

Flood Risk Assessment

Stoke Park Farm, SANG



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Eastleigh Brough Council

Report No.

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Project

Stoke Park Farm, SANG

Flood Risk Assessment

Client Name

Eastleigh Brough Council

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Executive Summary

Client	Eastleigh Brough Council
Site	The SANG is located off Stoke Common Road on the outskirts of Bishopstoke within the borough of Eastleigh. It can be located by the nearest postcode SO50 6JF and National Grid Reference (NGR) SU 47900 20241.
Development Description and Planning Policy	The proposed SANG is on approximately 20-25ha of predominantly greenfield land at Stoke Park Farm (with access road from the car park at Sewall Park).
Flood Sources & Flood Risk	According to the EA 'Flood Map for Planning' the site is in Flood Zone 1, meaning there is a less than 0.1% annual probability of fluvial/tidal flooding occurring. It is therefore safe from fluvial/tidal flooding. It has also been assessed that the impact of climate change will not significantly change the probability of flooding at the site. Other sources of flood hazards assessed in this flood risk assessment (FRA) included: • Ordinary Watercourse – low risk • Groundwater – low risk • Sewer – low risk • Surface Water – low risk • Flooding from the possible failure of existing artificial infrastructure – negligible risk The SANG does not have the potential to contribute additional flows into the public sewer network. Therefore, the risk of flooding from the Proposal elsewhere in the catchment (including to third-party land), is assessed to be low.

1 Introduction

1.1 Overview

Clarkebond (UK) Ltd was commissioned by Eastleigh Brough Council to provide a Flood Risk Assessment (FRA) to support planning application for the proposed Suitable Alternative Natural Green Space (SANG) at Stoke Park Farm in Eastleigh.

The report has been undertaken in accordance with flood risk policy contained within the National Planning Policy Framework (NPPF, 2023) and guidance found in the Flood Risk and Coastal Change National Planning Policy Guidance (NPPG). The assessment of flood risk was informed by the Level-1 Strategic Flood Risk Assessment (SFRA) 2016 for the Partnership for Urban South Hampshire (PUSH). Information publicly available from the Lead Local Flood Authority (LLFA) for Eastleigh Brough Council, Hampshire County Council, Environment Agency (EA) data and information available on government websites.

The main purpose of the report is to provide sufficient flood risk information to ensure the development is safe from flooding and would not pose a risk to third parties, with a particular focus on the management of surface water runoff.

1.2 Site Location and Description

The proposed SANG is on approximately 20-25ha of predominantly greenfield land at Stoke Park Farm (with access road from the car park at Sewall Park) – **see Figure 1**. The SANG is located off Stoke Common Road on the outskirts of Bishopstoke within the borough of Eastleigh. It can be located by the nearest postcode SO50 6JF and National Grid Reference (NGR) SU 47900 20241.



Figure 1: Site Boundary

The undulated landscape provided a natural environment with the opportunity to:

- Improve the biodiversity of the area.
- Compliment the river with wetlands and other water attenuation, diversion, and improvements.
- Create circulating walking routes within – both surfaces and unsurfaced; Improve connectivity between existing rights of way.
- Provide vehicular access and car parking provisions.
- Benefit from the connection with the surrounding woodlands.
- Develop a focal point with reaching views

A copy of the proposed layout is included as **Appendix A**.

1.3 Objectives

The main objectives of this FRA report, as recommended in the NPPF, are:

- To assess the site suitability in terms of the Sequential Test and, if required, the Exception Test.
- To identify the probability of flooding at the development.
- To assess the compatibility of the development with the flood risk zone.
- To identify the consequence of flooding at the development and suitable mitigation measures if required.

- Demonstrate that the development will not increase flood risk elsewhere, and where possible, will reduce flood risk.

1.4 Limitations

The information, views and conclusions drawn concerning the site are based, in part, on information supplied to Clarkebond by other parties. Clarkebond has proceeded in good faith on the assumption that this information is accurate. Clarkebond accepts no liability for any inaccurate conclusions, assumptions or actions taken resulting from any inaccurate information supplied to Clarkebond from others.

2 Planning and Flood Risk Policy Review

2.1 Overview of National Planning Policy Framework (NPPF)

National policy on planning and flood risk is set out in paragraphs 159 to 179 of the NPPF (2023) which is also supplemented by National Planning Practice Guidance (NPPG) for flood risk and coastal change, which was last updated in August 2022. The overarching aim of the NPPF is to ensure inappropriate development in areas at risk of flooding are avoided, which is achieved via application of the Sequential Test.

2.1.1 Sequential Test Process

The aim of the sequential test to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. Paragraph 23 of the NPPG states *'This means avoiding, so far as possible, development in current and future medium and high flood risk area considering all sources of flooding including areas at risk of surface water flooding.'* If the location of the low-risk area is not suitable due to wider sustainability objectives then progressively higher risk areas (Flood Zone 2/Flood Zone 3) can be considered, provided the development will be suitably safe from flooding and does not increase flood risk in other areas.

The process for undertaking the Sequential Test is shown in **Figure 2a and 2b. Table 1** (taken from Table 1 of NPPG) details the corresponding meaning of flood zones in relation to flood risk.

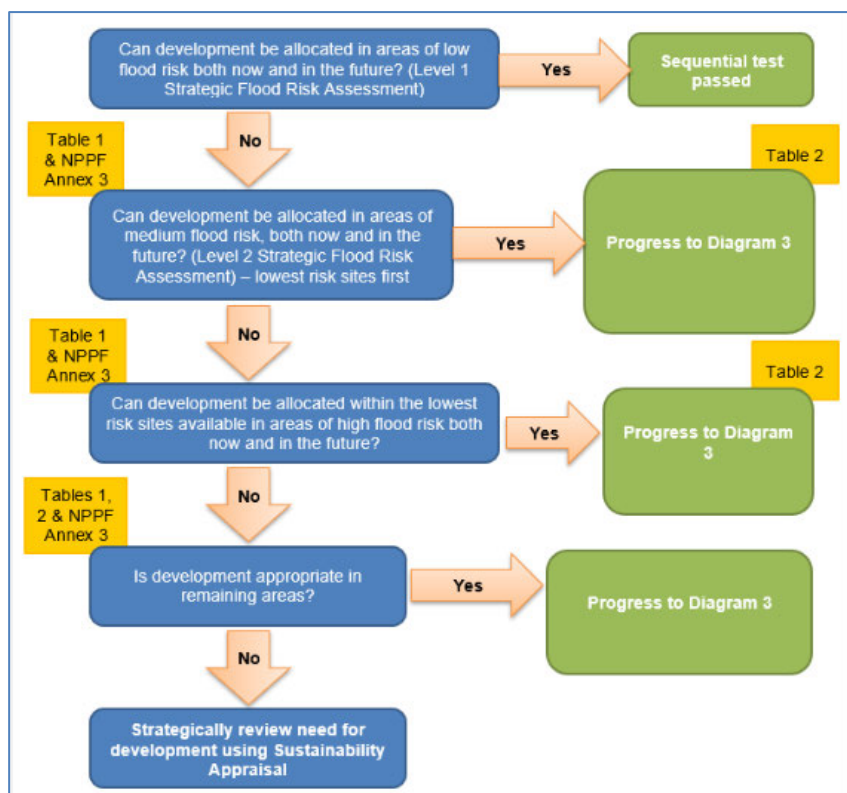


Figure 2a: Process of the Sequential Test (Diagram 2 – PPG Paragraph 025)

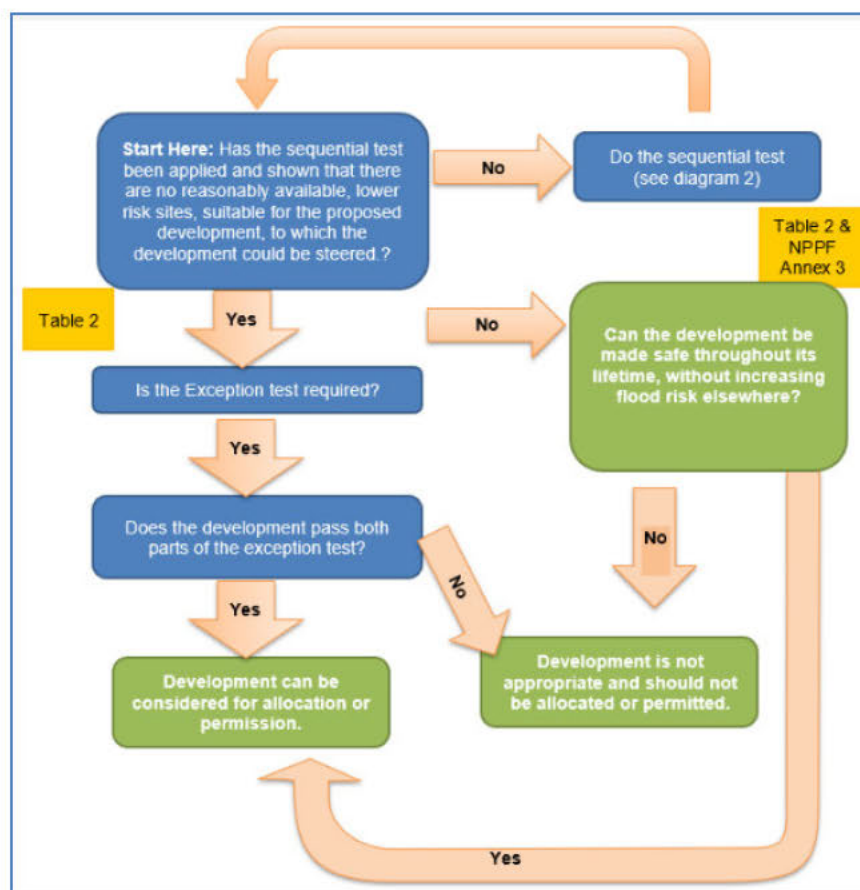


Figure 2b: Process of the Sequential Test (Diagram 3 – PPG Paragraph 025)

Table 1: Definition of Flood Zones (as defined in the NPPG)

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b).
Zone 2 Medium Probability	Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. (Land shown in light blue on the Flood Map).
Zone 3a High Probability	Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea. (Land shown in dark blue on the Flood Map).
Zone 3b The Functional Floodplain	This zone comprises land where water from rivers or the sea must flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise:

	- land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or - land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding).
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Certain development may require an Exception Test before it is considered acceptable.

2.1.2 Development Vulnerability and Flood Zone Compatibility

After undertaking the Sequential Test, the vulnerability of development to flooding must be considered so that more vulnerable uses are given priority for lower risk land. Refer to Table 2 (Paragraph 079) of NPPG which shows the Flood risk vulnerability and flood zone ‘*incompatibility*’ and requirements for the Exception Test.

Given that the SANG is in FZ1 combined with the associated vulnerability classifications of the proposed uses of the land, indicate that the Sequential Test is passed.

2.1.3 Design Flood Event

The SANG, and the proposed land uses at the SANG should be flood resistant and resilient including having safe access for the following extreme flood events, also known as the ‘*design flood*’ (taken from Paragraph 002 of NPPG):

- river flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year); or
- tidal flooding with a 0.5% annual probability (1 in 200 chance each year); or
- surface water flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year),

plus, an appropriate allowance for climate change.

Climate change is projected to increase the likelihood of flooding from most flood sources and therefore an assessment of the effects of climate change should be considered over the estimated designation of the SANG.

The lifetime of a non-residential development (which, in this case is the period for which the SANG is designated) is 75 years in accordance with NPPG; from a baseline of **2024** (this means assessing the flood risk up to the year **2099** on later).

2.2 Flood Risk Assessment Requirements

Footnote 55 of the NPPF states that a site-specific FRA is required for developments which:

- Are in Flood Zone 2 or 3.
- Are more than 1 hectare (ha) in Flood Zone 1.

- Are in an area which has critical drainage problems as notified by the Environment Agency.
- Land identified in a strategic flood risk assessment as being at increased flood risk in the future.
- Could be affected by sources of flooding other than rivers and the sea (e.g., surface water drains, reservoirs).
- Where a development will introduce a more vulnerable use.

The focus of FRAs for the higher risk zones is to fully assess the extent, depth, and hazard of flood waters, detail the required mitigation to manage flood risk (e.g., floor levels and access, evacuation routes, compensatory storage) and outline a surface water management plan.

FRAs for sites where the risk of flooding from rivers or the sea is classified as low (Flood Zone 1) will still need to assess all other sources of flood risk but will have a strong focus on management of surface water runoff.

2.3 Relevant Local Planning Policy

Local planning policy provides more specific detail on development requirements based on the flood risk in the local county or borough. Although these policies will broadly be in line with national policy, where additional requirements are required, this will take precedence.

A list of relevant planning policy documents that were consulted during this FRA include:

- Eastleigh Borough Local Plan 2016-2036
- Partnership for Urban South Hampshire – 1 SFRA (2016).
- Hampshire County Council Local Flood and Water Management Strategy (2020).
- EBC Biodiversity Strategy 2022-2032
- EBC Climate Change and Environmental Emergency Strategy

2.3.1 Eastleigh Borough Local Plan 2016-2036

As the overall strategic plan for Eastleigh Borough, this is the new Local Plan for Eastleigh Borough, which sets out the policies and plans to guide future development to 2036. It identifies how much development is required and key locations for this development, the infrastructure and services needed to support new and existing communities, and areas which will be protected from development. The key policy relating to flood risk is Policy DM 15: Managing Flood Risk (**Figure 3**) which echoes national policy; however, it provides some additional detail relating to specific requirements for developments within the Eastleigh Borough Council.

Policy DM5, Managing flood risk

1. Development will only be permitted within the areas at risk of flooding, now and in the future, as identified on the Environment Agency most recent flood maps and the Council's Strategic Flood Risk Assessment provided that:
 - a. it meets the sequential and exception test (where required) as outlined in Government guidance;
 - b. a site-specific flood risk assessment demonstrates that the development, including the access, will be safe without increasing flooding elsewhere, and where possible, will reduce flood risk overall;
 - c. the scheme incorporates flood protection, flood resilience and resistance measures appropriate to the character and biodiversity of the area and the specific requirements of the site and where appropriate takes advantage of opportunities to utilise natural flood management techniques;
 - d. appropriate flood warning and evacuation plans are in place; and
 - e. new site drainage systems are designed taking account of events which exceed the normal design standard.
 2. Development should not increase flooding elsewhere.
 3. Sustainable Drainage Systems (SuDS) must be designed in accordance with policy DM6.
- 5.28 Parts of the Borough are at risk from tidal, fluvial or other forms of flood risk. Development will only be permitted in these areas if it meets all of the criteria set out in policy DM5, which also reflect Government policy. Natural flood management techniques are those which use natural processes to reduce the risk of flooding, for example: restoring the bends in rivers, changing the way land is managed so that the soil can absorb more water, or creating coastal salt marshes.

Figure 2: Policy DM15 of the Local Plan 2016-2032

2.3.2 Partnership for Urban South Hampshire 1 SFRA (2016)

The purpose of this Level 1 Strategic Flood Risk Assessment (SFRA) is to fulfil the planning and flood risk requirements of the National Planning Policy Framework (NPPF) and supersedes the 2011 SFRA. This document provides a strategic overview for all sources of flood risk throughout the Urban areas of South Hampshire including the areas of Eastleigh Brough Council.

2.3.3 Hampshire County Council Local Flood and Water Management Strategy (2020)

This strategy is an important tool in understanding the Council's management of flood risks throughout Hampshire, in particular the responsible authorities and objectives in place.

2.3.4 EBC Biodiversity Strategy 2022-2032

This strategy sets out our approach for the protection, maintenance and enhancement of biodiversity and the natural environment in the borough from 2022-2032. It reflects the aims and obligations in legislation and in national, regional and Eastleigh BC or Local policy and provides the framework for delivery of a diverse natural environment and greener future for the borough.

2.3.5 EBC Climate Change and Environmental Emergency Strategy

This strategy outlines the council's approach to tackling climate change and reducing the impacts within the borough.

3 Background Information

3.1 Site Levels

A LiDAR Digital Terrain Model (DTM) was created from EA LiDAR data to give an overview of the site's topography. The DTM can be seen in **Figure 5** below. Levels indicate that the site falls in a north-westerly direction. The highest elevation (56.56mAOD) can be found at the eastern boundary, with the lowest elevation (20.18mAOD) at the northwestern boundary. Refer to topographic survey in **Appendix B**.

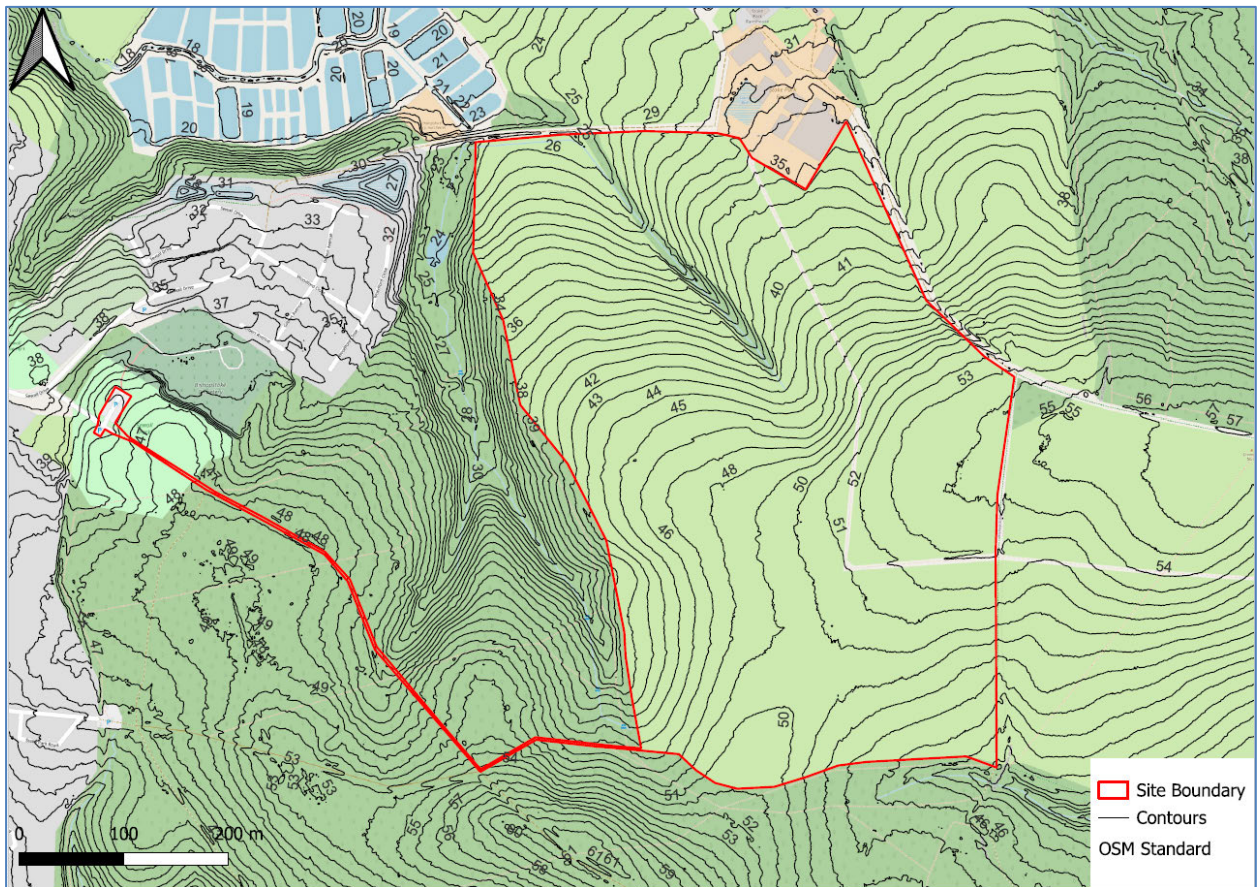


Figure 4 LiDAR DTM created from EA LiDAR data © Crown Copyright 2019

3.2 Existing Sewers

According to sewer records obtained from Southern Water there are no existing sewers on or near the proposed area of the SANG.

3.3 Hydrology

According to the EA's 'Catchment Data Explorer', the SANG is in the Ichen river operational catchment. There are no main rivers on the site; a main river refers to those watercourses under the jurisdiction of the EA. The closest main river, the Bow Lake, which is a tributary to the River Itchen is approximately 175m to the north of the SANG's boundary. **Figure 6** show the extent of the catchment boundary.

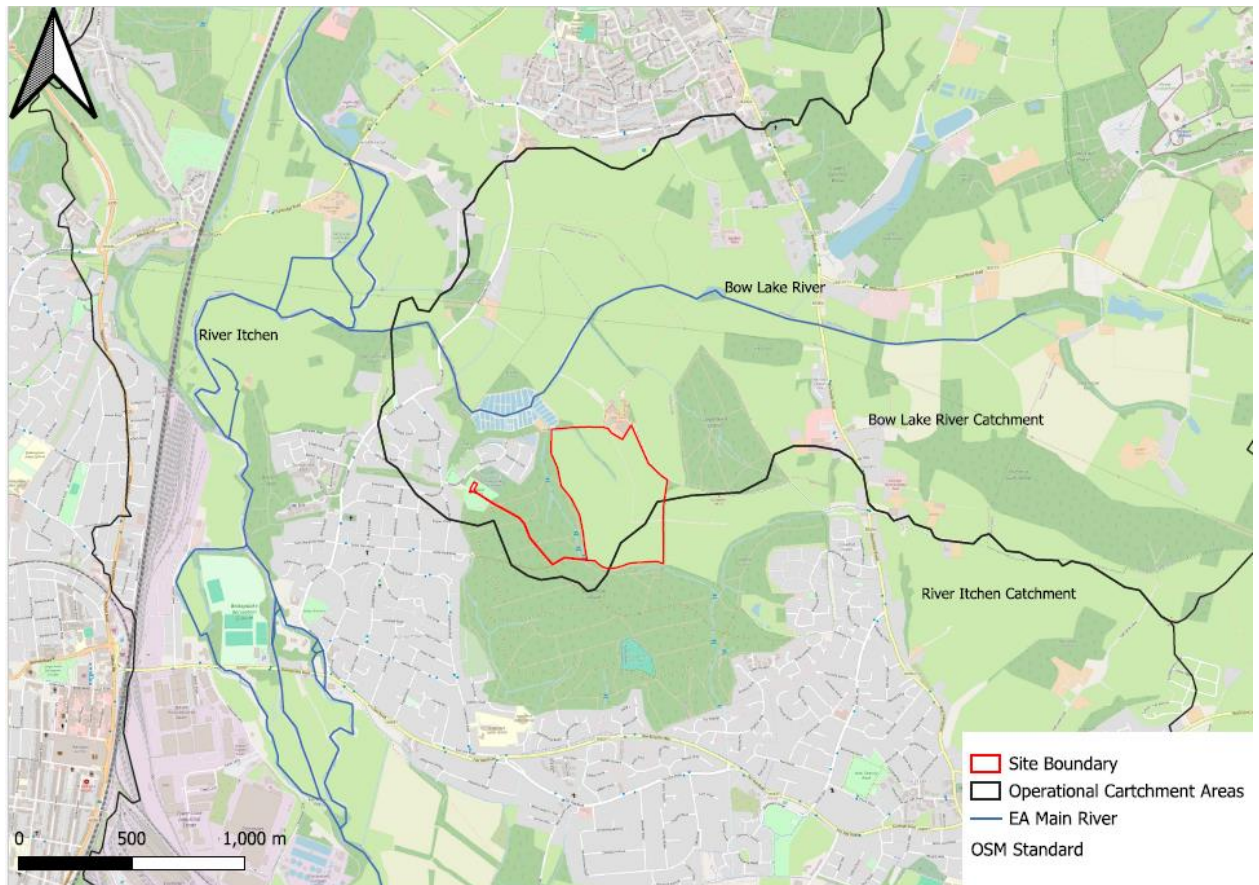


Figure 5: Sites Hydrological setting

According to OS maps, there is a minor watercourse known as an “ordinary watercourse” identified on the SANG. Ordinary watercourses refer to those under the jurisdiction of the LLFA, which in this case is the Council.

3.4 Geology, Groundwater, and Soils

The geology of the site is shown on the 1:50,000 scale British Geological Survey (BGS) map and on the BGS website's Geology of Britain viewer. A review of the available data indicates the anticipated geology at the site can be summarised as follows:

Superficial Deposits

- None Recorded

Bedrock

- London Clay Formation – comprising clay and silt to the north and south of the SANG
- Whitcliffe Sand Member- comprising sand to the south and central

With regards to groundwater vulnerability, according to 'Magic' maps parts of SANG are in an 'Unproductive Aquifer' area. These rocks have negligible significance for water supply or baseflow to rivers, lakes, and wetlands. They consist of bedrock or superficial deposits with a low permeability that naturally offer protection to any aquifers that may be present beneath. Other parts of the SANG are in Secondary A aquifers. The definition of a Secondary A aquifer is permeable strata that can support local water supplies and may form an important source of baseflow to rivers. The SANG does not fall within a Source Protection Zone (SPZ).

Areas of the SANG also have highly vulnerable groundwater, these areas are consistent with the underlying Whitecliff Sand Member.

According to LandIS 'Soilscales,' the entire SANG is underlain by 'Soilscape 18 comprising slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils. This area is known to have impeded drainage and is likely to drain to a stream network, rather than groundwater.

There are no available historic borehole records at or near the site.

4 Flood Risk Assessment

4.1 Flood Zones and Development Compatibility

The EA 'Flood Map for Planning' shows that the SANG is in Flood Zone 1 (see Figure 7). This means the SANG has annual probability of flooding of less than 0.1% (1 in 1000-year return period) from both fluvial and tidal sources.



Figure 6: EA 'Flood Map for Planning'

The proposed land uses at the SANG can be classified as a 'Less-Vulnerable' development, in accordance with Paragraph 079 of the NPPG. All forms of development are compatible in Flood Zone 1 in accordance with Table 2 (taken from Table 3 of the NPPG).

Table 2: Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zones	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a†	Exception Test required†	✓	X	Exception Test required	✓
	Zone 3b*	Exception Test required*	✓*	X	X	X

Where ✓ means Exemption Test is not required, and X means the development should not be permitted.

“+” In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

“*” In Flood Zone 3b (functional floodplain) essential infrastructure that has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood.
- result in no net loss of floodplain storage.
- not impede water flows and not increase flood risk elsewhere.

4.2 Impact of Climate Change

Although the SANG is not identified as being within a high-risk zone for fluvial/tidal modelled flood data, the NPPF states that the FRA should assess the increased risk posed by climate change over the timeframe of its designation. The SANG will also be affected by the projected increased risk of surface water and sewer flooding and so the new drainage system for land uses at the SANG should accommodate the projected increase in surface water flows over the timeframe of its designation.

EA guidance on climate change allowances to support the NPPF came into effect in February 2016 and were recently updated in 2022.

The range of allowances is based on percentiles. The:

- central allowance is based on the 50th percentile.
- higher central allowance is based on the 70th percentile.
- upper end allowance is based on the 95th percentile.

An allowance based on the 50th percentile is exceeded by 50% of the projections in the range. At the 70th percentile it is exceeded by 30%. At the 95th percentile it is exceeded by 5%.

According to NPPG (2022) when designing safe access, escape routes and places of refuge, use the central allowance for all development types except for essential infrastructure to ensure the safety of people using the development. For essential infrastructure the guidance says that the higher central allowance should be used.

The SANG is in the river Test and river Itchen Management Catchment with an assumed designation period of ~75 years. Based on NPPG guidance for ‘Less Vulnerable’ development in Flood Zone 1, the central allowance should be used to assess a range of allowances for fluvial flood events, as shown in Table 3.

Table 3: Peak River Flow Allowances for Test and Itchen Management Catchment

	Central	Higher	Upper
2020s	16%	24%	45%
2050s	17%	28%	61%
2080s	35%	56%	127%

Table 4 shows the recommended allowances for peak rainfall intensity for different statistical likelihoods. The upper end allowance should be used in areas where there are known flooding issues and there is highly vulnerable development in the downstream sewer network.

Table 4: Peak Rainfall Allowances

3.3% annual exceedance rainfall event	Central allowance	Upper end allowance
2050s (epoch)	20%	35%
2070s (epoch)	25%	40%
1% annual exceedance rainfall event	Central allowance	Upper end allowance
2050s (epoch)	20%	40%
2070s (epoch)	25%	45%

*Use '2050s' for development with a lifetime up to 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125.

4.3 Sources of Flood Risk

In accordance with British Standards report 'BS 8533', the flood risk elements that need to be considered for any site are:

- Flooding from rivers (fluvial) – occurs when the flows exceed channel capacity or due to a failure of flood defences.
- Flooding from the sea (tidal / coastal flood risk) – tidal flooding is caused by the funnelling of tides along estuaries and rivers and coastal flooding occurs from wave action.
- Flooding from surface water (overland flow) – occurs when intense rainfall is unable to soak into the ground and runs over the ground surface, collecting in low-lying areas which are impermeable and / or not served by adequate drainage systems.
- Flooding from groundwater – occurs when water in the ground rises above surface elevations. Bedrock flooding typically occurs in low-lying areas underlain by permeable bedrock where pore spaces in the rock allow the water table to rise rapidly following extended periods of rainfall. Superficial deposit flooding may occur in unconsolidated deposits which lie on river floodplains following high in-bank river levels or in deposits underlain by low permeability bedrock.
- Flooding from sewers – occurs when the sewer is overwhelmed by heavy rainfall, becomes blocked, is of inadequate capacity or due to pumping station failure.
- Flooding from Artificial Structures – this is flooding from reservoirs, canals, and ponds due to infrastructure failure or breach.

4.4 Fluvial Flood Risk

As previously mentioned, the SANG is in Flood Zone 1 which is the lowest risk classification given by the EA. It is an area where safe refuge should be sought from flooding and is safe.

The NPPF requires that the future impact of climate change on flood risk should be considered, even for those areas currently in Flood Zone 1. The SANG is approximately 275m from Bow Lake at the closest point and is upgradient from the watercourse. Therefore, a judgement can be made that the impact of climate change will not cause the floodplain to extend to reach the SANG.

Therefore, the risk from fluvial flood risk is **very low**. Tidal flood risk has been discounted as the SANG is outside of tidal limits of tidal watercourses.

4.5 Other Sources of Flood Risk

Other sources of flooding assessed are:

- Ordinary watercourses (watercourses not under jurisdiction of the EA)
- Groundwater
- Surface water
- Sewers (sewer and drain exceedance and pumping station failure)
- Reservoirs, canals, and other artificial waterbodies

4.5.1 Ordinary Watercourse Flooding

There is an ordinary watercourse with a flow route running through the central area of the site in a north-easterly direction. However, this has not been confirmed by the site topographic survey. This feature is assessed to pose a **low** flood risk to the SANG as the flood boundary associated with this feature is narrow and localised. .

4.5.2 Groundwater Flooding

Groundwater flooding typically occurs when water levels rise above surface elevations from underlying rocks or springs following prolonged rainfall. The two most common mechanisms of groundwater flooding are:

1. Bedrock Flooding – occurs following extended periods of rainfall in areas underlain by a permeable bedrock outcrop. Typically, chalk aquifers pose the greater risk, where the large pore spaces in the rock allow the water table to rise rapidly. Areas most at risk are those in low-lying areas and at the base of steep-sided valleys at the interface between permeable and impermeable strata (where the groundwater table is naturally closer to the ground surface).
2. Superficial Deposit Flooding – occurs in permeable unconsolidated deposits (e.g., gravel) which lie on river floodplains following high in-bank river levels.

The level-1 SFRA provides a general description of the geology in Eastleigh and the surrounding areas and states the following: ‘There have been a number of incidences of groundwater flooding in this part of the Borough, specifically in the River Itchen catchment upstream of Eastleigh and Bishopstoke’.

As the land uses proposed at the SANG are not particularly sensitive to groundwater flooding, the risk from groundwater flooding is assessed to be **low**.

4.5.3 Sewer Flooding

As previously mentioned, sewer records obtained from Southern Water show that no surface water or foul sewers run through or are located near to the SANG. Therefore, the risk from sewer flooding is assessed to be **low**.

4.5.4 Surface Water Flooding

Surface water flooding is caused by heavy rainfall events that cause significant surface runoff and ponding of accumulated water. For greenfield sites the probability and impact of flooding is heavily dependent on the topography of a site, as well as the ground conditions and infiltration capability. For brownfield sites, surface water flooding can be impacted by the condition and or the capacity of the existing drainage system in place.

As can be seen from the EA surface water flood map (**Figure 8**), the majority of the SANG is at very low risk of surface water flooding. This represents a less than 0.1% annual probability of occurrence. There is an area where there is a suspected overland flow route with patches of medium (1 in 100yr) and high risk (1 in 30yr) at surface water flooding. However, this is only confined a low point located on the site. Areas to the northwest of the SANG including the access road have areas of medium surface water flood risk.

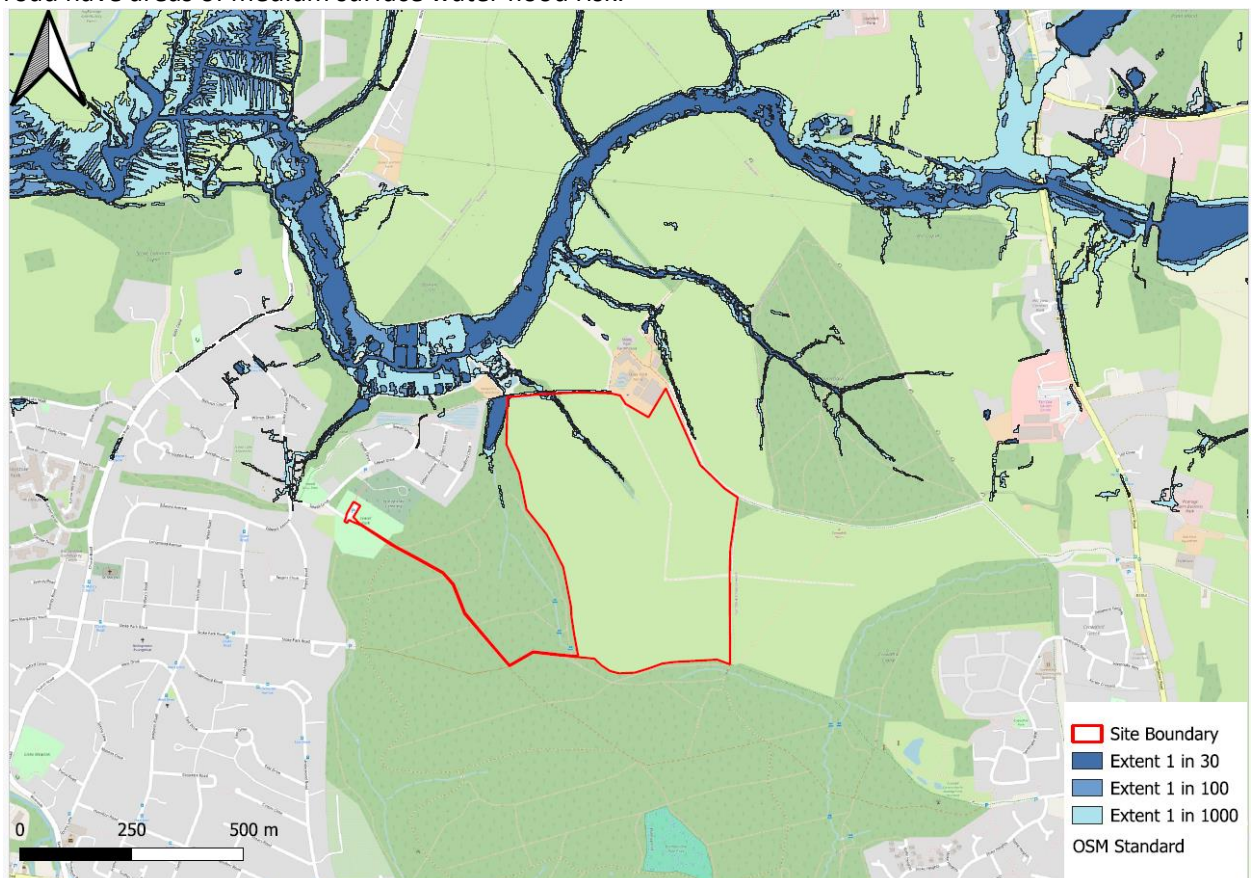


Figure 7: EA Surface Water Flood Map

For the purposes of detailed assessment, the 'medium' level of risk will be considered, as this is the same probability as the design fluvial flood event (>1% AEP). From both the modelled velocity and depth for this event, a flood hazard rating can be determined.

Figure 9 shows the modelled depth for the medium risk scenario (1 in 100yr) medium risk depth ranges between 0-900mm. With **Figure 10** showing the modelled velocity for the medium (1 in 100yr) level risk scenario. Medium level velocity is <0.25m/s.

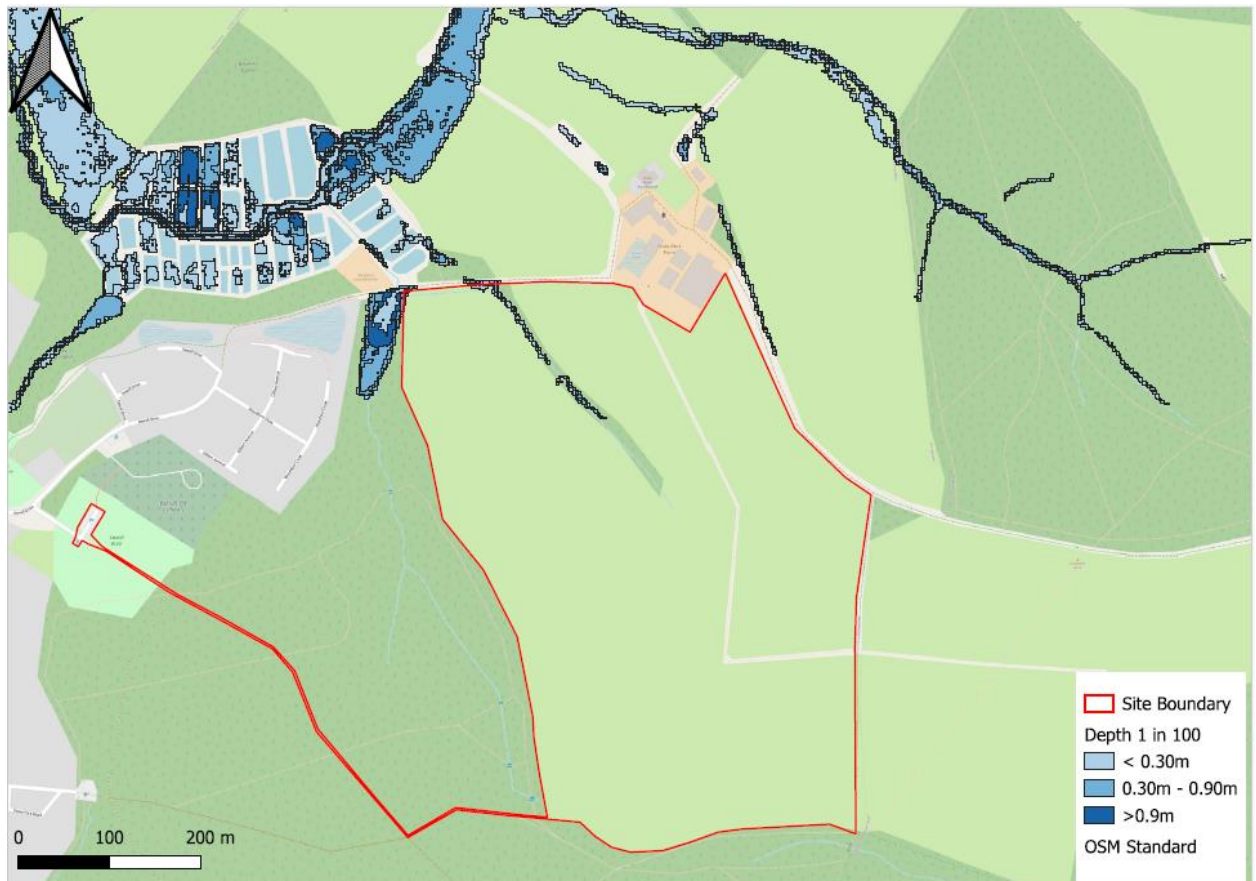


Figure 8: Medium Surface Water Flood Risk (Depth)

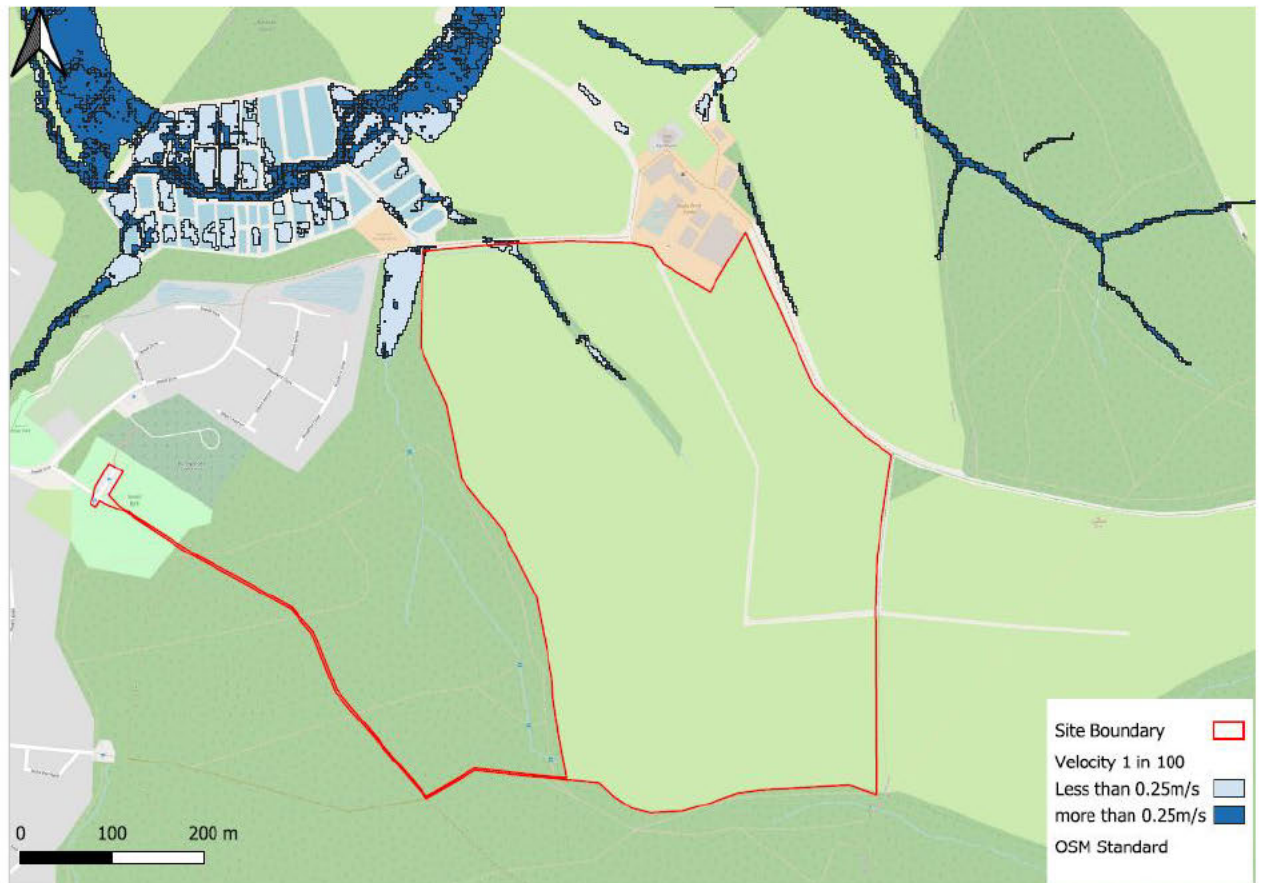


Figure 9: Medium Surface Water Flood Risk (Velocity)

Assessing both velocity and depth of flooding (depth of 0-900mm and velocity of <0.25m/s), this would result in a low hazard in accordance with FD2320/TR2 assessment methodology, as recommended in the FD2321/7400/PR supplementary note (2008). It should be noted that this method applies the precautionary principle that can be considered conservative.

Velocity (m/s)	Depth of flooding (m)											
	0.05	0.10	0.20	0.30	0.40	0.50	0.60	0.80	1.00	1.50	2.00	2.50
0.00												
0.10												
0.25												
0.50												
1.00												
1.50												
2.00												
2.50												
3.00												
3.50												
4.00												
4.50												
5.00												

Key:

- Danger for some
- Danger for most
- Danger for all

Figure 10: Flood Hazard Matrix (FD2320/TR2, DEFRA, 2005)

It should also be noted that the areas at risk of surface water flooding are confined to the overland flow route. Therefore, the risk from surface water flooding to the site is assessed to be **low**.

4.5.5 Flooding from Failure of Existing Artificial Infrastructure

The proposed development site is not within an area at risk of flooding from reservoirs, therefore the risk posed to the site from Artificial Infrastructure Failure is **negligible**.

4.6 Impact of Development on Flood Risk Elsewhere

A key requirement of this FRA, along with assessing flood risk to the site, is to adequately assess the impact of the Proposal on flood risk elsewhere. This involves determining the source of risk (e.g., changes to the site), the pathway of risk (e.g., re-direction of flow) and the receptors to the risk (e.g., nearby properties).

As the site is not expected to be affected by the 1% AEP fluvial flood event, any changes on site will not displace floodwater. Therefore, the Proposal will not increase fluvial flood risk elsewhere.

Although the Proposal has the potential to adversely affect surface water flood risk elsewhere by increasing impermeable area, this is predominantly due to the proposed car parking and footpaths areas. However, due to the small increase in impermeable areas and the low risk posed to the site it is assessed that the risk of the impact of the development on flood risk elsewhere is **low**.

4.7 Cumulative Impact on Flood Risk

Under the new NPPF guidelines, the cumulative impact on flood risk from both the Proposed Development and surrounding developments must be assessed. This should involve determining where there are common flood sources, pathways and receptors and assessing the scale and timings of any impacts likely.

It is judged that there is limited cumulative impact from the Proposal and other developments in the area. Due to the nature of the proposed development, it is thought unlikely to increase flooding elsewhere.

4.8 Safe Access and Egress

The SFRA stipulates that safe access and egress should be maintained for the lifetime of the development. As the site is in Flood Zone 1 and is at limited risk from the other flood sources assessed, safe access and egress is possible over the lifetime of the development.

4.9 Mitigation and Management Requirements

Flood risk mitigation and management measures for the development are determined by way of the hierarchical process outlined in Section 5 of the BS 8533:2017 'Assessing and Managing Flood Risk in Development – Code of Practice'. Application of this hierarchy is as follows:

1. Stage 1 – Assessing and understanding the flood risk:

A sound understanding of the sources of flood risk and how it varies over the site has been achieved.

2. **Stage 2 – Avoiding the Risk:**
All sources of flood risk have been avoided at this site.
3. **Stage 3 – Substitution:**
This is not required if the site is deemed to have passed the Sequential Test. See **Stage 2**.
4. **Stage 4 – Land raising, flood control/surface water management incorporation:**
Flood risk from all the potential flood hazards is assessed to be low. But as a precautionary measure the Drainage Strategy will be the mitigation tool for managing any flood risk.
5. **Stage 5 – Resistant/resilient building techniques:**
This is not required as appropriate mitigation is provided by way of Stage 4 measures.
6. **Stage 6 – Safety:**
Safe access and egress are possible to and from the site is possible over the lifetime of the development.

4.10 Summary Table

Flood Source	Current Level of Risk	Mitigation Required	Residual Risk
Fluvial/Tidal		None Required	
Ordinary Watercourse		None Required	
Groundwater		None required	
Sewer		None required	
Surface Water		Drainage strategy (only as a precaution).	
Artificial Infrastructure			
Flood Risk to Elsewhere		Drainage strategy (only as a precaution).	
Key		High Risk – Major constraint to development requiring active consideration in mitigation proposals	
		Moderate Risk – Issue requires consideration but not a significant constraint to development	
		Low – Issue requires some consideration and is not a significant constraint to development	
		Very Low - Issue requires little to no consideration and is not a significant constraint to development	
		Negligible Risk - No noticeable impact to site and not considered to be a constraint to development	

5 Summary & Conclusion

According to the EA 'Flood Map for Planning' the site is in Flood Zone 1, meaning there is a less than 0.1% annual probability of fluvial/tidal flooding occurring. It is therefore considered safe from fluvial/tidal flooding. It has also been assessed that the impact of climate change will not significantly change the probability of flooding at the site.

Other sources of flood hazards assessed in this flood risk assessment (FRA) included:

- Ordinary Watercourse – low risk
- Groundwater – low risk
- Sewer – low risk
- Surface Water – low risk
- Flooding from the possible failure of existing artificial infrastructure – negligible risk

Flood risk from the impact of the proposed development elsewhere was also assessed to be low.

This report has satisfied the objectives set in Section 1.4, demonstrating that the site is not at a significant level of flood risk from any of the sources of flood hazards assessed and that the Proposal will not increase flood risk elsewhere. Appropriate mitigation and flood management measures have been recommended for the proposed development as a precaution. The main mitigation will be outlined in the drainage strategy.

Appendix A – Proposed Development (x1 page)

Appendix B – Topographic Survey (x26 pages)