lane and Dog Kennel Lane. On Dog Kennel Lane, flood depths do not exceed 0.3m, whereas on Tanworth Lane, flood depths could reach 0.3 to 0.9m adjacent to the bridge over the Mount Brook, In the 100 year event, flood extents increase slightly on Dog Kennel Lane and Tanworth Road but flood depths remain similar to the 30 year event. In the 1000 year event, surface water flooding is shown to extend further eastwards along Dog Kennel Lane towards the roundabout and Stratford Road. Flood depths are largely less than 0.3m but could reach 0.3 to 0.9m in some locations. Flooding on Tanworth Lane extends further northwards and southwards and depths could be greater than 0.9m around the bridge. It would be preferable to access the site from Tanworth Lane, to the north of the Mount Brook or along the western extent of Dog Kennel Lane, where both fluvial and surface water flood risk is low. 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.		

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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 Mount Brook and surface water flooding across the site. • As part of the detailed modelling study completed for the Level 2 SFRA, modelling has included 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%). When the climate change allowances are modelled, there is only a small increase in flood extent and depth in the south western corner of the site. • As part of a site-specific Flood Risk Assessment, latest EA climate change allowances will need to be considered in the detailed hydraulic model once the hydrology has been reviewed, to confirm the impact to the site. • Climate change also needs to be considered for surface water events; at the site-specific Flood Risk Assessment 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. As a result of climate change, surface water flood risk across the site will increase, especially around the Mount Brook in the south western corner and along the access road to the north and west. Despite greater surface water flood extents, flood depths on average would be less than 0.3m across the site with isolated areas where 0.3 to 0.9m of flooding could be expected. • 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 of the site consists of:
		• Bedrock: Mercia Mudstone Group - Mudstone
		• Superficial
		  o East of the site: Till
		  o West of the site: Glaciofluvial Deposits, Glaciolacustrine Deposits and Alluvium - Clay, silt, sand and gravel.
		Soils at the site consist of: Slowly permeable seasonally wet acid loamy and clayey soils. 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 SMBCs **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.

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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. This has supported this site being taken forward for further consideration, including considering if the Exception Test would apply. Residential development is classified as 'More Vulnerable'. As the site is partially covered by Flood Zone 3 and is proposed for residential development, the Exception Test will need to be applied to the site. A sequential approach to site layout will contribute towards passing the flood risk element of the Exception Test, this means that the least vulnerable type of development (in terms of Table 2 of the Flooding section of the NPPG) should be located in the higher flood risk parts of the site. In no instances should highly vulnerable development be located in Flood Zones 3a and 3b. More vulnerable development (such as dwellings) should be located outside Flood Zone 3 whenever possible. Development in the high flood risk parts of the site should be designed such that it is flood resilient and resistant. It is anticipated that proposed development will be sequentially located within Flood Zone 1 on this site.
	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 part of a development site 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. • Although there is an existing model of the River Blythe including the Mount Brook, detailed modelling of the site will still be required as part of the site-specific FRA to confirm both fluvial and surface water flood risk and flow paths. Detailed modelling would require topographic survey of the site and well as any additional asset survey needed to refine the model further. In addition, the latest guidance on climate change allowances would need to be considered and any mitigation measures would need to be tested through modelling. • 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

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		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. • 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: • 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. • The **Solihull Feasibility Study** (AECOM, December 2020) identifies the importance of increased flood storage for flood risk management in the Blythe Catchment, particularly around Cheswick Green. The study identifies an opportunity for storage on the Mount Brook upstream of Cheswick Green. There is therefore an opportunity for betterment at this site in terms of increased flood storage. Developers should consider this and demonstrate to the Council that they have considered how the development of their site could contribute towards wider flood storage needs in the Mount Brook catchment. • 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 be preferable to access the site from Tanworth Lane, to the north of the Mount Brook or along the western extent of Dog Kennel Lane, where both fluvial and surface water flood risk is low. 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 existing WSP detailed 1D-2D model of the River Blythe and the Risk of Flooding from Surface Water map. More details regarding data used for this assessment can be found below.

Flood Zones	An existing detailed 1D-2D model of the River Blythe, produced by WSP, was available for this assessment. It was initially recommended that due to the uncertainties around inflow hydrology associated with this model, that the hydrology would be updated and the existing model re-run to produce updated flood risk datasets for the site. In depth investigations were undertaken to review the existing hydraulic model and any associated hydrological reporting. It was found that until there is a longer record of gauge data on the watercourses surrounding the site, that any update to the hydrology would be as uncertain as the existing flows within the model. As a result, the existing River Blythe model has been re-run to understand flood risk at this site.
Climate change	Climate change allowances were re-run on the existing detailed River Blythe model. It is recommended that the latest EA climate change allowances are modelled again when the hydrology within the existing model is updated in the future when additional gauge data is available.
Fluvial depth, velocity and hazard mapping	Fluvial depth, velocity and hazard mapping has been taken from the existing detailed model re-run 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.