Level 2 Strategic Flood Risk Assessment - Site TB23

A1-C01

28 March 2025

Prepared for:

Newcastle-under-Lyme Borough Council

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Contents

1 Background

TB23 was identified as an 'Amber' site in the Newcastle-under-Lyme Borough Council (NULBC) Level 2 Strategic Flood Risk Assessment (SFRA) based on both the risk of surface water and groundwater emergence on the site. However, during the stakeholder review of the Level 2 SFRA, the Environment Agency (EA) highlighted the presence of ordinary watercourses on the site and requested a more detailed site assessment be undertaken.

This document provides a more detailed site assessment for site TB23. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'Newcastle-under-Lyme Level 1 SFRA' and read the 'Newcastle-under-Lyme Level 2 SFRA Main Report' and the NaFRA2 addendum to the Level 2 SFRA and is therefore familiar with the terminology used in this report.

1.1 Site details

- Location: Land West of Galingale View, Thistleberry
- Site area: 4.37ha
- Existing site use: Greenfield
- Proposed site use: Residential

The site location is shown in Figure 1-1 below.

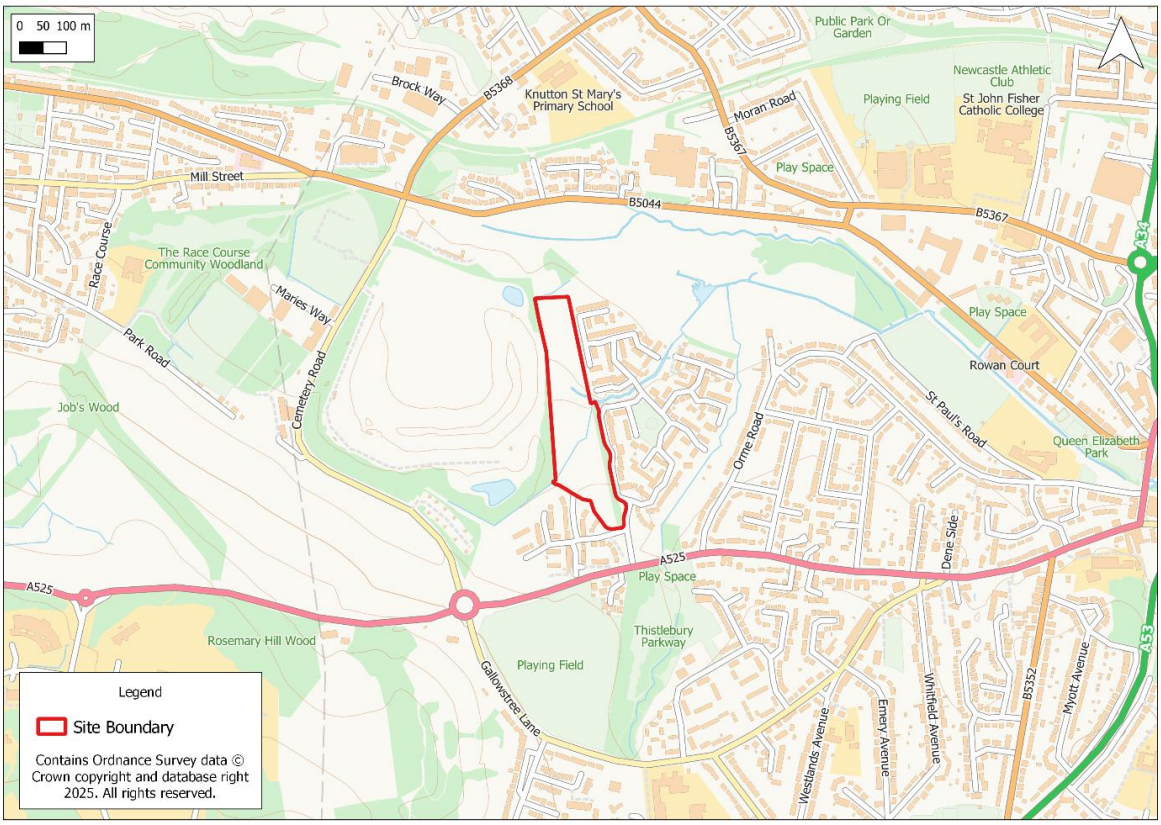


Figure 1-1: Location of Site TB23.

1.2 Topography

The EA 1m resolution LiDAR shows the highest elevations are in the south of the site. The topography then slopes steeply downhill towards the centre of the site where two ordinary watercourses cross the site. The topography then slopes more gently uphill towards the north end of the site.

The highest elevations in the south of the site reach 135mAOD whilst the lowest elevations along the path of the northernmost watercourse in the centre of the site reach approximately 118mAOD.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock - Salop Formation which consists of mudstone, sandstone, and conglomerate.
- Superficial - Devensian till which consists of diamicton.

Soils at the site consist of restored soils mostly from quarry and opencast spoil.

2 Sources of flood risk

2.1 Location of site within the catchment

The site is located within the central area of the 'Lyme Brook Catchment (trib of Tent)' which is rural in its upstream reaches and becomes urbanised downstream where Lyme Brook flows in a south-easterly direction through the centre of the Newcastle-under-Lyme urban centre. The catchment area upstream of the site is approximately 0.6km^2 extending west of the site and is predominantly rural.

2.2 Existing drainage features

There are two unnamed watercourses that cross the site. One flows from the northwest and the other from the southwest, converging just after crossing the eastern border and flowing northeast before joining the Lyme Brook.

Lyme Brook flows in an easterly direction approximately 125m north of the site.

2.3 Fluvial

2.3.1 Available data

The EA’s 2015 Estry-TuFLOW detailed hydraulic model of Lyme Brook was available for use within this assessment.

2.3.2 Description of risk to the site

The EA's Lyme Brook model does not show the site to be at fluvial flood risk from Lyme Brook. The entire site is located within Flood Zone 1. However, the ordinary watercourses within the site boundary are not included within the model extent and may pose a risk. Instead, the flood risk from these watercourses has been assessed using the EA RoFSW map (Section 2.4).

2.4 Surface water

2.4.1 Available data

The EA’s Risk of Flooding from Surface Water (RoFSW) map as published at the time of preparation of the Level 2 SFRA (January 2025) has been used within this assessment as this is the data used within the Level 2 SFRA for NULBC (referred to as the RoFSW map). This has been compared with the EA's updated National Flood Risk Assessment 2 (NaFRA2) RoFSW mapping (referred to as NaFRA2 RoFSW) which was published on the 28 January 2025 to supersede the previous NaFRA2 data. It should be noted that currently only extent information is available for the NaFRA2 RoFSW data with no accompanying depth, hazard, and velocity information. Please see the accompanying NaFRA2 addendum to the Level 2 SFRA which details the differences between the two datasets. It is noted that

the latest mapping suggests the site is at significantly greater risk than in the prior dataset, and developers will need to confirm the risk to the site through a site-specific FRA.

2.4.2 Description of risk to the site (RoFSW)

The surface water extents at the site are shown in Figure 2-1 and detailed in Table 2-1. Most of the site is not shown to be at surface water risk, particularly the higher elevation areas in the north and south of the site. In the 3.3% AEP event, there are a number of isolated areas of surface water ponding which form along the paths of the ordinary watercourses and on the western border. In the 1% and 0.1% AEP events, flow paths emerge along both watercourses, as well as a path flowing north along the western border of the site, connecting the two tributaries.

Table 2-1: Existing surface water flood risk based on the previous RoFSW map

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	2	4	10
Maximum depth (m)	0.60 to 0.90	0.90 - 1.20	>1.20m
Maximum velocity (m/s)	0.25 to 0.50	1.00 - 2.00	1.00 - 2.00
Maximum hazard classification	Danger for most	Danger for most	Danger for most

** The percentage surface water extents quoted show the percentage 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. 1% AEP includes the 3.3% AEP percentage)*.

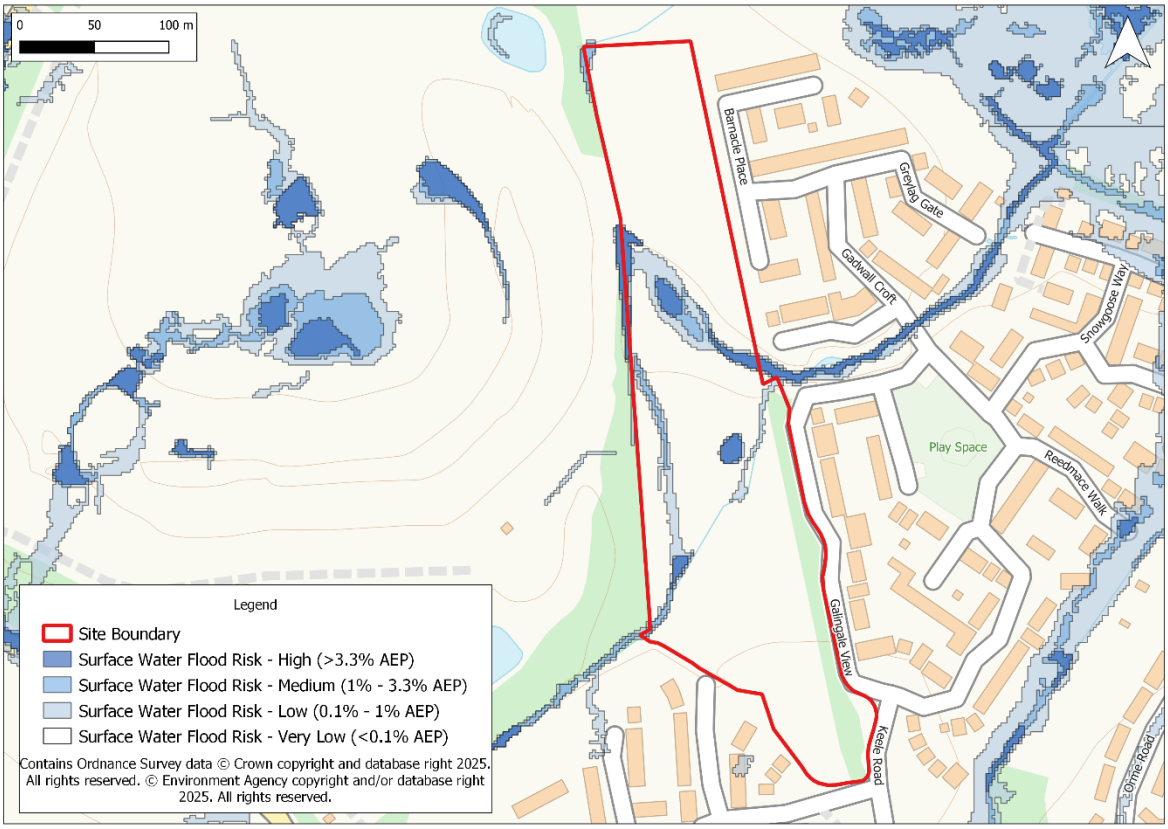


Figure 2-1: EA RoFSW surface water extents at the site.

In the 3.3% AEP event the greatest depths reach between 0.60m and 0.90m along the path of the watercourse near the eastern site boundary (Figure 2-2), with velocities of up to 0.50m/s (Figure 2-3), and a corresponding maximum hazard classification of 'Danger for most' (Figure 2-4). In the 1% AEP event, the maximum depths increase with a slightly larger area of the flow path between 0.60m and 0.90m and a small area of depths between 0.90m and 1.20m on the eastern boundary (Figure 2-5). Velocities along the northernmost watercourse remain mostly below 0.5m/s in the 1% AEP event, but there are greater velocities along the flow path which forms along the western site boundary (Figure 2-6). The greatest hazard is 'Danger for most' along the northernmost watercourse and the western site boundary (Figure 2-7). In the 0.1% AEP event there are greater areas of depths between 0.90m and 1.20m and an area where depths exceed 1.20m on the eastern site boundary (Figure 2-8). Velocities along the northernmost watercourse increase to between 1.0m/s and 2.0m/s in places (Figure 2-9). Maximum hazard classification remains as 'Danger for most' but covers more of the areas of risk (Figure 2-10).

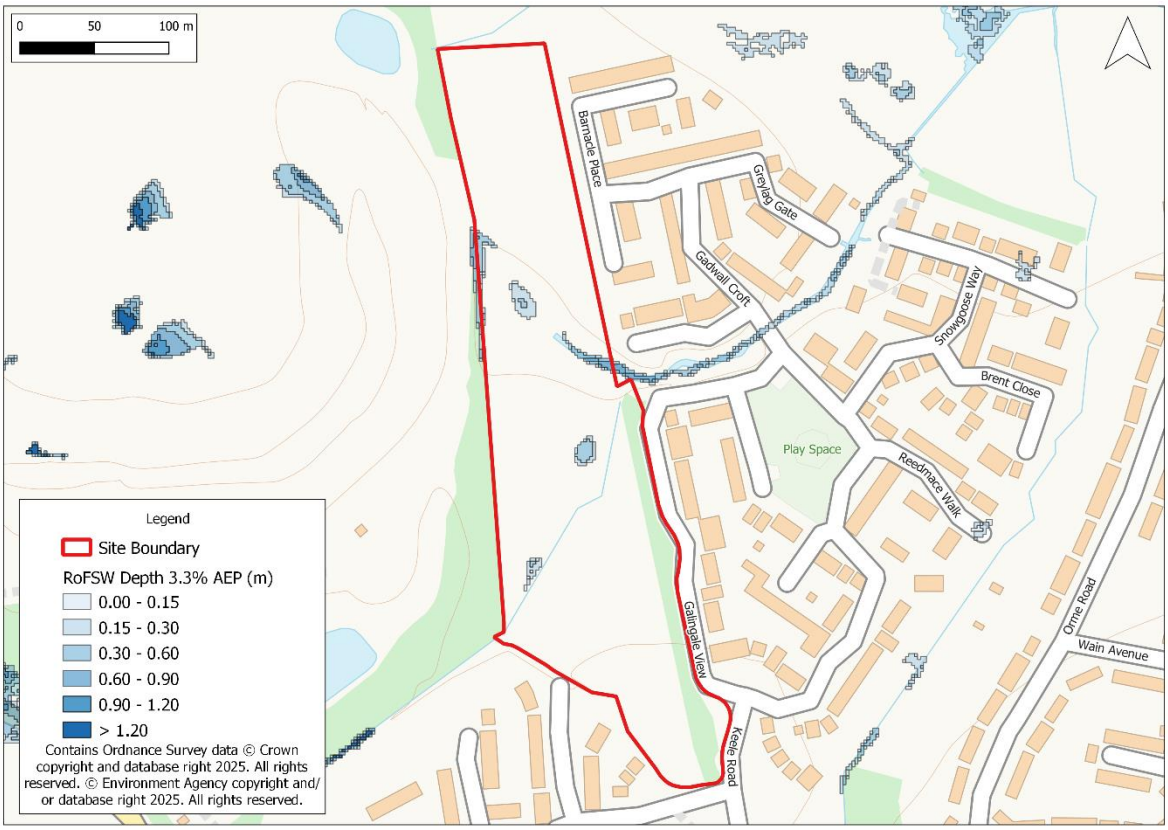


Figure 2-2: EA RoFSW surface water depths at the site for the 3.3% AEP event.

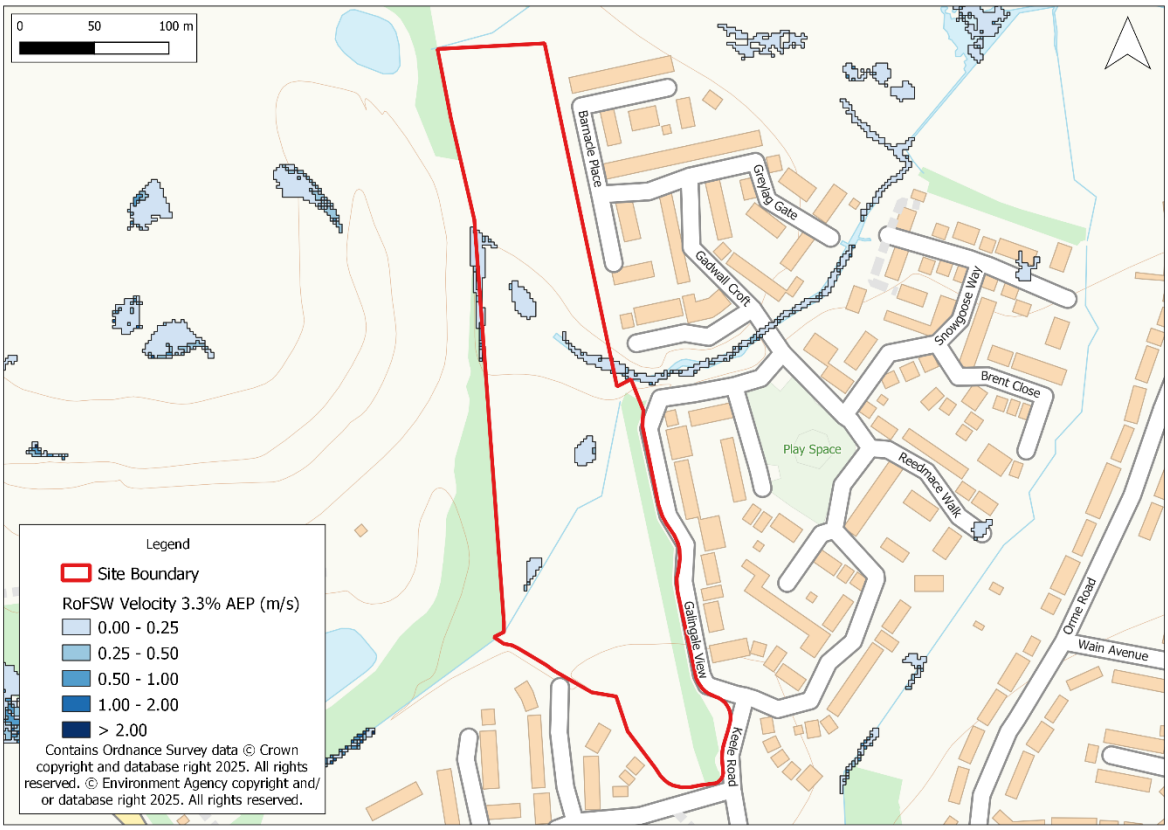


Figure 2-3: EA RoFSW surface water velocities at the site for the 3.3% AEP event.

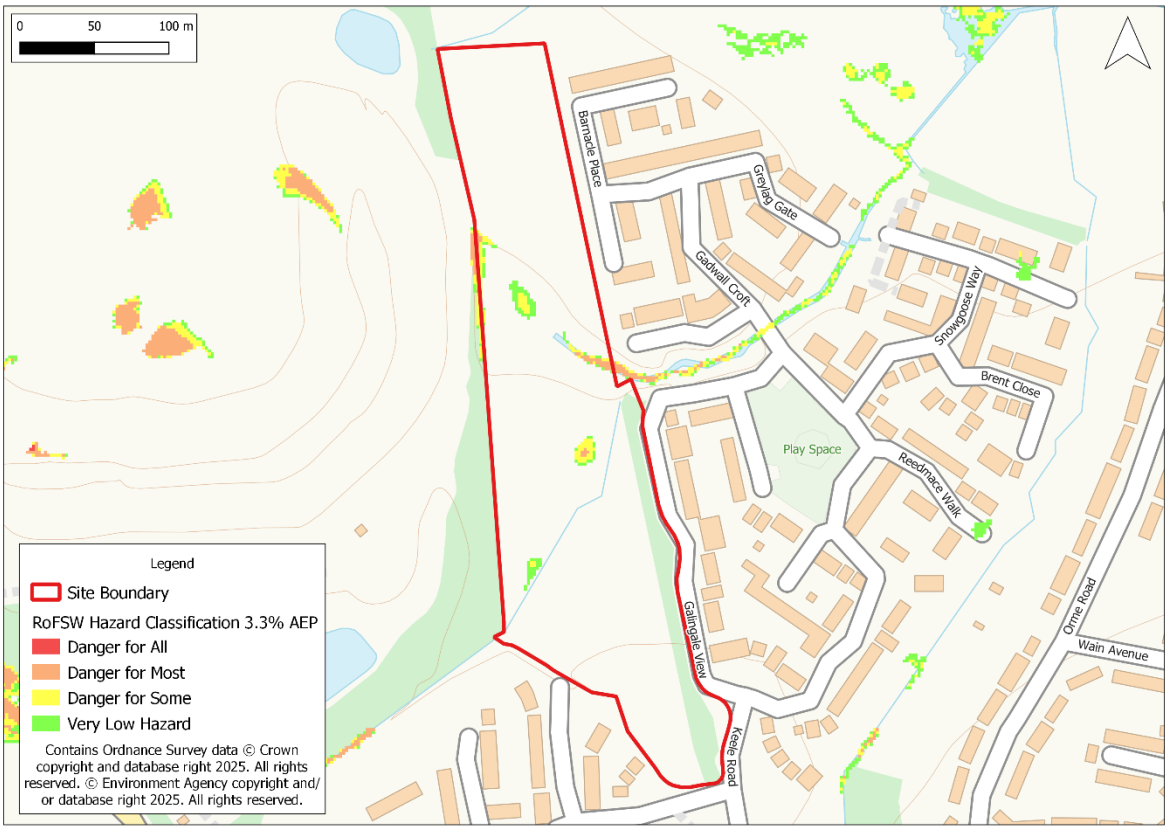


Figure 2-4: EA RoFSW surface water hazard at the site for the 3.3% AEP event.

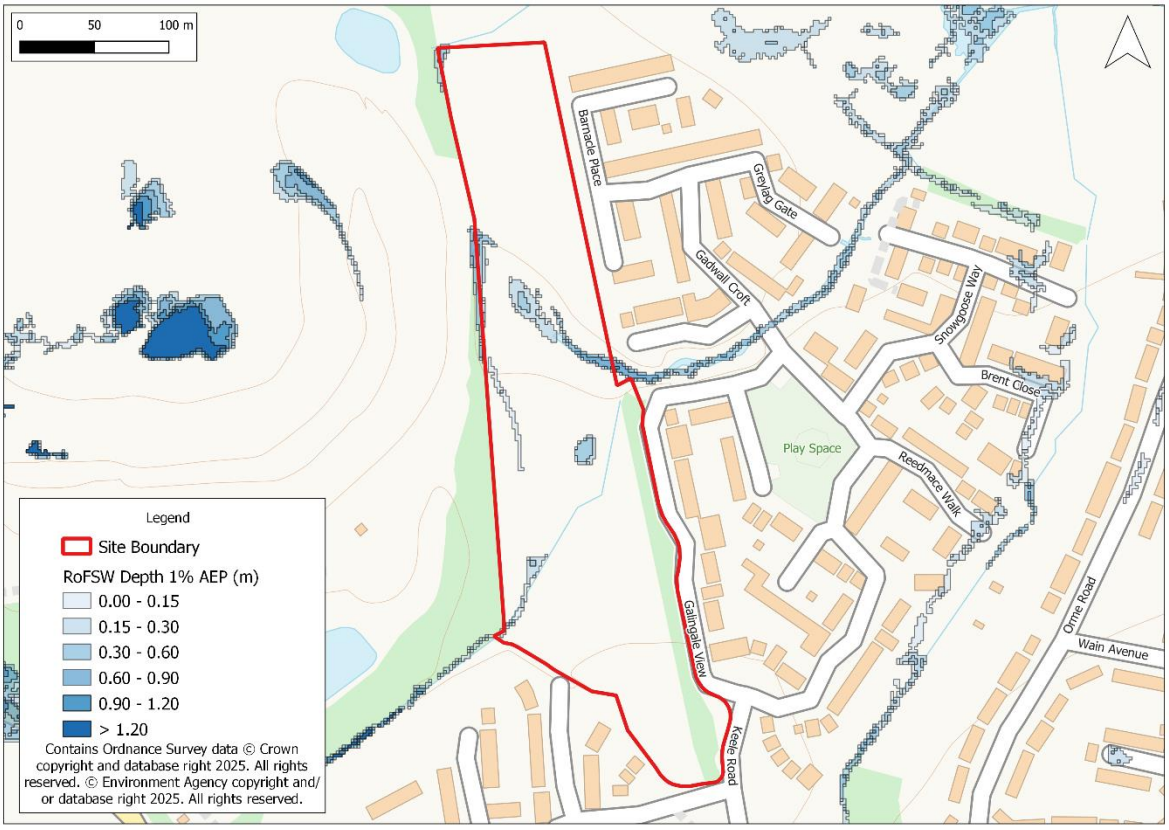


Figure 2-5: EA RoFSW surface water depths at the site for the 1% AEP event.

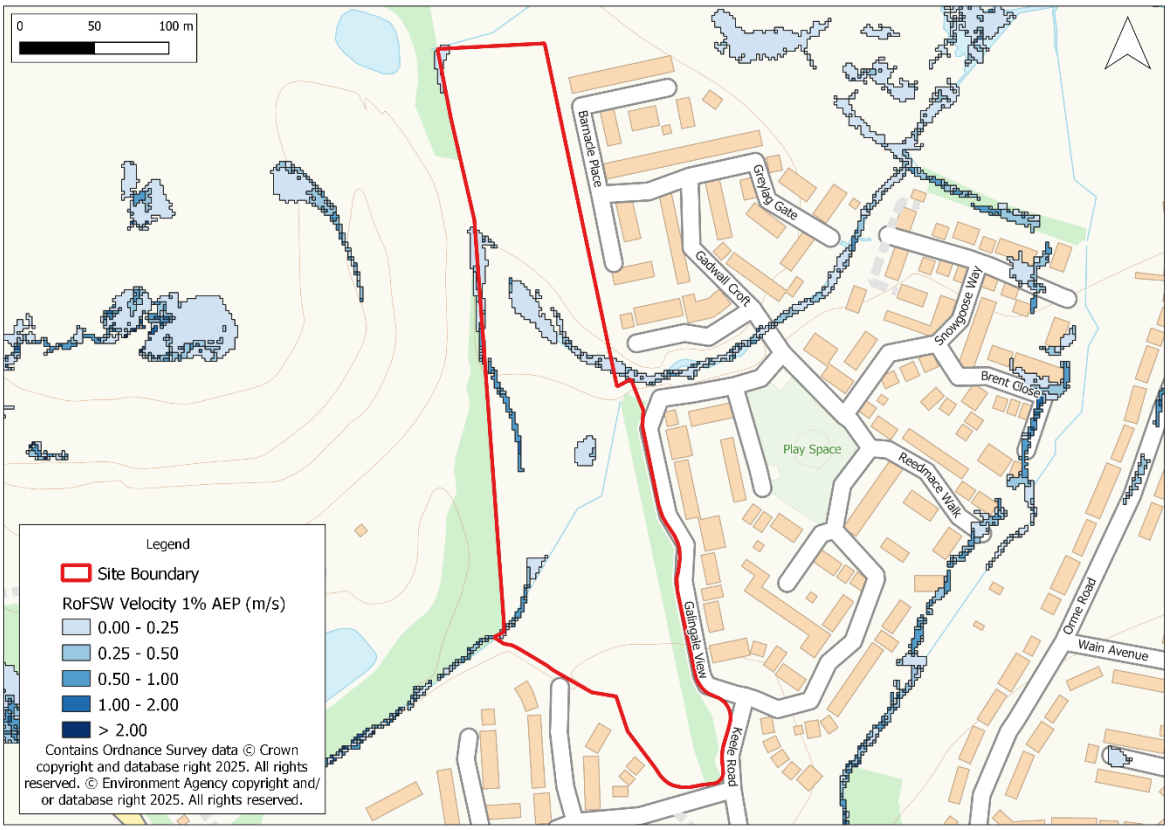


Figure 2-6: EA RoFSW surface water velocities at the site for the 1% AEP event.

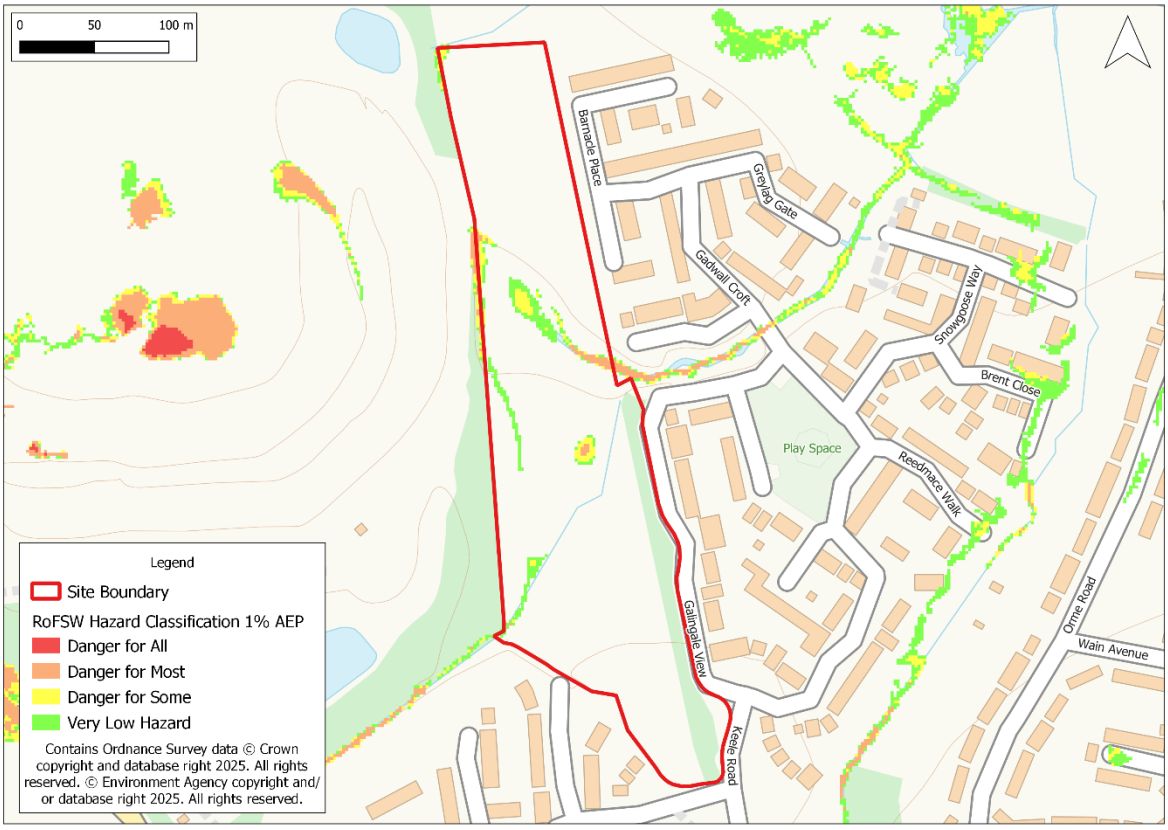


Figure 2-7: EA RoFSW surface water hazard at the site for the 0.1% AEP event.

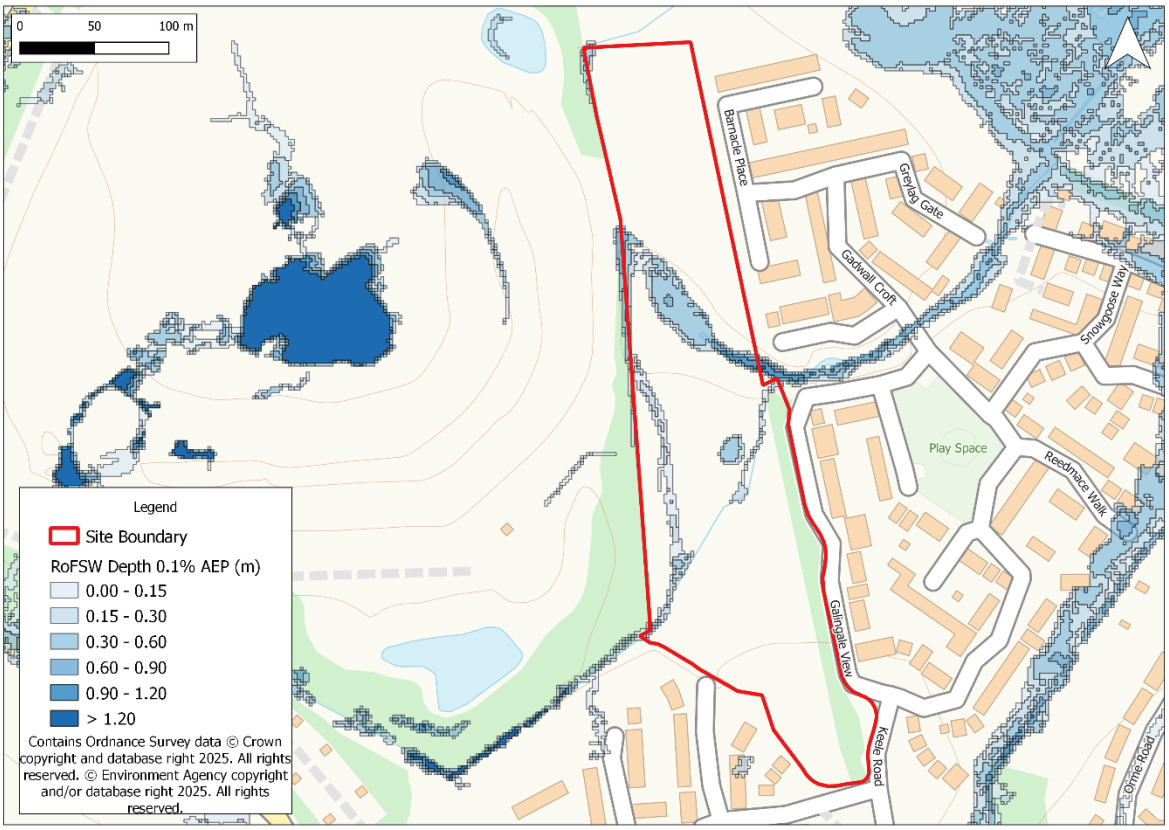


Figure 2-8: EA RoFSW surface water depths at the site for the 0.1% AEP event.

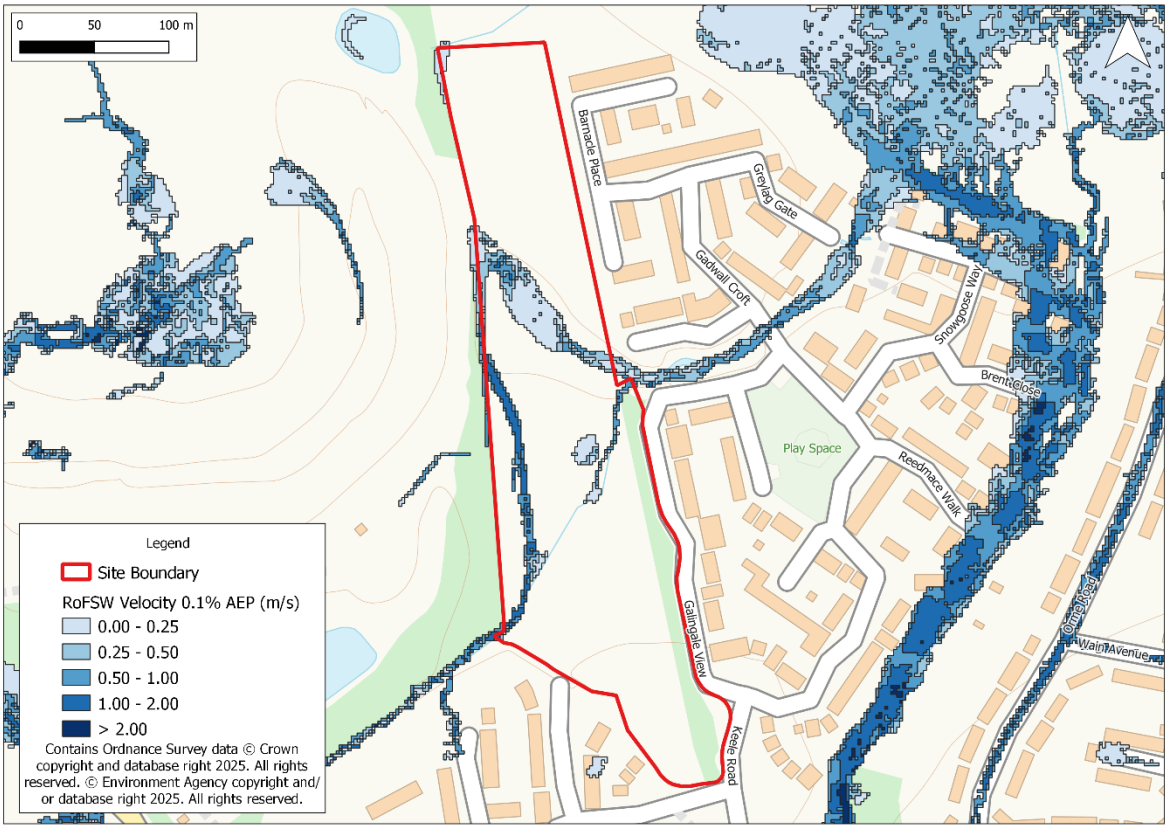


Figure 2-9: EA RoFSW surface water velocities at the site for the 0.1% AEP event.

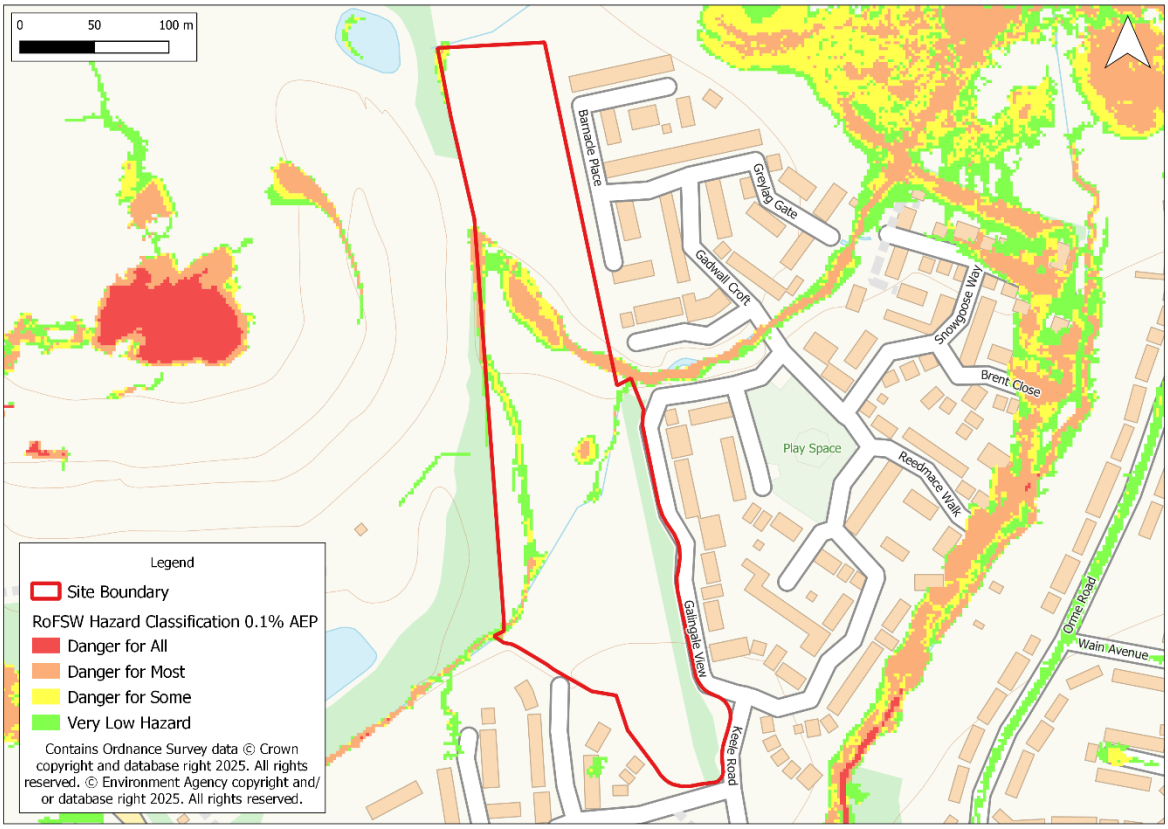


Figure 2-10: EA RoFSW surface water hazard at the site for the 0.1% AEP event.

2.4.3 Description of risk to the site (NaFRA2 RoFSW)

The NaFRA2 RoFSW mapping shows a considerable increase in surface water extent on the site along the path of the northernmost watercourse. The extent covers more of the area of lower topography in the centre of the site. The most significant increase in risk is in the 3.3% AEP extent which encompassed small areas of ponding in the previous RoFSW mapping but now covers the entire flow path with a wider extent in the NaFRA2 mapping. However, the areas of the site at risk are generally shown to be similar with the northern and southern areas of the site remaining mostly free from surface water risk. The NaFRA2 RoFSW extents are shown in Figure 2-11 below.

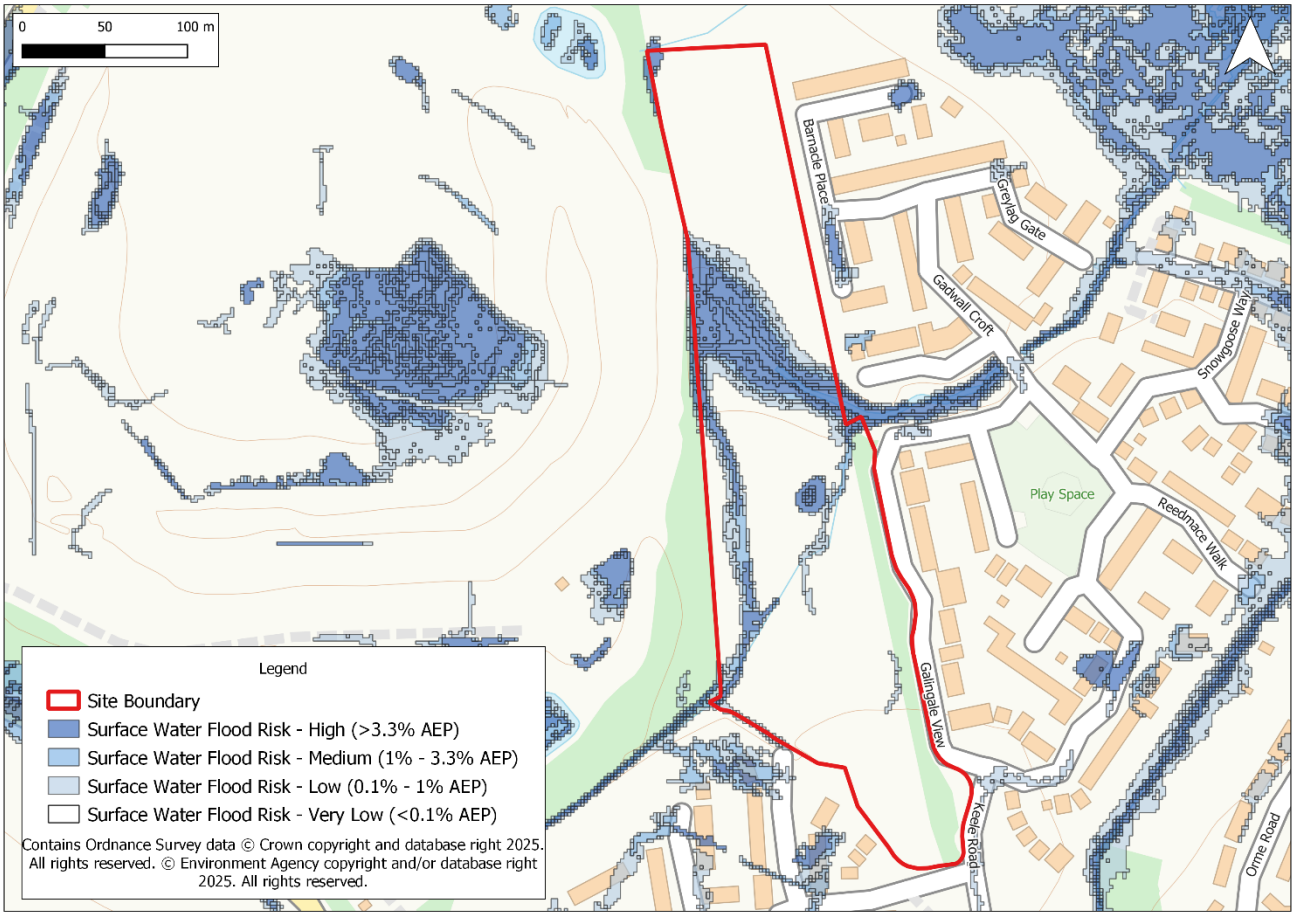


Figure 2-11: NaFRA2 RoFSW Extents.

2.5 Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

2.6 Groundwater

The EA Areas Susceptible to Groundwater Flooding (AStGWF) dataset (1km resolution) suggests that the northern half of the site has between a 25% and 50% susceptibility to groundwater flooding in any given year whilst the southern half of the site has less than a 25% susceptibility to groundwater flooding. The JBA Groundwater Emergence Map (5m resolution) suggests the site is at much lower risk, with the entire site deemed to be at negligible risk of groundwater emergence due to the nature of the underlying geological deposits.

This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

2.7 Sewers

The site is located in postcode area ST5 2. Severn Trent Water provided historical flooding data for reports of external and internal sewer flooding between 1 January 2004 and 19 March 2024, including locations with repeat incidents This included 11 properties within ST5 2, however, none of these properties are noted to be within close proximity of the site.

Severn Trent Water provided a review of the sites in relation to their impact to the existing public sewerage system ranking the sites as high, medium, or low risk. This site was ranked as medium due to the size of the development in context with the adjacent sewage pumping station.

2.8 Flood history

The EA's historic flooding and recorded flood outline datasets do not have a record of any flooding on or surrounding the site.

3 Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 3.5 of the main Level 2 SFRA report for information on fluvial models and climate change allowances.

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 escape must also address the potential increase in severity and frequency of flooding.

3.1 Fluvial

3.1.1 Available data

As part of the 2024 Level 1 SFRA for Newcastle-under-Lyme borough, the existing Environment Agency's 2015 Estry-TuFLOW detailed hydraulic model of Lyme Brook was uplifted with the latest central, higher central, and upper end climate change allowances for the 3.3%, 1%, and 0.1% AEP events.

3.1.2 Description of risk to the site

The site is not shown to be at fluvial flood risk in any of the modelled climate change events as the site is outside the extents of the Lyme Brook Model. However, the ordinary watercourses within the site boundary are not included within the model extent and may pose an increased risk due to the impacts of climate change. Instead, the flood risk from these watercourses has been assessed using the EA RoFSW map (Section 3.2).

3.2 Surface water

3.2.1 Available data

The latest climate change allowances have been applied to the RoFSW map to indicate the impact on pluvial flood risk.

The design event for rainfall intensities is the 1% AEP event with the upper end climate allowance for the 2070s epoch, which is the 1% AEP plus 40% climate change for the Trent Valley Staffordshire Management Catchment which this site falls within.

3.2.2 Description of risk to the site

The 1% AEP plus 40% climate change extent shows a similar extent to the 0.1% AEP extent on the site. Between the 1% AEP and 1% AEP plus 40% climate change events there is an increase in extent in the flow path along the northernmost watercourse which fully bisects the site in the climate change event. There is also an increase in extent in the

flow path along the western site boundary and a new flow path forms along the path of the southern ordinary watercourse.

Table 3-1: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP 2070s Upper End climate change extents.

Event	1% AEP	1% AEP plus 40% CC
Percentage of site at risk (%)	4	11
Maximum depth (m)	0.90 - 1.20	1.28
Maximum velocity (m/s)	1.00 - 2.00	2.53
Maximum hazard classification	Danger for most	Danger for most

4 Flood risk management infrastructure

4.1 Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

4.2 Residual risk

There is no residual risk to the site from flood risk management structures.

5 Emergency planning

5.1 Flood warnings and alerts

The northwest corner of the site is located in the West Midlands Flood Alert Area (033WAF309).

5.2 Access and escape

Safe access and escape will need to be demonstrated in the 1% AEP plus climate change fluvial and surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

Access and escape have been based on the RoFSW mapping as the NaFRA2 RoFSW mapping does not currently have available depth, hazard, and velocity data for use in this assessment. It is likely that hydraulic modelling of the two ordinary watercourses will be required at the FRA stage to fully represent the risk from each watercourse and confirm that safe access and escape can be maintained.

5.2.1 Existing access

There are no existing access roads/tracks which lead into the site. Access to the residential area of the east of the site is via Keele Road (A52) from the south. Rosemary Hill runs along the south of the site, Gallingale View runs along the eastern site boundary in the southern half of the site, and Barnacle Place runs to the east of the site in the northern part of the site. Therefore, potential access to the site has been assessed via each of these routes.

5.2.2 Fluvial

There is no fluvial modelling available for the site to assess safe access and escape routes. The RoFSW has been used as an indication of risk from the watercourses on site.

5.2.3 Surface water

As the site is crossed by two ordinary watercourses, access and escape have been considered for each area of the site.

Access from the site to the residential area to the east of the site is maintained in all modelled surface water events.

The northern part of the site can be accessed via Barnacle Place. Access is shown to remain unimpeded in all modelled surface water events. There is a flow path which crosses Gadwall Croft to the east of the site, which leads to Barnacle Place, where the ordinary watercourse passes beneath the road. However, the EA LiDAR shows that the road is between 2 and 3m higher than the watercourse in this location and therefore the risk is likely to remain confined to the channel in this location and not overtop onto the road.

Access to the south of the site via Rosemary Hill or Gallingale View is shown to be unimpeded during all modelled surface water events. The centre of the site does not form a dry island and is shown to be accessible via the south in all modelled surface water events, however, there is an ordinary watercourse in this location and therefore safe crossing will need to be considered, ensuring that any crossing does not impede the flow.

In the 1% AEP plus climate change event , access for emergency vehicles to the site is likely to be unaffected by surface water risk along Keele Road (A52) to the south of the site coming from the west. There is a small flow path which forms along the road but only covers a small area of the road. However, it should be noted that this flow path is shown to increase in length in the NaFRA2 RoFSW dataset. Depth, hazard, and velocity information is not currently available to accompany this dataset. Therefore, whilst available information suggests access and escape is unlikely to be affected this should be confirmed through a site-specific FRA.

There are several small flow paths which form along the A52 to the east of the site which may impede access from that direction. Depths are shown to remain below 0.3m, however there are some considerable velocities of up to 3.6m/s with a corresponding hazard classification of 'Danger for most'.

5.3 Dry islands

The site is not located on a dry island however the centre of the site is enclosed between two ordinary watercourses and a flow path which forms between them along the western boundary of the site.

6 Requirements for drainage control and impact mitigation

6.1 Broadscale assessment of possible SuDS

- 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 indicates that the underlying geology is largely comprised of mudstone, siltstone, and sandstone. This is likely to have highly variable permeability which should be confirmed through infiltration testing. The local soils are identified to be restored soils mostly from quarry and opencast spoil, which may suffer from compaction and, as a consequence, run off and erosion Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site.
- The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
- The site is located within a Nitrate Vulnerable Zone. Therefore, early engagement within the Lead Local Flood Authority and the EA is recommended to determine requirements for the site to manage the impact to surrounding watercourses. Consideration of water quality is likely to be of high importance and demonstrated through the use of the Simple Index Approach.
- The site is not located within a historic landfill site.
- Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the Lead Local Flood Authority. 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.
- The RoFSW mapping indicates the presence of surface water flow paths associated with the ordinary watercourses on site during all modelled surface water events. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space.
- If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.

6.2 Opportunities for wider sustainability benefits and integrated flood risk management

- 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 (Local Planning Authority, Lead Local Flood Authority, and the EA) at an early stage to understand possible constraints.
- The ordinary watercourses should be integrated into the site drainage strategy as blue-green infrastructure.
- 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 filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Consideration should be made to the existing condition of receiving waterbodies (Lyme Brook) and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.

7 NPPF and planning implications

7.1 Exception test requirements

The Local Planning 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.

The NPPF classifies residential development as 'More Vulnerable'.

The exception test is not required for this site because the entire site is shown to be located in fluvial Flood Zone 1, however, the ordinary watercourse risk at the site should be assessed further within a site-specific FRA.

7.2 Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- is greater than one hectare in Flood Zone 1; and
- is at risk of surface water flooding/ fluvial flooding from the unnamed ordinary watercourses.

All sources of flooding should be considered as part of a site-specific FRA.

Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Newcastle-under-Lyme Borough Council's Local Plan Policy's.

The development should be designed with mitigation measures in place where required.

7.3 Guidance for site design and making development safe

Development should be steered outside of the path of the ordinary watercourses on the site. Developers should consider utilising this area as a green corridor or as a location for SuDS.

A detailed hydraulic model of the ordinary watercourses may be required at FRA stage to accurately represent the risk from this watercourse and set the height of any mitigation measures. The developers should consult the Lead Local Flood Authority at an early stage to determine the requirements for buffers with no built development either side of the watercourses.

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 pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Arrangements for safe access and escape will need to be provided for the 1% surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

Provisions for safe access and escape should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk. This is key when considering the potential access to the central area of the site and any watercourse crossings required.

8 Conclusions

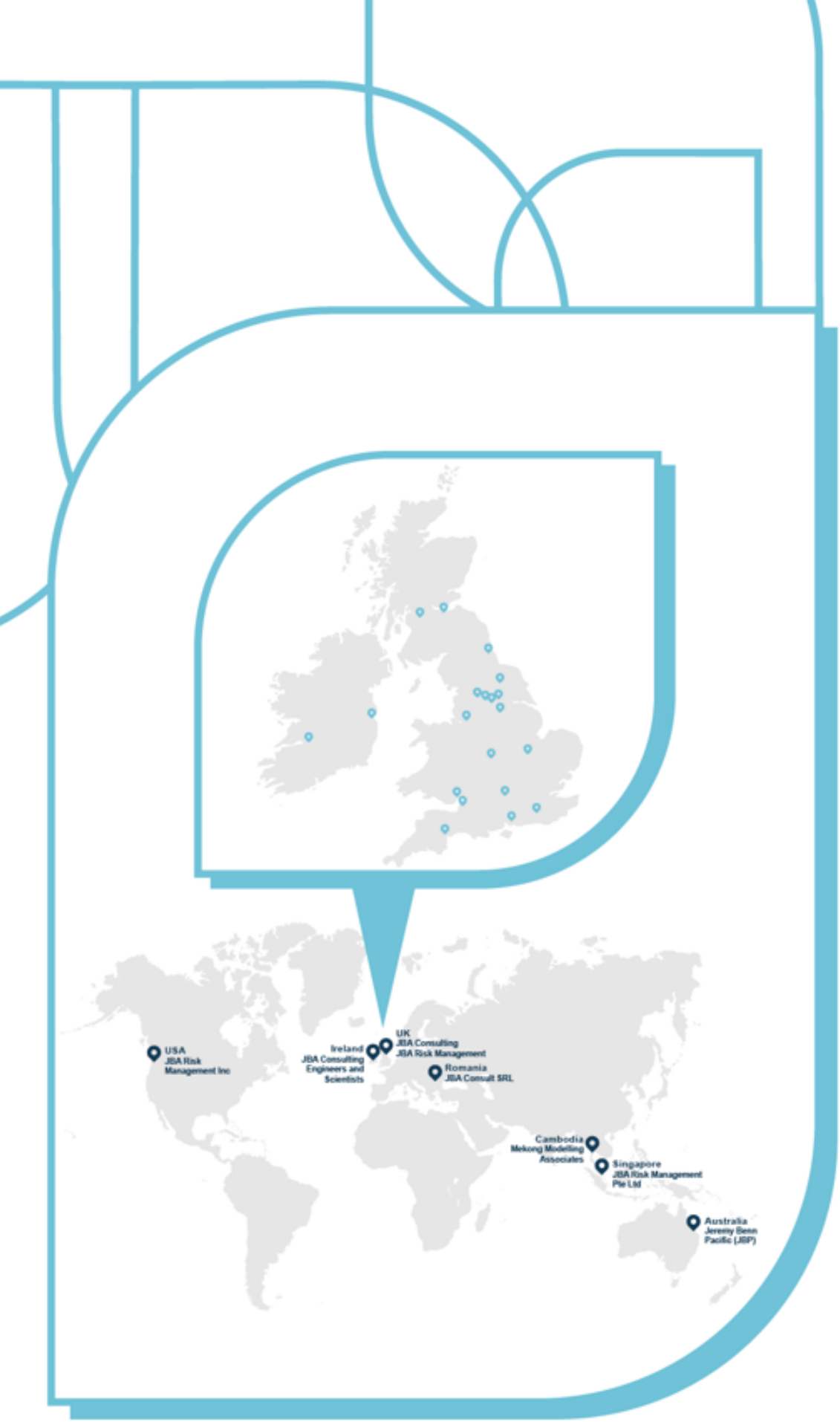
The site is at flood risk from two unnamed ordinary watercourses which cross the site. Neither watercourse is included within the EA's Lyme Brook modelling or wider broadscale modelling, however, the EA's NafRA2 RoFSW mapping suggests that flood extents could extend up to 25m from the channel in the centre of the site. These watercourses cross the site and access, and escape routes need to be considered for each area of the site.

The exception test is not required for this site because the entire site is located within Fluvial Flood Zone 1. However, a site-specific FRA will be required, because the proposed development site is one hectare or greater in Flood Zone 1 and subject to surface water/fluvial flooding from the unnamed ordinary watercourses.

The following points should be considered in development of this site:

- All development should be steered away from the areas of highest risk along the two unnamed ordinary watercourses which bisect the site and the flow path which forms along the western site boundary.
- The Lead Local Flood Authority should be consulted at an early stage to determine the requirements for a buffer with no built development either side of the ordinary watercourses.
- A detailed hydraulic model of the unnamed watercourses may be required at FRA stage to accurately represent the risk from these watercourses and set the height of any mitigation measures. However, given the underlying topography of the site and assessment of flood risk from these watercourses based on the NaFRA2 RoFSW mapping, it is unlikely that modelled risk will considerably change the developable area of the site, with the northern and southern areas of the site situated at higher elevations.
- Safe access and escape routes should be demonstrated in the 1% AEP surface water climate change event. This should consider any areas of the site that may be cut off by existing watercourses of flow paths which are shown to develop within the surface water events. Currently, this Level 2 assessment has shown that safe access and escape can be maintained from the site into the adjacent residential area, however, access to the residential area may be impeded by surface water risk along Keele Road to the south.
- A carefully considered and integrated flood resilient and sustainable drainage design should be put forward, including a site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan and supported by detailed modelling, with development to be steered away from the areas identified to be at highest risk of surface water flooding within the site. The ordinary watercourses should be integrated into any SUDs design for the site as blue-green infrastructure.

- Severn Trent Water should be consulted at an early stage regarding the proposed site drainage due to the potential implications of the size of the development in relation to the nearby sewage pumping station.



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