



City of Wolverhampton Council Level 2 Strategic Flood Risk Assessment Detailed Site Summary Tables

Site details

Site Code	H1
Address	Bluebird Industrial Estate and site to rear, Park Lane
Area	3.2ha
Current land use	Brownfield
Proposed land use	Housing
Flood Risk Vulnerability	More Vulnerable

Sources of flood risk

Location of the site within the catchment	<p>The site is bounded by Park Lane along the north-eastern boundary, with a private access road from Bridge Street at the south-western boundary. To the north-west and south-east of the site is industrial estate works. South-west of the site, approximately 60m from the site, raised rail tracks run parallel to the site.</p> <p>The site is located in the urbanised upstream reach of the Smestow Brook catchment, which is partially culverted approximately 350m south-west of the site, flowing north-west. The site is unlikely to drain into the Smestow Brook due to the raised rail tracks.</p>
Topography	<p>Environment Agency 1m resolution LiDAR across the site shows that the south-eastern half of the site is relatively flat at around 125m AOD, with the north-western half on a slight slope with elevations predominantly between 126m AOD and 127m AOD. The maximum elevation is 128.4m AOD in the northern corner of the site and the minimum elevation is 125.0m AOD in the central area of the site.</p> <p>The site is situated within a densely populated, developed urban area and LiDAR data is unlikely to be representative of the actual site topography, this may have an impact on some of the flood risk datasets used in this assessment. Developers should undertake new topographic surveying as part of a site-specific FRA.</p>
Existing drainage features	There are no drainage features within the site and is unlikely to drain into the open channel of the Smestow Brook due to the raised rail tracks. However, the site is likely to drain into the surface water sewer network where there are urban extents, which is in turn likely to then drain into the River Tame.
Critical Drainage Area	The site is not located within a Critical Drainage Area (CDA).
Fluvial	<p>The proportion of site at risk FMFP: FZ3 – 0% FZ2 – 0% FZ1 – 100%</p> <p><i>The Flood Zone values quoted show the percentage 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. This is because the values quoted are the area</i></p>

	<p><i>covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).</i></p> <p>Available data: Flood Zones are determined from the Environment Agency's Flood Map for Planning (FMfP).</p> <p>Flood characteristics: The site is situated entirely within Flood Zone 1 and is highly unlikely to encounter fluvial flood at the site.</p>
<p>Surface Water</p>	<p>Proportion of site at risk (RoFfSW): 3.3% AEP – 5.13% Max depth – 0.3 – 0.6m Max velocity – <0.25m/s 1% AEP – 9.72% Max depth – 0.3 – 0.6m Max velocity – 0.5 – 1.0m/s 0.1% AEP – 28.46% Max depth – 0.3 – 0.6m Max velocity – 0.5-1.0m/s</p> <p><i>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 %).</i></p> <p>Available data: The Environment Agency's Risk of Flooding from Surface Water mapping was used in this assessment.</p> <p>Description of surface water flow paths: The site is affected by all AEP events. In the 3.3% AEP event, there is an instance of ponding within the central area of the site, with encroachment from ponding at the lower north-eastern boundary. Maximum depths are between 0.3 to 0.6m in the central ponding, and maximum velocities do not exceed 0.25m/s. The hazard rating in this event is 'Danger to Some'.</p> <p>In the 1% AEP event, there are two instances of ponding in the northern area of the site, with an instance of ponding in the central area of the site. A flow path flows into this area of ponding from the eastern corner of the site, and there is encroachment into the site from a flow path along the lower north-eastern boundary. Maximum depths between 0.3 to 0.6m are found in the central instance of ponding and maximum velocities between 0.5 to 1.0m/s are found in the connecting flow path. The resultant hazard rating is 'Danger to Some'.</p> <p>In the 0.1% AEP event, there is a flow path that flows through the south-eastern half of the site, that flows from the upper central area of the site and the eastern corner down through to the southern corner of the site. There is encroachment along the north-western boundary, and there are 3 instances of ponding in the northern area of the site in topographic lows. Maximum depths are between 0.3 to 0.6m within the ponding in the northern area and the large flow path. Maximum velocities are between 0.5 to 1.0m/s within the large flow path at the eastern corner. The maximum hazard rating is 'Danger to Most' within the larger flow path and ponding.</p>
<p>Reservoir</p>	<p>The site is shown to not be at risk of Dry Day and Wet Day reservoir flooding according to the Environment Agency's reservoir flood mapping.</p>
<p>Groundwater</p>	<p>The JBA Groundwater Flood Emergence Mapping (5m resolution) shows the site is at no risk form groundwater emergence.</p>

Sewers	The site is located within a postcode area with 17 incidences of sewer flooding from 1997,1999, 2000, 2005, 2015, 2016, and 2018 according to the Severn Trent Water Hydraulic Sewer Flood Risk Register.
Flood history	The site is not located in or near historic flood outlines in accordance with flood records provided by City of Wolverhampton Council and the Environment Agency's Historic Flood Map and Recorded Flood Outline Map datasets.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset that there no flood defence within or near the site.
Residual risk	There is no residual risk to the site.
Emergency planning	
Flood warning	The site is not within an Environment Agency Flood Alert or Flood Warning Area.
Access and egress	<p>At present, access to the site is primarily through a private access track at the eastern corner and follows the south-eastern boundary to a secondary access track that connects to Bridge Street. The secondary access track from Bridge Street that leads to the central area of the site. Access to and from the site is primarily through Park Lane running north-west to south-east of the site. Bridge Street leads south-east of the site, joining Bank Street (Leading to Park Lane) and Powell Street. However, developers could add access points along Park Lane.</p> <p>In the 3.3% AEP surface water event, access and egress are maintained within the site, with access to the site maintained through Park Lane and Bridge Street in a south-eastern direction. Access from the north-west is possible if Guy Avenue is avoided, where a large flow path of depths between 0.9 to 1.2m and a velocity between 0.5 to 1.0m/s is present. This flow path has a hazard rating of 'Danger to Most'.</p> <p>In the 1% AEP surface water event, access and egress are maintained within the site. Access from the north-west is possible if Guy Avenue is avoided where depths exceed 1.2m and velocities are between 1.0 to 2.0 with a maximum hazard rating of 'Danger to All', though access is maintained following Park Lane eastwards. Access from the south-east is possible while avoiding the use of Cannock Road which has a flow path with variable depths and velocities along the road, where hazard ratings of 'Danger to Most' are primarily to the west, and 'Danger to Some' to the east.</p> <p>In the 0.1% AEP event, access and egress is not maintained within the site, with the two access tracks within the site encountering depths between 0.3 to 0.6m but velocities between 0.5 to 1.0m/s, with hazard ratings of 'Danger to Most'. The flow path within the southern area also forms a dry island, preventing access to and from that area of the site. Access to the site is also impeded, with significant flow paths along Bridge Street and Park Lane, encountering depths between 0.3 to 0.6m but velocities between 0.5 to 1.0m/s, with hazard ratings of 'Danger to Most'. Wider access to the site from the north-west and south-east is impeded with majority of roads experiencing depths exceeding 1.2m, velocities exceeding 2.0m/s and hazard ratings of 'Danger to All', particularly Guy Avenue and Cannock Road.</p> <p>The design surface water event (1% AEP plus 40% climate change) has extents similar to that of the 0.1% AEP surface water event, and as such is likely to face similar access and egress issues. Maximum depths of 2.4m are found on Guy Avenue north-west of the site, a maximum velocity of 2.7m/s is found along the Cannock Road where it connects to both Bridge Street and Park Lane, and majority of extents along access points to the site and the wider area have hazard ratings of 'Dange to Most' and 'Danger to All'.</p>

	<p>Arrangements for safe access and egress will need to be demonstrated for the 1% AEP plus an allowance for climate change rainfall events, using the depth, velocity, and hazard outputs. Any raising of access routes should not impede surface water flows or contribute to increasing flood risk off-site. If detailed modelling (including consideration of breach scenarios) suggests that the site is at significant risk of flooding which affects access routes, a Flood Warning and Evacuation Plan will be required.</p>
<p>Dry Islands</p>	<p>During the 0.1% AEP and design (1% AEP plus 40% climate change allowance) surface water events, there is a dry island at the south-eastern boundary.</p>
<p>Climate change</p>	
<p>Implications for the site</p>	<p>Management Catchment: Severn Middle Worcestershire</p> <p>Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding</p> <p>Surface Water:</p> <p>The design event for rainfall intensities is the upper climate allowance for the 2070s epoch. As such the design event is the 1% AEP + 40% CC. The extent of the design event has increased significantly, with the extent similar to that of the present day 0.1% AEP event. The design event has a maximum depth of 0.57m in the central area of the site. With a significant increase in extent, the site is shown to be very sensitive to increased surface water flood risk due to climate change.</p> <p>Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.</p>
<p>Requirements for drainage control and impact mitigation</p>	
<p>Broad-scale assessment of possible SuDS</p>	<p>Geology & Soils</p> <ul style="list-style-type: none"> • The geology consists of: <ul style="list-style-type: none"> ◦ Bedrock formed of siltstone and sandstone with subordinate mudstone that forms the Warwickshire Group. ◦ Superficial deposits consisting of diamicton till. • The soil is comprised of slowly permeable, seasonally wet, slightly acidic but base rich loamy and clayey soils. <p>SuDS</p> <ul style="list-style-type: none"> • The site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work. • BGS data suggests that the underlying geology is likely to have variable permeability and should be confirmed through infiltration testing. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff. • The site is not in a Groundwater Source Protection Zone, nor is there historic landfill within the site. • The site is within the River Stour (Worcestershire) – confluence Smestow Brook to confluence of River Severn Nitrate Vulnerability Zone, and in an undifferentiated Secondary Superficial Aquifer Designation Zone. As such, infiltration techniques may not be appropriate at the site in order to preserve water quality. • Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the

	<p>LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.</p>
<p>Opportunities for wider sustainability benefits and integrated flood risk management</p>	<ul style="list-style-type: none"> • Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
<p>NPPF and planning implications</p>	
<p>Exception Test requirements</p>	<p>The Local Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied.</p> <p>As the site is within Flood Zone 1, classified as 'More Vulnerable' and while it has some surface water flood risk within the site, and there is significant access and egress issues, it is recommended that the Exception Test is applied at this site.</p>
<p>Requirements and guidance for site-specific Flood Risk Assessment</p>	<p>Flood Risk Assessment:</p> <p>Section 2 of the Level 2 SFRA and Sections 2 and 3 of the Level 1 SFRA have more guidance on this section and any relevant policies and information applicable to development within Wolverhampton.</p> <ul style="list-style-type: none"> • Consultation with City of Wolverhampton Council, Severn Trent Water, and the Environment Agency should be undertaken at an early stage. • Developers should consult with Severn Trent Water to ensure that the development aims to help achieve the targets of the Drainage and Wastewater Management Plan. • Development plans should use their Level 1 and 2 SFRA for Wolverhampton, as well as the Local Flood Risk Management Strategies to identify cumulative flood risk issues. It should also promote an integrated approach to water management. Drainage should be designed and implemented in ways that promote multiple benefits. • Any FRA should be carried out in line with the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance; Birmingham City Council's Local Plan Policies and Sustainable Drainage Design and Evaluation Guide for developers. • From the Black Country Core Strategy – Policy ENV5 (2011) <p>The Wolverhampton Local Plan succeeds the Black Country Core Strategy building upon policies from the Strategy. Until the Local Plan is adopted the Strategy still applies. Developers should ensure the correct policy is applied. The following development principles will apply to assist in both reducing the extent and impact of flooding:</p> <ul style="list-style-type: none"> ○ incorporate Sustainable Drainage Systems (SuDS), unless it would be impractical to do so, in order to significantly reduce surface water run-off and improve water quality. The type of SuDS used will be dependent on ground conditions; ○ on sites requiring a Flood Risk Assessment, reduce surface water flows back to equivalent greenfield rates; ○ create new green space, increase tree cover and/or provide green roofs. <p>Guidance for site design and making development safe:</p>

- 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).
- Should built development be proposed within the 1% AEP surface water flood extent, careful consideration will need to be given to flood resistance and resilience measures.
- Developers should wherever possible open up underground culverts, and in a manner which improved biodiversity, amenity and natural drainage in accordance with the current River Basin Management Plans for the area
- Development must not take place over culverted watercourses and a suitable easement must be provided from the outside edge of the culvert.
- The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to greenfield rates.
- Arrangements for safe access and egress will need to be demonstrated for the 1% AEP pluvial events with an appropriate allowance for climate change, using the depth, velocity, and hazard outputs.
- In accordance with information supplied by Severn Trent Water, the site is likely to be served by the Barnhurst wastewater treatment works, which has been assessed as "not expected be an issue... (to estimated spare capacity)" and "no scope to provide additional capacity" for surface water discharge into watercourses. As such surface water disposal measures (detailed in the broad-scale assessments of SuDS section) should be undertaken by the developer.
- Developers should adhere to CWC's guidance on SuDS as laid out in Policy ENV 13 – Sustainable Drainage Systems (SuDS) and Surface Water Management:
 - All developments must incorporate Sustainable Drainage Systems (SuDS) and provide for their adequate adoption, ongoing maintenance, and management over the lifetime of the development, in accordance with any surface water drainage strategy required for the development under Policy ENV12.
 - SuDS must be designed in accordance with Local Lead Flood Authority standards, as follows:
 - demonstrate application of the surface water discharge hierarchy: Re-Use (Water Harvesting); Infiltration; Discharge to a watercourse; Discharge to a surface water sewer; Discharge to a combined sewer;
 - manage surface run-off as close to the source as possible to reduce flood risk and improve water quality;
 - include mitigation within storage calculations for future climate change, designed to 100yr + Climate Change (currently 40%);
 - designed to accord with the Environment Agency's Guidance on Flood Risk and Coastal Change, Construction Industry Research and Information Association (CIRIA) guidance, and Department for Environment Food & Rural Affairs (DEFRA) non-statutory technical standards;
 - designed to be daylight (open), natural and contribute to the conservation and enhancement of biodiversity and green infrastructure in the wider area, as far as is practical and viable.

- For all major developments, surface water flows must be reduced back to equivalent greenfield rates. If greenfield runoff rates are not considered to be feasible for viability or other reasons, then the developer must submit evidence demonstrating what the constraints to achieving this are and how their development will accommodate runoff rates that are as close as reasonably possible to greenfield rates.
- For all minor developments, a minimum reduction of 30% over pre-development run-off rates will be required. Under no circumstances will post-development runoff rates that are greater than pre-development run-off rates be permitted.
- A hydrogeological risk assessment must be provided where infiltration SuDS is proposed for anything other than clean roof drainage in a Source Protection Zone 1.
- Consultation with RMAs early on should be implemented to ensure an appropriate flood evacuation plan is put in place for the site.
- Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels. These measures should be assessed to make sure that flooding is not increased elsewhere. If the floor levels cannot be raised to meet the minimum requirements, developers will need to:
 - raise them as much as possible.
 - consider moving vulnerable uses to upper floors.
 - include extra flood resistance and resilience measures.
- Other examples of flood resistance and resilience measures include:
 - using flood resistant materials that have low permeability to at least 600mm above the estimated flood level.
 - making sure any doors, windows or other openings are flood resistant to at least 600mm above the estimated flood level.

Key messages

The site is at risk from the 0.1% AEP and design (1% AEP plus 40% climate change allowance) surface water events, where there are significant extents within the site, and access and egress are impeded within and to the sites. Development may proceed if:

- New development is located in areas of lowest risk, in line with the sequential method, by steering sites to river Flood Zone 1 and avoiding where possible areas with a high risk of surface water flooding. If a Sequential Test is undertaken and a site at flood risk is identified as the only appropriate site for the development, the Exception Test shall be undertaken. If development can't be avoided in a high-risk surface water Zone, then part "b" of the Exception Test should be satisfied.
- A site-specific Flood Risk Assessment demonstrates that site users will be safe in the 1% AEP fluvial and surface water events, including an allowance for climate change. This will need to use detailed surface water modelling to show that the site is not at an increased risk of flooding in the future and that development of the site does not increase the risk off site.
- Safe access and egress can be demonstrated in the 1% AEP plus upper climate change fluvial and surface water events. If this is not possible, an appropriate Flood Warning and Evacuation Plan is needed.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, including a site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan and supported by detailed modelling (as above), with development to be steered away from the areas identified to be at highest risk of surface water flooding within the site. This is in line with the sequential approach to site layout.
- Raise residential finished floor levels 600mm above the 1 in 100-year plus climate change flood level. Protect and promote areas for future flood alleviation schemes.
- 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).

Mapping Information

The key datasets used to make planning recommendations for this site were the Environment Agency's Flood Map for Planning and the Environment Agency's 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 the Environment Agency's Flood Map for Planning mapping.
Climate change	The latest climate change allowances (updated May 2022) have been applied to the EA's RoFSW dataset.
Surface Water	The Environment Agency's Risk of Flooding from Surface Water (RoFSW) map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The Environment Agency's Risk of Flooding from Surface Water (RoFSW) has been used to define areas at risk from surface water flooding.