Southleigh, Havant

Flood Risk Assessment

On behalf of **Bloor Homes**

Project Ref: 332310755/316 | Rev: P1 | Date: April 2026

Registered Office: Stantec House Kelburn Court, Birchwood, Warrington, England, WA3 6UT
Office Address: 10th Floor, Bank House 8 Cherry Street, Birmingham, B2 5AL
T: +44 (0)121 633 2900 E: Birmingham.UK@stantec.com

Document Control Sheet

Project Name: **Southleigh, Havant**
Project Ref: **332310755**
Report Title: **Flood Risk Assessment**
Doc Ref: **332310755/316**
Date: **April 2026**

	Name	Position	Signature	Date
Prepared by:	R Laker	Associate		01/04/2026
Reviewed by:	Richard Fisher	Senior Associate		01/04/2026
Approved by:	R. Riddington	Director		01/04/2026
For and on behalf of Stantec UK Limited				

Revision	Date	Description	Prepared	Reviewed	Approved
P1	April 26	Planning Issue	*RL*	*RF*	*RR*

This report has been prepared by Stantec UK Limited ('Stantec') on behalf of its client to whom this report is addressed ('Client') in connection with the project described in this report and takes into account the Client's particular instructions and requirements. This report was prepared in accordance with the professional services appointment under which Stantec was appointed by its Client. This report is not intended for and should not be relied on by any third party (i.e. parties other than the Client). Stantec accepts no duty or responsibility (including in negligence) to any party other than the Client and disclaims all liability of any nature whatsoever to any such party in respect of this report.

Contents

Executive Summary **3**
Summary of Key FRA Data **5**
Abbreviations **7**
1 Introduction **8**
1.1 Scope of Report 8
1.2 Existing Site and Proposed Development 8
1.3 Background and Context 8
1.4 Sources of Information 9
1.5 Consultation Summary 9
1.6 Caveats and Exclusions 10
2 Planning Policy Context **11**
2.1 National Policy and Guidance 11
2.2 Local Policy and Guidance 12
3 Site Setting **15**
3.1 Site Description 15
3.2 Topography 15
3.3 Hydrological Setting 16
3.4 Existing Drainage Arrangements 17
3.5 Geology and Hydrogeology 18
4 Climate Change Impacts **19**
4.1 Climate Change Allowances Overview 19
4.2 Peak Rainfall 19
4.3 Peak River Flow 19
5 Assessment of Flood Risk **21**
5.1 Sources of Flood Data 21
5.2 EA Opendata Flood Maps 21
5.3 Preliminary Flood Risk Assessment (PFRA) 24
5.4 Strategic Flood Risk Assessment (SFRA) 24
5.5 Flood Risk from Groundwater 26
5.6 Stantec Fluvial and Pluvial Modelling 26
5.7 Sewer Flood Risk 33
5.8 Other Sources of Flood Risk 34
5.9 Summary of Flood Risk 34
6 Proposed Development and Sequential Approach **36**
6.1 Proposed Development 36
6.2 Flood Risk Vulnerability 38
6.3 NPPF Sequential Approach 38
7 Flood Mitigation Strategy **39**
7.1 Sequential Approach 39

7.2 Building Floor Levels 39
7.3 Safe Access and Flood Warnings 40
7.4 Channel Restoration & Improvements 40
7.5 Floodplain Storage 40
7.6 Watercourse Crossings for Access 40
7.7 Flood Risk Activity Permit Requirements 41
8 Surface Water Management Strategy 42
9 Residual Risk 44
10 Conclusions 45

Figures

Figure 3-1: Site Location Plan 15
Figure 3-2: Topography of the site and immediate surrounding area 16
Figure 3-3: Watercourses on and adjacent to the site 17
Figure 5-1: EA Flood Zone Map 22
Figure 5-2: EA Surface Water Flood Map 23
Figure 5-3: SFRA Flood Zone Map 25
Figure 5-4: Flood Zone comparison against modelled results – Fluvial Model 28
Figure 5-5: Maximum depth map for 1 in 100 year plus 25% climate change event - Fluvial Model .. 29
Figure 5-6: Sensitivity testing - Nore Farm Stream - 1 in 100 year +25% CC event – Fluvial Model ... 31
Figure 5-7: Comparison - EA RoFSW and Stantec modelled surface water extents - 1 in 100 year ... 32
Figure 6-1: Proposed Concept Site Layout extract 37
Figure 8-1: Proposed Surface Water Drainage Strategy 43

Tables

Table 4-1: Climate Change – Peak Rainfall Intensity Allowances 19
Table 4-2: Climate Change – Peak River Flow Allowances 20
Table 5-1 Maximum depth for 2D flood extent (m) 30
Table 5-2: Summary of Sources of Flood Risk 34

Appendices

Appendix A OpenData Flood Maps
Appendix B Topographical Survey
Appendix C Fluvial & Pluvial Hydraulic Modelling Report
Appendix D Extracted Groundwater Elevations
Appendix E Proposed Development
Appendix F Surface Water Drainage Plan
Appendix G Stakeholder Correspondence

Executive Summary

This Flood Risk Assessment (FRA) has been prepared by Stantec on behalf of our client, Bloor Homes, to support the proposed development at Southleigh, Havant, Hampshire (the 'Site').

In accordance with the fundamental objectives of the National Planning Policy Framework (NPPF), the FRA demonstrates that:

(i) The development is safe;

(ii) The development does not increase flood risk; and,

(iii) The development does not detrimentally affect third parties.

There are a number of ordinary watercourses on site which ultimately drain to either the West Brook, in the south-east of the site, or to the Nore Farm Stream, located south and south-west of the site. West Brook is designated by the Environment Agency (EA) as a 'Main River' adjacent to the eastern site boundary, and Nore Farm Stream is designated a 'Main River' beyond the site south of the A27.

The (EA) Flood Zone map indicates the site to be primarily within Flood Zone 1 'Low Probability' (less than 1 in 1,000 (0.1%) Annual Probability (AP) of river or seas flooding), but partially within Flood Zones 2 'Medium Probability' and 3 'High Probability' along the route of the local watercourses and to the east of the site at the West Brook flood storage area, as defined in Planning Practice Guidance (PPG), Flood Risk and Coastal Change, Table 1.

Stantec undertook a hydraulic modelling exercise to more accurately assess fluvial and surface water (pluvial) flood risk at the site. The modelling results demonstrate that the majority of overland flow routes, for both fluvial and surface water (pluvial) flooding, are less than 0.15m deep for the 1 in 100 AP plus climate change event.

The comparison between the modelled extents and the Flood Zones (at the time the modelling was undertaken) demonstrate that both modelled flood extents at the West Brook and Nore Farm Stream are consistent with the published EA Flood Zones, albeit with slightly smaller extents of flooding.

The EA online Risk of Flooding from Surface Water (RoFSW) mapping indicates that the site is primarily at 'Very Low' risk of surface water flooding. However, there are localised areas of higher flood risk across the site associated with localised topographic depressions or existing drainage features. There is a flow route in the extreme 1 in 1000 AP event running east through the centre of the site, partly along Southleigh Road and towards the West Brook. There is also an area of surface water ponding in the south-west corner of the site along the unnamed tributary to the Nore Farm Stream, located upstream of the A27.

The Stantec site-specific surface water (pluvial) hydraulic modelling confirms that majority of the site is at 'Very Low' risk and indicates that most of the major flow routes on site are less than 0.15m deep (during the 1 in 100 AP plus climate change event). Comparison between the modelled extents and the EA surface water flood mapping demonstrate that the modelled extents generally show a smaller flood extent in the central area of the site with no flow route running north-west to south-east from a field drain, south of Southleigh Road.

The Partnership for South Hampshire (PfSH) Strategic Flood Risk Assessment (SFRA) suggests the site lies within an area susceptible to groundwater flooding, based on a high level national scale analysis of ground conditions. A ground investigation report has been undertaken, included groundwater monitoring to determine seasonally high groundwater levels on site. This indicated groundwater elevations are generally shallower in southern parts of the site and also when in close proximity to nearby watercourses, which suggests that groundwater levels are in hydraulic continuity with local watercourses and groundwater flooding is therefore likely to be contingent on fluvial flooding (which

would be the dominant factor regarding flood levels). Therefore, the overall risk from groundwater flooding is considered to be 'low'.

The PfSH SFRA does not contain any records of sewer flooding on site. SW asset plans show a 150mm foul water sewer located within the northern part of the site, which trends broadly in a south-west to west direction. Any potential leakage would subsequently be discharged downslope directly into the existing on site drainage system and subsequently West Brook watercourse east of the site. Utility organisations would subsequently repair the broken pipes. Therefore, the overall risk of sewer flooding is considered to be 'low'.

The proposals for this development comprise both 'Less Vulnerable' and 'More Vulnerable' development. All such development will be located wholly within Flood Zone 1 and predominately within 'very low' surface water flood risk areas, and is therefore appropriate and in accordance with the sequential approach.

The flood risk mitigation strategy for the proposed development consists of the following elements:

- Finished floor levels (FFLs) for development at risk of fluvial flooding will be set a minimum of 600mm above the 1 in 100 AP plus climate change modelled fluvial flood level where there is a risk of fluvial flooding (i.e. within 50m of any watercourses/river floodplain extent). FFLs for all parcels will also be raised a minimum of 300mm above general proposed ground levels, unless DDA requirements specify otherwise, to mitigate the risk of water ingress in a severe rainfall event, in accordance with EA and Local Authority guidance.

- A fluvial flow route has been identified across the south-west corner of the site over and above the 1 in 100 AP flood event. This small overland flow has been mitigated through removing a low spot in the riverbank alongside proposed channel widening to enhance capacity, such that all flow remains in-channel. At the detailed design stage, further channel restoration and re-naturalisation opportunities will be explored, in order to manage post-development overland flood flow routes, improving hydromorphology and ecology.

- The surface water drainage proposals for the site will utilise on-site attenuation and discharge at the existing QBAR greenfield runoff rate of 3.0 l/s per hectare of developable area via connections to the existing watercourse network ultimately conveying to either West Brook or Nore Farm Stream. As such, there will not be an increase in post-development flows and the scheme will provide an overall betterment to the risk of flooding due to reductions in peak runoff from existing rates in extreme events.

- Access and egress via the primary street/vehicular access into the development (from Southleigh Road - to the west) will be located wholly within Flood Zone 1, so they would be entirely safe with continuous dry access maintained at all times.

In summary, the FRA demonstrates that the proposed development is safe and in accordance with the requirements of national and local planning policy.

Summary of Key FRA Data

Aspect of flood risk	Applicable Guidance/ Source of Data	Summary	Section of FRA
Site Location	n/a	National Grid Reference SU 73740 07070	**3.1**
Existing Ground Levels	siteline ref. 01SQ01, March to June 2023.	Site slopes generally from north to south, with a highest elevation of approximately 40m AOD along the northern boundary and a lowest elevation of approximately 10m AOD along the south and south-eastern boundaries.	**3.2**
Primary source of flood risk	n/a	Fluvial & surface water from on-site ordinary watercourses and catchments associated with West Brook and Nore Farm Stream	**5.2/5.6**
Presence of flood defences	n/a	No	**n/a**
Proposed Development	Proposals by Stantec Ltd	Outline planning application (all matters reserved except for access) for up to 1,800 new homes, public open space, landscaping and associated infrastructure.	**6.0**
Planning Aspects			
Flood Risk Vulnerability	Planning Practice Guidance (PPG) 'Flood Risk and Coastal Change'	'More Vulnerable', 'Less Vulnerable' & 'Water Compatible'	**6.0**
Flood Zone		Site primarily in Flood Zone 1 'Low Probability' Flood Zones 2 and 3 located along local watercourses	**5.2/5.6**
Sequential Approach		A sequential approach has been applied in developing the site layout, such that the location of all proposed 'More Vulnerable' development will be limited to areas of 'low' risk from all sources of flooding (e.g. Flood Zone 1) – i.e. where all forms of development are considered acceptable.	**6.0**
Exception Test		The proposals for this development comprise both 'Less Vulnerable' and 'More Vulnerable' development. All such development will be located within Flood Zone 1 and predominately within 'very low' surface water flood risk areas, and is therefore appropriate.	**6.0**
Applicable Climate Change Allowances	EA climate change allowances guidance	Arun and Western Streams Management Catchment (2080s epoch): +25% 'Central' & +36% 'Higher' peak river flow allowance +40% and +45% (Upper End) for peak rainfall intensity	**4.0**
Reference Flood Extents			
Present Day	Stantec Fluvial and Pluvial Hydraulic Modelling Report, Ref. 332310755, Rev A, 02/04/26	Following events modelled in report - 1 in 30 Annual Probability (AP) 1 in 100 AP 1 in 1000 AP	**5.6**
Climate Change		Fluvial: 1 in 100 AP +25% CC 1 in 100 AP +36% CC	**5.6**

		Pluvial: 1 in 30 AP +40% CC 1 in 100 AP +45% CC	
Proposed Mitigation Measures			
Ground Floor Levels	BS8533:2011 EA PfSH SFRA 2024	Finished floor levels will be raised a minimum of 300mm above general proposed ground levels subject to DDA access requirements. Finished floor levels in vicinity of river floodplain will be raised to minimum of 600mm above the 1 in 100 AP +25% climate change fluvial level.	**7.2**
Floodplain Storage	EA guidance	No requirement for compensatory floodplain storage as no development will be located in the floodplain.	**n/a**
Safe Access	EA – Chapter 13 of Document FD2320 "*FRA Guidance for New Development*" PfSH SFRA 2024	Continuous dry access and egress available along the proposed primary street from Southleigh Road (to the west).	**7.3**
Surface Water Drainage	CIRIA SuDS Manual (C753) National Standards for Sustainable Drainage Systems (SuDS)	The surface water drainage proposals for the site will utilise on-site attenuation and discharge at the existing QBAR greenfield runoff rate of 3.0 l/s/ha via the existing surface water drainage network on site (ultimately discharging to either West Brook or Nore Farm Stream. This demonstrates no increased in post development flows and will provide overall betterment to the risk of flooding arising from the proposed development.	**8.0**

Abbreviations

ABI	-	Association of British Insurers
AP	-	Annual Probability
BGS	-	British Geological Survey
CDM	-	Construction (Design and Management)
CIRIA	-	Construction Industry Research and Information Association
DDA	-	Disability Discrimination Act
DEFRA	-	Department for Environment, Food and Rural Affairs
EA	-	Environment Agency
FAS	-	Flood Alleviation Scheme
FDC	-	Flood Defence Consent
FHR	-	Flood Hazard Rating
FRA	-	Flood Risk Assessment
FRAP	-	Flood Risk Activity Permit
FRMP	-	Flood Risk Management Plan
GIS	-	Geographic Information System
HBC	-	Havant Borough Council
HCC	-	Hampshire County Council
IDB	-	Internal Drainage Board
LLFA	-	Lead Local Flood Authority
M. AOD	-	Metres Above Ordnance Datum (Newlyn)
NPPF	-	National Planning Policy Framework
PFRA	-	Preliminary Flood Risk Assessment
PPG	-	Planning Practice Guidance
RoFSW	-	Risk of Flooding from Surface Water
SuDS	-	Sustainable Drainage Systems
SFRA	-	Strategic Flood Risk Assessment
SW	-	Southern Water

1 Introduction

1.1 Scope of Report

1.1.1 This Flood Risk Assessment (FRA) has been prepared by Stantec on behalf of our client, Bloor Homes, in support of proposals to develop land at Southleigh, Havant, Hampshire (the 'Site').

1.1.2 The report is based on the available flood risk information for the site as detailed in **Section 3** and prepared in accordance with the planning policy requirements set out in **Section 2**. The scope of the FRA is consistent with the 'Site-specific Flood Risk Assessment Checklist' from the National Planning Policy Framework (NPPF) Planning Practice Guidance (PPG).

1.1.3 Stantec has many years of experience in, amongst other areas, the assessment of flood risk, hydrology, flood defence and river engineering. The authors and reviewers of the document are all experienced engineers and reviewers members of chartered institutions such as the Chartered Institution of Water and Environmental Management (CIWEM) or the Institution of Civil Engineers (ICE).

1.2 Existing Site and Proposed Development

1.2.1 The proposed development site comprises approximately 105 hectares (ha) of land between the existing urban area of Havant to the west, Westbourne to the east and Emsworth to the south, and is centred on National Grid Reference SU 73740 07070. It is located north of the A27 and is divided into three parcels of land by both Southleigh Road and Eastleigh Road.

1.2.2 The site lies within the administrative boundary of Havant Borough Council (HBC).

1.2.3 The proposal is for outline planning permission for up to 1,800 new homes, mixed-use local centre, primary school, public open space, landscaping and associated infrastructure – see further details in **Section 6**.

1.3 Background and Context

1.3.1 The proposed development site lies within a larger draft allocation site known as 'Southleigh Broad Location' or 'Southleigh strategic site' (ref. BL5 – '*Strategic Housing and economic Land Availability Assessment (SHELAA)'*, HBC, December 2024), with a Gross Site Area of 146.32 ha for residential development of up to 2,100 (1,650 during the plan period). The SHELAA also notes, under '*Suitability*' of the site:

> "*Yes - This large greenfield site lies between the urban areas of Havant and Emsworth and bounded by the A27 and railway to the south. Parts of the site are at risk of fluvial flooding and can be avoided for built development. There are also protected trees and sewer lines within the site that would need to be avoided. There is a reasonable prospect that a suitable form of development can be achieved*."

1.3.2 The site is also referred to as 'Southleigh' (ref. BL05) within the '*Strategic Flood Risk Assessment - Local Plan Sites'* (HBC, February 2025), designated as a 'Higher Risk' Group 2 site, but recommended for allocation, stating:

> "*The site represents the only significant site in the borough for the comprehensive development of a new community of more than 2000 dwellings. Development of this scale brings with it the opportunity for comprehensive development with substantial sustainability gains not only through significant housing delivery, but associated infrastructure, such as a new local centre, school and significant amounts of greenspace which will be accessible to the wide community. While the areas at risk are significant in size, given the significant size and scale of this strategic site, it is*

considered that it will be possible to take a comprehensive approach to flood risk on the site, and that it will be possible to avoid areas at risk on site for development."

1.4 Sources of Information

- Environment Agency (EA) published **'Open Data'** datasets available online, reproduced with OS mapping under licence to Stantec (contains Ordnance Survey data © Crown copyright and database right [2025], contains EA information © Environment Agency and database right) – see **Appendix A;**
- **Topographical survey** of the site by siteline (ref. 01SQ01, March to June 2023) – see **Appendix B**;
- **Illustrative Concept Masterplan** by Stantec Ltd (Drawing Number 333101046 BL-M-01B Rev A, dated 03 2025) – see **Appendix E**;
- **Stakeholder consultation** with the EA and Hampshire County Council (HCC) as the Lead Local Flood Authority (LLFA) under Section 19 of the Flood and Water Management Act 2010 – see **Section 1.5** and **Appendix G**;
- HBC **Havant Borough Core Strategy** (March 2011);
- HBC **Havant Borough Local Plan (Allocations)**, Adopted Version (July 2014);
- HBC **The Emsworth Neighbourhood Plan** (Adopted 2021);
- HBC **Building a Better Future – Full Consultation Document** (2022);
- Partnership for South Hampshire (PfSH) **Level 1 Strategic Flood Risk Assessment, Part 1 Main Report**, Report (Version 6), February 2024;
- PfSH **Strategic Flood Risk Assessment, Part 4 – Havant Borough Council**, Final Report (Version 3), June 2024;
- HBC **Strategic Housing and Economic Land Availability Assessment (SHELAA)**, December 2024;
- HCC **Preliminary Flood Risk Assessment** (PFRA) (2011).
- Hampshire County Council (HCC) **Hampshire Groundwater Management Plan** (GMP) (2013);
- HCC **Local Flood and Water Management Strategy** (2020);
- HCC **Hampshire Catchment Prioritisation – Lavant Catchment Management Plan** (2023).

1.5 Consultation Summary

1.5.1 The pre-application consultation undertaken for this FRA is discussed below and a copy of pre-application correspondence with the EA and LLFA is included within **Appendix G**.

Flood Risk

1.5.2 A pre-application meeting with the EA was undertaken on 30th March 2023. This was undertaken in advance of the work to construct detailed fluvial and pluvial hydraulic models of the Site area and was beneficial in order to identify the key areas of concern , verify any key

areas of interest, identify the relevant information held by the design team and by the EA that would be of use in the modelling, and to discuss and agree the high level principles to be applied in the modelling exercises.

Drainage

1.5.3 A consultation response was received from HCC, as Lead Local Flood Authority (LLFA), in January 2023, in response to a pre-application advice request.

1.5.4 Their response indicated that the site is generally at 'very low' risk of flooding from surface water, but noted that local flow routes exist that have areas at 'low', 'medium' and 'high' risk throughout the site. It was recommended that development be sited outside areas at an elevated risk of flooding, and that existing surface water flow routes be maintained or managed to reduce the risk of flooding both on and off site.

1.5.5 It was also indicated by the LLFA that infiltration is unlikely to be feasible on site, but this should be supported by testing and groundwater monitoring in the winter months to show that any proposed infiltration features will be at least one metre above the highest groundwater levels. Testing has since been undertaken, please refer to **Section 3.5** below.

1.5.6 The LLFA advised that proposed discharges from the site should be restricted to greenfield QBAR up to the 1 in 100 year storm event, plus allowance for climate change.

1.6 Caveats and Exclusions

1.6.1 This FRA has been prepared in accordance with the NPPF and Local Planning Policy. The proposed flood management (including ground floor level recommendations) and surface water management strategies are based on the relevant British Standards (BS8533), the standing advice provided by the EA, LLFA guidance or based on common practice.

1.6.2 Activities during the construction phase may have an impact on the existing and future flood risk. Thus, an assessment of the risks and appropriate mitigation measures should be identified and managed by the contractor.

1.6.3 The Construction (Design and Management) Regulations 2015 (CDM Regulations) will apply to any future development of this site which involves "construction" work, as defined by the CDM Regulations. As such it is the responsibility of the proposed developer (ultimate client) to fulfil its duties under the CDM Regulations.

1.6.4 The findings of this FRA are based on data available at the time of the study and on the subsequent assessment that has been undertaken in relation to the development proposals as outlined in **Section 6**.

1.6.5 It should be noted that the insurance market applies its own tests to properties in terms of determining premiums and the insurability of properties for flood risk. Those undertaking development in areas which may be at risk of flooding are advised to contact their insurers or the Association of British Insurers (ABI) to seek further guidance prior to commencing development. Stantec does not warrant that the advice in this report will guarantee the availability of flood insurance either now or in the future.

2 Planning Policy Context

This FRA has been prepared in accordance with the relevant national, regional and local planning policy and statutory authority guidance as detailed below.

2.1 National Policy and Guidance

2.1.1 National policy in relation to flood risk is contained within the **National Planning Policy Framework (NPPF),** updated December 2024, issued by the Department for Levelling Up, Housing and Communities, with reference to Section 14 'Meeting the challenge of climate change, flooding and coastal change'.

2.1.2 The latest version of the associated **Planning Practice Guidance (PPG)** 'Flood Risk and Coastal Change' section was updated August 2022.

2.1.3 The NPPF and PPG demonstrate a flood risk management approach for the lifespan of the proposed development considering the effects of climate change. The document sets the framework to minimise vulnerability, provide resilience to the impacts of climate change, and to fully consider the potential impacts of climate change for the lifetime of the development within the mitigation measures.

2.1.4 The guidance on the application of climate change allowances in FRAs is linked via the PPG and was most recently updated in May 2022. The guidance provides contingency allowances for the potential increases in peak river flow, peak rainfall intensity and sea level rise which are considered accordingly subject to the site conditions – discussed further in **Section 4**.

2.1.5 The NPPF sets out the requirement for the Sequential Test and Exception Test in paragraph 173, 174, 175 and 177 – see below.

> *"**173**. A sequential risk-based approach should also be taken to individual applications in areas known to be at risk now or in future from any form of flooding, by following the steps set out below.*
>
> ***174**. Within this context the aim of the sequential test is to steer new development to areas with the lowest risk of flooding from any source. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test.*
>
> ***175**. The sequential test should be used in areas known to be at risk now or in the future from any form of flooding, except in situations where a site-specific flood risk assessment demonstrates that no built development within the site boundary, including access or escape routes, land raising or other potentially vulnerable elements, would be located on an area that would be at risk of flooding from any source, now and in the future (having regard to potential changes in flood risk).*
>
> ***177**. Having applied the sequential test, if it is not possible for development to be located in areas with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in Annex 3."*

2.1.6 These Tests are to be applied where appropriate, depending on the proposed development flood risk 'vulnerability', the Flood Zone in which it is located and the risk of flooding from other sources. This is detailed further in **Section 6**.

2.1.7 The NPPF and PPG place emphasis on the need to fully consider – and design for – the impacts of climate change as set out in the 'Flood risk assessments: climate change allowances' planning guidance accessible at the following link:

https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

2.1.8 This guidance provides contingency allowances for potential increases due to climate change in peak river flow, sea level rise and rainfall intensity. These allowances are key for designing appropriate mitigation into the development to consider the flood risks over the lifetime of the development (peak river flow and/or sea level rise), and for the management of surface water over the site (peak rainfall intensity). The relevant allowances for consideration and the impacts to the development are discussed further in **Section 6**.

2.2 Local Policy and Guidance

Havant Borough Core Strategy

2.2.1 Local planning policy is contained within the HBC **Havant Borough Core Strategy**, adopted 1st March 2011, with particular reference to '*CS15 Flood and Erosion Risk'*, which states:

> *"**Policy CS15 Flood and Coastal Erosion Risk***
>
> *Development in areas at risk of flooding now and in the future as identified on the latest Environment Agency flood risk maps and Strategic Flood Risk Assessment climate change maps will only be permitted where:*
>
> 1. *It meets the sequential and exception test (where required) in relation to PPS25.*
> 2. *The site is located in a low hazard area as defined in the Strategic Flood Risk Assessment.*
> 3. *A site-specific flood risk assessment demonstrates that the development will be safe, including the access, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*
> 4. *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.*
> 5. *Appropriate flood warning and evacuation plans are in place.*
> 6. *New site drainage systems are designed taking account of events which exceed the normal design standard.*
>
> *All development will be required to ensure that there is no net increase in surface water run off. Priority should be given to incorporating Sustainable Drainage Systems (SuDS) to manage surface water drainage, unless it is proven that SuDS are not appropriate. Where SuDs are provided arrangements must be put in place for their whole life management and maintenance.*
>
> *The council will work with partners to implement the Coastal Policy Zones in the North Solent Shoreline Management Plan to ensure that development avoids areas at risk from coastal erosion and coastal flooding and that areas required to offset coastal squeeze and prevent habitat fragmentation, to allow species to adapt to climate change, are identified and protected from development."*

2.2.2 The Core Strategy also includes '*DM8 Conservation, Protection and Enhancement of Existing Natural Features*', which states:

> *"DM8 Conservation, Protection and Enhancement of Existing Natural Features*
>
> *Development will only be permitted where it protects and enhances local habitats and landscape distinctiveness and which addresses all of the relevant criteria as set out below:*
>
> 1. *Protects natural features of nature conservation and/or amenity importance on the site, for example trees, woodlands, hedgerows, soils, streams, stream corridors, springs, ditches or ponds from damage, destruction and a deterioration in quality.*
> 2. *Sympathetically incorporates existing features into the overall design of the scheme including measures taken to ensure their continued survival.*
> 3. *Provides new landscape works that integrate successfully with the local environment and existing natural features, using local materials and plant species and making provision for future maintenance of new landscape works associated with new developments.*
> 4. *Ensures sequences of greenspaces are maintained and protects the attractiveness and visual amenity of all green open spaces that contribute to the identity of the borough."*

Emsworth Neighbourhood Plan (Adopted 2021)

2.2.3 Local flood risk guidance is contained within the HBC **Emsworth Neighbourhood Plan** (adopted 2021). The guidance sets out the standards to which HBC expects new development to be designed against and helps to inform/aid flood risk assessments and surface water drainage requirements. The Plan states that:

> "*New residential development will be supported by the right level of essential infrastructure such as schools, flood defence, drainage, health, transport, broadband, social services and employment opportunities*."

2.2.4 The guidance contained within this document has been reviewed as part of this study.

Building a Better Future – Full Consultation Document (2022)

2.2.5 Local flood risk guidance is contained within the HBC emerging Local Plan titled "***Building a Better Future – Full Consultation Document***", dated 2022. The guidance sets out proposed policies to which HBC expects new development to be designed against and helps to inform/aid flood risk assessments and surface water drainage requirements. Propose policies include the following:

- *'A strategic policy setting out the key infrastructure requirements over the plan period, including for coastal defences, flood alleviation schemes and drainage;*
- *Site allocations which avoid inappropriate development in areas at risk of flooding and coastal change;*
- *A development management policy on avoiding and managing flood risk in New Development;*
- *A development management policy setting out expectations regarding effective drainage provision, including Sustainable Drainage;*
- *Mapping to define Coastal Change Management Areas, and an associated policy explaining what development is and isn't appropriate in these areas.'*

2.2.6 The guidance contained within this document has been reviewed as part of this study.

HCC Preliminary Flood Risk Assessment

2.2.7 HCC is defined as the Lead Local Flood Authority (LLFA) under the Flood and Water Management Act 2010. The first element of the Flood Risk Regulations (2009) is for LLFAs to produce a **Preliminary Flood Risk Assessment (PFRA)** providing a high-level overview of flood risk from all sources within a local area, including consideration of surface water, groundwater and ordinary (minor) watercourses.

2.2.8 The PFRA was prepared by HCC released in April 2011 and has been reviewed to ascertain any details of historic flooding at the site as part of this study – see **Section 5**.

Partnership for South Hampshire Strategic Flood Risk Assessment

2.2.9 The PfSH **Strategic Flood Risk Assessment (SFRA); Part 4 – Havant Borough Council, Final Report (Version 3),** was released in June 2024 and forms part of the Local Plan evidence base, to inform future spatial planning and to assist in developing planning policies to protect from flood risk. Moreover, the document provides an overall understanding of the flood risk within the study area taking into account all potential sources.

2.2.10 The PfSH SFRA has been reviewed to ascertain any details of historic flooding and flood risk at the site as part of this study – see **Section 5.8**.

Strategic Flood Risk Assessment (Local Plan Sites)

2.2.11 HBC **Strategic Flood Risk Assessment (SFRA) – (Local Plan Sites)** was released in February 2025 and forms part of the Emerging Local Plan (Building a Better Future) evidence base, to inform future spatial planning and to assist in developing planning policies to protect from flood risk. Moreover, the document provides an overall understanding of the flood risk within the study area taking into account all potential sources.

2.2.12 The HBC SFRA has been reviewed to ascertain any details of historic flooding and flood risk at the site as part of this study – see **Section 5.8**.

3 Site Setting

3.1 Site Description

3.1.1 The proposed development site comprises approximately 105 hectares (ha) of land between the existing urban area of Havant to the west, Westbourne to the east and Emsworth to the south, and is centred around approximate Ordnance Survey (OS) National Grid Reference (NGR) SU 73740 07070 – see **Figure 3-1**. A site location plan is included in **Appendix A**.

3.1.2 It is located north of the A27 and is divided into three parcels of land by both Southleigh Road and Eastleigh Road. The site is currently comprised of primarily arable land use with fields divided by hedgerows.

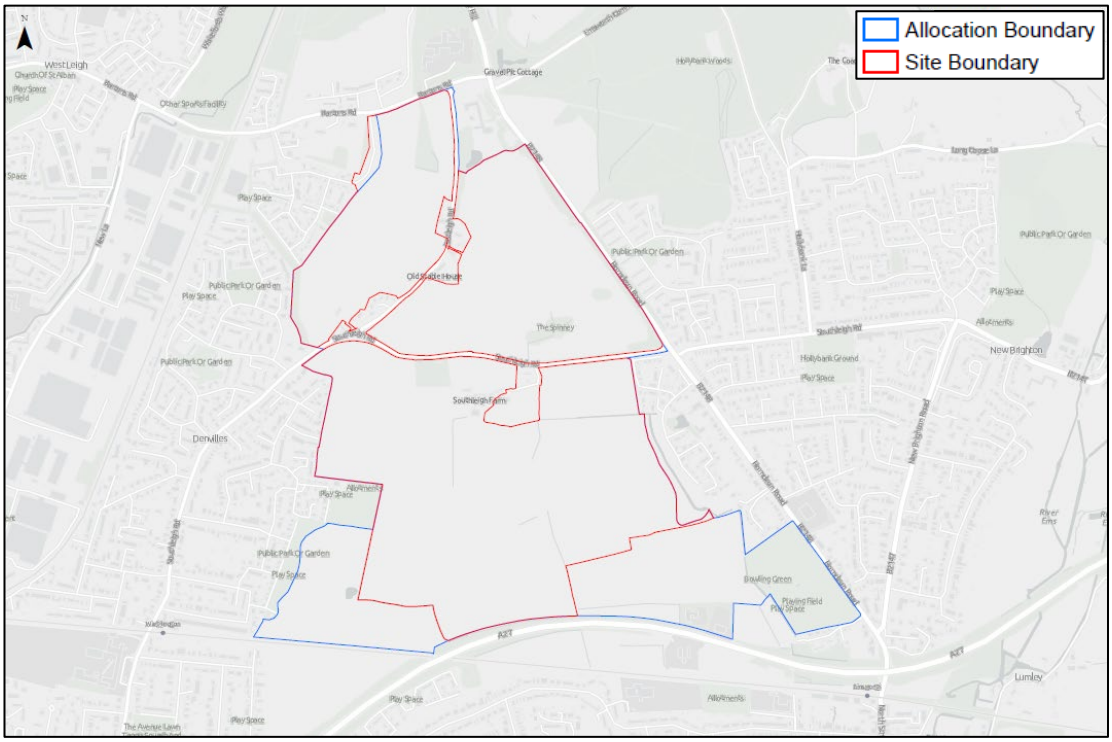

Figure 3-1: Site Location Plan

3.2 Topography

3.2.1 A topographical survey of the site was completed by siteline (ref. 01SQ01, March to June 2023). A copy is provided in **Appendix B**.

3.2.2 Open Source LiDAR data is also provided; this was identified as being consistent with the site survey and is utilised to provide a graphical overview of the pattern of topography over the site – see **Figure 3-2** (taken from **Figure 003a** in **Appendix A**).

3.2.3 The survey data indicates that the site slopes generally from north to south, with a highest elevation of approximately 40m AOD along the northern boundary and a lowest elevation of approximately 10m AOD along the south and south-eastern boundaries.

3.2.4 The A27 is adjacent to the southern boundary of the site and is elevated above the site on an embankment as the road passes above the railway line. To the south-east of the site, the A27 is generally at grade and at a comparable level to the surrounding ground.

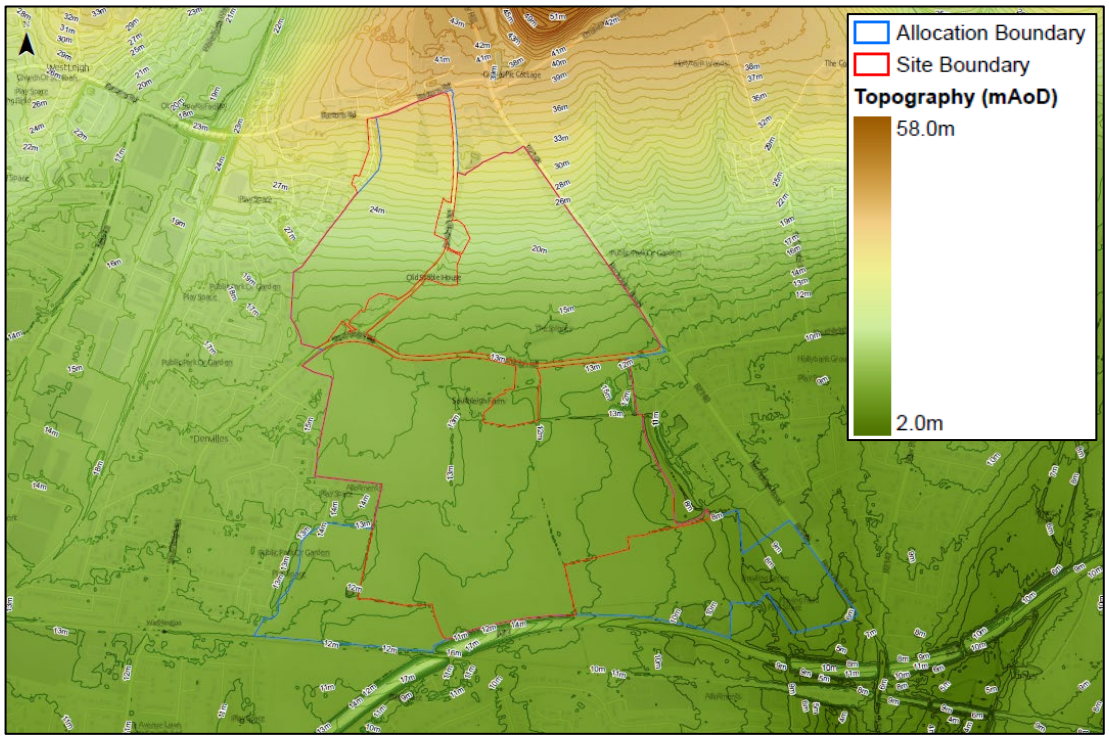

Figure 3-2: Topography of the site and immediate surrounding area

3.3 Hydrological Setting

3.3.1 There are several watercourses within or in the vicinity of the site as shown in **Figure 3-3.**

3.3.2 The site is located between the larger river catchments of the River Ems, located approximately 0.75km to the east of the site, and the Lavant Stream, located approximately 1.15km to the west of the site, both of which are classified as EA 'Main Rivers'.

3.3.3 The West Brook appears to pass under Horndean Road to the north-east of the site and then runs along the eastern boundary. It is designated as an EA 'Main River' immediately adjacent to and then south of West Brook View, where there is an area of the floodplain that has been lowered to provide floodplain storage/compensation, known as the West Brook FAS, in the south-east corner of the site. To the south of the site, the West Brook passes under the A27 and railways and then is largely culverted through Emsworth before discharging into Emsworth Pond and continuing south into Emsworth Mill Pond, and subsequently into the Emsworth Channel, part of the tidal Chichester Harbour.

3.3.4 The Nore Farm Stream rises along the western boundary of the site adjacent to Daffodil Way and the Stride Centre. It is classified as an 'ordinary watercourse' where it follows the western boundary of the site before turning east and passing under the A27 and railway. South of this point it is designated as an EA 'Main River'. The watercourse continues along the western side of Emsworth, partially in culvert, before discharging into the Nore Rithe, part of the tidal Chichester Harbour.

3.3.5 In the south-west corner of the site, adjacent to the A27 and upstream of where the unnamed tributary to Nore Farm Stream connects into the Nore Farm Stream, there is a flood storage area (FSA) which was delivered by the EA in 2014/15. The scheme is designed to reduce property flooding in Emsworth, in the area between Havant Road and the railway line. The scheme is based on the following components:

- A 200mm orifice installed on the A27 culvert.

- Weir level raised on the A27 culvert headwall to 11.45mAOD with high level 125mm diameter orifice.
- A flow control structure on the Network Rail ditch with a 400mm diameter flap valve.
- A stop log structure has been installed on the eastern connection ditch to manage flow towards the West Brook.

3.3.6 A 150mm diameter foul sewer is also indicated to be present beneath the north-western part of the site, as shown on the Southern Water (SW) asset plans included separately as part of the Surface Water Drainage Strategy report.

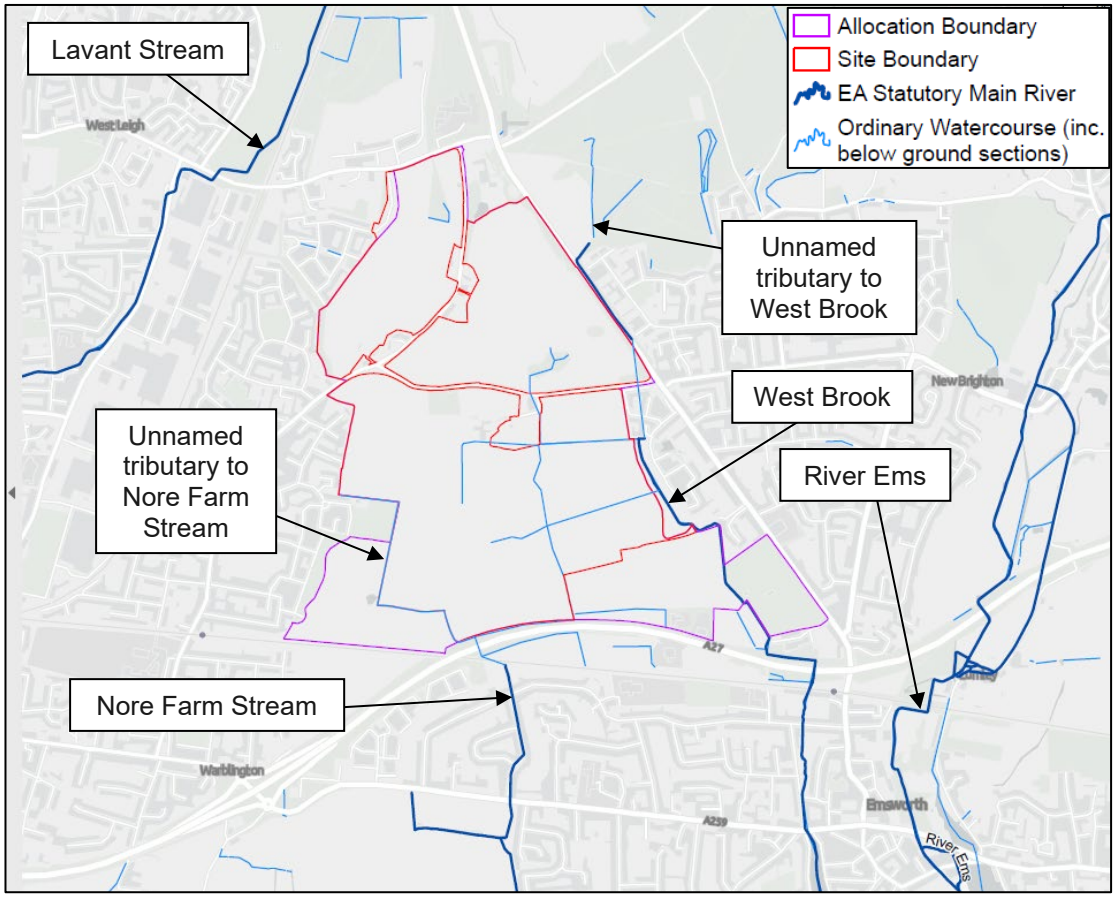

Figure 3-3: Watercourses on and adjacent to the site

3.4 Existing Drainage Arrangements

On-Site Drainage

3.4.1 As greenfield agricultural land, the existing on-site surface water runoff is via natural drainage patterns; i.e. either infiltration or conveyed via overland flows into the various watercourses and drainage ditches that are located around the site. Surface water conveyed within existing onsite ditches will eventually discharge from the site via the West Brook and Nore Farm Stream.

3.4.2 A minimal extent of the site is brownfield. Existing structures located in the site boundary, in proximity to Southleigh Farm, are set to be retained, whilst an existing structure accessed at the junction between Eastleigh Road and Southleigh Road is set to be demolished. Runoff generated by these existing impermeable structures may be intercepted, conveyed and discharged from the site via an existing private drainage network.

3.5 Geology and Hydrogeology

3.5.1 The British Geological Survey (BGS) Geology of Britain Viewer suggests that the site lies on bedrock of London Clay Formation, comprising clay, silt and sand, which is designated by the EA as an 'Unproductive' aquifer.

3.5.2 There are superficial deposits recorded across the majority of the site, comprising either River Terrace deposits, or Head deposits. The River Terrace Deposits are designated by the EA as a 'Secondary A' aquifer, and are located in southern and central parts of the site. Head deposits of clay, silt, sand & gravel are designated as a 'Secondary (undifferentiated)' aquifer, and are located along the corridor of the West Brook and in northern parts of the site.

3.5.3 A ground investigation was undertaken by Endeavour Drilling on behalf of Stantec, with a report produced in January 2024 (extract in **Appendix D**). The report confirmed the following:

- The site is predominantly overlain by clayey head deposits at shallow depths before reaching gravel head deposits.
- Infiltration testing was undertaken across the site. The results from this confirmed that the clayey head deposits would not be suitable for (shallow) infiltration features but that the gravel head deposits layers below yielded fast infiltration rates.
- Groundwater monitoring was undertaken between August and December 2023 to determine seasonal high groundwater levels on site. In August 2023, groundwater levels varied between 1.05m and 4.00m below ground level (bgl), but by November 2023 these were between 0.16m and 1.33m bgl.

3.5.4 DEFRA publishes indicative Groundwater Source Protection Zones (SPZs) for 2,000 groundwater sources such as wells, boreholes and springs used for public drinking water supply. The SPZs define areas where a range of human activities has potential to damage/pollute groundwater. Examination of the mapping shows that the majority of the site is located outside any SPZs, however the north-western part of the site is located within 'Zone I – Subsurface Activity' SPZ (see **Figure 007** in **Appendix A**).

3.5.5 The UK Soil Observatory (UKSO) online 'Soilscapes for England and Wales' viewer indicates that the soils on site comprise the following:

- Northern parts of the site: "*Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils*" (Soilscapes18);
- North-western parts of the site: "*Freely draining slightly acid loamy soils*" (Soilscapes 6); and
- The majority of the site (central and southern parts): "*Loamy soils with naturally high groundwater*" (Soilscapes 22).

4 Climate Change Impacts

4.1 Climate Change Allowances Overview

4.1.1 It is necessary to fully consider the potential impacts of climate change over the lifetime of new development. The applicable allowances to take into consideration are detailed in the 'Flood risk assessments: climate change allowances' planning guidance (see **Section 2.2**) and discussed in turn below.

4.2 Peak Rainfall

4.2.1 The potential increase in peak rainfall intensity needs to be considered in the surface water drainage strategy for new developments.

4.2.2 The EA climate change allowances guidance was updated in May 2022 to include a GIS based 'peak rainfall allowances' map showing the anticipated changes in rainfall intensity based on river management catchment. The anticipated changes in peak rainfall intensity in small catchments (less than 5km^2), or urbanised drainage catchments are summarised in **Table 4-1**. For large rural drainage catchments the peak river flow allowances are applied.

Table 4-1: Climate Change – Peak Rainfall Intensity Allowances

Arun and Western Streams Management Catchment	**Total potential change anticipated** (2070s epoch – i.e. 2061 to 2125)	
	Central	***Upper End***
3.3% (1 in 30-year) rainfall	*+25%*	*+40%*
1% (1 in 100-year) rainfall	*+25%*	***+45%***

4.2.3 As the development proposals are considered as having a design life of 100 years, a 45% climate change allowance will be assessed within the surface water drainage strategy discussed in **Section 8**.

4.3 Peak River Flow

4.3.1 The peak river flow allowances table provides a range of allowances based on percentile (i.e. the degree of certainty of an event occurring, based on the range of climate change scenarios assessed through scientific investigations). The provided allowances are also subject to the vulnerability classification of the proposed use and the river basin district of the site.

4.3.2 The site lies within the 'Arun and Western Streams' Management Catchment.

4.3.3 The conditions at the site and consequent peak river flow allowances to be considered as part of the FRA are as detailed in **Table 4-2**.

Table 4-2: Climate Change – Peak River Flow Allowances

Catchment	Flood Risk Vulnerability Classification	Total potential change anticipated for 2070-2115 (within 2080s epoch)		
		Central	Higher	Upper
Arun and Western Streams Management Catchment	More Vulnerable	**+25%**	+36%	+64%

4.3.4 The applicable fluvial climate change allowance for the proposed development is the 'Central' allowance of +25% (2080s epoch). As such, this has been considered in the fluvial modelling discussed in **Section 5.6**.

5 Assessment of Flood Risk

5.1 Sources of Flood Data

5.1.1 The assessment of flood risk has been undertaken based on the sources of information listed in **Section 1.2.**

5.1.2 The baseline flood maps discussed in **Section 5.2** have been taken from the Stantec GIS flood maps report in **Appendix A**, utilising the EA Open Data datasets available online and reproduced with OS mapping under licence to Stantec.

5.1.3 Stantec has completed a hydraulic modelling exercise to assess fluvial and surface water (pluvial) flood risk at the site, as outlined in **Section 5.6**.

5.2 EA Opendata Flood Maps

Flood Zone Map

5.2.1 The first phase in identifying whether a site is potentially at risk of flooding is to consult the EA's Flood Zone maps, available on the EA's website. This provides an initial indication of the extent of the Flood Zones. The Flood Zones are defined in Table 1 of the NPPF PPG ('Flood Risk and Coastal Change' section) as follows:

- **Flood Zone 1 'Low Probability'** – Land at less than 1 in 1000 (0.1%) annual probability of river or sea flooding;
- **Flood Zone 2 'Medium Probability'** – Land between 1 in 100 (1.0%) and 1 in 1000 (0.1%) annual probability of river flooding, or between 1 in 200 (0.5%) and 1 in 1000 (0.1%) annual probability of sea flooding;
- **Flood Zone 3 'High Probability'** – Land at 1 in 100 (1.0%) or greater annual probability of river flooding, or 1 in 200 (0.5%) or greater annual probability of sea flooding.

5.2.2 A copy of the latest EA Flood Map (2025) for the site is included in **Figure 5-1** and **Stantec Figure 004** in **Appendix A**. The EA provided a comprehensive update to the online Flood Map for Planning mapping service in March 2025 which utilises outputs from the updated National Flood Risk Assessment ('NaFRA2') outputs, for river/sea flooding as well as surface water. This national scale modelling exercise utilises improved national data and higher resolution mapping than previous iterations, providing an enhanced level of information where no local 'detailed' hydraulic modelling is available.

5.2.3 The majority of the site lies within Flood Zone 1, at 'Low' probability of river and sea flooding, and the areas of higher fluvial flood risk are limited to areas to the west and south of the site, with associated areas in Flood Zones 2 and 3 along the unnamed tributary to Nore Farm Stream. There is also an area of Flood Zone 2 and 3 associated with West Brook FAS to the east of the site.

5.2.4 The baseline (existing) fluvial flood risk on and adjacent to the site have been assessed in more detail as part of the Stantec baseline hydraulic modelling exercise, described in **Section 5.6**.

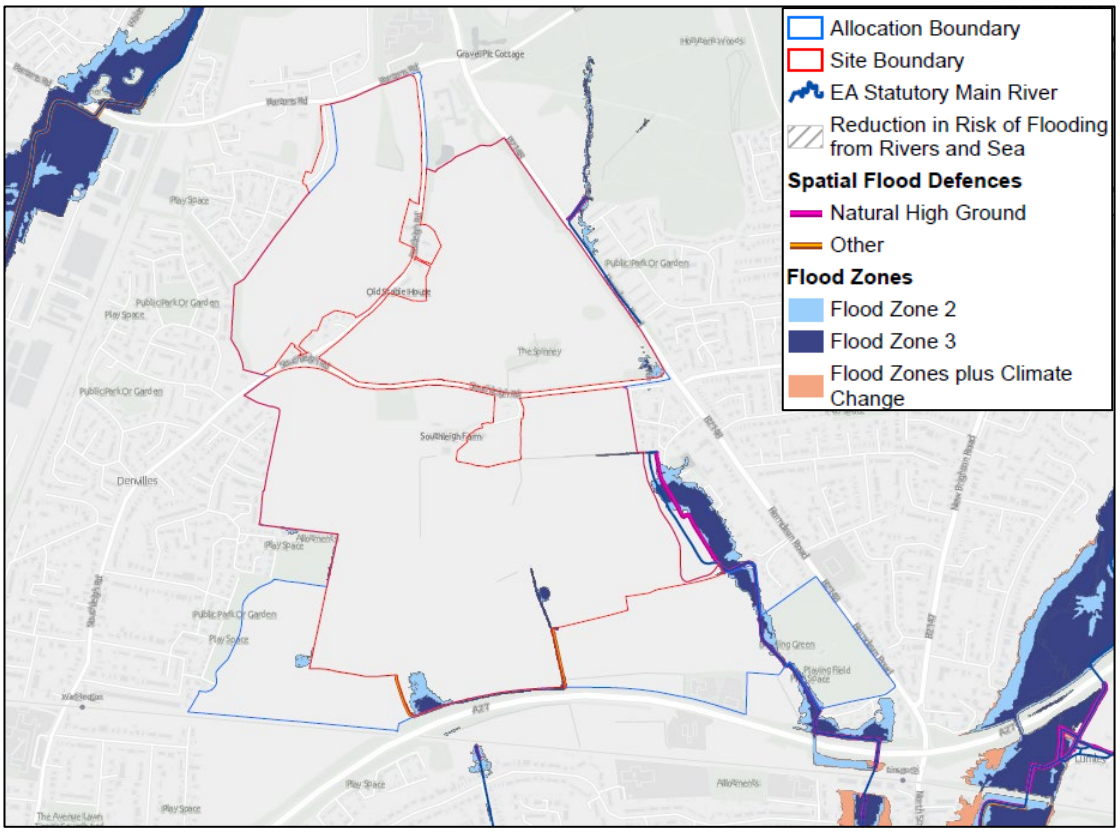

Figure 5-1: EA Flood Zone Map

Flood Risk from Surface Water

5.2.5 The EA 'Risk of Flooding from Surface Water' (RoFSW) mapping identifies areas that could be susceptible to surface water flooding in various rainfall events. The latest mapping assesses flooding resulting from severe rainfall events based on the following scenarios:

- 'High' Risk: 1 in 30 (3.3%) or greater AP rainfall event;
- 'Medium' Risk: Between a 1 in 100 (1%) and 1 in 30 (3.3%) AP rainfall event;
- 'Low' Risk: Between 1 in 1000 (0.1%) and 1 in 100 (1%) AP rainfall event;
- 'Very Low' Risk: Lower than 1 in 1000 (0.1%) AP rainfall event.

5.2.6 The surface water risk areas are presented on **Figure 5-2**; the majority of the site is at 'Very Low' risk of surface water flooding at less than a 1 in 1000 AP of flooding. However, there are some isolated areas of 'High', 'Medium' and 'Low' risk across the site as follows:

- Isolated low spots across the site associated with low-lying localised topographical depressions;
- In the north-west parcel of land with a flow route running north to south as well as an area of flooding in the south-west corner;
- A flow route running through the centre of the site from Southleigh Road, through Southleigh Farm and running east towards the West Brook; and,
- An area of surface water ponding along the southern site boundary along the unnamed tributary of Nore Farm Stream, located upstream of the A27.

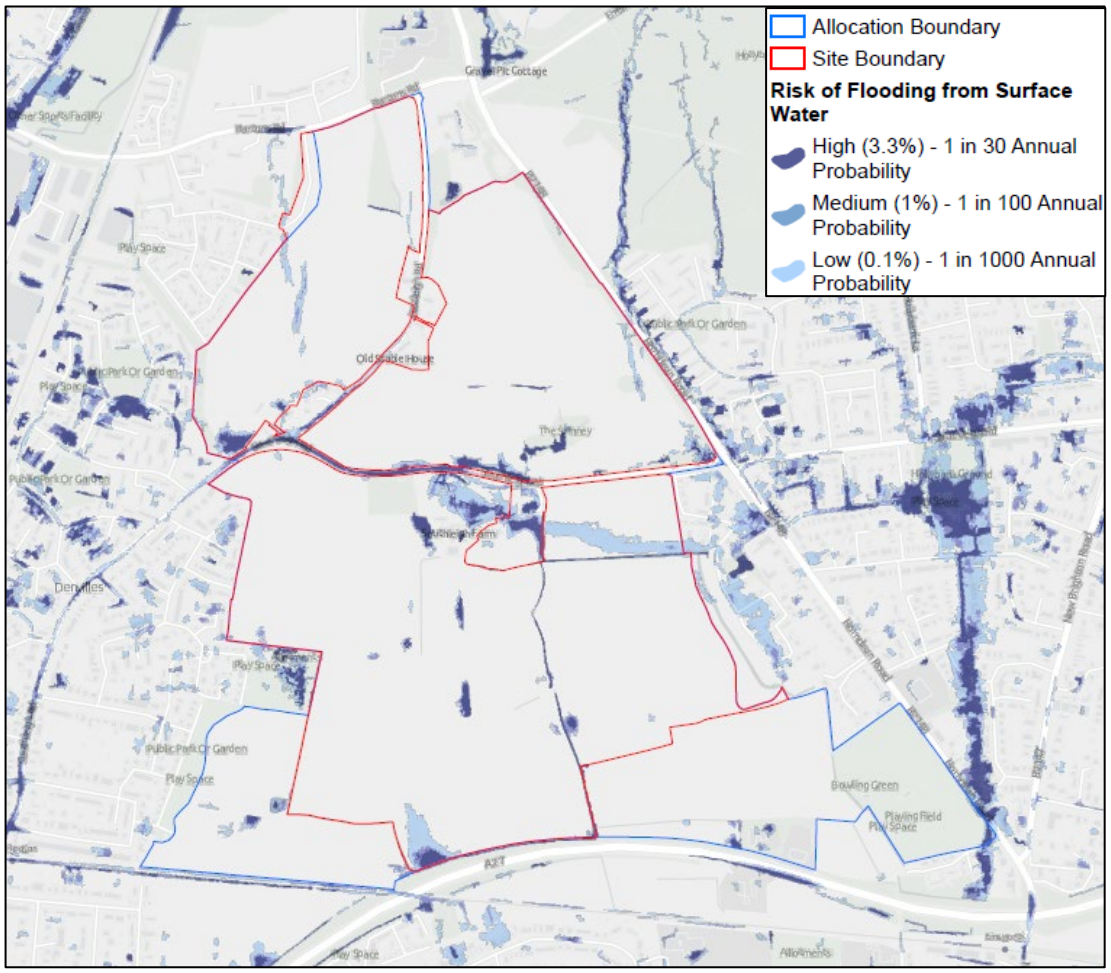

Figure 5-2: EA Surface Water Flood Map

5.2.7 It should be noted that the surface water maps are generated using a generic methodology on a national scale, whereby rainfall is routed over a ground surface model. The analysis does not typically take account of any specific local information on below-ground drainage infrastructure and infiltration, although an adjustment is included in urban are as to account for the impact of sewerage and a standard infiltration allowance based on soil type. Consequently, the mapping provides a guide to potentially vulnerable areas based on the general topography of an area.

5.2.8 The existing baseline surface water (pluvial) flood risk on and adjacent to the site has been assessed in more detail as part of the Stantec baseline hydraulic modelling exercise, described in **Section 5.6**.

Flood Risk from Reservoirs

5.2.9 The EA provides maps showing the risk of flooding in the event of a breach from reservoirs, based only on large reservoirs (over 25,000 cubic metres of water). The reservoir breach extents are captured in the baseline flood maps, which have been taken from the Stantec GIS flood maps provided in **Appendix A Figure 006**.

5.2.10 The EA reservoir maps show two flooding scenarios, a ‘dry-day’ and a ‘wet-day’. The ‘dry-day’ scenario predicts the flooding that would occur if the dam or reservoir failed when rivers are at normal levels. The ‘wet day’ scenario predicts how much worse the flooding might be if a river is already experiencing an extreme natural flood.

5.2.11 The online EA Flood Map for 'Flood Risk from Reservoirs' indicates that the entire site lies outside of both the 'wet-day' and 'dry-day' events (see **Appendix A**). Therefore, the risk of such flooding is considered to be negligible.

Historic Flood Extents

5.2.12 The EA 'Historic Flood Map' is a dataset showing the maximum extent of all individual recorded flood outlines from river, the sea and groundwater and shows areas of land that have previously been subject to flooding. A copy of the map is included in **Figure 007** of **Appendix A**.

5.2.13 The mapping indicates there is no record of historic flooding over the site. The EA has also confirmed via an initial data request in January 2023 that they "*do not hold any official recorded flooding history for this site or any neighbouring properties. Please be aware that our records are not comprehensive and may not include all events*."

5.2.14 Correspondence from HCC, dated 17th January 2023, also confirms that there have been no recorded incidences of flooding on site.

5.2.15 The responses from HCC and the EA are included within **Appendix D**.

5.3 Preliminary Flood Risk Assessment (PFRA)

5.3.1 The HCC PFRA (April 2011) highlights areas prone to 'Past Floods' and 'Future Floods', more specifically:

- PFRA Figure 11 shows the distribution of known flooding incidents across Hampshire. It should be noted, however, that this only shows known incidents of flooding and gives no indication of the severity of flooding.
- PFRA Figure 12 details 'areas susceptible to surface water flooding'; and,
- PFRA Figure 13 details Flood Map for Surface Water 1:200, and Localised Flooding Incidences.

5.3.2 Information contained within the above-mentioned figures have been reviewed as part of this study. There are no specific incidences of historic flooding on site and **Sections 5.2** and **5.6** provide a more up-to-date (and detailed) assessment of the current extent of surface water (pluvial) flooding, from the latest iteration of the EA RoFSW mapping.

5.4 Strategic Flood Risk Assessment (SFRA)

5.4.1 Information contained in the PfSH SFRA (Part 4 – Havant Borough Council, Final Report (Version 3), June 2024) has been reviewed as part of this study. Specifically, SFRA Figures 1 to 9 (pdf Maps) in Appendix A of the SFRA have been reviewed in terms of Flood Zones, historic flooding, risk of flooding from surface water, areas susceptible to groundwater flooding and flood warning areas.

Flood Zones

5.4.2 SFRA Figure 13 and Appendix B mapping contains details on current and future tidal/coastal flood risk and Flood Zones. The mapping confirms that the site lies wholly within Flood Zone 1 from tidal flooding in both the current and future scenarios, reconfirming that this is not a material risk to the site. This is further confirmed within HBC 'Building a Better Future' SFRA, dated February 2025, which states under site ref. BL05 – Southleigh, "*in tidal FZ1 now and in the future*".

5.4.3 The SFRA mapping, shown in **Figure 5-3** below, indicates areas of higher fluvial flood risk are limited to the west and south of the site as denoted by the areas of Flood Zone 2 'Medium Probability' and Flood Zone 3 'High Probability'.

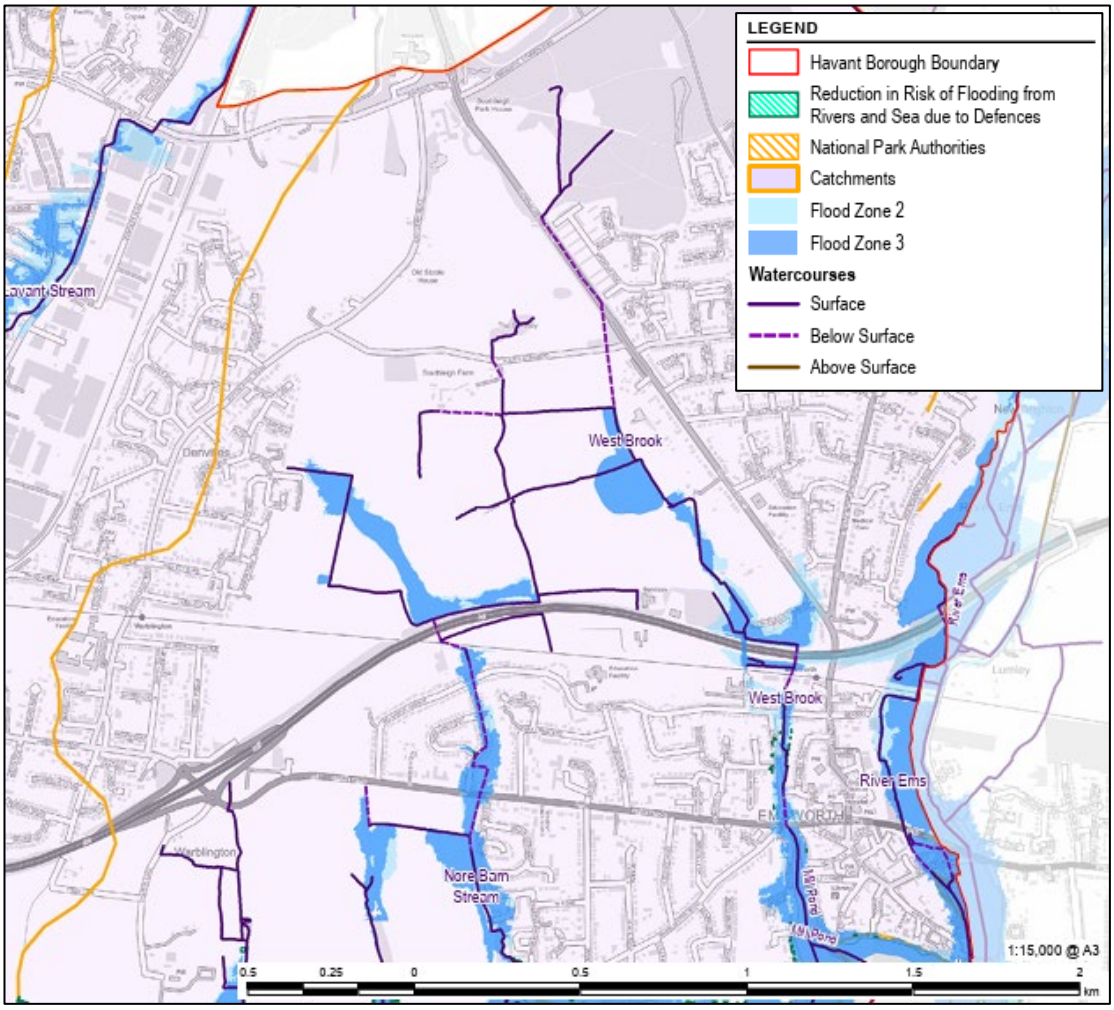

Figure 5-3: SFRA Flood Zone Map

5.4.4 It is notable that this shows more extensive areas of Flood Zone 2 and 3 that the latest iteration of the EA Flood Zone map in **Section 5.2**, particularly in the south-west corner where a diagonal overland flow cuts across part of the site which is not shown on the latest, more detailed, iteration of the Flood Zone map produced as part of the NaFRA update (see **Figure 5-1**).

5.4.5 While it is anticipated the SFRA will be updated in due course to relate to the new EA mapping, this overland flow route was considered as part of the detailed Stantec modelling discussed further in **Section 5.6**.

Risk of Flooding from Surface Water

5.4.6 The SFRA Surface Water Flood Map was generated based on an earlier iteration of the EA RoFSW mapping but corresponds with the general pattern of risk areas and flow paths shown on the EA maps described in **Section 5.2**, similarly indicating the majority of the site is at 'Very Low' risk of surface water flooding, at less than a 1 in 1000 AP of flooding.

5.4.7 However, there are some limited areas of higher risk which are broadly consistent with the latest EA RoFSW mapping discussed in **Section 5.2**.

Historic Flooding

5.4.8 The SFRA mapping is consistent with the EA 'Recorded Flood Outlines' described in **Section 5.2**, with no recorded incidences of flooding over the site.

Groundwater Flooding

5.4.9 Figures 4 and 5 within Appendix A of the SFRA mapping provides 'Areas Susceptible to Groundwater Flooding (EA)' and 'Susceptibility to Groundwater Flooding (BGS)' data sets, respectively. Both figures have been reviewed as part of this study and summarised below:

- Area Susceptible to Groundwater Flooding (EA) – majority of the site located within an area defined as >=75% susceptible to groundwater flooding; and
- Susceptibility to Groundwater Flooding (BGS) – majority of the site located within an area of '*potential for groundwater flooding to occur at surface*'.

5.4.10 It should be noted that there is no agreed national scale approach to modelling groundwater flood risk at the current time, and all the referenced mapping reiterates that they are a screening tool to identify areas '*potentially susceptible'* to such flooding based on topography and underlying ground conditions. As such, the emphasis is on obtaining site-specific information through intrusive investigations to accurately determine the groundwater conditions, so that development can be designed accordingly (see **Section 3.5**).

EA Flood Warning Areas

5.4.11 Figure 9 within Appendix A of the SFRA mapping details EA 'Flood Warning Areas' data set. There are no Flood Warning Areas located on site but the following areas are located south of the A27:

- West Brook at Emsworth; and,
- Langstone and Emsworth.

5.5 Flood Risk from Groundwater

5.5.1 As outlined in **Section 3.5**, a ground investigation was undertaken by Endeavour Drilling, with a report produced in January 2024. Groundwater monitoring water carried out as part of the investigation, between August and December 2023, to determine seasonally high groundwater levels on site. Extracted data from this report is included within **Appendix D**.

5.5.2 Groundwater elevations are generally shallower in southern parts of the site and also when in close proximity to nearby watercourses, which suggests that groundwater levels are broadly in hydraulic continuity with nearby watercourses across the area of the proposed development. Due to the proximity of each watercourse crossing through the proposed development area, any groundwater flooding would likely occur concurrently with fluvial flooding.

5.5.3 Therefore, the overall risk from groundwater flooding is considered to be 'low'. Further details on groundwater flooding from the SFRA are included in **Section 5.4**.

5.6 Stantec Fluvial and Pluvial Modelling

5.6.1 Stantec has completed a hydraulic modelling exercise to assess river (fluvial) and surface water (pluvial) flood risk at the site, as the EA Flood Zones for the site and surrounding area are predominantly based on national scale hydraulic modelling. Therefore, the published Flood Zones are not considered sufficient to provide a full understanding of the flood risk to the proposed development.

5.6.2 Details of the hydraulic modelling are provided in a separate report Ref. 332310755, Rev A, 02/04/26, included in **Appendix C**, with an overview provided below.

5.6.3 The hydraulic modelling exercise on site included the following:

- Collection of watercourse and structure survey data to inform the development of the hydraulic model of the Nore Farm Stream, West Brook and unnamed watercourses on site. The survey data was collected in accordance with the latest EA National Survey Specification at the time of the survey.
- A hydrological assessment of the catchment using FEH Statistical and ReFH2 methods to provide inflow hydrographs and rainfall to the hydraulic models.
- A site-specific 1D-2D hydraulic model was constructed, using the industry standard TUFLOW-ESTRY software packages, to assess fluvial and surface water flood risk.
- The hydraulic modelling report was produced to inform flood risk to the site, confirm the model outputs, and outline any measures required to mitigate the risk to the development from fluvial or surface water flood risk, while demonstrating nil detriment elsewhere.

Baseline Fluvial Modelling Results

5.6.4 The hydraulic model was run for the 1 in 30, 1 in 100 and 1 in 1000 AP present day events.

5.6.5 It was also run for the 1 in 100 AP +25% (Central – design event) and +36% (Higher) climate change allowances (2080s epoch – 'Arun and western Streams Management Catchment') for the summer storm. These events have been selected to understand the impacts of climate change over the lifetime of the development.

5.6.6 Flood extents for the 1 in 100 AP and 1 in 1000 AP are presented against the previously published Flood Zones (and those still presented in the SFRA) Flood Zones 3 and 2 shown in **Figure 5-4**. As noted in **Section 5.5**, the latest EA Flood Zones (updated March 2025) show a reduced area of flooding over the site so this appraisal is considered against the more precautionary previous mapping, which were applicable at the outset of the modelling work.

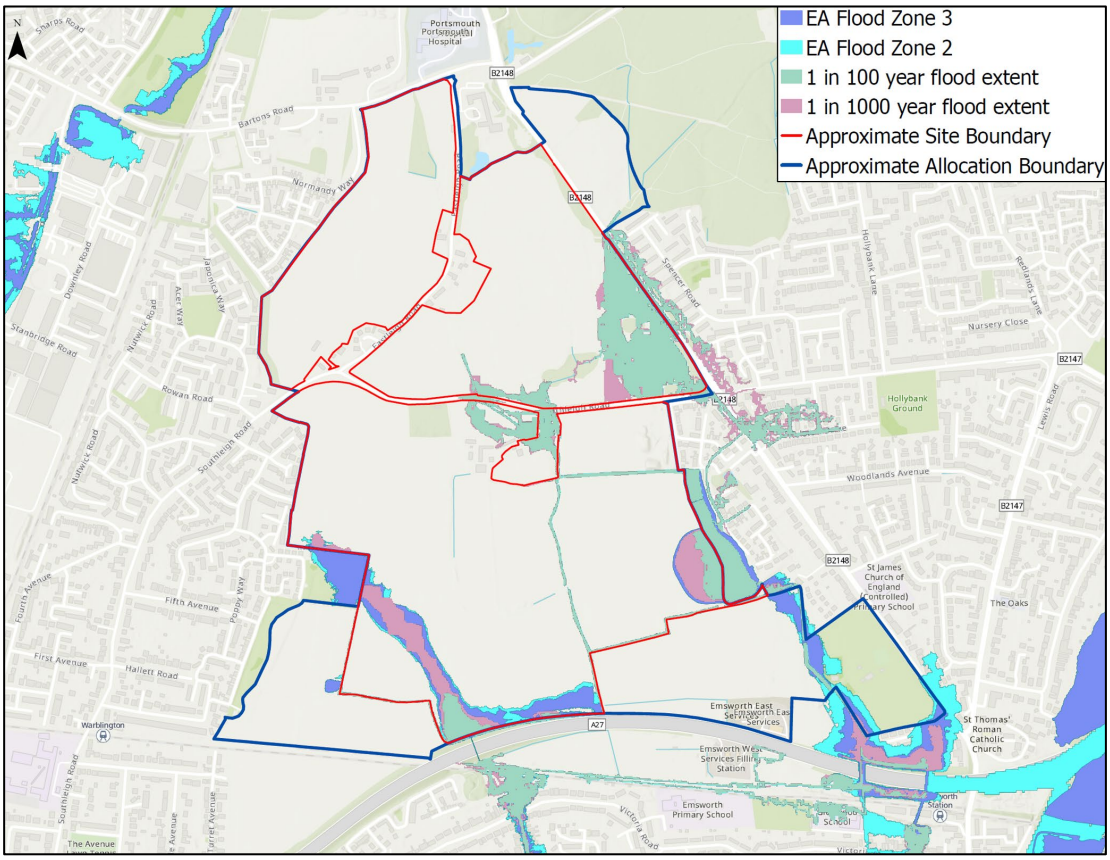

Figure 5-4: Flood Zone comparison against modelled results – Fluvial Model

5.6.7 The maximum modelled depths for the 1 in 100 AP +25% climate change allowance event are shown in **Figure 5-5**, along with the location where depth and level results have been extracted from the 2D flood extent.

5.6.8 **Table 5-1** shows the maximum depth results for key locations at the site of interest. Although there are some localised areas at great depths, such as upstream of the A27 (near the Nore Farm stream), in the central area of the site near Southleigh Road and the West Brook FAS, overall, the results demonstrate that most of the flood flow routes over the site are shallower than 0.15m.

5.6.9 Further details are provided within the hydraulic modelling included in **Appendix C**, and this modelling will be further refined for the detailed design/reserved matter applications to incorporate further detail on proposed elements, but a summary of the baseline modelling results is provided below:

- The comparison between the modelled extents and the SFRA Flood Zones demonstrates that modelled flood extents along both the West Brook and Nore Farm Stream are smaller than the SFRA Flood Zones;
- The Nore Farm Stream flow route that runs in a south-easterly direction to the A27 is significantly reduced in flood extent. In the case of the West Brook, the modelled extents are only slightly reduced;
- The model results show that, for both the model developed in this study and the SFRA Flood Zones for the 1 in 100 AP event, there is flooding at the Nore Farm Stream upstream of the A27 and along West Brook within the FAS. However, the flow path running in a westerly direction from the unnamed tributary to Nore Farm Stream (parallel to the A27) is not present;

- The modelled extents are larger than the SFRA Flood Zones in the centre of the site at Southleigh Road and Horndean Road. This is due to the SFRA Flood Zones not taking into account the smaller watercourses and ditches on site and therefore the detailed model results are considered more robust due to the use of site specific data;

- In extreme events, such as the 1 in 1,000 AP event, flood flows associated with the modified watercourses in central and south-western parts of the site do not remain in bank, but follow natural overland flow routes, dictated by existing topography.

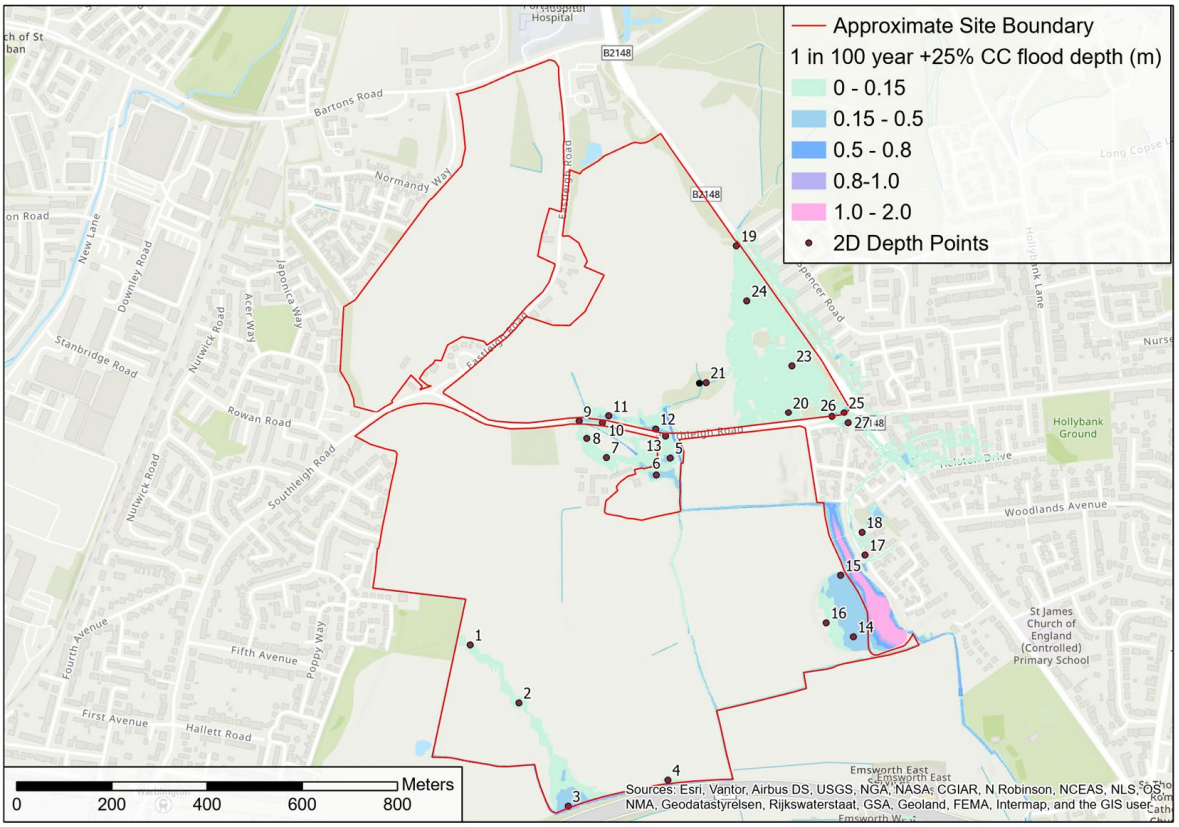

Figure 5-5: Maximum depth map for 1 in 100 year plus 25% climate change event - Fluvial Model

Table 5-1 Maximum depth for 2D flood extent (m)

ID	1 in 30 year (AP)	1 in 100 year	1 in 100 year +25% CC	1 in 100 year +36% CC	1 in 1000 year
1	0.00	0.00	0.00	0.01	0.02
2	0.00	0.00	0.00	0.01	0.02
3	0.39	0.42	0.43	0.44	0.48
4	0.00	0.03	0.05	0.05	0.09
5	0.32	0.33	0.33	0.33	0.34
6	0.23	0.26	0.29	0.30	0.33
7	0.00	0.01	0.01	0.01	0.02
8	0.00	0.00	0.00	0.00	0.00
9	0.25	0.26	0.26	0.26	0.27
10	0.11	0.11	0.12	0.12	0.13
11	0.30	0.31	0.32	0.32	0.33
12	0.30	0.30	0.31	0.31	0.32
13	0.03	0.03	0.04	0.04	0.04
14	0.00	0.15	0.38	0.47	0.67
15	0.00	0.13	0.35	0.44	0.65
16	0.00	0.00	0.01	0.10	0.31
17	0.04	0.05	0.06	0.06	0.06
18	0.00	0.00	0.00	0.01	0.01
19	0.01	0.01	0.02	0.02	0.02
20	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.03	0.05
23	0.01	0.01	0.01	0.01	0.02
24	0.00	0.00	0.00	0.00	0.00
25	0.33	0.34	0.34	0.35	0.35
26	0.50	0.50	0.51	0.51	0.52
27	0.25	0.27	0.28	0.29	0.30

Sensitivity Testing – Nore Farm Stream Overland Flow Route

5.6.10 A sensitivity test was carried out to understand the impact of mitigating the small overland flow overtopping the left bank of the Nore Farm Stream, in the 1 in 100 AP +25% climate change event. The floodwater is shown to spill out on the left (east) bank of the channel at a local low point, and it flows broadly in a south-east direction, joining flooding upstream of the A27.

5.6.11 This flow route only occurs in events exceeding the modelled present day baseline 1 in 100 fluvial event.

5.6.12 The baseline modelling confirmed that the overland flow was very shallow, at 0.01m depth in the 1 in 100 AP plus climate change event and 0.02m depth in the 1 in 1,000 AP event. Interrogation of the results further confirmed the overland flow was a negligible - in the order of 2l/s.

5.6.13 To mitigate this, the left bank ground levels were fixed in the model to a minimum level of 13.1mAOD. In addition, the channel for this section of watercourse has been widened from the

bed level to bank level by 0.5m on the site side (otherwise retaining the bank slope), to ensure there is significant surplus channel capacity to allow for the small increase in in-channel flow.

5.6.14 This channel modification revision was run for the fluvial design event. The change in flood extent is demonstrated in **Figure 5-6** below and the results demonstrate that mitigating this flow route has a local reduction (up to 70mm) in flood levels in the Nore Farm Stream, with no increase in flooding. No change in flood level is encountered in the area of flooding upstream of the A27 (where the overland flow route rejoins) or beyond the site.

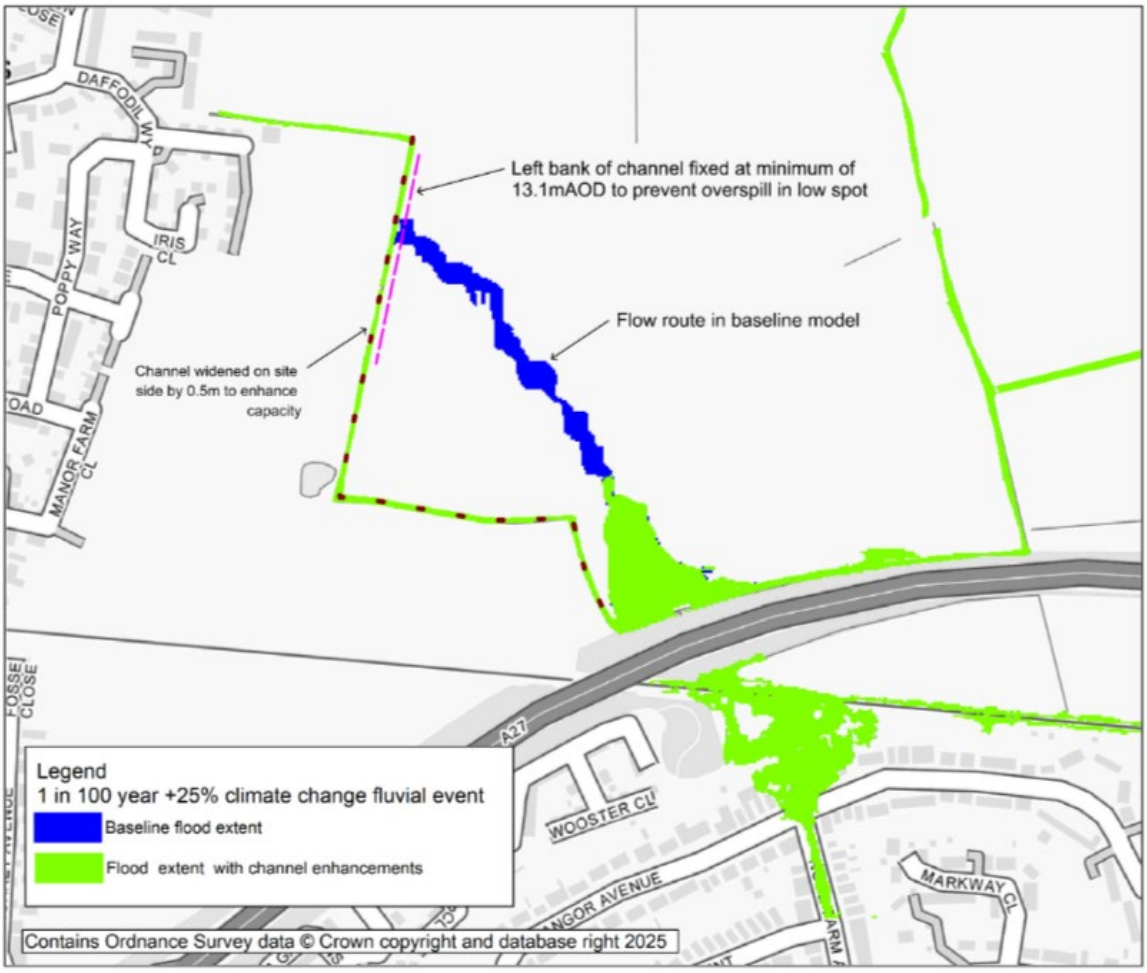

Figure 5-6: Sensitivity testing - Nore Farm Stream - 1 in 100 year +25% CC event – Fluvial Model

5.6.15 Further analysis to consider revisions to the local widening of the Nore Farm Stream will be carried out at detailed design stage, as required.

Surface Water Hydraulic Modelling Results

5.6.16 The 1D and 2D surface water (pluvial) hydraulic model was developed using the fluvial model as a basis. Full details on the amendments made to the model in order to convert the fluvial model build to a surface water model are provided within the hydraulic modelling report Ref. 332310755, Rev A, 02/04/26 in **Appendix C.** A summary of the baseline modelling approach is provided below:

- The surface water model was run using TUFLOW version 2023-03-AC-iDP-w64 which is the latest version of software at the time of model build. A ‘Double precision’ approach was utilised, as the recommended approach for surface water models.

- This model represents the risk of surface water flooding associated with the catchments draining to the site including the Nore Farm Stream and the West Brook.
- The model has been run for a range of present day and climate change scenarios. The events assessed are:
  - 1 in 30 AP annual probability;
  - 1 in 30 AP plus 40% annual probability;
  - 1 in 100 AP annual probability;
  - 1 in 100 AP plus 45% annual probability;
  - 1 in 1000 AP annual probability

5.6.17 As out of bank fluvial flooding does not impact the site beyond localised areas along the river channels, the surface water modelling results have been used to inform peak flood levels across the wider site where fluvial flood extents are not applicable (e.g. in the northern parcel of land).

5.6.18 The comparison between the modelled extents and the EA RoFSW 1 in 100 AP event at the site shown in **Figure 5-7**; note these are based on the previous iteration of the RoFSW (i.e. pre-January 2025 update) as these were the applicable reference data when the modelling was being undertaken. The comparison demonstrates that the modelled extents show a smaller flood extent in the central area of the site with no flow route running north-west to south-east from a field drain, south of Southleigh Road. Similarly to the fluvial scenario, in extreme rainfall events flood flows in the central and south-western parts of the site follow natural overland flow routes, dictated by existing topography, rather than the existing watercourse channels.

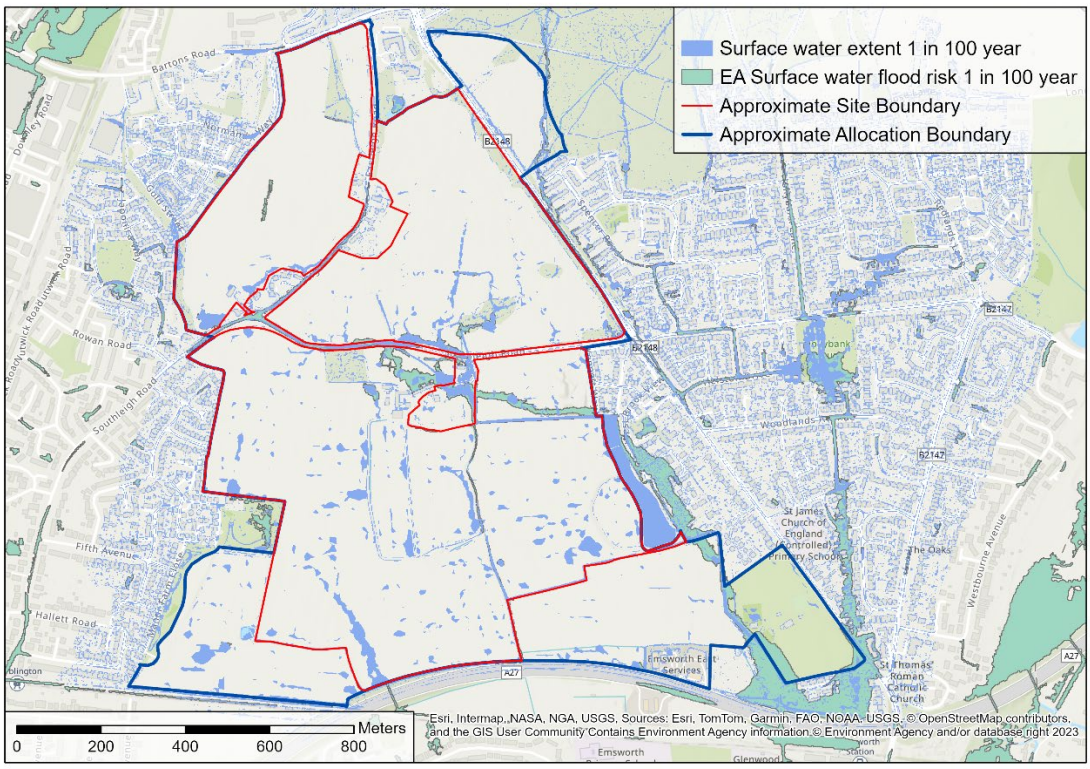

Figure 5-7: Comparison - EA RoFSW and Stantec modelled surface water extents - 1 in 100 year

5.6.19 Further details are provided within the hydraulic modelling report in **Appendix C**; however, a summary of the baseline modelling results is provided below:

- The results demonstrate that the majority of the main flow routes on site are less than 0.15m deep. There are some areas with flood depths greater than 0.15m within the site boundary including upstream of the A27 near the Nore Farm stream, in the central area of the site near Southleigh Road, in the northeast of the site where Southleigh Road joins Horndean Road and the northern parcel in the south west corner.
- There is an increase in flood extent for the Nore Farm Stream flow route and the West Brook food extent is not aligned with the RoFSW extent. In the northern parcel there is a larger extent in the southwest with no ponding in the centre of the northern parcel.
- Throughout the site there are areas of ponding not found in the RoFSW extent. This can be explained by the RoFSW mapping using a broad scale modelling grid, where the channel capacity is not well represented and does not directly represent culvert and bridge structures. In the case of the West Brook, the modelled extents do not match the RoFSW map as this extent predates the construction of the FAS.
- The model results from this study are considered more representative of the flood risk than the published EA surface water mapping, as this model is more detailed including the use of site-specific data for both the hydrological assessment and hydraulic model build.

5.7 Sewer Flood Risk

5.7.1 The PfSH SFRA; Part 4 – Havant Borough Council, Final Report (Version 3), released in June 2024, states the following in relation to sewer flooding:

> *"Sewer flooding is defined by Southern Water as incidents caused by an escape of water and sewage from a public sewer due to a blockage, sewer collapse, rising main burst, equipment failure or from too much water entering the system. Sewer flooding does not include extreme storms with a probability of occurring of less than once in 20 years. In their Drainage and Wastewater Management Plans, Southern Water have recorded incidents of internal and external flooding between 2018-2020 within Budds Farm.*
>
> *Records of flooding recorded by Southern Water (included in Appendix A Figure 2) show eight events to have taken place to the south of Hayling Island, and more than 50 events on the mainland. Most of these events are centred around Havant town and Emsworth, with another cluster to the northwest."*

5.7.2 Appendix A Figure 2 of the PfSH SFRA does not contain any records of sewer flooding on site.

5.7.3 Southern Water (SW) asset plans contained within Appendix D of the hydraulic modelling report, included in **Appendix C**, show a number of surface water and foul water assets offsite and around the periphery of the site, associated with existing residential areas to the east and south.

5.7.4 There is a 150mm foul water sewer located within the northern part of the site, which flows broadly in a south-west to west direction. Any potential leakage would subsequently be discharged downslope directly into the existing on site drainage system and subsequently West Brook watercourse east of the site, and utility organisations would subsequently repair the broken pipes in the event of flooding.

5.7.5 Therefore, the overall risk of sewer flooding is considered to be 'low'.

5.8 Other Sources of Flood Risk

5.8.1 Current guidance and policy outlines that all sources of flood risk should be considered, including flooding from water supplies and other water retaining infrastructures, canals, water (potable) supply etc. It has been considered that there are no other known sources that would pose a flood risk to the site.

5.9 Summary of Flood Risk

5.9.1 Table 5-2 provides an overview of flood risk to and from the site, based on the information obtained and detailed in this section.

Table 5-2: Summary of Sources of Flood Risk

Source of Flooding	Flood Risk Impact to the Site	Comment/Justification	Mitigation requirements for new development
Tidal		HBC SFRA (2025) states the site is "*in tidal FZ1 now and in the future*".	n/a
Fluvial		The majority of the site lies within Flood Zone 1, at 'low' risk of flooding with areas of Flood Zone 2 & 3 located to the east and southwest associated with the unnamed watercourses which drains to either the Nore Farm Stream or West Brook. Fluvial hydraulic modelling demonstrates that modelled extents show a smaller flood extent when compared to the SFRA mapping, and the majority of major overland flow routes on site are less than 0.15m deep in the 1 in 100 year plus climate change event.	All new development will be located within Flood Zone 1 and finished floor levels will be raised above the design event.
Surface Water/ Pluvial		The site is primarily at 'Very Low' risk of surface water flooding at less than a 1 in 1000 year rainfall event. However, there are areas of 'High', 'Medium' and 'Low' Risk associated with flow routes in the northwest parcel of land, through the centre of the site (towards West Brook) and an area of ponding I the south of the site (upstream of the A27). Surface Water (Pluvial) hydraulic modelling demonstrates that modelled extents show a smaller flood extent when compared to the EA mapping, and also that the majority of the major flow routes on site are less than 0.15m deep in the 1 in 100 year plus climate change event.	Implementation of an appropriate surface water drainage (SuDS) strategy to manage surface water runoff up to the design event.
Groundwater		Groundwater elevations generally shallower in southern parts of the site and when in close proximity to nearby watercourses, which suggests that groundwater levels are in hydraulic continuity with nearby watercourses. Due to the proximity of each watercourse crossing through the proposed development area, any groundwater flooding would likely occur concurrently with fluvial flooding.	Finished floor levels will be raised above existing ground levels and contoured to fall away from building thresholds to mitigate against any residual risk of flooding.
Sewers and Water Mains		SFRA shows no records of sewer flooding on site. One 150mm foul sewer located in the northern part of the site but no other SW assets on site.	Provision of adequate on-site surface water attenuation.
Artificial/ other Sources		The site is not at risk of flooding from canals or any other artificial sources.	n/a
Key:		**Low/Negligible Risk** – No noticeable impact to or from the Site and not considered to be a constraint to development	
		Medium Risk – Issue requires consideration but not a significant constraint to development	
		High Risk – Major constraint to development requiring active consideration in mitigation proposals	

5.9.2 The subsequent **Sections 7** and **8** outline the required mitigation to manage the flood risk impacts identified to have a medium or high risk (see **Table 5-2**). There is a predominantly low flood risk related to all other sources, as detailed in **Table 5-2**. The management of residual flood risk is covered in **Section 9**.

6 Proposed Development and Sequential Approach

6.1 Proposed Development

6.1.1 This FRA supports the outline planning application, which will be submitted with the following development proposed:

> "*Outline planning permission (all matters reserved except for access) for up to 1,800 new homes, public open space, landscaping and associated infrastructure.*"

6.1.2 The proposed development site lies within a larger draft allocation site known as 'Southleigh Broad Location' or 'Southleigh strategic site' (ref. BL5 – 'Strategic Housing and economic Land Availability Assessment (SHELAA)', HBC, December 2024), with a Gross Site Area of 146.32 ha for residential development of up to 2,100 units (1,650 during the plan period).

6.1.3 All proposed residential housing, primary school and early years development will be located wholly within Flood Zone 1 post development (**Figure 6-1**).

6.1.4 Proposed surface water drainage (SuDS) infrastructure will be located within areas adjacent to existing watercourses, but outside the fluvial floodplain in accordance with planning guidance.

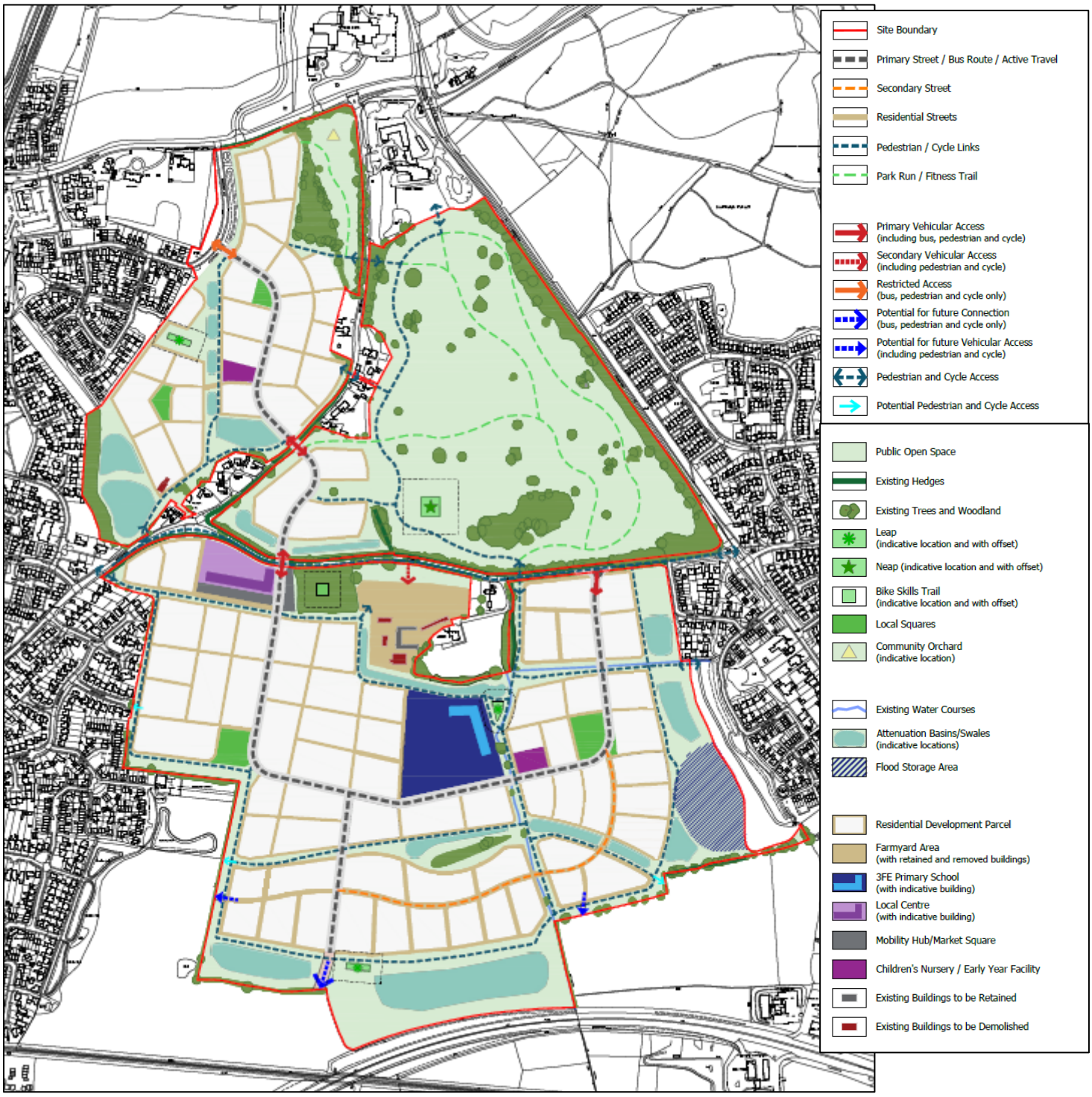

Figure 6-1: Proposed Concept Site Layout extract

6.1.5 A copy of the Indicative Concept Plan by Stantec (Drawing Number 333101046 BL-M-01 H) is contained in **Appendix E** (**Figure 6-1**).

6.1.6 The proposed mitigation is based on a design life for the development of 100 years, and the climate change allowances described in **Section 4** are also based on this assumption.

6.2 Flood Risk Vulnerability

6.2.1 NPPF PPG 'Flood Risk and Coastal Change' Table 2 confirms the 'Flood risk vulnerability classification' of a site, depending upon the proposed usage. This classification is subsequently applied to PPG Table 3 to determine whether:

- The proposed development is suitable for the Flood Zone in which it is located, and;
- Whether an Exception Test is required for the proposed development.

6.2.2 The proposed residential, primary school & early years development is all classed as 'More Vulnerable' development. The Local Centre and Mobility Hub/Market Square would be classified as 'Less Vulnerable' development.

6.2.3 The location of the proposed 'More Vulnerable' development is predominately within Flood Zone 1 (**Figure 6-1**) and within a 'very low' surface water flood risk area, and is therefore appropriate.

6.3 NPPF Sequential Approach

6.3.1 The NPPF follows a sequential risk-based approach in determining the suitability of land for development in flood risk areas, with the intention of steering all new development to the lowest flood risk areas.

6.3.2 The Sequential Test is a planning exercise to consider whether there are 'reasonably available' alternative sites at lower probability of flooding that would be suitable for the existing development.

6.3.3 The site is known as 'Southleigh' (ref. BL05) within the 'Strategic Flood Risk Assessment - Local Plan Sites' (HBC, February 2025), designated as a 'Higher Risk' Group 2 site, but recommended for allocation, stating:

> "*The site represents the only significant site in the borough for the comprehensive development of a new community of more than 2000 dwellings. Development of this scale brings with it the opportunity for comprehensive development with substantial sustainability gains not only through significant housing delivery, but associated infrastructure, such as a new local centre, school and significant amounts of greenspace which will be accessible to the wide community. While the areas at risk are significant in size, given the significant size and scale of this strategic site, it is considered that it will be possible to take a comprehensive approach to flood risk on the site, and that it will be possible to avoid areas at risk on site for development.*"

6.3.4 The proposed residential, primary school & early years land use are classed as 'More Vulnerable' development, while the local centre and market square would be 'Less Vulnerable'. Other infrastructure - e.g. SuDS and public open space - would be 'Water-compatible'.

6.3.5 A sequential approach has been applied in developing the masterplan, in accordance with national and local planning policy, such that the location of the proposed 'More Vulnerable' development be limited to areas of 'low' risk from all sources of flooding post development (e.g. Flood Zone 1) – i.e. where all forms of development are considered acceptable.

6.3.6 The mitigation measures proposed in **Section 7** demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

7 Flood Mitigation Strategy

7.1 Sequential Approach

7.1.1 The NPPF encourages the application of the 'sequential approach' in the master-planning process for new development, i.e. locating the more sensitive/vulnerable elements of new development in the areas which lie at lowest probability of flooding and, conversely, reserve the areas of the site at greatest risk of flooding for the least vulnerable elements of the development (or, preferably, leave such areas undeveloped or as soft landscaping).

7.1.2 The proposed development site lies within a larger draft allocation site known as 'Southleigh Broad Location' or 'Southleigh strategic site' (ref. BL5 – 'Strategic Housing and economic Land Availability Assessment (SHELAA)', HBC, December 2024), with a Gross Site Area of 146.32 ha for residential development of up to 2,100 (1,650 during the plan period).

7.1.3 The location of proposed 'More Vulnerable' development is limited to Flood Zone 1 and areas of 'low' risk from all other sources of flooding, therefore following a sequential approach.

7.2 Building Floor Levels

7.2.1 Standard requirements for ground floor levels of new development are set out in BS8533:2011 'Assessing and Managing Flood Risk in New Development – Code of Practice'.

7.2.2 The PfSH SFRA; Part 4 – Havant Borough Council, Final Report (Version 3), June 2024 also recommends the following:

> "*Where developing in Flood Zone 2 and 3 is unavoidable, the recommended method of mitigating flood risk to people, particularly with More Vulnerable (residential) and Highly Vulnerable development types (as outlined in Table 2 of the PPG), is to ensure internal floor levels are raised a freeboard level above the design flood level including an appropriate allowance for climate change. For fluvial flooding, the design flood is the 1% AEP (1 in 100 year) event, and for tidal flooding it is the 0.5% (1 in 200 year) AEP event. Less Vulnerable development should also aim to raise floor levels. Where this is not achievable, flood resilience measures should be incorporated to make up the shortfall (refer to Section 7.8). These measures should be detailed within the FRA.*
>
> *[…]*
>
> *With reference to the 'Flood risk assessment: standing advice for flood risk', finished floor levels should be a minimum of whichever is higher, 300mm above the general ground level of the site or 600mm above the estimated river or sea flood level*."

7.2.3 As such, where there is a risk of fluvial flooding (i.e. within 50m of any watercourses/river floodplain extent) then FFLs for development at risk of fluvial flooding will be set a minimum of 600mm above the local 1 in 100 AP plus climate change modelled fluvial flood level.

7.2.4 FFLs for all parcels will also be raised a minimum of 300mm above general proposed ground levels, unless DDA requirements specify otherwise, to mitigate the risk of water ingress in a severe rainfall event.

7.2.5 As noted within **Section 5.6**, the majority of the major flow routes on site, for both fluvial and surface water (pluvial), are less than 150mm deep for the 1 in 100 AP plus climate change event.

7.3 Safe Access and Flood Warnings

7.3.1 It is necessary to consider and incorporate safe access arrangements as part of the mitigation, to ensure the users/occupants of the development are safe in times of flooding.

7.3.2 Consideration of the safety of any pedestrian route has been based on the guidance in the EA document '*Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purpose – Clarification of the Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1'*.

7.3.3 The 'hazard to people' classification has four ratings:

- Very low hazard – caution (Flood Hazard Rating ('FHR') less than 0.75)
- Danger for some – i.e. children, the elderly and infirm (FHR between 0.75 and 1.25)
- Danger for most – includes the general public (FHR between 1.25 and 2.0), and
- Danger for all – includes the emergency services (FHR greater than 2.0).

7.3.4 Access and egress via the primary street/vehicular access into the development (from Southleigh Road - to the west) will be located wholly within Flood Zone 1 at levels above the 1 in 1,000 AP event and thus will have continuous access to land entirely outside of the floodplain.

7.4 Channel Restoration & Improvements

7.4.1 At the detailed design stage, channel restoration and re-naturalisation options will be explored in order to manage post-development overland flow routes.

7.4.2 This will provide flood mitigation in addition to improvements and wider connection for landscape and ecology, restoring the surface water network to a more natural state whilst reducing flood risk to receptors both on and off site.

7.4.3 More specifically, opportunities and options will consider two-stage channels, improved channel morphology & sinuosity, and other 'soft' engineering or nature based solutions, delivering multiple benefits.

7.5 Floodplain Storage

7.5.1 No built development is proposed within the floodplain and therefore no floodplain storage compensation is required. All built development will be located in Flood Zone 1 and this will be confirmed at the detailed design stage through completion of post-development hydraulic flood modelling.

7.5.2 There will be no built development within Flood Zones 2 & 3; only SuDS features and soft landscaping at existing topographical elevations, subject to detailed design.

7.6 Watercourse Crossings for Access

7.6.1 The culverting of ordinary watercourses on site might be required in order to facilitate access or to allow highways/infrastructure to cross. The HCC 'Guide to Ordinary Watercourse Consenting' document is available at:

https://documents.hants.gov.uk/flood-water-management/guide-to-ordinary-watercourse-consenting.pdf

7.6.2 The above document states:

> "*All works which affect the capacity and flow of a watercourse require consent. […]*
>
> *The replacement of ditches with pipes* (or culverts) *will not be accepted unless there is no alternative due to the adverse ecological, flood risk, human safety and visual impact*."

7.6.3 Clear span structures will be prioritised at the detailed design stage, as these features would be the preferred option of both the EA and LLFA, and the appropriate Ordinary Watercourse Consent will be obtained at the appropriate stage of design.

7.7 Flood Risk Activity Permit Requirements

7.7.1 Proposed works in, over, under or near a main river or a flood defence require a 'Flood Risk Activity Permit' (FRAP) application to be made to the EA. This is required to demonstrate any new development does not have a detrimental impact on flood risk, either through impacting the integrity of the existing defence or through preventing maintenance access to the defence.

7.7.2 Any activity within 8 metres of the bank of a main river, or within 8 metres of any flood defence structure or culvert on a main river, will require a FRAP.

7.7.3 Separate consent from HCC, as LLFA, is required for development or any works within existing channels that may impact on minor and ordinary watercourses within and adjacent to the site.

8 Surface Water Management Strategy

8.1.1 As of April 2015, the Lead Local Flood Authority (LLFA) has become a statutory consultee on planning applications for surface water management. As the LLFA, HCC are therefore responsible for the approval of surface water drainage systems within new major development.

8.1.2 The surface water drainage proposals for the site are presented in an indicative outline surface water drainage plan shown in **Figure 8-1**, drawing SRH-STN-HDG-XX-DR-CD-0001-P04 within **Appendix F**. The full surface water drainage strategy is outlined in a separate report, which accompanies the planning application, but a brief summary is provided below:

- Due to the development site being steeper in the north than the south, the northern half will feature cascading swales that will be piped into basins and discharge accordingly. The southern half of the site, where the Local Centre and Primary School is located, is flatter and therefore does not utilise cascading swales in open spaces but instead a series of pipes, swales and cellular storage.
- In the absence of detailed SuDS guidance from either HCC or HBC, it is proposed that peak runoff rates from post-development areas are restricted to the equivalent present-day greenfield QBAR rate. Using FEH data and the FEH Statistical Method, this has been calculated to be 3.0 litres per second (l/s) per hectare of developable area.
- The allowable discharge rate is limited to 3.0 l/s per hectare of developable development, making an allowance for urban creep. This ensures that if urban creep does not take place immediately or over the lifetime of the development, proposed discharge rates from each sub-catchment cannot exceed 3.0 l/s per hectare.
- SuDS features will discharge at the restricted greenfield rates to the existing watercourse network located on and adjacent to the site.
- It is recommended that the outline surface water drainage strategy is refined as the masterplan is developed. This will include amending attenuation volumes to adequately manage peak runoff rates from the proposed development as the proportion of land uses evolves, as well as identifying suitable SuDS management trains. These SuDS management trains will aid in managing surface water runoff rates and volumes but will principally provide source control of water quality which will be necessary in relation to nutrient neutrality.

8.1.3 The proposed drainage design will ensure a reduction in runoff rates from the site, hence there will be no increased flood risk to external receptors as part of the development proposals.

8.1.4 Consequently, it is considered that surface water management (and associated flood risk) for the proposed development should not be an impediment to obtaining planning consent.

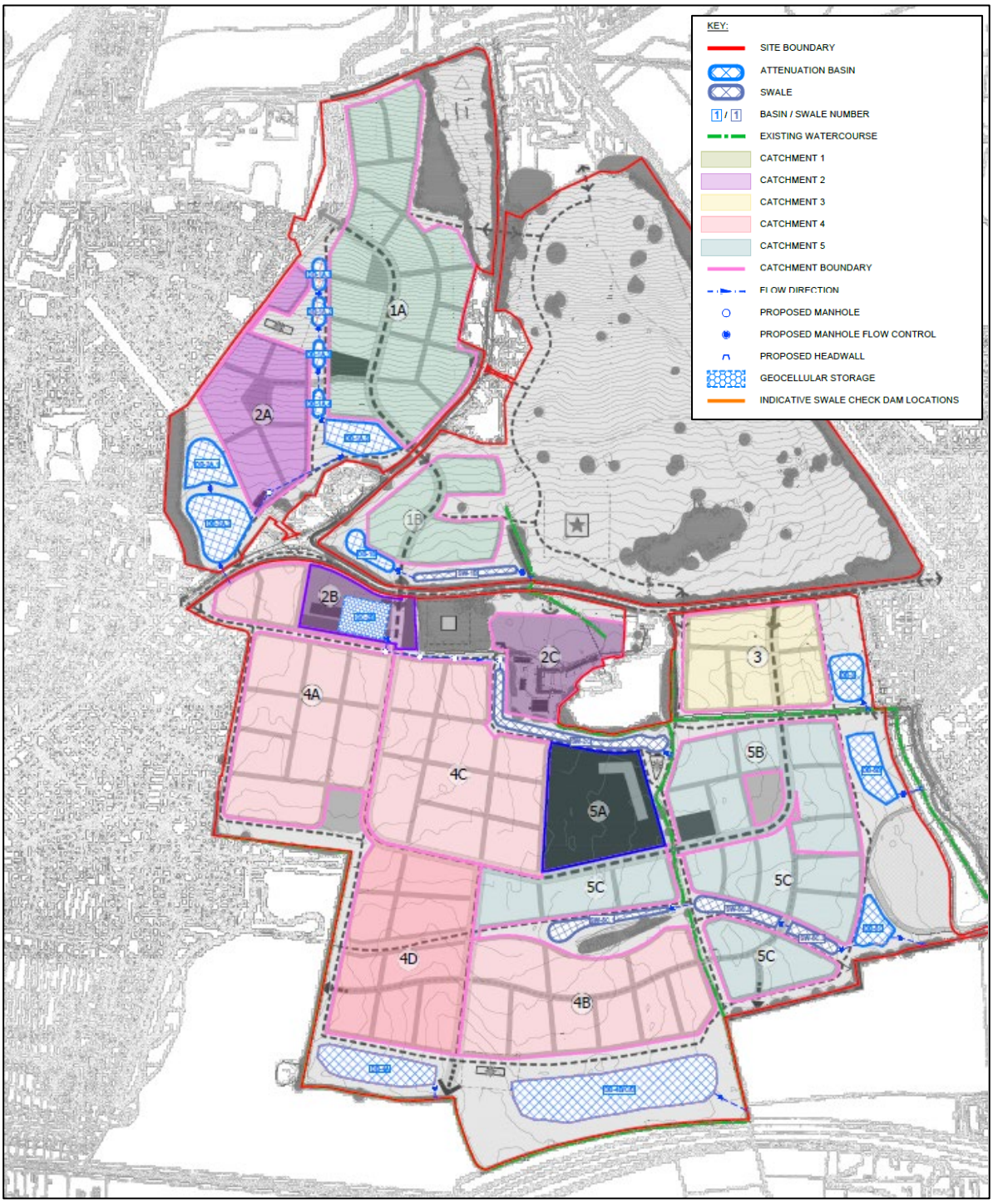

Figure 8-1: Proposed Surface Water Drainage Strategy

9 Residual Risk

9.1.1 It is difficult to completely guard against flooding since extreme events greater than the design standard event are always possible; however, it is practicable to minimise the risk by allowing a substantial freeboard (safety margin) and by using suitable construction and management techniques.

9.1.2 Finished floor levels (FFLs) for development at risk of fluvial flooding will be set a minimum of 600mm above the 1 in 100 AP plus climate change modelled fluvial flood level where there is a risk of fluvial flooding (i.e. within 50m of any watercourses/river floodplain extent). FFLs for all parcels will also be raised a minimum of 300mm above general proposed ground levels, unless DDA requirements specify otherwise, to mitigate the risk of water ingress in a severe rainfall event.

9.1.3 The surface water management strategy for the development will ensure that overland exceedance flows from SuDS features, i.e. higher than the capacity of the positive drainage system, are routed away from all buildings and directed towards the surface water drainage features. Planting and hard landscaping areas should also be designed to temporarily hold any flow during exceedance events. The need for any temporary storage or flow routing measures, along with the estimated volume of storage, location and depth will be confirmed at the detailed design stage.

9.1.4 There remains a residual risk of pluvial flooding due to surcharging of surface water management systems in exceedance events. Regular inspection and maintenance of any drainage systems should also be undertaken to further mitigate this residual risk.

9.1.5 Construction methodology will be agreed at detailed design with method statements provided and FRAP obtained, where appropriate, prior to any construction being undertaken.

9.1.6 As such, the residual risk is considered to be acceptable for the lifetime of the development.

10 Conclusions

10.1.1 This FRA has been prepared by Stantec on behalf of our client, Bloor Homes, to support the proposed outline planning application for up to 1,800 new homes, public open space, landscaping and associated infrastructure' on land off Southleigh Road, Havant, Hampshire (the 'Site').

10.1.2 The site falls within the jurisdiction of Hampshire County Council (HCC) and within the administrative boundary of Havant Borough Council (HBC).

Vulnerability and Sequential Test

10.1.3 The proposed residential, primary school and early learning development is classed as 'More Vulnerable' development. The local centre and market square would be 'Less Vulnerable'. Other infrastructure e.g. SuDS and public open space, would be 'Water-compatible'.

10.1.4 A sequential approach has been applied in developing the masterplan, in accordance with national and local planning policy, such that the location of the proposed 'More Vulnerable' development is limited to areas of 'low' risk from all sources of flooding post development (e.g. Flood Zone 1 and predominately within a 'very low' surface water flood risk area) – i.e. where all forms of development are considered acceptable.

10.1.5 The mitigation measures proposed in **Section 7** demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

Flood Risk

10.1.6 The EA mapping shows that the majority of the site lies within Flood Zone 1, at 'low' risk of flooding and the areas of higher fluvial flood risk are located to the west and south of the site, with associated areas in Flood Zones 2 and 3, at the unnamed watercourse which drains to the Nore Farm Stream. There is also an area of higher fluvial flood risk to the east of the site at the West Brook flood storage area.

10.1.7 Stantec completed a hydraulic modelling exercise to assess fluvial and surface water (Pluvial) flood risk at the site. More specifically, development of a 1D-2D hydraulic model and a site-specific model using the industry standard TUFLOW-ESTRY software packages to assess fluvial flood risk and surface water flood risk respectively.

10.1.8 The fluvial modelling results demonstrate that during the 'design' 1 in 100 annual probability (AP) plus climate change event, the majority of the flow routes on site are less than 0.15m deep. The comparison between the modelled extents and the EA Flood Zones demonstrates that both modelled flood extents at the West Brook and Nore Farm Stream are less extensive than the EA Flood Zones.

10.1.9 The EA online flood mapping indicates that the site is primarily at 'Very Low' risk of surface water flooding. However, there are localised areas of higher risk located in the north-west parcel of land, with a flow route running north to south, as well as an area of flooding in the south-west corner. There is also a notable flow route running through the centre of the site from Southleigh Road, south-east towards the West Brook. There is an area of surface water ponding at the south of the site along the unnamed tributary to Nore Farm Stream, located upstream of the A27.

10.1.10 The site-specific surface water (pluvial) hydraulic modelling completed by Stantec demonstrates that the majority of the flow routes on site are less than 0.15m deep, during the 1 in 100 AP plus climate change event.

10.1.11 The Strategic Flood Risk Assessment (SFRA) shows the site lies within an area susceptible to groundwater flooding; and within an area of 'potential for groundwater flooding to occur at surface'. Ground investigations were undertaken by Endeavour Drilling to determine seasonally high groundwater levels on site. Groundwater elevations are generally shallower in southern parts of the site and also when in close proximity to nearby watercourses, which suggests that groundwater levels are in broad hydraulic continuity with nearby watercourses across the area of the proposed development. Due to the proximity of each watercourse crossing through the proposed development area, any groundwater flooding would likely occur concurrently with fluvial flooding. Therefore, the overall risk from groundwater flooding is considered to be 'low'.

10.1.12 The SFRA does not indicate any records of sewer flooding on site. Southern Water (SW) asset plans show a 150mm foul water sewer located within the northern part of the site. Any potential leakage would subsequently be discharged downslope directly into the existing on site drainage system and subsequently West Brook watercourse east of the site. Utility organisations would subsequently repair the broken pipes. Therefore, the overall risk of sewer flooding is considered to be 'low'.

10.1.13 Mapping provided from the EA indicates that there are no recorded incidences of flooding located on site. Correspondence from HCC similarly confirms no records of historical flooding on site.

Mitigation Strategy

10.1.14 Finished floor levels (FFLs) for development at risk of fluvial flooding will be set a minimum of 600mm above the 1 in 100 AP plus climate change modelled fluvial flood level (i.e. within 50m of any watercourses/river floodplain extent). FFLs for all parcels will also be raised a minimum of 300mm above general proposed ground levels, unless DDA requirements specify otherwise, to mitigate the risk of water ingress in a severe rainfall event.

10.1.15 Access and egress via the primary street/vehicular access into the development (from Southleigh Road - to the west) will be located wholly within Flood Zone 1, so they would be safe with continuous dry access maintained at all times.

10.1.16 Localised channel capacity improvements are proposed on the Nore Farm Stream in the south-west corner of the site, consisting of channel widening by 500mm, to mitigate a small overland flood flow route in extreme events and locally reduce flood levels. At the detailed design stage, further channel restoration and re-naturalisation opportunities will be explored, in order to manage post-development flood risk, and potentially improve hydromorphology and ecology.

10.1.17 The surface water drainage proposals for the site will utilise on-site attenuation and discharge at the existing greenfield QBAR run off rate of 3.0 l/s/ha of developable area via the existing watercourse network on and adjacent to the site. This will reduce current discharge rates and will provide overall betterment to the risk of flooding arising from the proposed development.

10.1.18 In conclusion, the future occupants and users of the proposed development will be at a mitigated risk of flooding and the development will not increase flood risk elsewhere. It is demonstrated that the proposal complies with the National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG) and the local planning policy with respect to flood risk, and is an appropriate development at this location.

Appendix A OpenData Flood Maps

- Site Location Plan
- Site Location (Aerial Photography)
- Topography (LiDAR)
- Topography - Detailed (LiDAR)
- EA Flood Zone Map
- EA Surface Water Flood Risk
- EA Surface Water Flood Risk – Depth 3.3% Event
- EA Surface Water Flood Risk – Depth 1.0% Event
- EA Surface Water Flood Risk – Depth 0.1% Event
- Reservoir Flood Map
- Source Protection Zones
- EA Historic Flood Map

Appendix B Topographical Survey

Appendix C Fluvial & Pluvial Hydraulic Modelling Report

[PROVIDED SEPERATELY UPON REQUEST DUE TO SIZE]

Appendix D Extracted Groundwater Elevations

Appendix E Proposed Development

Indicative Concept Plan – reference 333101046 BL-M-01 – rev H (Stantec, March 26)

Appendix F Surface Water Drainage Plan

Appendix G Stakeholder Correspondence

EA Pre-Application Advice Note – September 2019

EA P5/6/7/ email and letter responses – 27th January 2023

HCC flood risk and drainage response – 17th January 2023

HCC historic flooding information – 17th January 2023

EA Pre-App Meeting minutes – 30th March 2023