South Downs National Park Authority

Level 1 Update and Level 2 Strategic Flood Risk Assessment

Final Report

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Amec Foster Wheeler Environment
& Infrastructure UK Limited

Report for

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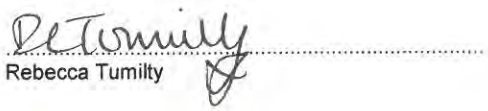

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Document revisions

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Executive summary

Purpose of this report

This report has been produced for the purpose of reporting the results of a combined Level 1 update and Level 2 Strategic Flood Risk Assessment (SFRA) for the South Downs National Park. This study has been commissioned by the South Downs National Park Authority (SDNPA) as part of the evidence base for three local planning documents which are currently under preparation: the South Downs Local Plan, which covers the entire national park, plus Neighbourhood Development Plans (NDPs) for the settlements of Lewes, a market town in the east of the National Park, and Twyford, a village in the west of the National Park. In total 37 potential allocation sites were put forward for assessment from the South Downs Local Plan, 18 sites from the Lewes NDP and a single site from the Twyford NDP.

For the Level 1 update, all sites were screened against high level, nationally available, tidal, fluvial, surface water and groundwater flood risk mapping data. Fifteen potential allocation sites were 'screened-out' on the basis of no identified flood risk either to the site or potential access. Nine further sites were 'screened-out' where no flood risk to the site was identified, but where a minor surface or groundwater flood risk to access was possible. The remaining 32 sites, comprising 21 sites from the South Downs Local Plan, 10 sites from the Lewes NDP and the single site from the Twyford NDP, were 'screened -in' and taken forward for a more detailed Level 2 site-specific assessment.

The further assessment was based on existing flood risk information. No new hydraulic modelling was carried out to inform the assessments presented in this report. Environment Agency (EA) river model outputs and flood zone maps were used to provide further detail on flood risk for those sites which were identified as at risk of fluvial or tidal flooding. For other sources of flooding, nationally available mapping datasets were supplemented by information provided by Lead Local Flood Authorities (LLFAs) covering the National Park area. Southern Water also provided information on historical sewer flooding incidents for Lewes.

The details of the further assessments have been captured in site-specific flood risk information sheets (Appendix B). For those sites with fluvial and/or tidal flood risk, these information sheets will help to inform the Sequential Test and also, if required, the Exception Test. For all sites, the information sheets also set out site-specific flood risk management recommendations, recommendations for future site specific Flood Risk Assessments (FRA) and recommendations for the incorporation of Sustainable Urban Drainage Systems (SuDS) into development. Further, more general, flood risk management recommendations are also provided in the main text.

The impacts of future climate change on flood risk for sites affected by fluvial and/or tidal flood risk has been assessed using outputs from existing EA modelling, which is reported in the flood risk information sheets. Further assessment of potentially more severe climate change impacts on fluvial flood risk is also presented in the main report text.

Relevant guidance on site drainage and the use of SuDS is provided in the report, and a high level assessment of SuDS suitability is provided for all potential allocation sites. SuDS should be incorporated in all developments, as far as practically possible. For sites with fewer constraints on drainage, a broad range of SuDS techniques may be applicable. Conversely, the range of SuDS options may be limited where there are constraints, particularly brownfield sites, underlying geology or being within areas of flood risk.

Contents

1. Introduction

This report has been produced for the purpose of reporting the results of a combined Level 1 update and Level 2 Strategic Flood Risk Assessment (SFRA) for the South Downs National Park. This section provides the overall context and scope for the SFRA and provides an overview of the structure of the remainder of the report.

1.1 Terms of Reference

1.1.1 The South Downs National Park Authority (SDNPA) is preparing its Pre-submission Local Plan for the South Downs National Park (hereafter referred to as the SDNP, or the 'National Park'), which will set out planning policy and allocate land for development over the next 15 years. One of the key aims of the Local Plan is to promote sustainable development that allows local communities to develop, whilst protecting the special qualities that led to the designation of the South Downs as a national park in 2010.

1.1.2 A key part of promoting sustainable development is ensuring that where new development has to take place in areas of higher flood risk, it is safe from flooding, and does not itself increase flood risk to others. The decision making basis for this is set out in National Planning Policy Framework[1] (NPPF) and its associated Planning Practice Guidance[2] (PPG) on Flood Risk and Coastal Change.

1.1.3 A Level 1 SFRA was produced alongside a Water Cycle Study for the National Park in April 2015[3]. This document provided an overview of flood risk across the National Park, and a screening assessment for flood risk for sites being considered for allocation (hereafter referred to as 'allocation sites') in the Local Plan at that time. However, as a result of updates to the Strategic Housing Land Availability Assessment (SHLAA) and consultation on the Preferred Options Local Plan, the list of sites put forward for allocation for housing has changed. In addition, a Neighbourhood Development Plan (NDP) that will allocate sites for housing is being prepared for Lewes, a large market town in the eastern area of the National Park, parts of which are at high risk of flooding from multiple sources. A single site at known risk of flooding is also being considered for allocation for housing in a NDP that is being developed for the village of Twyford, in the Itchen valley, in the western part of the National Park.

1.1.4 All of these issues have driven the need for this further SFRA study. In terms of the formal definitions of Level 1 and Level 2 SFRAs provided by the NPPF PPG, this study constitutes a combined Level 1 update and Level 2 assessment. It is an update to the previous Level 1 assessment, in terms of providing revised or additional flood screening assessments for potential allocation sites for both the South Downs Local Plan and the Lewes NDP to support application of the Sequential Test. For the South Downs Local Plan, a Sequential Test is being carried out using the Sustainability Appraisal of the Pre-submission plan. For the NDPs, the Sequential Test will be carried out as part of the ongoing process of developing site allocations.

1.1.5 In addition to a Level 1 screening assessment, the study also provides detailed site-specific assessments consistent with the requirements of a Level 2 study. For sites where a fluvial and/or tidal flood risk has been identified, information is provided to facilitate application of the Exception Test if this proves necessary, following application of the Sequential Test. For all sites where a significant flood risk has been identified from any source via the screening assessment, the Level 2

[1] Department for Communities and Local Government, 2012. National Planning Policy Framework, published March 2012. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf.
[2] Department for Communities and Local Government, 2014. Flood Risk and Coastal Change – Planning Practice Guidance, published March 2014. https://www.gov.uk/guidance/flood-risk-and-coastal-change.
[3] AMEC (2015) South Downs National Park: Water Cycle Study and SFRA Level 1 (Document R032i4). http://www.southdowns.gov.uk/planning/planning-policy/national-park-local-plan/evidence-and-supporting-documents/water-cycle-study/

assessment seeks to specify site-specific policies for flood risk management for the Local Plan and NDPs and provide guidance for prospective developers on requirements for site-specific flood risk assessments (FRAs). A preliminary assessment of the suitability of the site for Sustainable Drainage Systems (SuDS) is also provided.

1.2 Scope of Study

1.2.1 In broad terms, the scope of this assessment is as follows:

- A revised list of potential allocation sites in the South Downs Local Plan has been screened for flood risk using a broadly similar methodology as was employed for the Level 1 SFRA. Sites in the Lewes NDP were also screened in this way. The screening assessment considered potential risks from fluvial and tidal flooding; surface water flooding and groundwater flooding based on the same nationally available, high level datasets that were used for the Level 1 assessment (datasets have been updated for this study). To account for climate change and the potential increased flood risk, a buffer was applied to the fluvial and surface water flood outlines to include sites within close proximity to Flood Zones;
- Sites where a substantive flood risk from all sources could not be excluded were then subject to further, site-specific assessment. This has been based on existing flood risk information. Environment Agency (EA) river model outputs and flood zone maps were used to provide further detail on flood risk for those sites which are at risk of fluvial or tidal flooding. For other sources of flooding, nationally available mapping datasets were supplemented by information provided by Lead Local Flood Authorities (LLFAs) covering the National Park area. Southern Water also provided information on historical sewer flooding incidents for Lewes. No new hydraulic modelling was carried out to inform the assessments presented in this report;
- Information from the site-specific assessments carried out as part of this study has been used to provide an evaluation of relative level of flood risk at the sites considered thereby facilitating application of the Sequential Test;
- Appropriate recommendations for flood risk management and for further assessment to be carried out as part of site-specific flood risk assessments (FRAs) for planning applications were also made on the basis of the site-specific assessments made in this study. This information will provide SDNPA with the basis for application of the Exception Test where required, and for the formulation of site-specific flood risk management policies to be included in Local Plan; and
- In addition, a high level assessment of the suitability of Sustainable Drainage Systems (SuDS) has been carried out for all potential allocation sites.

1.2.2 This SFRA has been carried out in consultation with the EA, and LLFAs for Hampshire, West Sussex and East Sussex; these bodies along with Southern Water have also provided data and information to support the assessment.

1.3 Report Structure

1.3.1 The remainder of this report is structured as follows:

- Section 2 presents background information on the National Park, and the policy context for this assessment. It starts by providing an overview of the landscape and water environment for the National Park, and of key sources and locations of flood risk. An overview of national and local planning policy, as it relates to flood risk generally and as it informs the scope of this assessment specifically is then provided. Finally, an overview of those bodies with flood risk management responsibilities is provided, along with a summary of recent relevant flood risk assessments, policies and strategies that they have produced (with further details presented in Appendix A);

- Section 3 presents the flood risk screening assessment that has been applied to all the sites being considered in this study, in order to identify those for which flood risk is either likely or possible, and for which further, more detailed assessment will be carried out;
- Section 4 presents the approach for further site-specific assessment for fluvial and tidal, surface water, and groundwater flood risk. A summary of results for the site-specific assessments is presented, and site-by-site details are contained in a series of Flood Risk Information Sheets presented in Appendix B;
- Section 5 identifies appropriate responses to the flood risks identified in Section 4. Requirements for application of the Sequential and Exception Tests are identified for those sites at risk of fluvial and/or tidal flooding. For all sites, site-scale flood risk measures are discussed. For areas where multiple sites are concentrated, the applicability of area-wide measures is discussed. A summary of recommendations for site-specific policies for the Local Plan and associated Neighbourhood Development Plans (NDPs), and for site-specific FRAs to accompany planning applications is then provided. Further details for all sites is provided in the Flood Risk Information Sheets in Appendix B;
- Section 6 summarises appropriate SuDS guidance for new development in the National Park, based on national policy requirements and best practice guidance, and relevant drainage advice from LLFAs. It then provides a site-by-site assessment of suitability for different types of SuDS, leading to the development of appropriate Local Plan/NDP policy recommendations for each; and
- Finally, an overall summary and conclusions are presented in Section 7.

1.4 Terminology

1.4.1 In this report, the probability of a flood occurring is expressed in terms of annual exceedance probability (AEP), which is the inverse of the annual maximum return period (for example the 100-year flood can be expressed as the 1 in 100 AEP flood, which has a 1% change of being exceeded in any year). Table 1.1 sets out how the AEP is used to define Flood Zones for fluvial and sea flooding.

Table 1.1 Flood Zone Definitions

Flood Zones	Probability of flooding	Definition
Zone 1	Low Probability	Land having a less than 1 in 1,000 AEP of river or sea flooding
Zone 2	Medium Probability	Land having between a 1 in 100 and 1 in 1,000 AEP of river flooding; or land having between a 1 in 200 and 1 in 1,000 AEP of sea flooding
Zone 3a	High Probability	Land having a 1 in 100 or greater AEP of river flooding; or Land having a 1 in 200 or greater AEP of sea flooding.
Zone 3b	The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. For the purposes of this report, it has been defined as land having a less than 1 in 20 AEP of fluvial flooding.

Based on NPPF[1] Flood Risk and Coastal Change PPG[2], Table 1

2. Background Information and Policy Context

This section provides the reader with background information on the South Downs National Park, including flood risk, and provides an overview of the emerging planning policy relevant to the National Park, describing how and why it provides the context for this assessment. Finally it provides and overview of flood risk management as relevant to the National Park, covering national planning policy for flood risk and new development, responsibilities for flood risk management across the National Park, including flood risk management plans, policies and strategies produced by responsible authorities.

2.1 Background Information

The South Downs National Park

2.1.1 The South Downs is a range of rolling chalk hills and dry valleys that extends over 70 miles from the Itchen Valley (just east of Winchester) in Hampshire to Beachy Head (just west of Eastbourne) in East Sussex (Figures 2.1, 2.2 and 2.3). The northern edge of the South Downs is marked by a steep north facing escarpment which overlooks the Weald.

2.1.2 The South Downs National Park forms a much larger area than the chalk range of the South Downs and includes part of the western Weald which is geologically and ecologically different. The undulating countryside of the Weald in Hampshire and West Sussex is underlain by clay and the landscape includes a mixture of dense woodland and heathland areas.

2.1.3 The water environment in the area is influenced by rainfall, the underlying geology, and types of land use in the district. Long term rainfall data at Eastbourne (1959-2013) shows average rainfall in the area is 792 mm per year[4]. A thick band of porous chalk underlies the South Downs, forming a Principal Aquifer[5] which provides much of the water supply in the local area. Water infiltrates quickly into the bedrock and flows quickly through the aquifer, emerging as seasonally flowing streams, or 'winterbournes', along the northern escarpment.

2.1.4 Water flows quickly through the chalk aquifer and the level of groundwater can increase rapidly in response to prolonged rainfall, leading to groundwater flooding when the water reaches the surface. In contrast the generally poorly permeable clay geology of the Western Weald does not support high rates of infiltration and in surface water runoff is much more prevalent in this area. The Lower Greensand, a sandstone Secondary Aquifer[6] is also present in the Weald. Infiltration is greater on the Lower Greensand than on the clay geology, but the high storage capacity of the sandstone aquifer means that groundwater levels respond less to rainfall than in the Chalk, meaning groundwater flooding is less likely on this aquifer.

2.1.5 The chalk aquifer provides baseflow for the chalk-rivers of the Itchen, Meon, and in part the Rother, although most of the Rother flow is supported by rainfall runoff through the Weald and baseflow from the Lower Greensand. Further east the Arun and Adur also have their headwaters in the Weald and slice through the South Downs on their way to the English Channel whilst the sea pushes inland via the tidal reaches of the Ouse and Cuckmere in East Sussex. The majority of

[4]Analysis of data from: http://www.metoffice.gov.uk/pub/data/weather/uk/climate/stationdata/eastbournedata.txt (Accessed 24/07/2017).

[5] These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

[6] These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

other valleys are dry, although some support winterbournes that flow as a result of seasonal raising of the water table.

2.1.6 Inside the National Park settlements comprise villages, and four larger market towns at Petersfield, Midhurst, Petworth and Lewes. Roads and villages are concentrated along the river valleys, while the more elevated areas are sparsely settled with scattered farmsteads. The total population living within the National Park is around 108,000.

Flood Risks across the South Downs National Park

2.1.7 The April 2015 Level 1 SFRA provided a high level overview of flood risk across the National Park. Following on from this, four principal sources of flood hazard have been identified for consideration within this Level 2 SFRA, including:

- Fluvial - from the various watercourses and tributaries across the study area (Rivers Itchen, Meon, Rother, Arun, Adur, Ouse, and the Cuckmere River) both defended and undefended;
- Tidal - along the lower Rivers Adur, Ouse, and the Cuckmere River (flood defences are present on the River Adur and Cuckmere River but are still being constructed on the Lower Ouse);
- Surface water - where rainfall accumulates quicker than it can infiltrate into the ground and/or be conveyed away by local drainage (man-made and natural systems) flooding can occur. The information suggests multiple areas are at risk across the study area; and
- Groundwater - the extensive chalk geology across the study area makes groundwater a key issue. The information suggests multiple areas are at risk across the study area.

2.1.8 It is recognised that sewer flooding may also be a locally significant source of flood hazard in urban locations within the National Park. However, detailed information on this source of flood risk has not been made available, so it is only considered in general terms for sites in urban locations like Lewes. Flooding from reservoir failure is considered to be a low flood risk to the sites considered in this assessment, and has therefore not been considered in detail. However, sites where a potential reservoir flood hazard exists have been identified. Direct coastal flooding has also been screened out of the assessment because all of the sites being considered in this study are distant from the coast.

2.1.9 Key flood risk locations in the National Park, and the principal hazards, identified in the Level 1 SFRA are listed below:

- Liss: flood risk from the upper River Rother and tributaries, surface water flow paths, urban drainage, and historical sewer flooding;
- Petersfield: flood risk from the upper River Rother and tributaries, surface water flow paths and urban drainage. An incidence of groundwater flooding from chalk at Petersfield is mentioned; although geological mapping indicates Petersfield overlies greensand/clay deposits. Multiple incidents of past sewer flooding; and
- Lewes: River Ouse combined tidal and fluvial flood risk, groundwater emergence in various areas, particularly along the Winterbourne Stream. Surface water flooding, associated with dry valleys and where various raised embankments cross flow paths. Exceedance of the piped drainage systems (multiple past sewer flooding incidents). Tide locking and backing up of piped drainage systems and tributary watercourses due to high water levels in the River Ouse.

2.1.10 None of the sites being considered for allocation in the South Downs Local Plan are located in Liss or Petersfield, so flood risks to these settlements has not been considered further in this study. A detailed assessment of flood risks in Lewes is presented in this report due to the inclusion of proposed site allocations for the Lewes NDP in this study, as well as the assessment of a strategic site proposed for Lewes in the South Downs Local Plan.

2.2 Flood Risk and Planning Policy

National Planning Policy

2.2.1 The NPPF[1] and its associated Flood Risk and Coastal Change PPG[2] form the primary source of statutory planning guidance with regard to new development and flood risk for England. The overall thrust of national planning policy with regards to flood risk is to steer new development away from areas of flood risk, as far as possible, through the application of the 'Sequential Test'. Development in areas of higher flood risk should only be permitted where application of the Sequential Test has determined that it is required in order to fulfil local plan policy requirements. A further test, the 'Exception Test' has to be satisfied to demonstrate that development in areas of high flood risk:

- Has wider sustainability benefits to the community that outweigh flood risk; and
- The development will be safe for its lifetime (considering the impacts of climate change on flood risk), taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

2.2.2 Requirements for the application of the Sequential and Exception Test are determined through consideration of the Vulnerability Classification of the proposed development and the Flood Zone in which it is located, as set out in Table 3 of the PPG. Flood Zone and Vulnerability Classification definitions are provided in Tables 1 and 2 of the PPG respectively.

2.2.3 NPPF requires local planning authorities such as the SDNPA to take flood risk into account when developing policies and land allocations for Local Plans. Preparation of a SFRA provides the evidence base to facilitate this. In particular, the NPPF PPG (paragraph 010) states that local planning authorities should use a SFRA to:

- Determine the variations in risk from all sources of flooding across their areas, and also the risks to and from surrounding areas in the same flood catchment;
- Inform the sustainability appraisal of the Local Plan, so that flood risk is fully taken into account when considering allocation options and in the preparation of plan policies, including policies for flood risk management to ensure that flood risk is not increased;
- Apply the Sequential Test and, where necessary, the Exception Test when determining land use allocations;
- Identify the requirements for site-specific flood risk assessments in particular locations, including those at risk from sources other than river and sea flooding;
- Determine the acceptability of flood risk in relation to emergency planning capability; and
- Consider opportunities to reduce flood risk to existing communities and developments through better management of surface water, provision for conveyance and of storage for flood water.

2.2.4 The NPPF PPG sets out two levels of SFRA (paragraph 011):

- A Level 1 Assessment should be carried out in local authority areas where flooding is not a major issue and where development pressures are low. The assessment should be sufficiently detailed to allow application of the Sequential Test to the location of development and to identify whether the development can be allocated outside high and medium flood risk areas, based on all sources of flooding, without application of the Exception Test; and
- Where a Level 1 assessment shows that land outside flood risk areas cannot appropriately accommodate all the necessary development, it may be necessary to increase the scope of the assessment to a Level 2 to provide the information necessary for application of the Exception Test where appropriate. A Level 2 SFRA should consider the detailed nature of the flood characteristics within a flood zone, including flood probability, depth, velocity, rate of onset, and duration of flooding.

2.2.5 A Level 1 SFRA for the National Park was produced in April 2015. However, as noted in Section 1.1, the list of sites put forward for allocation for housing under the Local Plan has changed. In addition, sites are being considered for allocation in the Lewes NDP, which were not considered in the original Level 1 SFRA. There is therefore a need to revisit the flood screening assessment carried out for the Level 1 SFRA, to provide information required to support the Sequential Test.

2.2.6 Level 2 site-specific assessments are provided in this Study for all sites where the screening assessment has indicated a potential flood risk. For sites where a fluvial and/or tidal flood risk has been identified, information is provided to facilitate application of the Exception Test if this proves necessary, following application of the Sequential Test. For all sites where potential flood risk has been identified from any source via the screening assessment, the Level 2 assessment seeks to specify site-specific policies for flood risk management for the Local Plan and NDPs and provide guidance for prospective developers on requirements for site-specific FRAs. A preliminary assessment of the suitability of the site for SuDS is also provided.

2.2.7 The national planning policy context with regards to flood risk has remained largely unchanged since the Level 1 SFRA was produced in April 2015, with the exception of supplementary guidance on climate change allowances for flood risk assessment, which was published February 2016 and subsequently updated in February 2017[7].

Local Planning Policy

The South Downs Local Plan

2.2.8 The South Downs Local Plan will set out planning policy and allocate land for development over the next fifteen years (2018 to 2033). One of the key aims of the Local Plan is to promote sustainable development that allows local communities to develop whilst protecting that special qualities that led to the designation of the South Downs as a National Park in 2010.

2.2.9 The SDNPA has planned for the provision of housing through medium scale growth of existing towns and villages which is currently being considered in the Draft Local Plan. The Draft Local Plan identifies more than 50 potential allocation sites, widely dispersed across the National Park, that are well placed to accommodate some level of growth. The, wide, spatial distribution of development allocations has primarily been driven by the need to protect the special qualities of National Park and to meet the National Park's duty to foster the economic and social well-being of its local communities. This may not always be aligned with location of new development in areas of lowest flood risk. These issues are being considered against the requirements of the flood risk Sequential Test as part of the Sustainability Appraisal for the Local Plan.

Neighbourhood Development Plans (NDPs)

2.2.10 Neighbourhood Planning gives local communities the power to shape development in their area through the Localism Act 2011. NDPs address how growth can be managed over a 15-20 year time frame (i.e. a similar timescale to that being considered for the Local Plan). Once 'made' (adopted), they become part of the statutory development plan for the National Park, alongside the Local Plan, and the policies and proposals contained within them used in the determination of planning applications, including appeals, for the communities they have been developed for.

2.2.11 The NDP for Lewes in East Sussex, which is in the process of preparation, has been considered as part of this assessment. As noted in Section 2.1, there are extensive and complex flood risks issues in Lewes. However, there are also other planning considerations in the town that have driven the selection of sites, including the need for affordable housing, urban regeneration, and preserving the integrity of the historic townscape, that may be in conflict with locating new development in areas of lowest flood risk. Development of any of these sites may offer opportunities for reducing flood risk to a wider area of Lewes, through reduction of runoff rates, or via the development of new flood defences.

[7] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances (Accessed 13/07/2017).

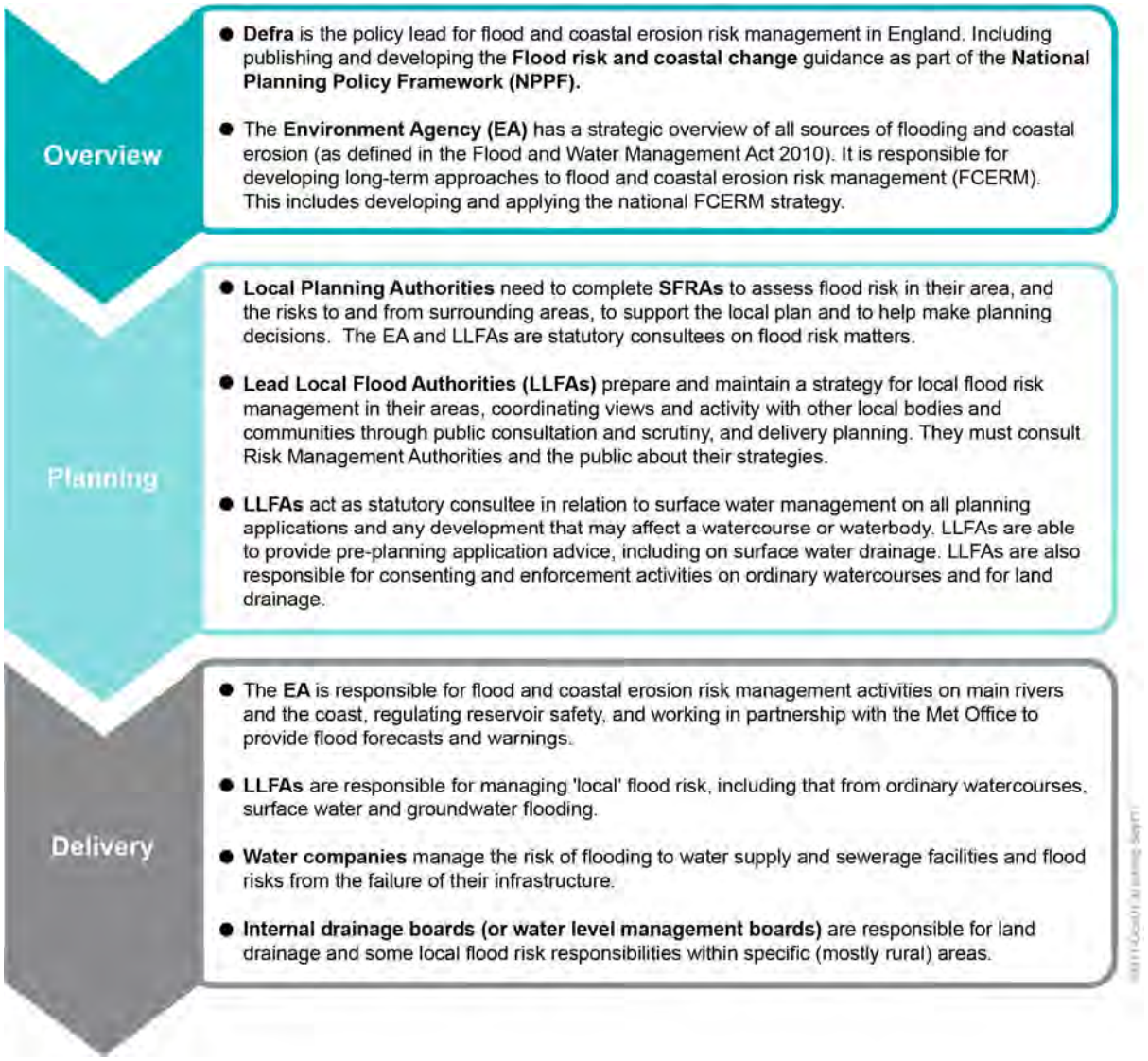
2.2.12 A site proposed in the Twyford NDP in Hampshire, which is in the process of preparation, is subject to flooding issues. This was included in the assessment as part of a specific request to support the neighbourhood planning group in identifying appropriate mitigation measures for the flood risks identified.

2.3 Flood Risk Management

Overview of Responsibilities

2.3.1 The role and responsibilities for flood risk management of various levels of governance in England are set out in Figure 2.4

Figure 2.4 Flood Risk Management Hierarchy for Delivery of Local Flood and Coastal Flood Risk Management



2.3.2 The role of the SDNPA as the local planning authority, and the management of flood risk in the local planning process for the National Park has been described in Section 2.1.10. The other responsible bodies with a role in flood risk management within the National Park are as follows:

- Hampshire, West Sussex and East Sussex County Councils and Brighton and Hove City Councils are the Lead Local Flood Authorities (LLFAs)[8];
- Southern Water is the sewerage undertaker with responsibility for management of sewer flooding;
- The EA, in addition to exercising its flood risk management powers for main rivers, also maintains land drainage responsibilities for the River Arun Internal Drainage District (IDD). Until 31st March 2017, it also exercised these responsibilities for the River Adur, South West Sussex, and River Ouse (East Sussex) IDDs. However, with certain exceptions it no longer maintains or operates infrastructure in these districts. Instead, responsibility for maintenance and operation of ordinary watercourses and water level management infrastructure has passed to riparian landowners, and the LLFAs have assumed responsibility for consenting and enforcement; and
- The Pevensey and Cuckmere Water Level Management Board exercises land drainage responsibilities, including consenting for works affecting ordinary watercourses, for its IDD, which extends to low-lying, rural areas of the lower Cuckmere valley within the National Park.

Local Flood Risk Management Policies and Strategies

2.3.3 Relevant flood risk information is located within numerous studies and guidance documents produced by those bodies noted above with flood risk management responsibilities in the SDNP. A summary of those documents produced prior to the end of 2014 is presented in the Level 1 SFRA and is not repeated here. An overview of additional documents produced since that date is provided below with more specific details about key documents provided in Appendix A.

South East River Basin District Flood Risk Management Plan:

2.3.4 Flood risk management plans (FRMPs) have been published by the EA for all River Basin Districts (RBDs) in England to provide an overview of the risk of flooding from rivers, the sea, surface water, groundwater and reservoirs, as well as measures and objectives for managing flood risk for the period 2015 to 2021. FRMPs have superseded the Catchment Flood Management Plans (CFMPs) discussed in the Level 1 SFRA.

2.3.5 The Relevant FRMP for the National Park is the South East River Basin District Flood Risk Management Plan (2015 – 2021), published in 2016. Nine catchments are identified within the FRMP for the South East RBD, five of which are pertinent to the SDNP Level 2 SFRA (Test and Itchen, East Hampshire, Arun and Western Streams, Adur and Ouse, and the Cuckmere and Pevensey Levels). Objectives are set to prevent, protect, and prepare for flooding, with detailed programs of work for individual communities.

LLFA Strategies, Guidance and Management Plans

2.3.6 Each of the LLFAs are responsible for developing a number of key documents that identify the key flood risks within their area and establish guidance and objectives for managing this risk, now and in to the future. These documents have been used to inform this Level 2 SFRA as part of the screening process, and to ensure that the outcomes and policy recommendations will help in the delivery of the LLFA responsibilities. A list of these documents is provided below.

- **Preliminary Flood Risk Assessments (PFRAs)**: the focus of a PFRA is to focus on sources, local to the LLFA, of flooding from main rivers, the sea or large reservoirs. They consider the risk posed by these sources of flooding as well as identifying areas where additional investigation may be necessary. PFRAs are a requirement of the Flood Risk Regulations (2009). PFRAs of relevance to National Park are:

[8] As stated in Section 1.2, this SFRA has been carried out in consultation with the EA, and LLFAs for Hampshire, West Sussex and East Sussex. The LLFA for Brighton and Hove was not consulted as no allocation sites are located in the part of the National Park close to Brighton and Hove.

- East Sussex PFRA (June 2016);
- West Sussex PFRA (May 2011);
- Hampshire County Council, PFRA 2011-2017 (June 2011); and
- Brighton and Hove City Council PFRA (June 2011).

2.3.7 At the time of writing this SFRA, all four PFRAs of relevance are currently being updated and it is anticipated that these documents will be published before the end of 2017.

- **Local Flood Risk Management Strategies (LFRMSs):** These are strategic documents that focus on the management of flood risk from surface water, groundwater and ordinary watercourses. They provide guidance and objectives for 'local' flood risk management for the county or unitary authority areas covered by the LLFA. LFRMSs are a requirement of the Flood and Water Management Act (2010). LFRMSs of relevance to National Park include:
  - East Sussex LFRMS 2016-2026 (September 2016);
  - West Sussex LFRMS 2013-2018 (May 2013);
  - Hampshire County Council, Hampshire LFRMS (July 2013); and
  - Brighton and Hove City Council LFRMS (February 2015).
- **Strategic Flood Risk Assessments (SFRAs):** SFRAs assess flood risk at a strategic level on a Local Planning Authority (LPA) scale. Relevant SFRAs within the National Park area are:
  - Winchester City Council Level 1 SFRA (September 2007);
  - Mid Sussex District Council Level 1 SFRA (June 2015);
  - Lewes District Council Level 1 SFRA (September 2009);
  - Brighton and Hove City Council Level 1 SFRA (March 2008);
  - East Hampshire District Council Level 1 SFRA (April 2015);
  - Chichester District Council Level 1 SFRA (July 2008);
  - Horsham District Council Level 1 SFRA (updated version, April 2010);
  - Arun District Council Level 1 and Level 2 SFRA (updated version, September 2016);
  - Adur District Council and Worthing Borough Council Level 1 and Level 2 SFRA, (January, 2012); and
  - Wealden District Council Level 1 and Level 2 SFRA (updated, June 2017).
- **Surface Water Management Plans (SWMPs):** The purpose of a SWMP is to identify local flood risk issues in more detail, the potential options to manage the flood risk, and who should take these options forward. SWMPs are a requirement of the Flood and Water Management Act (2010), and should be completed in line with Defra guidance[9]. The following SWMPs are relevant to the National Park:
  - Easebourne SWMP (West Sussex County Council, January 2015);
  - Lewes SWMP (East Sussex County Council, unpublished draft 2017); and
  - Lidsey SWMP (West Sussex County Council, October 2014).
- **Groundwater Management Plans (GWMPs):** A GWMP identifies the areas at risk of groundwater flooding and establishes a number of measures to manage the risk. These

[9] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69342/pb13546-swmp-guidance-100319.pdf (Accessed 13/07/2017).

measures include improving flood warning service to more specific planning policy guidance. GWMPs are a requirement of the Flood and Water Management Act (2010). The only GWMP of relevance to National Park is:

- Hampshire Groundwater Management Plan (Hampshire County Council, October 2013).

- **Sustainable Urban Drainage Systems (SuDS) Guidance:** SuDS are encouraged for all scales of new development as a sustainable means of managing surface water runoff. These documents provide guidance as to how to incorporate SuDS into drainage plans as well as providing information as to the key national and local, legislation, policy and guidance. For the National Park, SuDS guidance comprises:

  - Water. People. Places. A guide for master planning sustainable drainage into developments (Lead Flood Authorities of the South East of England, September 2013);
  - Surface Water and Sustainable Drainage. Guidance for Developers, Designers and Planners. (Hampshire County Council, November 2015);
  - Guide to Sustainable Drainage Systems in East Sussex. (East Sussex County Council, June 2015); and
  - West Sussex LLFA Policy for the Management of Surface Water. (West Sussex County Council, July 2017).

2.3.8 A Full discussion of SuDS guidance is provided in Section 6 of this report.

Minerals and Waste Planning SFRAs

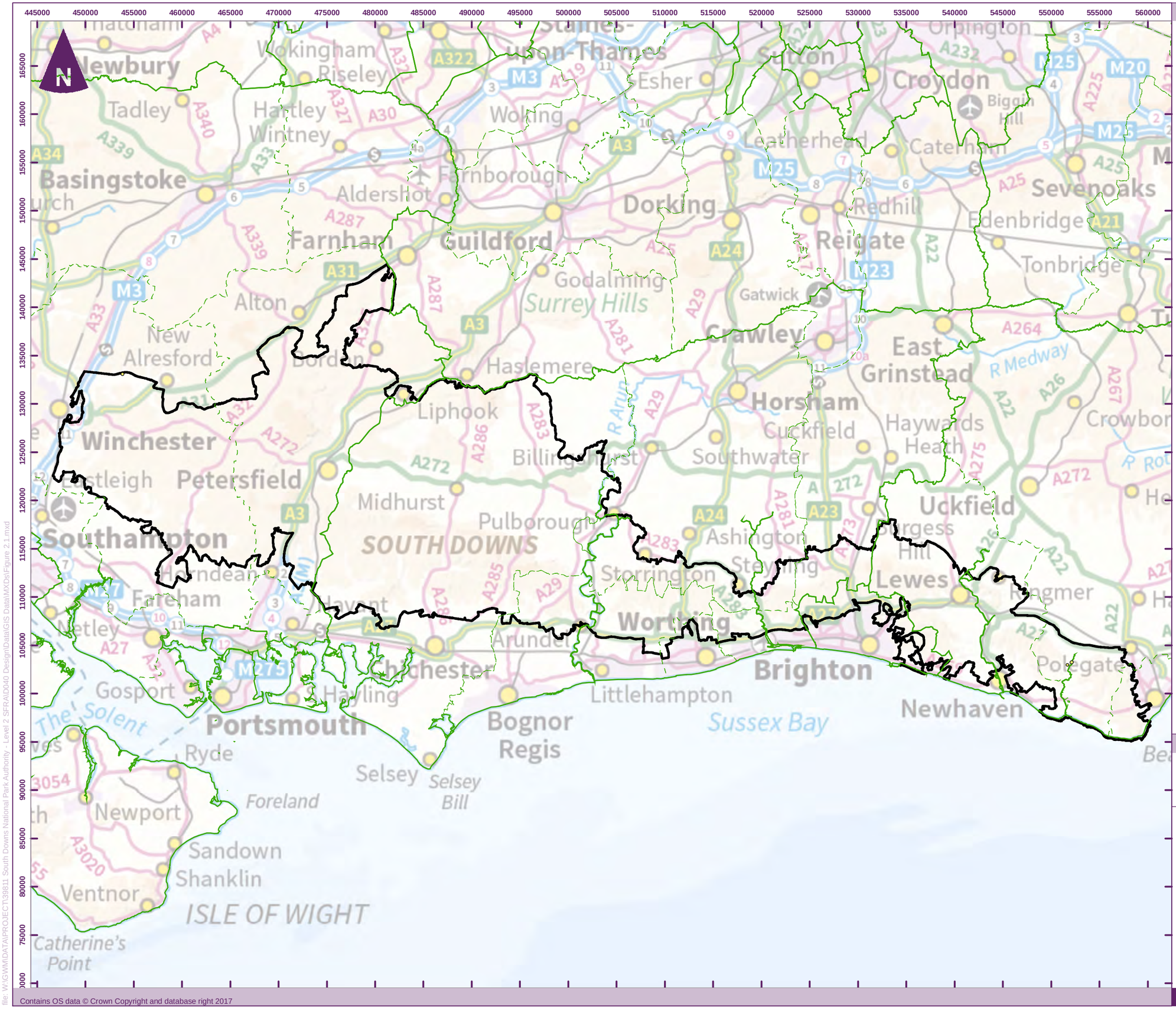
2.3.9 In addition to the SFRAs listed above, further targeted SFRAs have been produced to support the development of Minerals and Waste Plans. These concern flood risks to specific potential mineral and waste sites, which usually comprise previously developed brownfield land. SFRA documents of relevance to the National Park are:

- East Sussex County Council, South Downs and Brighton and Hove Waste and Minerals Sites Plan (2017);
- West Sussex County Council Level 1 SFRA (January 2010);
- West Sussex and National Park Authority SFRA Update (2017); and
- Hampshire (Portsmouth, Southampton, New Forest National Park and National Park) Minerals and Waste Plan (Adopted October 2013).

Site-specific FRAs for Major Strategic Developments

2.3.10 A FRA[10] was undertaken as part of a planning application for a strategic development site at North Street Quarter in Lewes. In support of the FRA a detailed modelling study was performed in 2013[11] to investigate the standard of protection provided by proposed flood defences for this area of Lewes and to ensure that there was no increase in flood risk elsewhere in Lewes due to the loss of conveyance. Planning permission has now been granted for the North Street Quarter development, and consequently this site is not being considered in this Level 2 SFRA. However, the North Street Quarter FRA and associated modelling study are of relevance, as the development of new flood defences for this site could affect flood risk elsewhere in Lewes town centre.

[10] Tully De'Ath (2015) North Street Quarter, Lewes, Flood Risk Assessment.
[11] JBA (2013) North Street Quarter, Lewes: Flood Defence Modelling.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County Boundaries
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SOUTH DOWNS NATIONAL PARK
South Downs National Park Authority
Level 2 SFRA
amec foster wheeler
Figure 2.1
Study Area
July 2017
Figure 2.1.mxd ROSCV
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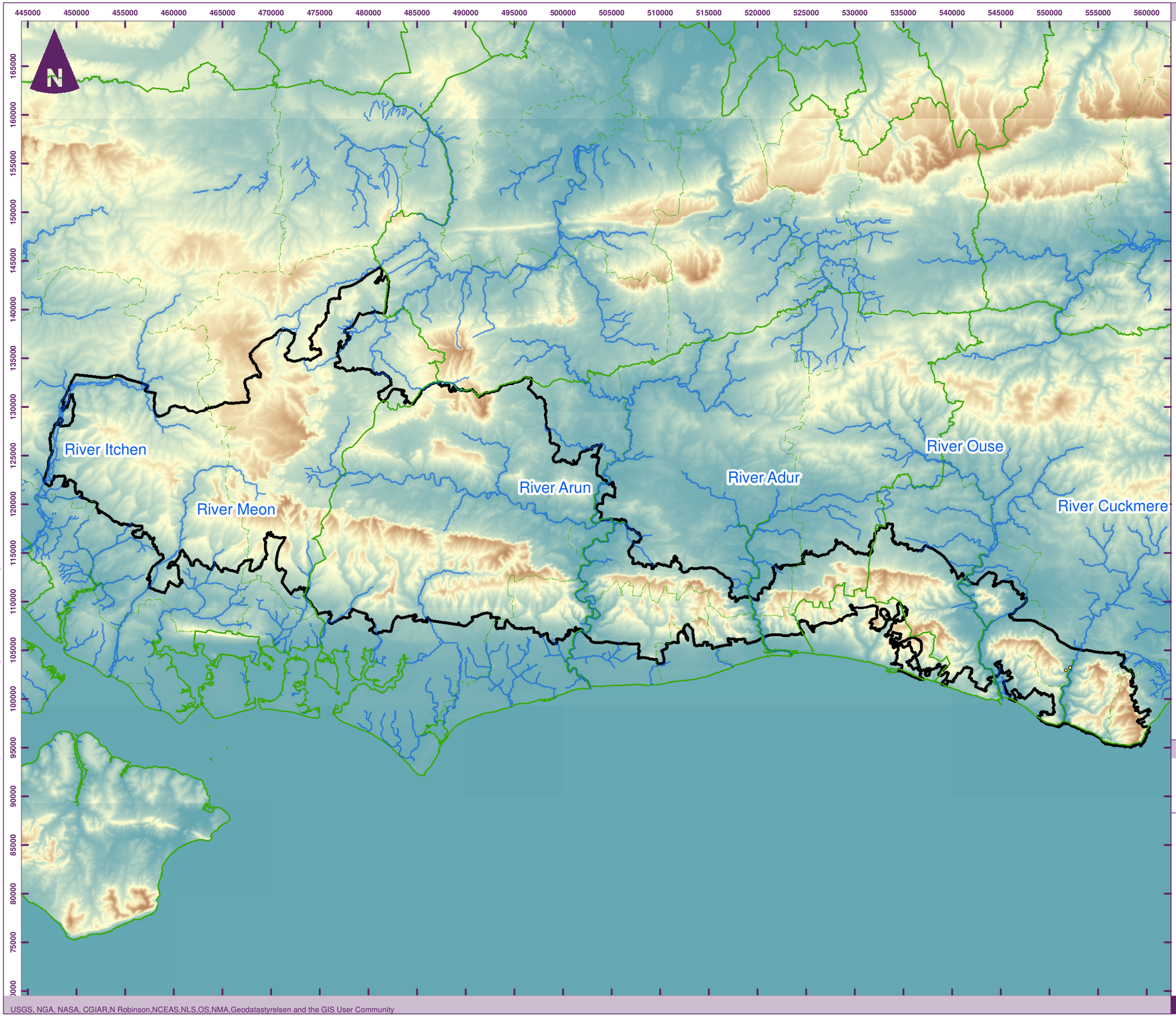

Key

- Main Rivers
- County Boundaries
- District Boundaries
- SDNPA Boundary

Digital Terrain Model (mAOD)

High: 290

Low: -1

0 2.5 5 7.5 10 12.5 15 17.5 20 km

Scale at A3: 1:375,000

Client

SOUTH DOWNS NATIONAL PARK

South Downs National Park Authority
Level 2 SFRA

amec foster wheeler

Figure 2.2
Topography and Watercourses

July 2017 Figure 2.2.mxd ROSCV

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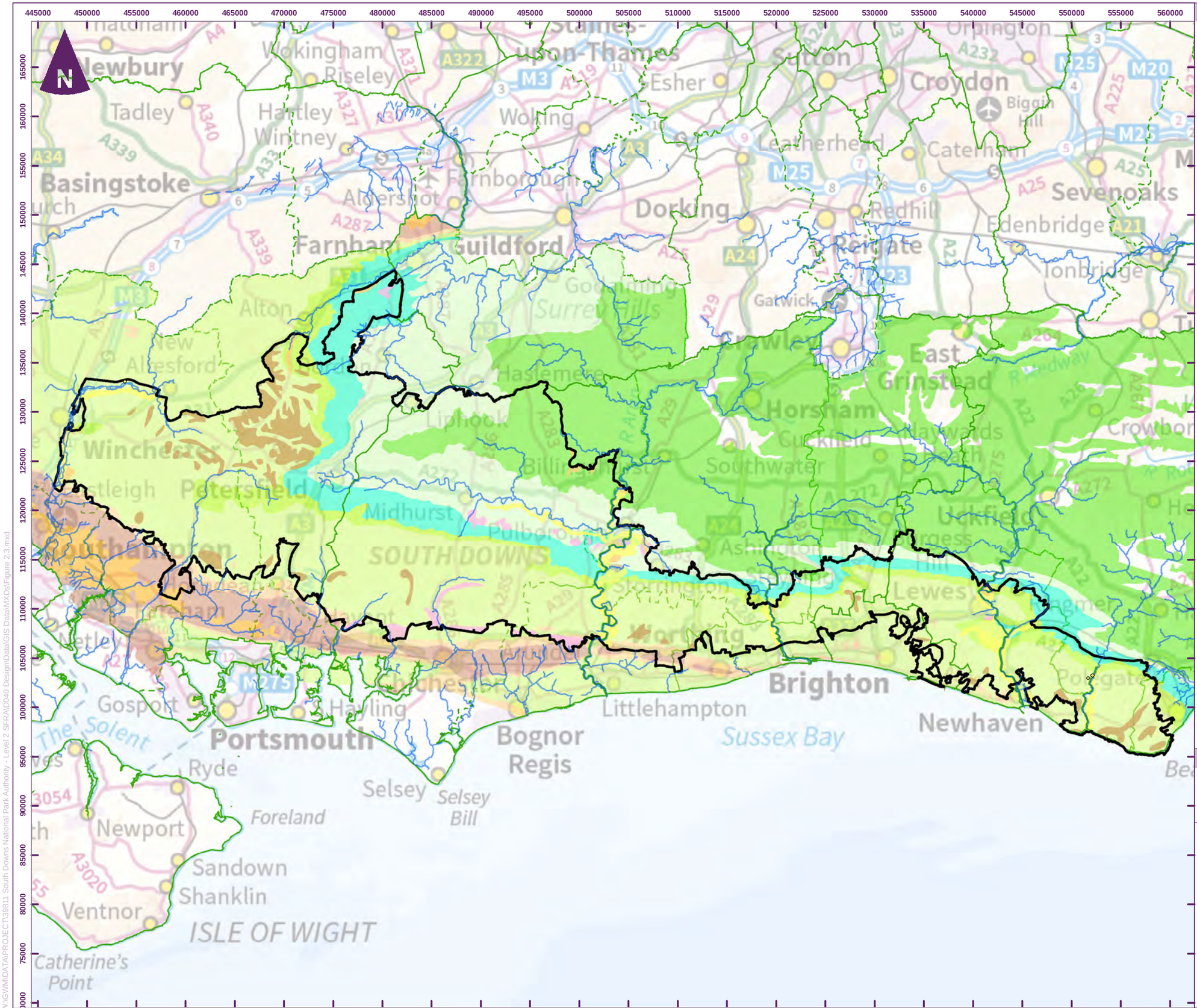

Key

- Main Rivers
- SDNP Boundary
- District Boundaries
- County Boundaries

Superficial Geology

- ALLUVIUM
- BRICKEARTH
- CLAY-WITH-FLINTS
- LACUSTRINE DEPOSITS (UNDIFFERENTIATED)
- RIVER TERRACE DEPOSITS (UNDIFFERENTIATED)
- SAND AND GRAVEL OF UNCERTAIN AGE AND ORIGIN

Solid Geology

- BRACKLESHAM GROUP AND BARTON GROUP (UNDIFFERENTIATED)
- GAULT FORMATION AND UPPER GREENSAND FORMATION (UNDIFFERENTIATED)
- GREY CHALK SUBGROUP
- LAMBETH GROUP
- LOWER GREENSAND GROUP
- THAMES GROUP
- WEALDEN GROUP
- WHITE CHALK SUBGROUP

0 2.5 5 7.5 10 12.5 15 17.5 20 km

Scale at A3: 1:375,000

Client

SOUTH DOWNS NATIONAL PARK

South Downs National Park Authority
Level 2 SFRA

amec foster wheeler

Figure 2.3
Study Area Surface Geology

3. Flood Risk Screening

This section describes the flood risk screening assessment applied to the potential development sites considered in this study. Sites likely or possibly at risk of flooding are identified and the requirements for further investigation presented.

3.1 Approach

Sites Considered

3.1.1 A total of 56 sites have been screened for flood risk, comprising the following:

- 37 South Downs Local Plan potential site allocations, comprising:
  - 31 housing and mixed use sites[12];
  - 1 strategic, mixed-use site; and
  - 5 gypsy and traveller sites.
- 18 potential housing sites from the Lewes NDP; and
- 1 potential housing site from the Twyford NDP.

3.1.2 Throughout the rest of this document, South Downs Local Plan sites are identified with the prefix 'SD'; whereas Lewes NDP sites are identified with the prefix 'PL1'.

Datasets Used for Screening

The screening process used the following datasets:

- The EA Flood Zone 2 (1 in 1000 Annual Exceedance Probability, or AEP) extent – used for fluvial and tidal risk screening;
- The EA Risk of Flooding from Surface Water (RoFfSW) 1 in 1000 AEP extent – used for surface water risk screening, but also provides some context as a surrogate for groundwater emergence risk, particularly over chalk;
- EA Areas Susceptible to Groundwater Flooding – used for groundwater risk screening; and
- British Geological Survey (BGS) superficial and drift geology mapping[13] - used to support the groundwater risk screening.

Screening Methodology

3.1.3 A two-phase screening process was adopted, which was broadly similar to that used in the Level 1 SFRA. Firstly, a preliminary GIS-based automated process was used to intersect each of the allocation site boundaries against the mapping data listed above. This was also done with 50 m and 100 m buffers around each of the site boundaries to identify those sites where access may be at flood risk, and/or where climate change could mean that flood risks in the vicinity could extend onto the site into the future. The second phase was a manual assessment using visual examination of the datasets to verify the first phase.

[12] An original list of 33 potential housing and mixed use allocation sites was supplied by SDNPA. Two sites were subsequently removed from further consideration, as planning permission had already been granted for them.
[13] http://mapapps.bgs.ac.uk/geologyofbritain/home.html (Accessed 20/06/2017).

3.1.4 The screening process classifications and criteria are shown in Table 3.1. A simple 'traffic-light' assessment methodology was employed to indicate the likelihood of flooding. The likelihood of flooding for sites categorised as green is unlikely/none, therefore these sites were 'screened out' and not considered further. Sites categorised with a potential (amber) and likely (red), likelihood of flooding, were 'screened in' to undergo further assessment. If an allocation was screened in for any one flood risk type, then it was screened in for further assessment.

Table 3.1 Screening Process Classification and Criteria

Likelihood of flooding	Fluvial/tidal	Surface Water	Groundwater
Likely	Within Flood Zone 2	Clear surface water flood pathways or significant areas of ponding within site boundary	On Chalk aquifer with topographic context suggesting emergence of groundwater likely (particularly as evidenced by surface water pathways through the site)
Possible	Within 50m of the edge of Flood Zone 2 and in a topographic setting which suggests climate change could increase flood risk over development lifetime.	Surface water flood risk affects small parts of site (e.g. along site boundary) or site access	On Chalk aquifer, but topographic context suggests less risk to site, although there could be risk to access or immediate environs. On Lower Greensand or minor aquifer and topographic context suggests potential for flooding (surface water pathways in or near site)
Unlikely / no risk	More than 50m away from edge of Flood Zone 2	Surface water flood risk does not affect either site or its access	Sites on aquifers, but at the tops of hills/on non-convergent valley side slopes where groundwater emergence is not considered likely. Sites on non-aquifer strata.

3.2 Results

3.2.1 A summary of the results of the screening assessment is provided in Table 3.2 and Figures 3.1 and 3.2. The individual screening assessments for fluvial and tidal, surface water, and groundwater flood risk, along with the overall screening results are presented in Table 3.3.

Table 3.2 Summary of Flood Risk Screening Exercise

Plan Document	No. of sites	No. of sites with potential fluvial/tidal flood risk	No. of sites with potential surface water flood risk	No. of sites with potential groundwater flood risk	No. of sites with no identified flood risk (screened out)	No. of sites with minor risks to access only (screened out)	Overall no. of sites screened in for further assessment
South Downs Local Plan	37	5	23	16	13	3	21
Lewes NDP	18	8	16	10	2	6	10
Twyford NDP	1	0	1	1	0	0	1
All	**56**	**13**	**40**	**27**	**15**	**9**	**32**

3.2.2 In summary:

- 5sites in the South Downs Local Plan and 8 in the Lewes NDP were identified with a Likely or Possible fluvial and/or tidal flood risk, primarily due to sites being located in FZ2 or FZ3 of major watercourses such as the Rivers Rother, Adur, Cuckmere and Ouse;
- 23 sites in the South Downs Local Plan,16 in the Lewes NDP and 1 sites in the Twyford NDP were identified as having a Likely or Possible surface water flood risk assessment, due to mapped surface water flow pathways crossing the site or potential site access; and
- 16 sites in the South Downs Local Plan and 10 in the Lewes NDP were identified with a Likely or Possible groundwater flood risk, most often due to the presence of underlying Chalk and location of the sites in floodplains or dry valleys.

3.2.3 From the screening assessment, no flood risks were identified for 15 sites. Three of these sites, which are all potential South Downs Local Plan allocations, have areas exceeding 1 ha, for which NPPF would require a FRA to accompany a planning application, regardless of the lack of flood risks identified in this exercise:

- SD64, Land South of London Road, Coldwaltham;
- SD73, Land at Petersfield Road, Greatham; and
- SD92: Stedham Sawmill, Stedham.

3.2.4 It is recommended that Local Plan policies for these three sites specify that a FRA should accompany any planning application and concentrate on demonstrating that the site drainage strategy is consistent with NPPF requirements to not increase flood risk elsewhere over the lifetime of the development.

3.2.5 A further nine sites, three from the South Downs Local Plan and six from the Lewes NDP, were identified where there is no flood risk to the sites themselves, but where there is a potential surface water or groundwater flood risk to access only. These sites were excluded from further assessment on the basis that any surface water and groundwater risks to access are localised, and, in the case of surface water flooding, of short duration. Off-site flood risks for these sites were therefore unlikely to be a critical consideration for the overall safety of any development at these sites. It was concluded, therefore, that it would be more appropriate for a site-specific FRA to consider flood risk to access when specific proposals for development at these sites are brought forward for planning permission and when means and detail of access arrangements are known. It is recommended that Local Plan/NDP policies for all these sites specify that a FRA should accompany any planning application, and that this should particularly consider the flood risk to access and egress.

3.2.6 These sites are

- South Downs Local Plan:
  - SD71, Land at Elm Rise, Findon;
  - SD85, Land at Park Crescent, Midhurst and
  - SD87, Land at Church Lane, Pyecombe.
- Lewes NDP:
  - PL1 (02), Land at Astley House and police garage, Lewes;
  - PL1 (21), Land at Kingsley Road garage site, Lewes;
  - PL1 (34), Land at Little East Street car park, corner of North and East Street, Lewes;
  - PL1 (44), Land at Princes Charles Road garage site, Lewes;
  - PL1 (46), Land at Queens Road garage site, Lewes; and

- PL1 (52), Land at St Anne's Crescent, Lewes.

3.2.7 The screening exercise has resulted in a total of 32 out of 56 sites screened in because one or more types of flooding are considered possible or likely within the site itself.

Allocation ID	Allocation Name	LLFA	Settlement	Site area (ha)	Allocation	Fluvial/ tidal flood risk	Fluvial/tidal - Justification	Surface water flood risk	Surface water - Justification	Groundwater flood risk	Groundwater - Justification	Screening Decision	Screened out but development area greater than 1 ha
South Downs Local Plan Housing Development Allocations													
SD58	Former Allotments	East Sussex	Alfriston	0.42	5 - 10	**Likely**	Partially within FZ2/3 of Cuckmere River	**Likely**	Site intersects surface water flow pathway	**Likely**	On Chalk aquifer at edge of floodplain, suggesting emergence of groundwater likely	**In**	
SD59	Kings Ride	East Sussex	Alfriston	0.38	6 to 8	**Unlikely**	Not within 100 m of FZ2	**Unlikely**	No mapped surface water flood risk within 100m	**Unlikely**	On Chalk aquifer, but valley side slope location suggests low likelihood of groundwater emergence	**Out**	
SD60	Land at Clements Close	Hampshire	Binsted	0.53	10 to 12	**Unlikely**	Not within 100 m of FZ2	**Unlikely**	No mapped surface water flood risk within 50m	**Unlikely**	Upper Greensand - non-aquifer or secondary aquifer. Low likelihood of groundwater emergence	**Out**	
SD62	Land at Greenway Lane	Hampshire	Buriton	0.51	8 to 12	**Unlikely**	Not within 100 m of FZ2	**Unlikely**	No mapped surface water flood risk within 100m	**Unlikely**	On Chalk aquifer, but valley side slope location suggests low likelihood of groundwater emergence	**Out**	
SD63	Land South of the A272 at Hinton Marsh	Hampshire	Cheriton	0.86	12 to 15	**Unlikely**	Between 50 and 100m from FZ2.	**Unlikely**	No mapped surface water flood risk within 50m	**Possible**	On Chalk aquifer, close to source of R. Itchen. BGS records indicate spring on site historically. Edge of winterbourne stream valley floor.	**In**	
SD64	Land South of London Road	West Sussex	Coldwaltham	3.88	35 to 40	**Unlikely**	Not within 100 m of FZ2	**Unlikely**	Mapped surface water flood risk within 50m of site, but draining away from site, and does not affect access	**Unlikely**	On Lower Greensand aquifer, but valley side slope location suggests low likelihood of groundwater emergence	**Out**	**Yes**
SD66	Land at Park Lane	Hampshire	Droxford	1.04	26-32	**Unlikely**	Not within 100 m of FZ2	**Likely**	Site intersects surface water flow pathway	**Likely**	On Chalk aquifer with topographic context suggesting emergence of groundwater possible (dry valley feature)	**In**	
SD67	Cowdray Works Yard	West Sussex	Easebourne	0.94	Mixed use 16-20	**Unlikely**	Not within 100 m of FZ2	**Likely**	Site intersects surface water flow pathway	**Possible**	On Lower Greensand aquifer and topographic context suggests potential for groundwater flooding (dry valley and surface water flow pathways)	**In**	
SD68	Land at Egmont Road	West Sussex	Easebourne	0.68	16-20	**Unlikely**	Not within 100 m of FZ2	**Possible**	Flooding on site minimal, but access roads are potentially affected	**Possible**	On Lower Greensand aquifer and topographic context suggests potential for groundwater flooding (dry valley and surface water flow pathways)	**In**	
SD69	Former Easebourne School	West Sussex	Easebourne	2.14	16-20	**Unlikely**	Not within 100 m of FZ2	**Possible**	Potential flood risk to access	**Possible**	On Lower Greensand aquifer and topographic context suggests potential for groundwater flooding (dry valley and surface water flow pathways)	**In**	
SD71	Land at Elm Rise	West Sussex	Findon	0.73	15-20	**Unlikely**	Not within 100 m of FZ2	**Possible**	Potential flood risk to access	**Possible**	On Chalk aquifer, but topographic context suggests little or no risk to site, although there could be risk to access	**Out - flood risk to access only**	
SD72	Soldiers Field House	West Sussex	Findon	0.60	10 to 12	**Unlikely**	Not within 100 m of FZ2	**Likely**	Site intersects surface water flow pathway	**Likely**	On Chalk aquifer with topographic context suggesting emergence of groundwater likely	**In**	
SD73	Land at Petersfield Road	Hampshire	Greatham	2.37	35-40	**Unlikely**	Not within 100 m of FZ2	**Unlikely**	No mapped surface water flood risk within 50m	**Unlikely**	On Lower Greensand aquifer, but topographic context suggests little potential for groundwater flooding.	**Out**	**Yes**
SD76	Land at Itchen Abbas House	Hampshire	Itchen Abbas	0.66	8 to 10	**Unlikely**	Within 50m of FZ2, but site sufficiently elevated above the flood mapping extents to be unaffected. The site slopes from north to south towards the River Itchen	**Unlikely**	Mapped surface water flood risk within 50m of site, but draining away from site, and does not affect access	**Unlikely**	On Chalk aquifer, but topographic context suggests little or no risk to site.	**Out**	
SD77	Land at Castelmer Fruit Farm	East Sussex	Kingston Near Lewes	0.72	10 to 12	**Unlikely**	Not within 100 m of FZ2	**Possible**	Localised surface water ponding in part of site	**Possible**	On Chalk aquifer with topographic context suggesting emergence of groundwater likely	**In**	
SD79	Land at Old Malling Farm	East Sussex	Lewes	9.97	220-240	**Likely**	Within River Ouse FZ 2 and 3	**Possible**	Surface water flooding within 50m of site boundary	**Likely**	Low-lying floodplain location, river terrace gravels over Chalk, groundwater emergence possible	**In**	
SD81	Depot and former Brickworks site	West Sussex	Midhurst	4.07	65-90	**Unlikely**	Not within 100 m of FZ2	**Likely**	Site intersects surface water flow pathway	**Unlikely**	On Lower Greensand aquifer, but topographic context suggests little potential for groundwater flooding.	**In**	
SD82	Holmbush Caravan Park	West Sussex	Midhurst	4.96	50 to 70	**Likely**	Partially within FZ2 and 3 of tributary of the River Rother	**Likely**	There is a pond on the site	**Possible**	On Lower Greensand aquifer, topographic context suggests some potential for groundwater flooding.	**In**	
SD83	Land at the Fairway	West Sussex	Midhurst	0.11	8 to 10	**Unlikely**	Between 50 and 100m from FZ2	**Unlikely**	Surface water flooding within 50m of site boundary, but does not affect access	**Unlikely**	On Lower Greensand aquifer, but topographic context suggests little potential for groundwater flooding.	**Out**	
SD84	Land at Lamberts Lane	West Sussex	Midhurst	0.43	20	**Unlikely**	Not within 100 m of FZ2	**Likely**	Site intersects surface water flow pathway and potential risk to access	**Unlikely**	On Lower Greensand aquifer, but topographic context suggests little potential for groundwater flooding.	**In**	
SD85	Land at Park Crescent	West Sussex	Midhurst	0.34	8 to 12	**Unlikely**	Not within 100 m of FZ2	**Possible**	Potential flood risk to access	**Unlikely**	On Lower Greensand aquifer, but topographic context suggests little potential for groundwater flooding.	**Out - flood risk to access only**	
SD87	Land at Church Lane	West Sussex	Pyecombe	0.98	8	**Unlikely**	Not within 100 m of FZ2	**Possible**	Potential flood risk to access	**Possible**	On Chalk aquifer with topographic context suggesting emergence of groundwater possible in immediate vicinity of site, affecting access (dry valley feature).	**Out - flood risk to access only**	
SD88	Land at Ketchers Field	Hampshire	Selborne	0.24	5 to 6	**Unlikely**	Not within 100 m of FZ2	**Possible**	Flooding on site minimal, but potential flood risk to access	**Unlikely**	On Lower Greensand aquifer, but topographic context suggests little potential for groundwater flooding.	**In**	

Allocation ID	Allocation Name	LLFA	Settlement	Site area (ha)	Allocation	Fluvial/ tidal flood risk	Fluvial/tidal - Justification	Surface water flood risk	Surface water - Justification	Groundwater flood risk	Groundwater - Justification	Screening Decision	Screened out but development area greater than 1 ha
SD89	Land at Pulens Lane	Hampshire	Sheet	3.59	30 to 32	Likely	Partially within FZ2 and 3 of the River Rother	Possible	Only a small area of surface water flooding	Likely	On Lower Greensand covered with aluvium. Flood plain location suggests potential for flooding from alluvial deposits assocated with R Rother.	In	
SD90	Land at Loopers Ash	West Sussex	South Harting	0.60	6 to 8	Unlikely	Not within 100 m of FZ2	Unlikely	No significant mapped flood risk in vicinity of site	Unlikely	On Chalk aquifer, but topographic context suggests little or no risk to site.	Out	
SD91	Land North of the Forge	West Sussex	South Harting	0.12	5 to 6	Unlikely	Not within 100 m of FZ2	Likely	Site intersects surface water flow pathway and is close to a minor watercourse	Unlikely	On Lower Greensand aquifer, but topographic context suggests little potential for groundwater flooding.	In	
SD92	Stedham Sawmill	West Sussex	Stedham	1.28	30	Unlikely	Not within 100 m of FZ2	Unlikely	No mapped surface water flood risk within 50m	Unlikely	On Lower Greensand aquifer, but topographic context suggests little potential for groundwater flooding.	Out	Yes
SD93	Land South of Church Road	Hampshire	Steep	0.68	8 to 12	Unlikely	Not within 100 m of FZ2	Possible	Only small area of site near boundary mapped at risk	Unlikely	On Gault Formation (non-aquifer) and topographic context suggests little potential for groundwater flooding.	In	
SD94	Land at Ramsdean Road	Hampshire	Stroud	1.44	26 - 30	Unlikely	Not within 100 m of FZ2	Likely	Site intersects surface water flow pathway	Unlikely	On Gault Formation (non-aquifer) and topographic context suggests little potential for groundwater flooding.	In	
SD95	Land South of Heather Close	West Sussex	West Ashling	0.68	15	Unlikely	Not within 100 m of FZ2	Unlikely	No mapped surface water flood risk within 50m	Unlikely	On Chalk aquifer, but topographic context suggests little or no risk to site.	Out	
SD96	Land at Long Priors	Hampshire	West Meon	0.48	10 to 12	Unlikely	Not within 100 m of FZ2	Possible	Only small area of site and access at risk	Likely	On Chalk aquifer with topographic context suggesting emergence of groundwater possible(dry valley feature).	In	
South Downs Local Plan Strategic Sites													
SD056	Shoreham Cement Works	West Sussex	Shoreham	44.36	Mixed uses numbers/floor space not specified	Likely	Partially within FZ2 and 3 River Adur	Likely	Ponding of surface water within site	Possible	On Chalk aquifer, site is disused Chalk quarry. Groundwater flood risk on most of site is low, but some risk assocated with alluvium in the west of the site adjacent to R Adur.	In	
South Downs Local Plan Traveller Site Allocations													
SD61	New Barn Stables, The Street	Hampshire	Binsted	0.17	2	Unlikely	Not within 100 m of FZ2	Unlikely	No mapped surface water flood risk within 50m	Unlikely	On Upper Greensand (secondary / non-aquifer), and topographic context suggests little or no risk to site.	Out	
SD74	Land at Fern Farm	Hampshire	Greatham	0.79	4	Unlikely	Between 50 and 100 m from FZ2 and 3	Unlikely	No mapped surface water flood risk within 50m	Unlikely	On Lower Greensand aquifer, but topographic context suggests little or no risk to site.	Out	
SD75	Half Acre	Hampshire	Hawkley	0.24	3	Unlikely	Not within 100 m of FZ2	Likely	Site intersects surface water flow pathway. Access potentially impacted.	Unlikely	On Gault Formation (non-aquifer) and topographic context suggests little or no risk to site.	In	
SD78	The Pump House	East Sussex	Kingston near Lewes	0.09	1	Unlikely	Not within 100 m of FZ2	Unlikely	No mapped surface water flood risk within 100m	Unlikely	On Chalk aquifer, but topographic context suggests little or no risk to site.	Out	
SD86	Offham Barns	East Sussex	Offham and Cooksbridge	0.3	4	Unlikely	Not within 100 m of FZ2	Likely	Surface water ponding on the site	Possible	On Chalk aquifer, topographic context (edge of dry valley) suggests GW emergence is possible.	In	
Lewes Local Neighbourhood Plan Allocations													
PL1 (02)	Land at Astley House and police garage	East Sussex	Lewes	0.18	25	Unlikely	Not within 100 m of FZ2	Possible	Potential flood risk to access	Unlikely	On Chalk aquifer, but topographic context suggests little or no risk to site.	Out - flood risk to access only	
PL1 (03)	Land at the Auction Rooms	East Sussex	Lewes	0.16	11	Likely	Within FZ2 and 3 right bank tributary of the River Ouse	Likely	Site intersects surface water flow pathway	Likely	On Chalk aquifer, overlain by alluvium assocated with the Lewes Winterbourne. Topographic setting indicates groundwater emergence likely.	In	
PL1 (04)	Land at Blois Road, garage site north	East Sussex	Lewes	0.11	6	Unlikely	Not within 100 m of FZ2	Unlikely	No mapped surface water flood risk within 50m	Unlikely	On Chalk aquifer, but topographic context suggests little or no risk to site.	Out	
PL1 (05)	Land at Blois Road, garage site south	East Sussex	Lewes	0.10	6	Unlikely	Not within 100 m of FZ2	Unlikely	No mapped surface water flood risk within 50m	Unlikely	On Chalk aquifer, but topographic context suggests little or no risk to site.	Out	
PL1 (08)	Land at Buckwell Court, garage site	East Sussex	Lewes	0.04	6	Possible	Within 50 m of FZ2 and 3 of the River Ouse; SDNPA project brief mentions possible history of flooding	Possible	Potential flood risk to access	Possible	On Chalk aquifer with topographic context (just raised above River Ouse flood plain) suggesting emergence of groundwater possible.	In	
PL1 (13)	Land at the former Wenban Smith Site	East Sussex	Lewes	0.42	11	Likely	Within FZ 2 and 3 River Ouse	Likely	Site intersects surface water flow pathway	Likely	On Chalk aquifer overlain with alluvium. Topographic context (floodplain location) suggests emergence of groundwater likely.	In	
PL1 (21)	Land at Kingsley Road garage site	East Sussex	Lewes	0.06	6	Unlikely	Not within 100 m of FZ2	Possible	Potential flood risk to access	Unlikely	On Chalk aquifer, but topographic context suggests little or no risk to site.	Out - flood risk to access only	
PL1 (30)	Land at Landport Road garage site	East Sussex	Lewes	0.09	6	Likely	Within FZ2 and 3 River Ouse	Likely	Site intersects surface water flow pathway	Likely	On Chalk aquifer overlain by alluvium. Topographic context (flood plain location) suggests emergence of groundwater likely	In	
PL1 (34)	Land at Little East Street car park, corner of North and East Street	East Sussex	Lewes	0.08	11	Unlikely	Between 50 and 100 m from FZ2 and 3	Possible	Potential flood risk to access	Unlikely	On Chalk aquifer, but topographic context suggests little or no risk to site.	Out - flood risk to access only	

Allocation ID	Allocation Name	LLFA	Settlement	Site area (ha)	Allocation	Fluvial/ tidal flood risk	Fluvial/tidal - Justification	Surface water flood risk	Surface water - Justification	Groundwater flood risk	Groundwater - Justification	Screening Decision	Screened out but development area greater than 1 ha
PL1 (35)	Land at the Lytchets garage site	East Sussex	Lewes	0.05	6	Unlikely	Not within 100 m of FZ2	Possible	Small part of site and access at risk	Possible	On Chalk aquifer, but topographic context suggests little or no risk to site, although there could be risk to access or immediate environs.	In	
PL1 (36)	Land at Magistrates Court Car Park, Court Road	East Sussex	Lewes	0.13	9	Likely	Within FZ2 and 3 River Ouse	Possible	Potential flood risk to access	Likely	On Chalk aquifer overlain by alluvium. Topographic context (flood plain location) suggests emergence of groundwater likely	In	
PL1 (39)	Land at former petrol station, Malling Street	East Sussex	Lewes	0.05	5	Likely	Within FZ2 and 3 River Ouse	Possible	Potential flood risk to access	Likely	On Chalk aquifer overlain by alluvium. Topographic context (flood plain location) suggests emergence of groundwater likely	In	
PL1 (44)	Land at Princes Charles Road garage site	East Sussex	Lewes	0.01	6	Unlikely	Not within 100 m of FZ2	Possible	Potential flood risk to access	Unlikely	On Chalk aquifer, but topographic context suggests little or no risk to site.	Out - flood risk to access only	
PL1 (46)	Land at Queens Road garage site	East Sussex	Lewes	0.18	10	Unlikely	Within 50m of FZ2 and 3 of the River Ouse, but land rises steeply at edge of floodplain	Possible	Potential flood risk to access	Unlikely	On Chalk aquifer, but topographic context suggests little or no risk to site.	Out - flood risk to access only	
PL1 (48)	Land at former Ambulance Headquarters, Friars Walk	East Sussex	Lewes	0.07	18	Likely	Within FZ2 and 3 River Ouse	Likely	Site intersects surface water flow pathway	Possible	On Chalk aquifer, topographic context (edge of flood plain) suggests GW emergence is possible.	In	
PL1 (52)	Land at St Anne's Crescent	East Sussex	Lewes	0.18	12	Unlikely	Not within 100 m of FZ2	Possible	Potential flood risk to access	Unlikely	On Chalk aquifer, but topographic context suggests little or no risk to site.	Out - flood risk to access only	
PL1 (53)	Former St Anne's School Site	East Sussex	Lewes	1.68	26 but could accommodate much more	Unlikely	Within 50 m of FZ2, but land rises steeply away from floodplain	Likely	Site intersects surface water flow pathway	Possible	On Chalk aquifer with topographic context (valley side of the Lewes Winterbourne) suggesting emergence of groundwater possible.	In	
PL1 (57)	Lewes railway station car park	East Sussex	Lewes	0.36	20	Likely	Within FZ2 and 3 River Ouse	Likely	Site intersects surface water flow pathway	Likely	On Chalk aquifer, overlain by alluvium assocated with the Lewes Winterbourne. Topographic setting indicates groundwater emergence likely.	In	
Twyford Local Neighbourhood Plan Allocation													
Twyford_NDP_26	Land at Hazeley Road	Hampshire	Twyford	0.63	20	Unlikely	Not within 100 m of FZ2	Likely	Site intersects surface water flow pathway. Access potentially impacted.	Likely	On Chalk aquifer with topographic context (dry valley location) suggesting emergence of groundwater likely.	In	

N

SD61
SD60
SD88
SD74
SD73
SD75
SD76
SD63
SD93
SD89
SD96
SD94
Twyford_NDP_26
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SD68
SD92
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SD62
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SD81
SD85
SD82
SD83
SD90
SD66
SD64
See Figure 3.2
SD87
SD86
SD79
SD71
SD72
SD56
SD78
SD77
SD95
SD58
SD59

Key

- SDNP Boundary
- County Boundaries
- District Boundaries
- Main Rivers
- Flood Defences
- Flood Zone 2
- Surface Water Flood Extent (1% AEP)

Flood Risk

Screened Out

- 0-8
- 9 - 12
- 13 - 20
- 21 - 30
- 31 - 40

Screened In

- 0-8
- 9 - 12
- 13 - 20
- 21 - 30
- 31 - 90
- 91 - 240

The colours red and green refer to whether the site was screened In or Out respectively, The size of the symbol refers to the number of properties proposed for each site.

0 1 2 3 4 5 6 7km

Scale at A0: 1:115,000

Client

SOUTH DOWNS NATIONAL PARK

South Downs National Park Authority
Level 2 SFRA

amec foster wheeler

Figure 3.1
Screening Results: SDNPA Local Plan and Twyford Neighbourhood Development Plan Sites

August 2017 | Figure 3.1.mxd ROSCV

539000 540000 541000 542000 543000

112000 111000 110000 109000

N

White Stable Cottage
The Gate House
Offham
The Drove
Hamsey Place Barn
Chalkham Farm
Oxham House
Ryderswells Farm
Queensland Cottage
Upper Stoneham Farm
Twin Cottages
Offham Hill
Ousedale House
Old Malling Farm House
South Malling
Racecourse House
Landport Bottom
Nevill Rd
Offham Rd
Hill Rd
Wallands Park
Lewes
Paddock La
High St
Houndean Bottom
Houndean Rise
Brighton Rd
Dale Rd
Valley Rd
Southover
Mountfield Rd
The Coombe
Cliffe Hill
Cuilfail
Machine Bottom
Bridle's Tan
Rise Farm
Old Mill House
Juggs Rd

PL1(8)
PL1(4)
PL1(5)
PL1(30)
PL1(21)
PL1(2)
PL1(52)
PL1(53)
PL1(46)
PL1(44)
PL1(35)
PL1(39)
PL1(13)
PL1(34)
PL1(48)
PL1(36)
PL1(57)
PL1(3)

Key

- District Boundaries
- Main Rivers
- Flood Defences
- Flood Zone 2
- Surface Water Flood Extent (1% AEP)
- Screened In
- Screened Out

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 km

Scale at A3: 1:15,000

Client

SOUTH DOWNS NATIONAL PARK

South Downs National Park Authority
Level 2 SFRA

amec foster wheeler

Figure 3.2
Screening Results: Lewes Neighbourhood Development Plan Sites

August 2017 Figure 3.2.mxd resid

4. Site-specific Flood Risk Assessment

This section outlines the more detailed assessment of flood risks carried out for those sites identified as potentially being at risk of flooding in Section 3. It covers fluvial, tidal, surface water and groundwater risks.

4.1 Approach

Overview

4.1.1 A more detailed assessment of flood risk has been undertaken for those sites identified in the screening exercise, as potentially being at risk of flooding. The results of this further assessment is provided in a Flood Risk Information Sheet for each site (Appendix B). These are structured to provide a detailed assessment of the flood risk posed by fluvial/tidal, surface water, and groundwater sources, where present for each site. The assessment for each type of flood risk presents the available historic flood information, and the extent and likelihood of risk to a site with consideration for future climate change. Based on this assessment, a series of flood risk management policy requirements and recommendations are provided for each site. These requirements set out the expectations for the development of a site in performing the Sequential and Exception tests, and what is required of a site-specific FRA.

4.1.2 A summary of the further assessments for fluvial/tidal, surface water, and groundwater flood risk is provided in the following sections. The flood risk management recommendations are discussed in Section 5.

Fluvial and Tidal Flood Risk

Scope

4.1.3 A more detailed assessment of flood risk has been carried out for those sites that were identified from the screening exercise presented in Section 3, as having at least a potential risk of fluvial and/or tidal flooding.

4.1.4 South Downs Local Plan:

- SD56 – Shoreham Cement Works (River Adur);
- SD58 – Former Allotments, Alfriston (Cuckmere River);
- SD82 – Holmbush Caravan Park, Midhurst (tributary of the River Rother);
- SD89 – Land at Pulens Lane, Sheet (River Rother); and
- SD79 - Land at Old Malling Farm, Lewes (River Ouse).

4.1.5 Lewes NDP (sites at risk of flooding from either the River Ouse or its tributary the Winterbourne Stream):

- PL1 (03) - Land at the Auction Rooms;
- PL1 (08) - Land at Buckwell Court, garage site;
- PL1 (13) - Land at the former Wenban Smith Site;
- PL1 (30) - Land at Landport Road garage site;
- PL1 (36) - Land at Magistrates Court Car Park, Court Road;

- PL1 (39) - Land at former petrol station, Malling Street;
- PL1 (48) - Land at former Ambulance Headquarters, Friars Walk; and
- PL1 (57) - Lewes railway station car park.

4.1.6 The following information has been used to support assessments for all sites potentially at risk from fluvial and tidal flooding:

- Flood Map for Planning datasets (Flood Zones 2 and 3 outlines, areas benefiting from defences);
- Historical flood extents; and
- National Flood and Coastal Defence Database (NFCDD) date on flood defence type and standard of protection.

Datasets

4.1.7 The EA provided river model results to support assessments for sites at risk from the River Ouse at Lewes, for the River Adur (SD56 – Shoreham Cement Works) and River Rother (SD89 – Land at Pulens Lane, Sheet), as summarised in Table 4.1. No model results are available to inform further assessment for sites SD58 (Former Allotments, Alfriston) and SD82 (Holmbush Caravan Park, Midhurst).

Table 4.1 EA Models Used for Site-specific Analyses

Model study	Date completed	Data interrogated	SFRA sites assessed
Ouse Model Maintenance ABD and Hazard Mapping[14] (Lower R. Ouse)	2012	Modelling report and accompanying appendices. Defended and Undefended, standard modelling AEP scenarios: ▶ Gridded water depths for fluvial, tidal and combined scenarios; ▶ Gridded Hazard mapping; ▶ Flood extent shapefiles; and ▶ Areas Benefitting from Defences (ABD) shapefiles.	All sites in Lewes screened in as having a fluvial/tidal flood risk.
North Street Quarter (NSQ), Lewes: Flood Defence Modelling	2013	Modelling report and accompanying appendices as part of NSQ FRA[10].	PL1 (13) Former Wenban Smith site PL1 (30) Landport Road garage site
River Adur Flood Mapping Study[15] (Lower)	2005	Modelling report. Defended and Undefended gridded water depths and maximum velocities for fluvial, tidal and combined for standard modelling AEP scenarios.	(SD56) Shoreham cement works
The River Rother Flood Study[16]	2007	Modelling report and accompanying appendices (D) of maximum water depths for standard modelling AEP scenarios at all model cross-sections.	(SD89) Land at Pulens Lane

4.1.8 Two comparatively recent hydraulic modelling studies have been carried out in Lewes. The first, listed in Table 4.1, modelled the Lower River Ouse for a range of fluvial, tidal and combined AEP events to investigate the areas benefiting from defences (ABD) and provide hazard maps. The resulting data from the first study have been made available for this SFRA. The second modelling study was performed to inform a FRA[11] for a development at the North Street Quarter (NSQ) area

[14] JBA (2012). Ouse Model Maintenance ABD and Hazard Mapping.
[15] Atkins/PBA/Jacobs consortium (2005). River Adur Flood Mapping Study.
[16] Peter Brett Associates (2007) - The River Rother Flood Study - Modelling Report.

of Lewes, north of the Phoenix Causeway. The second study was completed in October 2013 included an estimation of the level of protection offered by proposed flood defences along the boundary of the NSQ development as well as upgrades to defences in the Landport Road area of Lewes. Only the resulting report of the second study has informed this SFRA, no modelling outputs have been provided.

4.1.9 Where available, existing model outputs have been used to define:

- The extent of Flood Zone 3b, the functional floodplain, as defined by the 1 in 20 AEP fluvial or 1 in 20 AEP tidal scenarios, whichever has the greater extent.
- Flood depths at the each site and along potential access routes, for the present day and future 1 in 100 AEP fluvial events, including a 20% flood peak climate change uplift, and the 1 in 1000 AEP fluvial event. Where available, the 1 in 1000 AEP fluvial event was also used as a proxy for the future 1 in100 AEP fluvial event under conditions of more severe climate change than implied by a 20% increase in flows would, as discussed further below. Where there is a tidal component to the flood risk, the 1 in 200 AEP present day and future (2115) flood levels have also been referred to. Figures quoted are from defended scenarios, as these most closely represent the true prevailing flood risk.
- Areas benefiting and dis-benefiting from defences by comparing the defended and undefended flood extents from the Lower River Ouse at Lewes. (The modelling results available for Lewes show that the defended model outputs have greater flood extents and water depths at certain locations over the undefended model scenario, as was noted in 2012 EA modelling study[14]).
- Flood hazard as defined by the Defra FD2321 methodology[17], for sites and potential access routes for the 1 in 100 AEP + 20% climate change and the 1 in 1000 AEP fluvial event. Where available, the 1 in 1000 AEP fluvial event was also used as a proxy for the future 1 in100 AEP fluvial event under conditions of more severe climate change than implied by a 20% increase in flows would, as discussed further below.
- The standard of protection offered by flood defences. Where this standard of protection exceeded 1 in 100 AEP, an assessment of the Danger to People arising from flood defence breach was undertaken, based on the FD2321 methodology. This has been assessed in this report by factoring distance from defence and the 1 in 100 AEP plus climate change water depth in front of the defence, as per the FD2321 methodology[17].

Approach to Climate Change Assessment

4.1.10 Model information was used to assess the potential impact of future climate change on flows and tidal levels wherever possible. However, all the modelling output provided by the EA to support this study incorporated a 20% increase in fluvial flows to account for climate change impacts, which has now be superseded by updated guidance on climate change allowances for FRA first published by the EA in 2016[7]. The EA is currently updating its modelling for the National Park area with updated climate change allowances, but that this will not be available until the end of 2017.

4.1.11 The current EA climate change guidance provides regionally varying climate change allowances for peak river flows. For each river basin district across England and for each climate change epoch (considering the 2020s, 2050s and 2080s), values are given for a range of allowance categories, 'Central', Higher Central', and 'Upper End', reflecting the uncertainty in future climate projections and their impacts on peak river flows. Guidance is then provided on which allowance category to assign based on the flood zone in which the development is located and its flood risk vulnerability classification. For More Vulnerable land uses such as housing, the guidance recommends Higher

[17] Defra (2006) R&D outputs: Flood risks to people, Phase 2 FD2321/TR2 Guidance Document http://randd.defra.gov.uk/Document.aspx?Document=FD2321_3437_TRP.pdf (Accessed 18/07/2017).
The FD2321 methodology is a process by which information on flood depth and velocity from model outputs is processed into a hazard score. Data presented in this report are based on model outputs provided by the Environment Agency, and are provided as contextual information for application of the Exception Test and for future site-specific FRAs.

Central and Upper End allowances are used to assess the range of potential climate change impacts on river flows flood risk over the development lifetime. For the South East region for the 2080s epoch, the Higher Central and Upper End river flow allowances are 45% and 105% respectively. These represent a significant increase in fluvial flood risk due to climate change compared to the previous standard 20% increase in flows used for all the modelling made available for this study.

4.1.12 For sites where a potential fluvial flood risk has been identified, there is therefore a requirement to assess the potential impact on site suitability and flood risk that these greater increases in peak flows would imply. Once updated model results are available from the EA, this could be done on the basis of these model outputs. We have recommended for all sites that developers need to consider fluvial and tidal flood risk in line with the latest EA guidance and outputs in site-specific FRAs. However, in the interim, we have used two alternative methods to assess the impact of more severe impacts of climate change on fluvial flood risk:

1) **Use of the current 1 in 1000 AEP flood as a proxy for the future climate change 1 in 100 AEP flood ('Method 1' – sites in Lewes only)**. Evaluation of the hydrological inputs used for the Lower Ouse model suggested that the 1 in 1000 AEP fluvial flow constitute a 67% increase in peak flow compared to the 1 in 100 AEP event (considering a weighted average of all inflow hydrograph peaks). This represents a flow which is mid-way between the Higher Central and Upper End estimates specified for the South East region for the 2080s by the current EA guidance. It was therefore agreed with the EA that the 1 in 1000 AEP event would be used as a reasonably proxy to represent a future 1 in 100 AEP (plus climate change) that would be broadly in line with current guidance on climate change allowances for FRA. This assessment has been carried out for sites in Lewes only, as the only model supplied by the EA for which 1 in 1000 AEP flood depths and extents were available was the Lower Ouse model. By way of comparison, the previous 1 in 100 AEP plus 20% increase in flows climate change standard scenario has also been reported on.

2) **Application of a buffer around Flood Zone 2 ('Method 2' – all sites).** A 15m buffer was placed around the Flood Zone 2 extent, in order to represent the situation where a future climate change-impacted 1 in 100 AEP event yields a flood extent that is slightly greater than the current 1 in 1000 AEP extent. This is based on feedback from the EA that Upper End river flow allowances in the South East region could give rise to greater flood extents than the current 1 in 1000 AEP extents defining Flood Zone 2[18]. It is recognised that this approach is somewhat simplistic in that it does not account for specific local topographic or hydraulic circumstances. However, it does provide some indication of the additional area of the site where development might become constrained for flood reasons in the future. This method was applied to all sites where a potential fluvial flood risk was identified. For the four sites outside Lewes, application of this method was the only source of information available on future more severe climate change impacts on fluvial flood risk. For the sites in Lewes, this method was used in addition to Method 1, as discussed above.

4.1.13 Results from these two methods are presented below in Section 4.2. These results provide an indication of the greater impacts of future climate change on fluvial flood risk that are now anticipated by current EA guidance. However, they are not based on a full update of hydraulic modelling with current climate change allowances, and, as such, should be viewed as indicative only. Given this uncertainty, results from the previous standard fluvial climate change '+20%' scenarios are provided in the Flood Risk Information Sheets in Appendix B. However, it is noted in the Flood Risk Information Sheets for all sites affected by fluvial flood risk that design flood levels would need to be evaluated in a site-specific FRA using current EA climate change guidance.

4.1.14 It should be noted that this additional assessment only relates to the impacts of climate change on fluvial flows, as the allowances for sea level rise for climate change used in tidal scenarios are unchanged between current and previous guidance.

[18] Telephone conversation between Carrie Whittaker of the EA and Steve Anderton of Amec Foster Wheeler, 16th August 2017. A 15m buffer on Flood Zone 2 was subsequently agreed with the EA on 18th August 2017, in a telephone conversation between Carrie Whittaker and Gareth Owen of Amec Foster Wheeler.

Surface Water Flood Risk

4.1.15 In order to assess the risk of surface water flooding, for each allocation site, the following has been undertaken:

- Assessment of the 1 in 30, 1 in 1000 and 1 in 1000 AEP RoFfSW map outlines for each site and its potential access routes;
- Assessment of the FD2321 Flood Hazard rating associated with the 1 in 100 AEP RoFfSW event for each site and its potential access points; and
- Historic flood risk incident and Drainage Risk Area datasets, provided by East Sussex County Council.

4.1.16 Assessment of a dataset detailing areas at risk of drainage failure provided by West Sussex County Council. No data were available on which to base a quantitative assessment of the effects of climate change on surface water flood risk, but qualitative comments were made as appropriate. In most cases, this was limited to the observation that climate change would probably increase surface water flood risk over the lifetime of the development.

Groundwater Flood Risk

4.1.17 For the allocation sites where groundwater flooding has been identified as possible or likely, a more detailed assessment of groundwater flood risk has been undertaken. Unlike for the fluvial, tidal and surface water flood risk assessments, no detailed quantitative data are available for the groundwater assessment, so the more detailed assessment effectively formed an extension of the qualitative assessment carried out for the screening exercise. Information considered includes:

- Solid and superficial surface geology mapping[13];
- Ordnance survey topographical maps;
- EA RoFfSW 1 in 1000 AEP outline maps; and
- Historical records of groundwater flooding and other groundwater flood risk information in published reports such as groundwater management plans, and surface water management plans where available.

4.1.18 Without knowledge of site-specific conditions, such as groundwater levels in the strata underlying the site, this assessment is necessarily high level. The groundwater flood risk assessment has been undertaken by a hydrogeologist experienced in Chalk and Greensand hydrogeology, but does rely on professional judgement, to establish the likely risk to the sites.

Other Sources of Flood Risk

4.1.19 Other sources of flood risk have been noted at site level in individual Flood Risk Information Sheets in Appendix B as appropriate. This includes consideration of the following:

- Residual flood risk from failure of an upstream reservoir impoundment, based on visual assessment of online mapping[19];
- Southern Water have provided data for sewer flooding in Lewes. In addition, where other reports refer to sewer flooding in a locality, this has been noted; and
- Residual risk of flooding from culvert blockage has been noted, where it is apparent that watercourses are culverted in the vicinity of allocation sites.

[19] https://flood-warning-information.service.gov.uk/long-term-flood-risk/ (Accessed 27/07/17).

4.2 Results

Fluvial and Tidal Flood Risk

4.2.1 This section provides a summary of the results from the fluvial and tidal flood risk assessments, including the assessment of potential climate change impacts. Firstly, a brief overview of the flood risk to the four South Downs Local Plan sites identified as being at potential risk of fluvial or tidal flooding from the River Rother, the River Adur, and the Cuckmere River is provided. Following this, the fluvial and tidal flood risk to sites in Lewes (eight Lewes NDP sites and one South Downs Local Plan site) is described.

River Rother

4.2.2 Site SD89 – Land at Pulens Lane, Sheet, was screened in as being at potential fluvial flood risk from the River Rother. Only a small part of the overall area of the site immediately adjacent to the river is assessed as being at flood risk, with 18.6 % of the site in Flood Zone 2 and 14 % of the site in Flood Zone 3. Available model outputs were limited to maximum water levels at model nodes for a range of events probabilities. Model results indicated peak flood levels of 49.42 mAOD for the 1 in 100 AEP event and 49.54 mAOD for the 1 in 100 AEP plus 20 % climate change (ISIS node 2.010).

4.2.3 Estimated from Ordnance Survey contour mapping, approximately 26 % (~0.95 ha) of the site is below an elevation of 50 mAOD, which provides an indication of the likely extent of future flood risk. The likely access road to the site is not mapped as being affected by the present day 1 in 100 AEP event[16]. The 'Method 2' further climate change analysis of applying a 15 m buffer to Flood Zone 2 suggested that an additional 19 % (0.67 ha) of the site could potentially be at risk of fluvial flooding from an extreme future 1 in 100 AEP event, including its likely access.

4.2.4 A further site, SD82 – Holmbush Caravan Park, Midhurst, is shown by the Flood Map for Planning to be at risk of fluvial flooding from a tributary of the River Rother. No specific model information is available for this site, so assessment was confined to interpretation of flood zone extents. Over half of the site is at low risk of fluvial flooding (Flood Zone 1). There is a fluvial risk coinciding with an onsite pond connecting to the adjacent tributary of the River Rother. Climate change could increase this risk over the lifetime of the development, although this likely to be limited to the land adjacent to the pond. Currently, 47 % (2.35 ha) of the site is located within Flood Zone 2; to assess potential climate impacts, a 15 m buffer was applied to Flood Zone 2 (climate change assessment 'Method 2'), which suggested that an additional 16 % (0.77 ha) of the site could potentially be at risk from the extreme future 1 in 100 AEP flood. From the current flood extent data and the further climate change analysis, the risk of flooding to the likely site access is assessed as low.

River Adur

4.2.5 EA model outputs indicate that flood risk along the River Adur adjacent to the Shoreham Cement works site (SD56) is a combination of tidal and fluvial. Currently, no flood risk is shown for the site for either fluvial or tidal scenarios under both defended and undefended scenarios. However, a small area that largely coincides with the access track heading northwest from the A283 and the western most boundary, is identified as susceptible to flooding with climate change allowances (+ 20 % to flows). Maximum modelled water depth at the site for the 1 in 100 AEP plus climate change fluvial event is 1.37 m, and 1.69 m for the 1 in 200 AEP plus climate change tidal event, though this coincides with only a very small proportion of the total site area (Figure 4.5). The Method 2 approach for assessing potential climates change impacts estimates that 0.56 ha (1 %) of the site lies within the 15 m buffer, where only 0.04 ha (< 1 %) of the site falls within Flood Zone 2. The risk of site drainage being tide-locked will need to be considered at the FRA stage.

Cuckmere River

4.2.6 The Cuckmere River adjacent to the Former Allotments site (SD58) poses a fluvial flood risk with a tide-locking component. No modelling outputs were available for this watercourse at this location,

so assessment was confined to interpretation of flood zone extents. Most of site at low risk of fluvial flooding (Flood Zone 1), but the most likely site access appears to be in lowest part of site in Flood Zones 2 and 3. Flood Zone 2 overlaps with 20 % (0.08 ha) of the site. To account for the likelihood of climate change increasing fluvial flood risk over the lifetime of the development an 15 m buffer applied to Flood Zone 2 (climate change assessment 'Method 2'), suggesting an additional 22 % (0.09 ha) of the site as potentially being at risk from an extreme future 1 in 100 AEP extent.

River Ouse in Lewes

4.2.7 Lewes is at risk from both fluvial and tidal flooding, with a tide locking element to the flood risk (Figure 4.1). A number of flood defences, of differing types, have been constructed throughout Lewes, offering a range of standard of protection (SOP) from 1 in 25 AEP to 1 in 200 AEP (Figure 4.1).

4.2.8 The assessment of the present day flood risk identifies two of the nine sites screened in, Old Malling Farm (SD79) and the former Wenban Smith Site (PL1 (13)), as intersecting the functional floodplain (Flood Zone 3b). Three sites are identified as currently being at risk from both fluvial and tidal flooding, with a tide locking element to the flood risk. These three sites are situated in low lying areas of Lewes and include the Landport Road garage site (PL1 (30)), in addition to SD79 and PL1 (13).

4.2.9 The available EA modelling data for the River Ouse[14] most likely under represents the flood risk to the sites adjacent to the Winterbourne Stream as it is not explicitly included in the model. The Winterbourne Stream runs in a culvert from Garden Street, at the southwestern corner of the Auction Rooms (PL1 (3)) site, for several hundred metres before re-emerging into an open channel downstream of the railway station. Sites where fluvial flood risk is likely underrepresented by the River Ouse model are the Auction Rooms (PL1 (3)) and Lewes railway station car park (PL1 (57)). This is particularly evident for PL1 (3) where 5% of the site is assessed as being in Flood Zone 3. However, the River Ouse modelling of the 1 in 100 AEP fluvial event does not show the site as being at risk (Figure 4.2).

4.2.10 The defences within Lewes offer flood protection to certain locations but at the 'dis-benefit' of other locations, i.e. where modelled flood levels for the defended scenarios exceed those from the undefended scenarios. This is illustrated in Figure 4.2 for the 1 in 100 AEP event, where the dis-benefit is most evident for areas of the town centre to the west of the River Ouse, and particularly in the parkland along the lower reach of the Winterbourne Stream. As the defended scenario most closely represents the true flood risk, levels and hazard ratings from this scenario have been reported for allocation sites in the Flood Risk Information Sheets. However, it should also be acknowledged that Flood Zone definitions are based on undefended scenarios.

4.2.11 The proposed, new, NSQ flood defence extending from Willeys Bridge (National Grid Reference (NGR): TQ 41467 10781) in the north to Phoenix Causeway (NGR: TQ 41923 10395) in the south, will not offer any significant benefits to the sites assessed in this study. The modelling for the NSQ FRA estimated that water depths downstream of the Phoenix Causeway would reduce by less than 10 mm for 1 in 100 plus 20 % climate change AEP event, whilst the upstream floodplain areas adjacent to Landport Road garage site (PL1 (30)) may be at a marginal dis-benefit, as flood levels could increase by up to 0-60mm under the same scenario.

4.2.12 Six sites were screened in as being possibly at risk of fluvial/tidal flooding but have been assessed as having no risk under the present day 1 in 100 AEP fluvial or 1 in 200 AEP tidal scenarios from the River Ouse model. For four of these sites, PL1 (3) the Auction Rooms, PL1 (57) the Railway Station Car Park, the Magistrates Court Car Park (PL1 (36)) and the former Ambulance Headquarters (PL1 (48)), climate change (represented by a 20 % and 67% increase in flows respectively, the latter being represented by the present day 1 in 1000 AEP event – the Method 1 additional climate change assessment described above) is shown to introduce a 1 in 100 AEP fluvial flood risk to at least a part of these sites, as shown on Figure 4.3, and as summarised in Table 4.2.

4.2.13 PL1 (39) – former petrol station, Malling Street, is located within an area designated as benefitting from defences, with a standard of protection exceeding the 1 in 200 AEP tidal event. A breach hazard assessment for these defences in relation to the site is estimated a rating of 'Danger for Some' based on the FD2321 methodology (factoring distance from defence and the 1 in 100 AEP plus 20 % climate change water depth in front of the defence). Using the 1 in 1000 AEP fluvial results as proxy for 1 in 100 AEP +67% climate change scenario that the whole site will be impacted by overtopping of the flood defence, up to a depth of 2.16 m, which is estimated as posing a 'Danger to All'.

4.2.14 The land at Buckwell Court, garage site (PL1 (08)) was screened in as possibly being at risk of fluvial flooding. However, the site is located beyond the well-defined edge of the River Ouse floodplain, just to the north of Landport Farm Road. PL1 (8) is considered to be at low risk of fluvial flooding, even when climate change flood extents for both 1 in 100 AEP +20% and +67% scenarios are taken into account.

4.2.15 The available EA modelling data[14] for the River Ouse, in addition to flood depths and extents, calculated flood hazard maps using the FD2321[20] methodology. The three sites identified as posing the greatest hazard to people (PL1 (30), SD79 and PL1 (13)) are at least partially categorised as a 'Danger to Most' for the present day 1 in 100 AEP fluvial event (Figure 4.4). The hazard categories for sites and their potential access routes affected by the future 1 in 100 AEP fluvial events with +20% and +67% climate change allowances are summarised in Table 4.2. Under the +20% climate change scenario, a 'Danger for Most' hazard has been identified for all or parts of three sites, and a 'Danger for All' hazard has been identified for part of one site. Under the +67% climate change scenario, this increases to a 'Danger for Most' at four sites, and a 'Danger for All' at four sites.

Table 4.2 Lewes Climate Change Impact Assessment: Comparison of Results from 1 in 100 AEP +20% and 1 in 100AEP +67% Future Fluvial Flow Scenarios (Method 1)

Site	Site area (ha)	Extent (ha/%): 1 in 100 AEP +20%	Max depth (m): 1 in 100 AEP +20%	Max hazard on site 1 in 100 AEP +20%	Max hazard to access 1 in 100 AEP +20%	Extent (ha/%) 1 in 100 AEP +67%	Max depth (m): 1 in 100 AEP +67%	Max hazard on site 1 in 100 AEP +67%	Max hazard to access 1 in 100 AEP +67%
PL1 (03) - Land at the Auction Rooms	0.16	0.01 (7 %)	0.18	Very Low	Very Low	0.07 (48 %)	0.71	Danger for Most	Very Low
PL1 (13) - Land at the former Wenban Smith Site	0.42	0.37 (89 %)	1.40	Danger for Most	Very Low	0.40 (96 %)	2.00	Danger for All	Very Low
PL1 (30) - Land at Landport Road garage site	0.09	0.09 (100 %)	1.32	Danger for Most	Danger for Most	0.09 (100 %)	1.95	Danger for All	Danger for All
PL1 (36) - Land at Magistrates Court Car Park	0.13	< 0.01 (2 %)	0.20	Very Low	Danger for Most	0.13 (100 %)	0.57	Danger for Most	Danger for Most
PL1 (39) - Land at former petrol station	0.05	0	0	Very Low	Very Low	0.05 (100 %)	2.16	Danger for All	Danger for Most

[20] Defra (2006) R&D outputs: Flood risks to people, Phase 2 FD2321/TR2 Guidance Document http://randd.defra.gov.uk/Document.aspx?Document=FD2321_3437_TRP.pdf (Accessed 18/07/2017).

Site	Site area (ha)	Extent (ha/%): 1 in 100 AEP +20%	Max depth (m): 1 in 100 AEP +20%	Max hazard on site 1 in 100 AEP +20%	Max hazard to access 1 in 100 AEP +20%	Extent (ha/%) 1 in 100 AEP +67%	Max depth (m): 1 in 100 AEP +67%	Max hazard on site 1 in 100 AEP +67%	Max hazard to access 1 in 100 AEP +67%
PL1 (48) - Land at former Ambulance Headquarters	0.07	< 0.01 (7 %)	0.07	Very Low	Very Low	0.07 (100 %)	0.64	Danger for Most	Danger for Most
PL1 (57) - Lewes railway station car park	0.36	0.25 (71 %)	0.68	Danger for Most	Very Low	0.33 (92 %)	1.24	Danger for Most	Very Low
SD79 - Land at Old Malling Farm	9.97	0.91 (9 %)	2.39	Danger for All	Very Low	1.08 (11 %)	3.04	Danger for All	Very Low

4.2.16 In addition, the Method 2 climate change assessment (15 m buffer to Flood Zone 2 to represent extreme future 1 in 100 AEP fluvial flood extent) was performed for the Lewes sites with the results shown in Table 4.3. As would be expected, this identifies the same sites as being at risk from future increases in fluvial flood risk as the application of Method 1 above. However, it does identify one further site: PL1 (08) - the Buckwell Court garage. This site is not identified as being at risk by the Method 1 assessment, but 23 % of the site is identified as likely being impacted by climate change using Method 2. The edge of the River Ouse floodplain is topographically well-defined by a clear break in slope in the vicinity of PL1 (08), so it is likely that the simple application of a 15m buffer to the edge of Flood Zone 2 is overestimating the potential impact of future climate change on the 1 in 100 AEP flood extent. However, further site-specific assessment would be required to exclude this possibility entirely. In contrast, a further site, PL1 (46) Queens Road garage, was also identified by the 15m buffer around Flood Zone 2. However, this site was excluded from Table 4.3, as inspection of Ordnance Survey mapping clearly indicates that this site is considerably elevated above the edge of the River Ouse floodplain immediately to the north.

Table 4.3 Lewes Climate Change Impact Assessment Results (Method 2 - Flood Zone 2 with 15 m Buffer Intersect)

Site	Site area (ha)	Area (ha) in FZ2	Area (ha) in FZ2 and 15m buffer
PL1 (03) - Land at the Auction Rooms	0.16	0.14 (87 %)	0.16 (100 %)
PL1 (08) - Land at Buckwell Court, garage site	0.04	0	0.01 (23 %)
PL1 (13) - Land at the former Wenban Smith Site	0.42	< 0.42 (99 %)	0.42 (100 %)
PL1 (30) - Land at Landport Road garage site	0.09	0.09 (100 %)	0.09 (100 %)
PL1 (36) - Land at Magistrates Court Car Park	0.13	0.13 (100 %)	0.13 (100 %)
PL1 (39) - Land at former petrol station	0.05	0.05 (100 %)	0.05 (100 %)

Site	Site area (ha)	Area (ha) in FZ2	Area (ha) in FZ2 and 15m buffer
PL1 (48) - Land at former Ambulance Headquarters	0.07	< 0.07 (92 %)	0.07 (100 %)
PL1 (57) - Lewes railway station car park	0.36	0.30 (83 %)	0.36 (100 %)
SD79 - Land at Old Malling Farm	9.97	1.55 (16 %)	2.32 (23 %)

Surface Water Flood Risk

4.2.17 Based on the available data, it would appear that the majority of the allocation sites are at a relatively low risk of surface water flooding. By the nature of this source, associated flood risk is widely dispersed throughout the National Park, and is a function of local topography, geology and the interaction with other flood sources. For instance, impermeable sites are less conducive to infiltration and generate greater volumes of run-off, whilst low-lying sites that are subject to tide-locking can prevent efficient drainage.

4.2.18 The sites at the most significant risk of surface water flood risk are those that intersect a surface water flow pathway, and are also within fluvial/tidal flood zone and/or at risk of groundwater flooding. As noted in various strategic documents for the SDNP study area (see Appendix A), areas at risk of multiple sources of flooding are at greatest risk due to the potential for tide-locking, or prolonged in-combination surface water and groundwater flooding. There are a number of the potential allocation sites for the Lewes NDP where surface water flooding could interact with fluvial and/or groundwater flooding, including: (PL1 (57) Lewes railway station car park, PL1 (30) Land at Landport Road Garage, PL1 (3) Land at the Auction Rooms, and PL1 (13) Land at the former Wenban Smith Site). Of the South Downs Local Plan allocation sites, SD58 (Former Allotments, Alfriston) could also be affected by a combination of surface water and fluvial flooding.

4.2.19 Several other sites have been identified to be at risk of localised surface water ponding, or to fall within a wider overland flow path, based on the 1 in 1000 year AEP event RoFfSW outline, including:

- South Downs Local Plan sites: SD56 - Shoreham Cement Works; SD66 - Land at Park Lane, Droxford; SD67 - Cowdray Works Yard, Easebourne; SD72 - Soldiers Field House, Findon; SD75 - Half Acre, Hawkley; SD86 - Offham Barns, Offham and Cooksbridge; SD91 - Land North of the Forge, South Harting; and SD94 - Land at Ramsdean, Stroud;
- Lewes NDP sites: PL1 (48) - Land at Former Ambulance Headquarters, Friars Walk; and PL1 - (53) Former St Anne's School Site; and
- Twyford NDP Site 26 Land at Hazeley Road.

Groundwater Flood Risk

4.2.20 Based on the available evidence (as summarised in Section 4.1), the sites that have a significant risk of groundwater flooding are typically those situated on alluvial deposits overlying Chalk, and situated in the floodplains of major watercourses such as the Rivers Ouse and Rother. In these areas the water table is always close to the ground surface, and could rise above ground level during wet periods. The presence of flood embankments and tidal locking of outfalls to the rivers near the coast could prevent the drainage of groundwater flooding from affected areas, prolonging the duration of flood events. The sites in these areas are:

- South Downs Local Plan Sites: SD58 - Former Allotments, Alfriston; SD79 - Land at Old Malling Farm, Lewes; SD56 - Shoreham Cement Works; and

- Lewes NDP sites: PL1 (13) – former Wenban Smith Site; PL1 (36) – Magistrates Court Car Park; PL1 (48) – former Ambulance Headquarters; PL1 (08) – Buckwell Court garage site; PL1 (30), Landport Road garage site; and PL1 (39) – former petrol station, Malling Street.

4.2.21 Other sites that are also at significant risk of groundwater flooding are those associated with winterbourne streams. During typical winters, the Chalk water table will rise above the base of the valley and the winterbourne will flow. During particularly wet winters, the water table may rise sufficiently to result in flood conditions. A key example of this is the Lewes Winterbourne Stream, situated to the southwest of Lewes town centre. Lewes NDP sites situated along the Lewes Winterbourne Stream are PL1 (03) – Land at the Auction Rooms, PL1 (53) – Former St. Annes School, and PL1 (57) – railway station car park. Of the South Downs Local Plan sites, SD63 – Land South of the A272 at Hinton Marsh is also associated with Chalk winterbournes at the head of the River Itchen.

4.2.22 In addition to the sites located close to Chalk winterbournes, a number of sites are also situated in Chalk dry valleys. Whilst these streams may not flow during a typical winter, during very wet winters groundwater may emerge along the base of the valley and also as springs in the valley sides. Sites situated in Chalk dry valleys include a number of the South Downs Local Plan sites, SD66 - Land at Park Lane, Droxford, SD72 - Soldiers Field House, Findon, SD77 - Land at Castelmer Fruit Farm, Kingston near Lewes, SD87 - Land at Church Lane, Pyecombe, SD96 - Land at Long Priors, West Meon, and SD86 - Offham Barns, Offham and Cooksbridge, as well as the Twyford NDP Site 26 - Land at Hazeley Road, Twyford.

4.2.23 Sites situated on the Lower Greensand are generally at lower risk from groundwater flooding, due to the higher storage capacity and lower transmissivity of the aquifer. However a number of South Downs Local Plan sites underlain by the Lower Greensand have been identified as being at risk from groundwater flooding, due to shallow a water table within overlying alluvial deposits associated with major watercourses (e.g. SD89 - land at Pulens Lane in Sheet), or the topographical setting of a dry valley and historical records of groundwater flooding (SD67- Cowdray Works Yard, SD68 Egmont Road, and SD69 Former Easebourne School, all in Easebourne). SD82, Holmbush Caravan Park, Midhurst, which appears to be located in a former Lower Greensand sand quarry, may also be at risk from groundwater flooding.

Other Sources of Flood Risk

4.2.24 Other sources of flood risk include the residual risk of reservoir failure (EA Reservoir Flood Risk Map), the risk posed by minor watercourses and the potential for culvert blockage of these watercourses and any historical occurrence of sewer/drainage system flooding.

4.2.25 There a number of sites identified as being at residual risk of reservoir flooding. These include:

- South Downs Local Plan sites:
  - SD58 - Former allotments, Alfriston. Failure of the embankment at Arlington Reservoir, in the Cuckmere River valley upstream of Alfriston could affect the lowermost part of the site and access; the area affected is very similar to the fluvial flood extent.
  - SD66 - Land at Park Lane, Droxford. Qualitatively can be considered to have a very low residual risk of flooding due to a failure of an underground reservoir, on Fir Down 900m west but upstream of the site. Flood risk from this source is not mapped on the EA Reservoir Flood Risk Map and therefore remains uncertain.
  - SD79 - Land at Old Malling Farm, Lewes. Reservoir flood extent very similar to fluvial flood extent, and could affect lowermost part of site adjacent to the river; and
  - SD89 - Land at Pulens Lane, Sheet. Mapping suggests reservoir flooding to less extensive than the fluvial flood extent but could affect part of site.
- Lewes NDP sites:

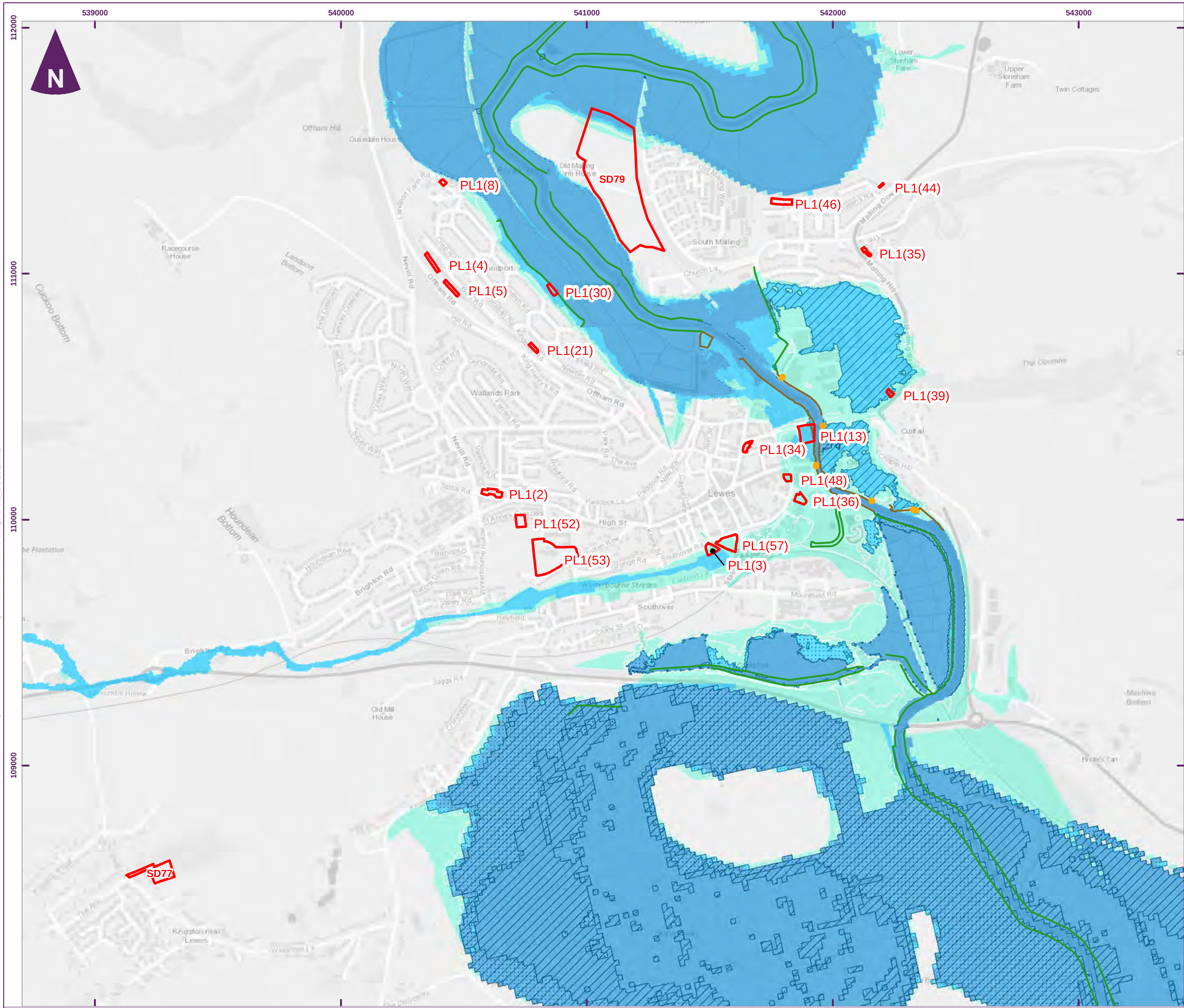
- Land at the former Wenban Smith Site (PL1 (13)) – 60% of the site identified as being at risk of reservoir flooding, but which is coincident with that area at risk from fluvial flooding.

4.2.26 Sites identified as having a residual risk of flooding due to the potential for blockage to a culverted watercourse include:

- South Downs Local Plan sites:
  - SD69 - former Easebourne School - watercourse follows Easebourne Street;
  - SD91 - Land North of the Forge, South Harting - watercourse passes close to southern extent of site; and
  - SD94 – Land at Ramsdean Road, Stroud - watercourse passes beneath Ramsdens Road close to site.
- Lewes NDP sites:
  - PL1 (03) - Land at the Auction Rooms – close to Winterbourne Stream culvert; and
  - PL1 (57) - railway station car park – close to Winterbourne Stream culvert.
- Twyford NDP Site 26 – Land at Hazeley Road – watercourse below Finches Road.

4.2.27 The data provided by Southern Water contained 18 records of hydraulic overloading (surcharging) of the combined (3), foul (12) and surface water (3) drainage systems, for postcode centroids in Lewes. Two such incidents occurred in the vicinity of proposed Lewes NDP allocation sites:

- Adjacent to the former Wenban Smith Site (PL1 (13)), on Eastgate Wharf; and
- Adjacent to the Landport Road garage site (PL1 (30)).



Key

Allocation Sites

Flood Zone 2

Flood Zone 3a

Flood Zone 3b

Flood Defence

Embankment

Flood Gate

Wall

Fluvial - Area Benefitting from Defences (1 in 100 AEP)

Tidal - Area Benefitting from Defences (1 in 200 AEP)

NOTE - Only areas identified as defended to at least a 1 in 100 AEP Fluvial event or a 1 in 200 AEP Tidal event are officialy mapped as 'Benefitting from Defences.'

0 0.1 0.2 0.3 0.4 0.5 0.6 km

Scale at A3: 1:15,000

Client

SOUTH DOWNS NATIONAL PARK

South Downs National Park Authority
Level 2 SFRA

amec foster wheeler

Figure 4.1
Fluvial/Tidal Flood Risk Overview - Lewes

August 2017 Figure 4.1_arc 10.2.mxd OwenG

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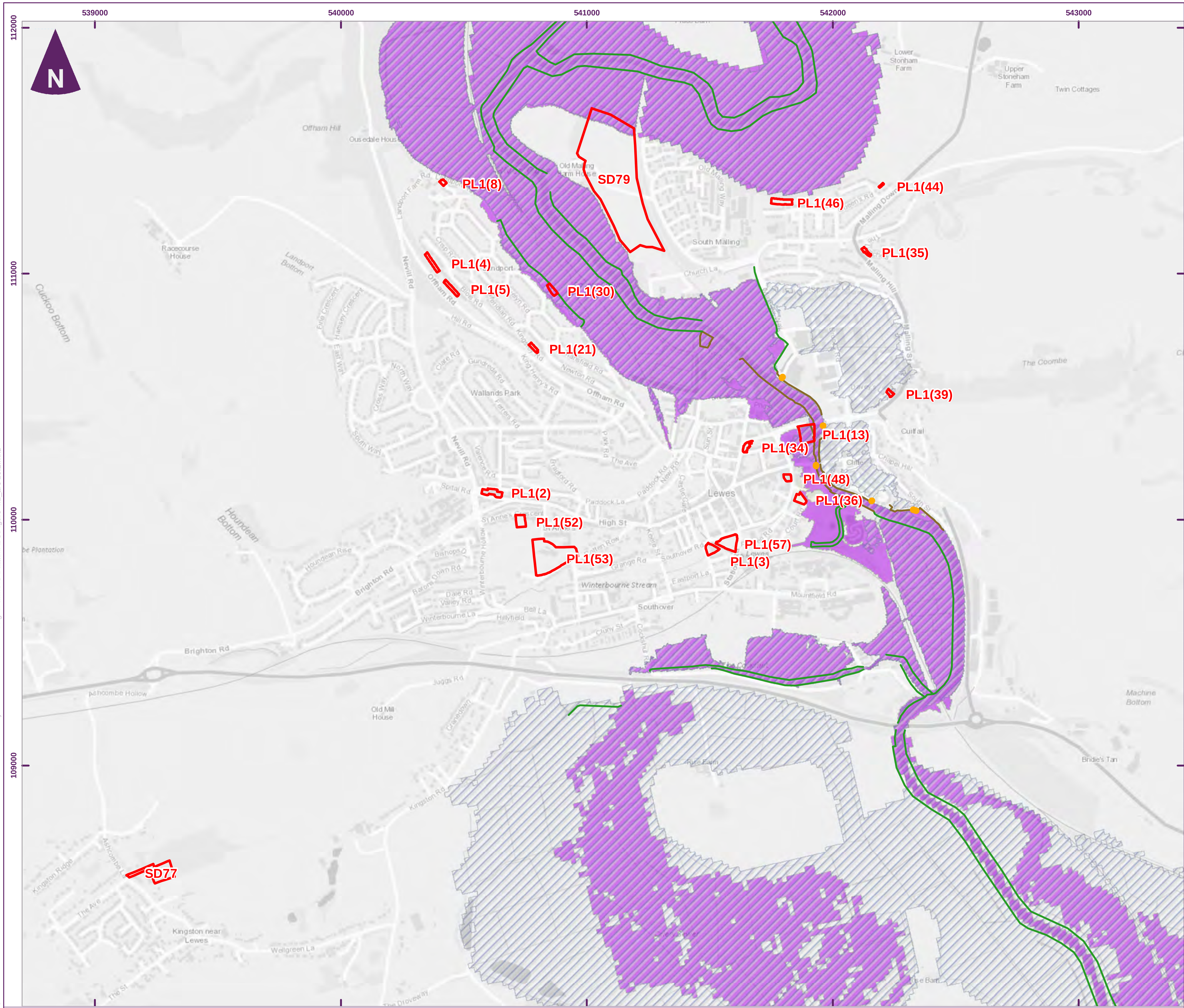


Key

Allocation Sites

Fluvial 1 in 100 AEP (Undefended)

Fluvial 1 in 100 AEP (Defended)

Flood Defence

Embankment

Flood Gate

Wall

0 0.1 0.2 0.3 0.4 0.5 0.6 km

Scale at A3: 1:15,000

Client

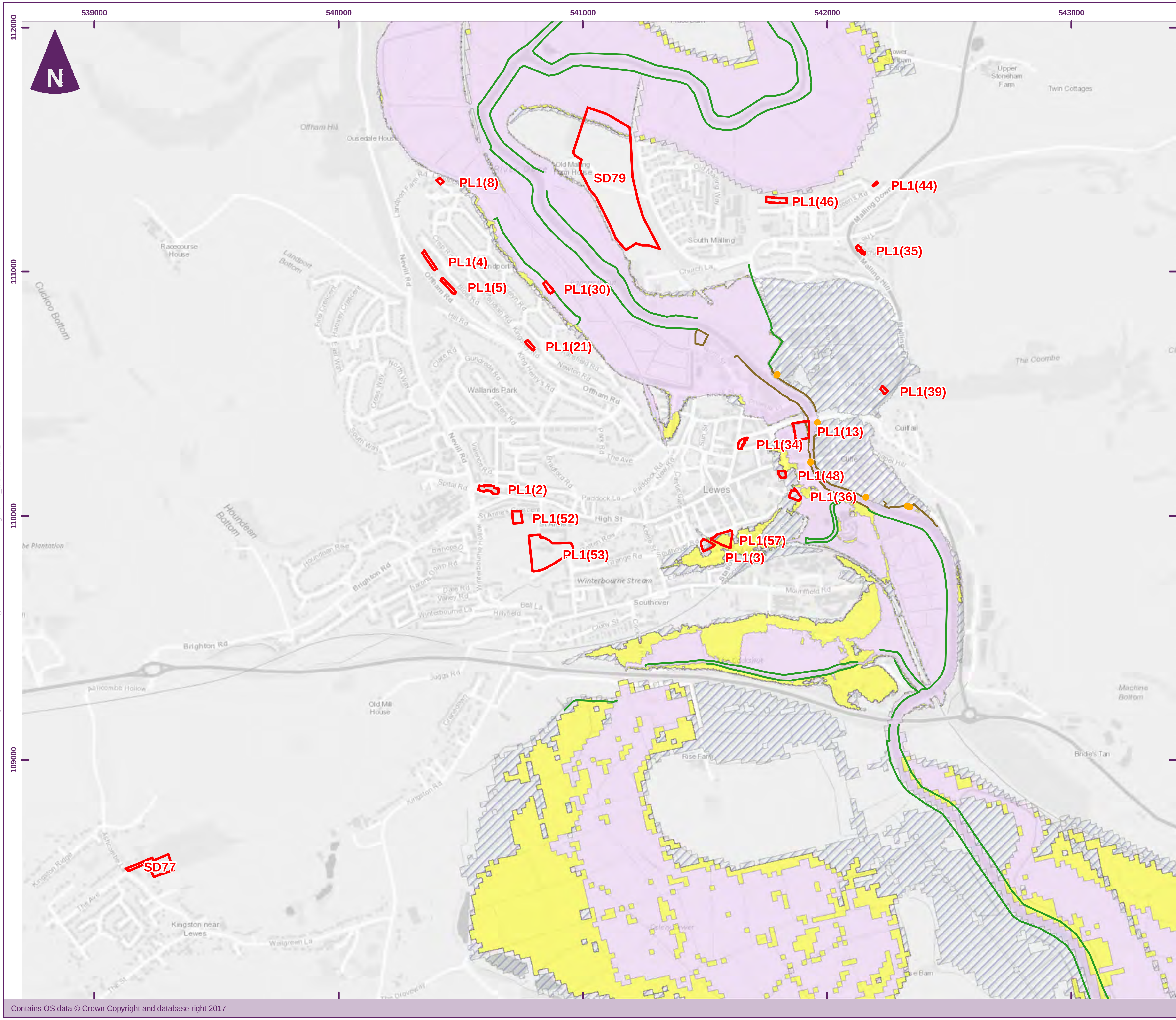
SOUTH DOWNS NATIONAL PARK

South Downs National Park Authority Level 2 SFRA

amec foster wheeler

Figure 4.2
Comparison of defended and undefended modelled flood extents - Lewes

August 2017 Figure 4.2_arc 10.2.mxd OwenG



Key

- Allocation Sites
- Fluvial 1 in 100 AEP (Defended)
- Fluvial 1 in 100 AEP +20% CC (Defended)
- Fluvial 1 in 1000 AEP (Defended)

Flood Defence

- Embankment
- Flood Gate
- Wall

0 0.1 0.2 0.3 0.4 0.5 0.6 km

Scale at A3: 1:15,000

Client

SOUTH DOWNS NATIONAL PARK

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Level 2 SFRA

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Figure 4.3
Modelled impact of climate change (fluvial flows) on defended flood extents - Lewes

August 2017 Figure 4.3_arc 10.2.mxd OwenG

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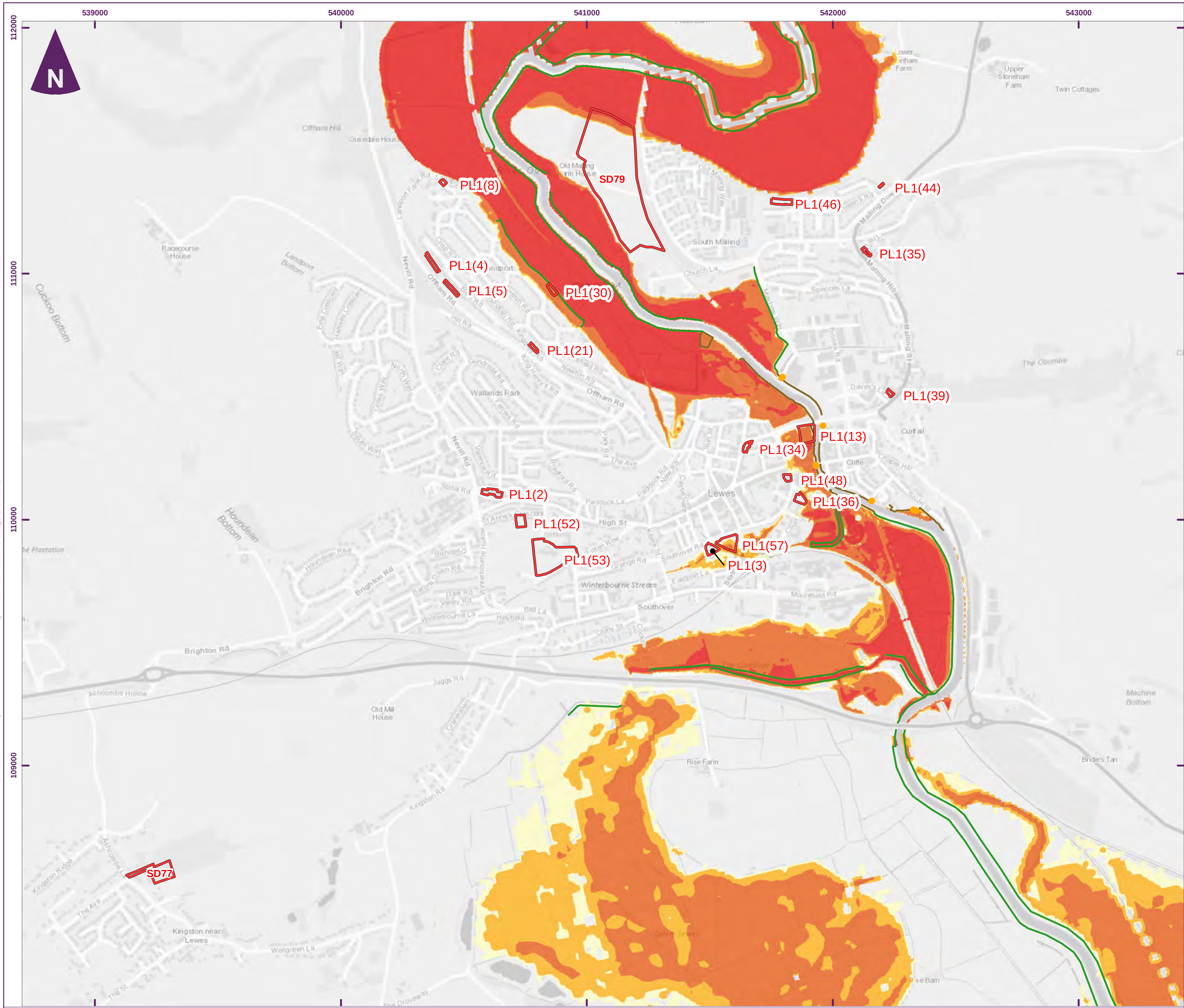

Key

Development Allocations

Fluvial 1 in 100 AEP +CC (Def)

Very low (HR < 0.75)

Danger for Some (0.75 < HR < 1.25)

Danger for Most (1.25 < HR < 2.00)

Danger for All (HR > 2.00)

Flood Defence

Embankment

Flood Gate

Wall

NOTE -
HR = Hazard Rating (FD2321 method)

0 0.1 0.2 0.3 0.4 0.5 0.6 km

Scale at A3: 1:15,000

Client

SOUTH DOWNS NATIONAL PARK

South Downs National Park Authority
Level 2 SFRA

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Figure 4.4
Fluvial Flood Hazard - Lewes

August 2017 Figure 4.4.mxd OwenG

519000 520000 521000 522000

110000 109000 108000 107000

N

SD56

Key

Allocation Sites

Tidal 1 in 200 AEP

Tidal 1 in 200 AEP+CC (2115) Defended

Flood Defence

Embankment

Wall

NOTE - The defended scenario represents the present day defences without further flood defence investment.

0 0.1 0.2 0.3 0.4 0.5 0.6 km

Scale at A3: 1:15,000

Client

SOUTH DOWNS NATIONAL PARK

South Downs National Park Authority
Level 2 SFRA

amec foster wheeler

Figure 4.5
Future Tidal Flood Risk Overview - Shoreham Cement Works

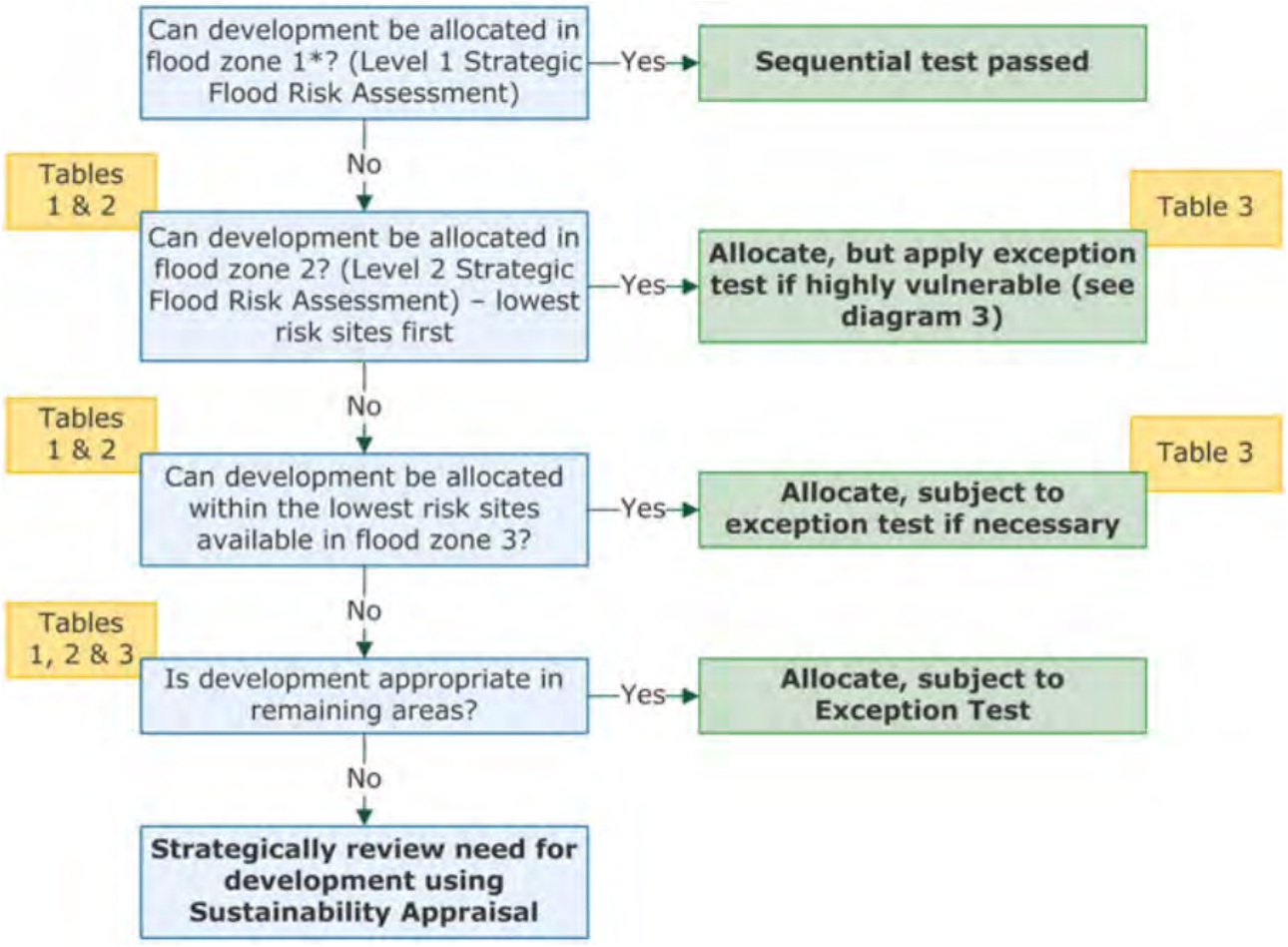
5. Flood Risk Management

This section identifies appropriate responses to the flood risks identified in Section 4. Requirements for application of the Sequential and Exception Tests are identified for those sites at risk of fluvial and/or tidal flooding, which are concentrated in Lewes. For all sites, site-scale flood risk measures are discussed. For Lewes where multiple sites are concentrated, the applicability of area-wide measures is discussed. A summary of recommendations for site-specific policies for the Local Plan/NDPs and for site-specific flood risk assessments is provided, with further details provided on a site-by-site basis in the Flood Risk Information Sheets in Appendix B.

5.1 Site Suitability and the Sequential Test

5.1.1 The Sequential Test is applied during preparation of a Local Plan to steer the allocation of development sites towards areas of lowest flood risk, as set out in Diagram 2 of the NPPF PPG, which is reproduced below as Figure 5.1.

Figure 5.1 Application of the Sequential Test for Local Plan Preparation



Reference to Tables 1, 2, and 3 in this figure refer to tables in the NPPF PPG which provided definitions of Flood Zones, Development Vulnerability and the Flood Risk Vulnerability and Flood Zone Compatibility matrix respectively.

5.1.2 Developments are also classified according to their flood risk vulnerability as set out in Table 2 of the NPPF planning guidance on Flood Risk and Coastal Change. The allocations assessed in this SFRA fall in to two of the five vulnerability classes. The Gypsy and Traveller sites are classed as 'Highly Vulnerable' as they provide pitches for caravans to be used for permanent residential homes. Buildings used for dwelling houses are classified as 'More Vulnerable'. The mixed use allocations will also fall into the 'More Vulnerable' class even though shops, restaurants, office space, and similar non-residential developments alone are classified as 'Less Vulnerable'. Table 3 of the NPPF guidance combines the information in Tables 1 and 2 of the guidance to provide flood risk vulnerability and flood zone 'compatibility' matrix as shown in Table 5.1.

Table 5.1 Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Zones	Highly Vulnerable Development (Gypsy and Traveller Sites)	More Vulnerable (Residential, Mixed Use)	Less Vulnerable (Commercial)
1 - Land having a less than 1 in 1,000 AEP of river or sea flooding	✓	✓	✓
2 - Land having between a 1 in 100 and 1 in 1,000 AEP of river flooding; or land having between a 1 in 200 and 1 in 1,000 AEP of sea flooding	Exception Test required	✓	✓
3a - Land having a 1 in 100 or greater AEP of river flooding; or Land having a 1 in 200 or greater AEP of sea flooding.	✗	Exception Test required	✓
3b - This zone comprises land where water has to flow or be stored in times of flood. For the purposes of this report, and where appropriate modelling outputs are available, it has been defined as land having a less than or equal to 1 in 20 AEP risk of river or sea flooding.	✗	✗	✗

Where: ✓ indicates development is appropriate and ✗ indicates development is inappropriate. The full table is provided in the NPPF.

5.1.3 Information is provided in the Flood Risk Information Sheets in Appendix B that enables each site to be assessed on the basis of what proportion of the allocation is within each of the Flood Zones. This information can then be used to assess the different allocations against each other in Sequential Test terms.

5.1.4 Five South Downs Local Plan allocation sites have been identified as being at fluvial/tidal flood risk, i.e. being partially located in Flood Zones 2 and 3 (SD56 – Shoreham Cement Works; SD58 – Former allotments at Alfriston; SD79 – Land at Old Malling Farm; SD82 – Holmbush Caravan Park, Midhurst; and SD89 – Pulens Lane, Sheet). The need to develop these sites in addition to other allocation sites entirely in Flood Zone 1 will need to be considered as the SDNPA applies the Sequential Test using the wider Sustainability Appraisal for the Local Plan. For SD56 - Shoreham Cement Works, EA modelling data demonstrated that, although small areas of the site were in Flood Zone 3a, none of the sites was located in Flood Zone 3b, as defined above in Table 5.1. For SD79 – Land at Old Malling Farm, EA model data suggests that approximately 5% of the site is in Flood Zone 3b (i.e. those areas most immediately adjacent to the River Ouse). For three of these sites, SD58 – former allotments at Alfriston, SD82 – Holmbush Caravan Park, Midhurst and SD89 – Pulens Lane, Sheet, there were no modelling data available to differentiate between Flood Zones 3a and 3b. In the absence of further information, it is therefore recommended that all of Flood Zone 3 within these sites is treated as Flood Zone 3b, unless further evidence is provided to the contrary as part of a site-specific FRA. This is consistent with the recommendation made in the 2015 Level 1 FRA, that all areas of Flood Zone 3 that are currently undeveloped, and where no specific modelling information exists, be treated as Flood Zone 3b.

5.1.5 Lewes NDP allocation sites that were screened-in as being at potential risk of fluvial and/or tidal flooding have been ranked according proportion of their site areas in Flood Zones 1, 2, 3a and 3b in Table 5.2. This provides an indication of the order in which sites would be preferred for allocation in terms of the flood risk Sequential Test. Only one of these sites, the Former Wenban Smith site (PL1 (13)), intersects Flood Zone 3b. At this site, there is a flood defence along the river at the site offering a 1 in 50 AEP Standard of Protection. This is set back a little and consequently there is an area on the river side of the flood defence within the site boundary which is classified as Flood Zone 3b. The land at the Former Petrol Station, Malling Street (PL1 (13)) is almost entirely within Flood Zones 2 and 3a. However, it is defended to both the 1 in 200 AEP plus climate change (2115) tidal event and the 1 in 100 AEP plus 20% climate change fluvial event, although these defences would be overtopped by the current 1 in 1000 AEP, and, therefore by a future 1 in 100 AEP plus 67% climate event. The worst ranked sites are those at greatest risk of flooding and estimated as posing the greatest hazard to people, making them the least suitable sites for habitation.

Table 5.2 Lewes NDP Allocations Sites Ranked by Available Land Area at the Lowest Risk of Flooding

Rank	Site ID and Name	Area (ha)	Allocation (no. of units)	% in FZ1 (Area [ha])	% in FZ2 (Area [ha])	% in FZ3a (Area [ha])	% in FZ3b (Area [ha])
1	PL1 (08) - Land at Buckwell Court, garage site	0.04	6	100 % (0.04 ha)	-	-	-
2	PL1 (57) - Lewes railway station car park	0.36	20	17 % (0.06 ha)	83 % (0.3 ha)		
3	PL1 (03) - Land at the Auction Rooms	0.16	11	16 % (0.02 ha)	79 % (0.13 ha)	>5 % (0.009 ha)	-
4	PL1 (48) - Land at former Ambulance Headquarters, Friars Walk	0.07	18	8 % (0.006 ha)	92 % (0.068 ha)	-	-
5	PL1 (36) - Land at Magistrates Court Car Park, Court Road	0.13	9	-	100 % (0.13 ha)	-	-
6	PL1 (39) - Land at former petrol station, Malling Street	0.05	5	-	39 % (0.02 ha)	61 % (0.03)	-
7	PL1 (13) - Land at the former Wenban Smith Site	0.42	11	< 1 % (0.003 ha)	8 % (0.035 ha)	82 % (0.344 ha)	9 % (0.038 ha)
8	PL1 (30) - Land at Landport Road garage site	0.09	6	-	-	100 % (0.09 ha)	-

5.1.6 The only guidance that NPPF and its associated PPG provides on how to consider the Sequential Test in terms of other sources of flooding is as follows:

"Within each flood zone, surface water and other sources of flooding also need to be taken into account in applying the sequential approach to the location of development."

5.1.7 For surface water and groundwater flood risk no extensive areas have been identified within the allocation sites considered. Since these risks can be managed via the sequential approach to site layout and the use of other mitigation measures, we do not recommend that surface water and groundwater risks be specifically in their own right as part of the Sequential Test process.

5.2 Flood Risk Management Measures and the Exception Test

5.2.1 The Exception Test is a tool to ensure that the development is necessary to provide wider sustainability benefits to the community that outweigh flood risk, and that it will be safe from

flooding to an acceptable standard for its lifetime, does not increase flood risk elsewhere, and where possible reduces flood risk overall.

5.2.2 The Exception Test should be applied where required based on the vulnerability of a development type and the flood zone in which the development is located.(Table 5.1).

Application of the Exception Test

5.2.3 The Flood Risk Information Sheets provided in Appendix B enable an assessment of the site to be made on the available land in each flood zone as well as taking account of the other sources of flood risk, namely surface water and groundwater. The Flood Risk Information Sheets can be used to establish the likely type and scale of mitigation measures that will be required to make a site safe for habitation. The measures considered will likely have cost implications for the development of a site. Potential measures are suggested for each site within the 'Flood Risk Management' section of the Flood Risk Information Sheets.

Site-scale Measures

5.2.4 These types of measures can be applied to minimise the risk from flooding to developments that have undergone the Sequential Test, but are in areas of flood risk. These measures have been considered for all main sources of flooding (fluvial, tidal, surface water and groundwater) but are particularly important where localised surface water and groundwater flood risk have been identified, as site scale measures are often the only practical options to deal with these types of flooding. These measures are discussed in greater detail in the policy recommendations in Section 5.3 but the three principal methods used are:

- Sequentially locating the development within the site boundary to avoid the areas of highest flood risk (i.e. preferentially direct flood vulnerable development to Flood Zone 1 over Flood Zone 2, and Flood Zone 2 over Flood Zone 3a);
- Raising the ground floor level of new buildings; or
- Alternatively, using the ground floor for less vulnerable uses, such as parking or commercial use.

5.2.5 Other techniques may also be relevant to some development sites, however, these do not 'design-out' flood risk, and so need to be carefully considered in view of the consequences should flooding occur.

- Application of flood resilient and resistant building design techniques (e.g. water resistant materials and fittings, non-return valves in drainage systems). Where flood resistance eliminates the ingress of water to the property and resilience attempts to minimise the damage and disruption caused by the flood;
- Securing safe site access and egress during a flood event; and
- Developing flood warning schemes and flood evacuation plans.

Area-wide Measures

5.2.6 These measures include formal flood defences such as flood walls and embankments to protect multiple developments concentrated in a particular settlement or neighbourhood from tidal, fluvial and surface water flooding. The design will need to demonstrate how the defence delivers the target standard of protection, consider residual risk, and consider how flood water displaced from one area could create a dis-benefit, i.e. increased flood extent or depth in adjacent areas.

5.2.7 The concentration of sites in Lewes town centre to the west of the River Ouse and to the south of Phoenix Causeway may benefit from such an area-wide flood defence scheme, including PL 1 (3) the Auction Rooms; PL1 (13) former Wenban Smith site; Pl1 (36) Magistrates Court Car Park; PL1 (48) former Ambulance Headquarters and PL1 (57) railway station car park. None of these sites currently benefit from the defences protecting other parts of the town centre from flooding from the

River Ouse. Figure 4.3 shows that all of these sites are either currently at risk of flooding from the 1 in 100 AEP event, or at likely to be at risk of flooding from this frequency of event in the future due to climate change.

5.2.8 Catchment management techniques may also be applied to manage flood risk. For example, the Easebourne SWMP[21] indicates that sediment laden runoff contributes to blocked drainage systems within the village. Upstream management through intercepting overland flow paths and trapping sediment is recommended.

5.3 Summary of Site-specific Recommendations

Policy Recommendations

5.3.1 In each Flood Risk Information Sheet, a number of recommendations are made to inform the scope of site-specific FRAs. A summary of these recommendations is provided below.

5.3.2 An overview of the policy recommendations for each site are summarised in Table 5.3. There is a commonality to the proposed recommendations for sites that are at risk from similar types of flooding, though the recommendations have been tailored where appropriate to be more site-specific.

[21] CH2MHILL for West Sussex County Council (2015) Easebourne Surface Water Management Plan.

Table 5.3 Policy Recommendations for Site-specific Flood Risk Management Measures

	South Down Local Plan Sites																		Lewes NDP Sites												Twyf' NDP
Recommendations	**SD 56**	**SD 58**	**SD 63**	**SD 66**	**SD 67**	**SD 68**	**SD 69**	**SD 72**	**SD 75**	**SD 77**	**SD 79**	**SD 81**	**SD 82**	**SD 84**	**SD 86**	**SD 88**	**SD 89**	**SD 91**	**SD 93**	**SD 94**	**SD 96**	**PL1 (03)**	**PL1 (08)**	**PL1 (13)**	**PL1 (30)**	**PL1 (35)**	**PL1 (36)**	**PL1 (39)**	**PL1 (48)**	**PL1 (53)**	**PL1 (57)**	**26**
No specific flood risk management recommendations for this site																							✓								
All housing development to be located in Flood Zone 1 (Sites ticked are at least partially in Flood Zones 2 and/or 3)	✓	✓									✓		✓				✓														
Finished floor levels of habitable areas to be in excess of 1 in 100 AEP fluvial event plus climate change plus freeboard level (or tidal equivalent)	✓	✓									✓		✓							✓		✓		✓	✓		✓	✓	✓		✓	
All development to be located in Flood Zone 1. Flood Zones 2 and 3 should be reserved as public open space / amenity / conservation uses.																	✓														
No development other than Essential Infrastructure or Water Compatible development in FZ3b											✓													✓							
Level for level compensation storage to be provided for any ground raising in Flood Zone 3 (including allowance for future climate change)	✓	✓									✓		✓				✓														
Safe means of emergency access and egress during flooding to be demonstrated for all developed areas of the site	✓	✓									✓		✓				✓			✓		✓		✓	✓		✓	✓	✓		✓	
Housing to be located outside low-lying areas potentially prone to groundwater emergence			✓																												
Access to site and internal site access roads to be designed to be compatible with potential groundwater flood risk.			✓																												
Housing to be located outside surface water flood extent and area of potential groundwater emergence				✓	✓	✓	✓	✓	✓	✓		✓			✓						✓								✓		
Access to site and internal site access roads to be designed to be compatible with surface water and groundwater flood risk.				✓	✓	✓	✓	✓	✓	✓		✓			✓						✓								✓		
Investigate measures to divert the identified surface water flow pathway around, rather than through, the site to enable development, but ensuring flood risk elsewhere is not increased									✓																						
Housing to be located outside localised areas of potential surface water flood risk														✓		✓		✓	✓			✓									✓
Access to site and internal site access roads to be designed to be compatible with potential surface water flood risk														✓		✓		✓	✓			✓									✓

	South Down Local Plan Sites																					Lewes NDP Sites											Twyf' NDP
Recommendations	**SD 56**	**SD 58**	**SD 63**	**SD 66**	**SD 67**	**SD 68**	**SD 69**	**SD 72**	**SD 75**	**SD 77**	**SD 79**	**SD 81**	**SD 82**	**SD 84**	**SD 86**	**SD 88**	**SD 89**	**SD 91**	**SD 93**	**SD 94**	**SD 96**	**PL1 (03)**	**PL1 (08)**	**PL1 (13)**	**PL1 (30)**	**PL1 (35)**	**PL1 (36)**	**PL1 (39)**	**PL1 (48)**	**PL1 (53)**	**PL1 (57)**	**26**
Commercial development may be appropriate for areas of Flood Zones 2 and 3a within the site, subject to the development of appropriate mitigation measures	✓																															
All development to be located outside areas at risk of flooding from the ordinary watercourse																				✓												
Safe means of emergency access and egress during flooding to be demonstrated for all developed areas of the site																				✓												
Adopt a sequential approach to site layout, ensuring housing and other sensitive aspects of infrastructure are located in areas of lowest risk within the site. Reserve higher risk areas for least flood vulnerable aspects of the development, such as car parking and public open space																						✓		✓	✓		✓	✓	✓		✓	
Compensatory measures to be provided for any flood defence measures such as ground raising or new flood defences that have the potential to increase flood risk elsewhere																						✓		✓	✓		✓	✓	✓		✓	
The development layout should preferably avoid other low-lying areas within the site in Flood Zone 1 which are potentially prone to surface water flooding, or should incorporate appropriate mitigation measures for this risk. If necessary, the least vulnerable (i.e. Commercial) parts of the development should be directed to these areas	✓																															

Recommendations for Site-specific FRAs

5.3.3 Site-specific FRAs should accurately define the baseline flood risk at development sites, infilling gaps in the understanding of flood risk as necessary to assess the risk to proposed development. This information can be assessed against the characteristics/vulnerability of the proposed development to understand the potential consequences and evaluate the mitigation measures needed to manage flood risk. The FRA requirements are intended to ensure that development at each site is consistent with policy recommendations for the site. Site-specific FRA requirements are listed in Box 5.1.

Box 5.1 Site specific FRA requirements

- Design flood level for sites to be defined using current, up to date, climate change allowances[7]. If undertaking additional modelling is disproportionate to the size of the proposed development, an appropriate freeboard allowance for raising may need to be agreed with the EA in lieu of detailed level information.
- New site masterplans should be designed to 'managed for exceedance'[1], such that above the design event surface water flows are safely conveyed through the site in a similar manner/direction to existing runoff pathways (typically by the road network/greenspaces), to minimise the risk of property flooding.
- Site masterplans should avoid directing new development to areas at significant risk of surface water flooding (i.e. mapping indicates flow paths crossing the site or deep ponding in depressions and upslope of embankments). Developments should avoid displacing flood water off-site.
- Development access routes should be suitably designed to ensure access and egress are maintained to the design event, with arrangements for residual risk clearly stated. New roads should be designed so as not to block or divert surface water flow paths such that flood risk to existing or new development is increased.
- Where ground raising is proposed in Flood Zone 3, level-for-level compensatory storage will typically be required to avoid displacing flood water off-site. Compensatory storage should be designed to ensure that flood risk to third parties is not increased.
- Further site-specific assessment of groundwater flood risk, considering potential climate change impacts over the lifetime of the development.
- Include a site-specific drainage assessment, in-line with local guidance from relevant LLFA (see section 6 of this report).

5.3.4 For sites identified as likely being impacted by the Lewes Winterbourne Stream, modelling should be undertaken that explicitly includes the potential impacts of both the Lewes Winterbourne Stream and the River Ouse throughout Lewes. It is understood that the EA currently developing such a model for the Lewes Winterbourne Stream, although its scope and the timescales for its completion have not been confirmed. However, once completed, such a model could be used to better understand flood risk for sites in Lewes around the Winterbourne Stream for future site-specific FRAs or SFRA updates. The modelling recommended for these sites should account for the probability of flooding from the Winterbourne and Ouse individually and jointly.

5.3.5 For the nine sites identified (Section 3) as having a potential surface water or groundwater flood risk to access only, early discussion with the EA, LLFA, and potentially the emergency services will be required to inform a FRA to comply with NPPF's requirements on safe access and egress.

5.3.6 A site-specific FRA will be required for all sites with an area of 1 ha or greater, since suitable management of runoff from developments of this size is essential to manage off-site flood risk. The three sites screened 'Out' from detailed assessment in this study that have an area greater than 1 ha are summarised in Table 5.4. Drainage strategies for such sites should be developed in line with LLFA drainage guidance, which is discussed further in Section 6.1.

Table 5.4 Development Allocations in the South Downs Local Plan Screened Out But Will Require A Site-Specific FRA

Site ID	Site Name	Allocation	Area (ha)	Settlement	LLFA
SD64	Land South of London Road	35 to 40	3.88	Coldwaltham	West Sussex
SD73	Land at Petersfield Road	35 to 40	2.37	Greatham	Hampshire
SD92	Stedham Sawmill	30	1.28	Stedham	West Sussex

6. Sustainable Urban Drainage Systems

This section summarises appropriate SuDS guidance for new development in the National Park, based on national policy requirements and best practice guidance, and relevant drainage advice from LLFAs. It then provides a site-by-site assessment of suitability for different types of SuDS leading to the development of appropriate Local Plan/NDP policy recommendations for each.

6.1 General SuDS Guidance

6.1.1 Sustainable urban drainage is the systematic management of runoff to mimic natural catchment processes, in order reduce the volume and rate of surface water run-off from new and existing development. There are several means by which to achieve this, including:

- Source control (i.e. reducing the amount of surface water generated);
- Allowing water to soak into the ground (infiltration);
- Storing water and releasing it slowly (attenuation); and
- Slowing the movement of water over the ground surface (conveyance).

6.1.2 Wherever possible, SuDS are designed to provide environmental enhancement by improving water quality, biodiversity, and landscape and amenity value. Although SuDS are generally designed at the site-specific scale, they should also give consideration to their ability to provide larger scale benefits to the wider area.

6.1.3 The main driver for incorporation of SuDS into new and existing developments is at national level, from the NPPF, with accompanying non-statutory guidance being provided by the Department for the Environment, Food and Rural Affairs (Defra). LLFAs provide local guidance on how developers should incorporate SuDS into development, including detail on what information should be provided and how it should be presented for planning. This section provides a summary of the main SuDS guidance applicable to National Park.

NPPF and PPG

6.1.4 The NPPF[1] and its associated PPG[2] advises that developers should use SuDS to manage runoff at source, replicate the natural hydrological cycle as closely as possible and reduce the pressure on downstream drainage networks, thus helping to manage flood risk to downstream development. SuDS should be incorporated into the site layout as an integral part of the development form. Preference should be given to open-air SuDS formed as part of the development's green space to maximise the benefits SuDS can provide by improving water quality, and providing for amenity, recreation and wildlife. The PPG acknowledges that SuDS may not be applicable for all sites, for instance if there are pre-existing concerns about flooding. However, SuDS ought to be provided unless it is demonstrated that they are not appropriate for a particular development. When considering discharge requirements for SuDS, the following hierarchy should be applied:

1) Infiltration into the ground;
2) Discharge to a surface water body;
3) Discharge to a surface water sewer, highway drain, or to another drainage system; and
4) Discharge to a combined sewer.

6.1.5 When planning SuDS, the developer must consider construction, operation and maintenance requirements, both above and below the ground surface. The capacity of the system should be

designed to take into account the design storm, allowances for future climate change, and likely changes in impermeable area over the lifetime of the development (the Local SuDS Officer Organisation (LASOO) practice guidance[22] specifies a range of allowances for future urban creep[23]). The suitability, or otherwise, of SuDS for a particular site is determined by the LPA, in consultation with the LLFA.

Defra, Sustainable Drainage Systems: Non-statutory Technical Standards

6.1.6 The Defra sustainable drainage systems: non-statutory technical standards provide guidance on the design, construction, operation and maintenance of SuDS[24]. This guidance is set out as a series of 14 standards which sets out peak and volume run-off control rates for development, design measures for drainage system exceedance, structural integrity of the drainage system and maintenance considerations.

LASOO, Non-statutory Technical Standards for Sustainable Drainage: Practice Guidance

6.1.7 LASOO practice guidance supports the DEFRA non-statutory technical guidance[24] by explaining how the standards are applied by the LLFA. It gives consideration to: runoff, flood risk outside development, peak flow control and volume control, flood risk within development and SuDS maintenance and construction.

CIRIA, SuDS Manual (C753)

6.1.8 The CIRIA SUDS Manual (C753)[25] provides industry standard best practice guidance on the planning, design, construction and maintenance of SuDS. It covers the principles of SuDS design, designing for water quantity, water quality, amenity, biodiversity, pollution control and how such systems should be designed for specific site conditions. It contains technical guidance on a variety of SuDS systems from infiltration systems to detention basins, and also covers community engagement, cost benefit analysis, and health and safety in design. It also provides advice on the maintenance requirements of SuDS, which should be documented in a site-specific maintenance plan. Regular maintenance is required to ensure that the drainage system operates efficiently and prevents failure (which could result in flooding). It also provides guidance on what to include in a schedule for maintenance and adoption, which is integral to the success of any drainage system.

CIRIA, Designing for Exceedance in Urban drainage – Good Practice (C635)

6.1.9 CIRIA (C635)[26] outlines best practice measures for how to design for exceedance in urban drainage (i.e. how to plan for run-off above and beyond that for which the system is designed to accommodate). This intends to minimise the flood risk in the event that the drainage capacity is overwhelmed. Management of this scenario is a requirement of Technical Standards S7, S8 and S9 of the Defra sustainable drainage systems: non-statutory technical standards[24]. CIRIA (C635) provides guidance and technical design criteria, along with several case study examples.

[22] Local SuDS Officer Organisation practice guidance (LASOO), (2016). Non-statutory Technical Standards for Sustainable Drainage: Practice Guidance.
[23] Urban creep is defined as the conversion of permeable surfaces to impermeable surfaces (above that shown on the development master plan), over time, for residential development. For instance, to allow for the paving over of green spaces such as garden to create additional car parking spaces.
[24] Defra, (March 2015). Sustainable drainage systems, non-statutory technical standards for sustainable drainage systems.
[25] CIRIA, (2015). The SuDS Manual (C753). CIRIA, London.
[26] CIRIA (2006). Designing for exceedance in urban drainage – good practice (C635). CIRIA, London.

EA, The Environment Agency's Approach to Groundwater Protection

6.1.10 This document[27] sets out the EA position statements on managing and protecting groundwater. The primary aim is provide a framework that allows for consistent decision making to prevent pollution to groundwater. Position statement G13 outlines the considerations needed for infiltration SuDS within a SPZ. It notes:

"The design of infiltration SuDS and of their treatment stages needs to be appropriate to the sensitivity of the location and subject to a relevant risk assessment, considering the types of pollutants likely to be discharged, design volumes and the dilution and attenuation properties of the aquifer."

6.1.11 Position statements G10, G11 and G12 respectively explain the approach for developments posing an unacceptable risk of pollution, discharges from areas subject to contamination and discharge of clean water (such as clean roof drainage or highway drainage).

LLFA Drainage Advice

6.1.12 LLFA drainage guidance documents set out further detail on how SuDS should be integrated into the master planning process for new development. These documents provide specific, local context that should be used for outline and detailed SuDS design and outline local requirements for the planning process. LLFAs also provide site-specific pre-planning advice to developers, although there is usually a fee for this service. A summary of LLFA guidance applicable to the SDNPA area is provided below.

South East LLFAs

6.1.13 The partnership of South East LLFAs[28] have prepared a guidance document[29] to ensure a consistent, best practice approach to the use of SuDS as part of the master planning process across South East England. It is designed to provide over-arching guidance for the region as a whole, which is complemented by more localised LLFA guidance documents. At the time of writing this report, of the LLFAs covering the National Park, only Brighton and Hove City Council have not produced their own stand-alone drainage guidance in addition to that presented in the South East LLFA document.

6.1.14 The LLFA partnership guidance document explains that the sustainable management of rainwater is important for protection of water quality, water quantity, and in reducing flooding; the physical characteristics of many parts of the South East region provides opportunities for the use of SuDS. In particular, the incorporation of SuDS into both greenfield and brownfield development can reduce the pressure on existing drainage infrastructure in and around urban areas.

6.1.15 The guidance contains a 'SuDS selection matrix', which can be used to steer the developer towards the most suitable options for a given site, based on its geology, topography, flood risk, existing land use, spatial constraints and ownership and maintenance. It sets out a framework to guide the developer through the master planning process in terms of site baseline assessment, initial testing of the chosen SuDS strategy and design refinement, and provides case study examples of how SuDS have successfully been used in existing developments throughout the region.

6.1.16 Of equal importance are measures for the long-term maintenance of a proposed drainage system, both in terms of plans for routine maintenance but also for adoption (by the LLFA. local authority, highways authority, third party management Company, land owner or a water company). These

[27] EA (March 2017). The Environment Agency's approach to groundwater protection.
[28] The partnership comprises Brighton and Hove City Council, Kent County Council, Southampton City Council. East Sussex County Council, Surrey County Council, Hampshire County Council, Portsmouth City Council and West Sussex County Council.
[29] AECOM on behalf of the Lead Flood Authorities of the South East of England (September 2013). Water. People. Places. A guide for master planning sustainable drainage into developments.

measures need to be considered from the construction phase onwards, through the full lifetime of the development.

East Sussex County Council

6.1.17 Drainage guidance for new development stem from the East Sussex LFRMS (2016 to 2026), which identifies four Drainage Risk Areas covering the county. These areas are spatial groupings which represent the drainage characteristics typical to the area, and provides specific standing advice to inform the preparation of drainage strategies. A summary of the strategies and implications for drainage from this document is provided below:

6.1.18 **Drainage Risk Area 1** – covers areas of steep relief within the National Park. Topography causes high velocity surface water, sedimentation (drainage blockage) and ponding in low points. Catchments respond quickly to rainfall but the permeable geology has a high potential for infiltration. For Drainage Risk Area 1, East Sussex LFRMS (2016 to 2026) states:

- *"The LLFA will expect to see an improvement upon greenfield runoff rates from the site, in order to minimise the downstream surface water flood risk;"*
- *"Developments which connect drainage into existing watercourses should provide evidence to demonstrate the potential effects of the development on the wider catchment;"*
- *"In response to the high levels of sediment transport, regular planned maintenance of the surface water drainage system, particularly in the High Weald, is essential;" and*
- *"Proposed SuDS techniques in an Environment Agency Source Protection Zone (particularly the South Downs) should ensure that the required stages of the 'treatment train' are provided, before surface water drains through the bedrock."*

6.1.19 **Drainage Risk Area 2** – represents the transitional area between the upland and flat river valleys. Drainage systems are typically interconnected (highways, surface water sewers and watercourses). Blockage or lack of capacity can result in widespread flooding.

- *"Due to the extent of clay geologies, any proposed infiltration method should present sensitive, rigorously-tested techniques, and be supported by detailed site testing";*
- *"Control surface water runoff as close to source as possible (particularly upstream of major watercourses) to minimise potential surface water flooding impacts downstream and on the wider catchment;" and*
- *"Make sure that an outfall connection can be secured, and that there is sufficient capacity within the existing drainage systems to convey runoff from the site, particularly where the system may serve several drainage purposes."*

6.1.20 **Drainage Risk Area 3** – low-lying areas, with considerable surface water flood risk caused by connections and blockages of culverts, and overloading of the combined surface water-sewer system in urban areas.

- *"Infiltration techniques, such as soakaways and infiltration trenches, are likely to be inappropriate in the majority of the Low Weald and Coastal Marshes, due to low permeability and high groundwater levels. However infiltration can be considered where there are pockets of more permeable surface or underlying geologies;"*
- *"Attenuation and conveyance techniques, such as swales and detention basins, are likely to be more successful, and should be sensitive to any impact to areas offsite;"*
- *"Details of the route and condition of any existing watercourses and drainage networks on the site should be investigated during the drainage design stage;" and*
- *"The location of an outfall connection must be secured, and the capacity of the end destination for surface water leaving the site must be fully understood, particularly if it discharges to a combined sewer system."*

6.1.21 **Drainage Risk Area 4**– flat, low-lying land associated with fluvial/coastal floodplain, including settlements on the Rivers Ouse, Cuckmere and Upper Rother. Tide-locking poses the main constraint on drainage, and ephemeral bournes pose a surface water and groundwater flood risk.

- *"Due to high groundwater levels, for any proposed infiltration technique, robust evidence must be provided, specifying its suitability in the context of the site;"*
- *"Controlling the surface water issue at source is preferable, to make sure that the effects of fluvial and coastal flooding are not made worse;"*
- *"Raised surface structures, if used, should be designed to withstand flood damage. Any underground storage structures should also be designed with hydraulic and structural resilience to groundwater flooding;" and*
- *"Raised surface structures, if used, should be designed to withstand flood damage. Any underground storage structures should also be designed with hydraulic and structural resilience to groundwater flooding."*

6.1.22 East Sussex County Council have also published a stand-alone drainage guidance document[30], which outlines how SuDS should be designed in East Sussex and explains specific requirements for the approval process. It outlines the site-specific considerations that need to be taken into account as part of the SuDS selections process, which comprises:

- Groundwater and Source Protection Zones (SPZs);
- Topography;
- Landscape and ecology;
- Flood risk; and
- Archaeology.

6.1.23 The guidance document also details the specific stakeholders that will need to be consulted on, and agree to, proposed drainage outfalls and rates from new SuDS. Of particular use to developers is an information checklist, clearly stating what information to be provided as part of a planning application for outline or detailed design. This includes detail on the proposed drainage system design (calculations, drainage layout plan) as well as details regarding proposed maintenance schedules and management and/or adoption.

6.1.24 In support of the guidance document, East Sussex Council have also developed a SuDS Decision Support Tool for Small Scale Development[31]. This online tool has been designed to assist planning authorities and developers in assessing the suitability of SuDS for small scale development proposals (0.5 ha residential development or 1 ha non-residential development). The primary purpose is to allow planning authorities to ensure that flood risk requirements for SuDS have been met for a given development site. It does not provide definitive SuDS design, and further assessment information will be required for the planning process (as outlined in the checklist) and should be used for high level, indicative assessment only.

West Sussex County Council

6.1.25 West Sussex County Council has published specific local guidance on the management of surface water[32]. It establishes the local requirements for a site-specific drainage strategy, based around ten SuDS policies. These are: SuDS Policy 1 (follow the drainage hierarchy); SuDS Policy 2 (manage flood risk through design); SuDS Policy 3 (mimic natural flows and drainage flow paths); SuDS Policy 4 (seek to reduce existing flood risk); SuDS Policy 5 (maximise resilience); SuDS Policy 6 (design to be maintainable); SuDS Policy 7 (safeguard water quality); SuDS Policy 8 (design for

[30] East Sussex County Council, (June 2015). Guide to Sustainable Drainage Systems in East Sussex.
[31] East Sussex County Council, SuDS Decision Support Tool for Small Scale Development. Available at: http://eastsussex.suds-tool.co.uk/ (accessed 20/07/17).
[32] West Sussex County Council, (July 2017). West Sussex LLFA Policy for the Management of Surface Water.

amenity and multi-functionality); SuDS Policy 9 (enhance biodiversity); and SuDS Policy 10 (link to wider landscape objectives).

6.1.26 Policies 1 to 6 are designed to ensure the proposed drainage strategy for a development site is compliant with the NPPF and Defra non-statutory technical standards for sustainable drainage, whilst policies 7 to 10 set out expectations driven by environmental legislation and guidance from West Sussex County Council and the Local Planning Authorities.

6.1.27 The drainage strategy should include consideration of design calculations (peak flow, volume control and greenfield and/or brownfield run-off rates), account for climate change and future development allowances. It should also establish a proposed adoption strategy and maintenance plan for the drainage system. Any such drainage strategy should make reference to the relevant Local Plan policy and the most up-to-date SWMPs and surface water flood risk mapping. It must also set out principles for surface water management during the construction phase, along with any required consents.

Hampshire County Council

6.1.28 Hampshire County Council's guidance[33] sets out the required surface water and drainage information that should be provided as part of a planning application. The level of detail corresponds to whether the application is for outline or full planning approval, with the latter requiring more detailed information in terms of SuDS design. As a bare minimum, a developer is required to submit plans for the proposed SuDS scheme, and calculations assessing run-off rates from the pre-existing site and proposed development. More usually, supporting evidence in the form of infiltration testing, run-off rate calculations, run-off volume calculations, required attenuation volumes, design for exceedance of the drainage system, and proposed maintenance proposals will be required. Early consultation with the LLFA is recommended. For brownfield sites an assessment of the sensitivity of proposed discharge point is required, along with a demonstration that appropriate levels of water quality treatment have been provided. All proposals should include details for the long-term maintenance and management over the anticipated development lifetime.

6.2 Site-specific SuDS Suitability Assessment and Recommendations

Approach

6.2.1 As outlined in national and local guidance on SuDS in Section 6.1, the SuDS management hierarchy should be applied in the design of drainage systems to serve development. Any requirements for water treatment prior to discharge are primarily driven by the presence of SPZs or arising from brownfield land use (e.g. an industrial site may be contaminated). Where a development sites fitting these criteria, the EA guidance on groundwater protection[27] should be adhered to. In some SPZ aquifers, infiltration may not be permitted. Similarly, for contaminated brownfield sites additional measures may be required to ensure that the proposed drainage system does not pose an unacceptable risk of pollution to groundwater. All of the above should be considered on a site-by-site basis, as early as possible in the site design stage.

6.2.2 A high-level approach has been developed for this SFRA in order to provide site-specific SuDS suitability assessment and recommendations for all allocation sites (including those screened out of further assessment in Section 3). The approach follows on from the Level 1 SFRA by considering:

- Underlying site geology and topographic context;
- Presence (or otherwise) of groundwater Source Protection Zones (SPZs);
- Previous land use (either greenfield or brownfield);
- The distribution of other sources of flood risk within the site (e.g. fluvial, groundwater); and

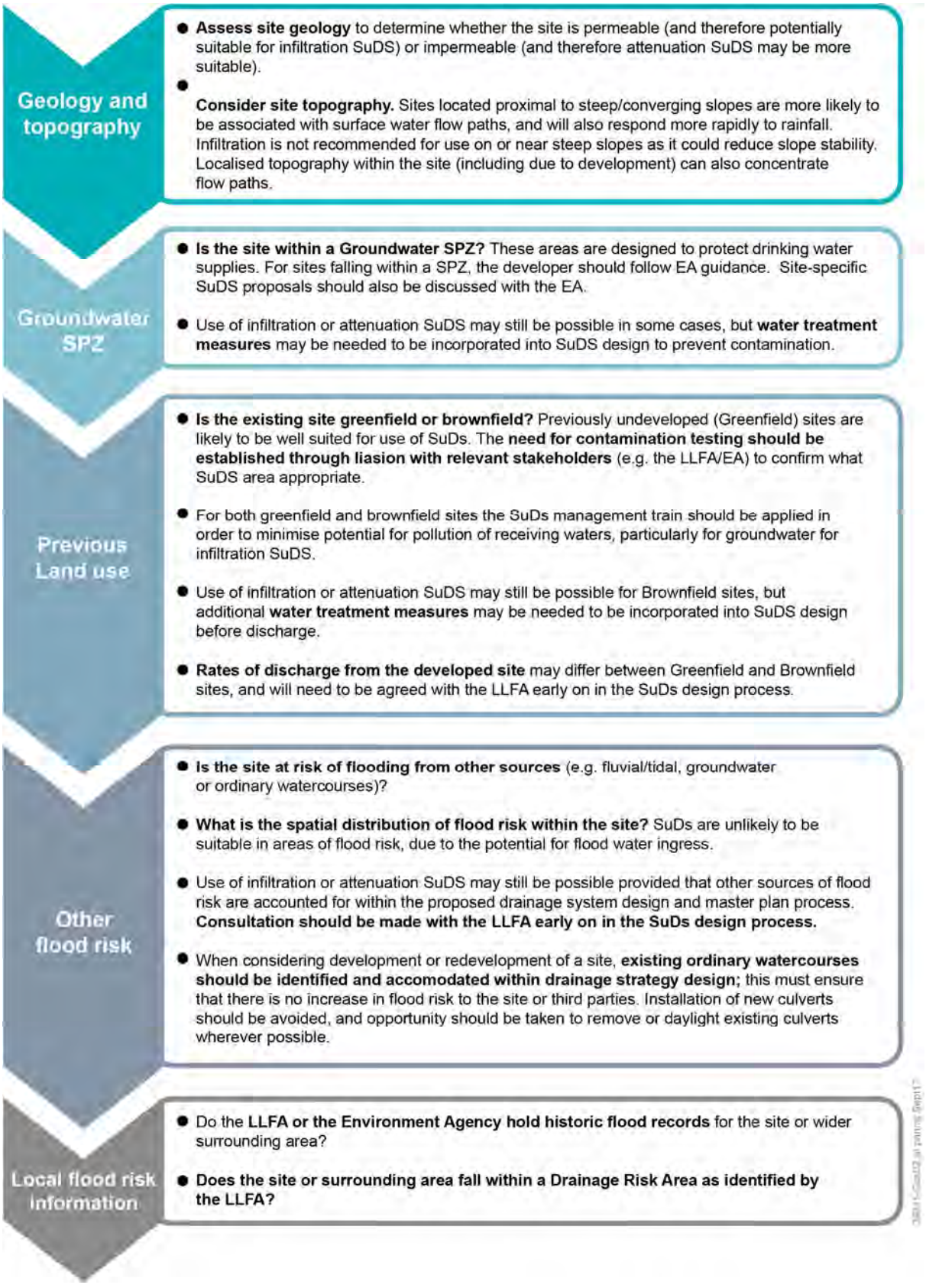
[33] Hampshire County Council, (November 2015). Surface Water and Sustainable Drainage. Guidance for Developers, Designers and Planners.

- Local flood risk information and records provided by the relevant LLFA.

6.2.3 Each allocation site will be assigned a SuDS suitability rating, defined as follows:

- High (SuDS) suitability – the site is likely to be suitable for use of most types of SuDS (i.e. infiltration and attenuation). However, there may still be additional considerations (e.g. SPZ/brownfield) which constrain the configuration of the drainage system;
- Moderate (SuDS) suitability – the site is compatible with a range of SuDS, but there is likely to be more significant constraints on the particular types, and additional considerations may also apply;
- Limited (SuDS) suitability – the site may only be compatible with limited SuDS options, for instance through the use of below ground storage tanks for attenuation. This does not mean to definitively say that these sites are unsuitable for SuDS, simply that the range of options will be restricted; and
- The site-specific SuDS assessment process applied in this SFRA is summarised in Figure 6.1.

Figure 6.1 Site-specific SuDS Suitability Assessment Methodology



Results

6.2.4 Results of the site-specific SuDS suitability screening are presented in Table 6.1. In applying the methodology outlined above, it has been estimated that approximately 30% of the allocation sites have high suitability for the use of SuDS, around 50% have moderate suitability for SuDS (subject to further site investigation) and approximately 20% appear to have limited suitability for the use of SuDS.

6.2.5 Sites that have been identified to be suitable for the use of SuDS are at low risk of flooding from all sources. The use of infiltration and/or attenuation SuDS should be considered on a site-by-basis with appropriate consideration of localised ground conditions (e.g. infiltration and ground stability testing), as appropriate. In these areas it is possible that betterment could be achieved on the pre-existing site run-off rates. Key recommendations for the application of SuDS provided in Box 6.1.

Box 6.1: Recommendations for the application of SuDS

Sites with high suitability for SuDS

Of the sites defined to have high suitability for SuDS, several are within a groundwater SPZ. For these sites, infiltration SuDS may not be appropriate and where attenuation is proposed additional surface water treatment measures are likely to be required prior to discharge. Reference should be made to EA guidance for groundwater protection[27] and consultation with the EA should be undertaken in order to determine appropriate site-specific measures. A further seven of the sites are brownfield and will require consultation with the LLFA to ensure appropriate levels of water treatment are incorporated into the proposed drainage design. SD74 (Land at Fern Farm) is both brownfield and within an SPZ. The agreement of appropriate SuDS measures for this site will need to be made with both the EA and the LLFA.

Sites potentially suitable for SuDS

Around half of the sites have been determined to potentially be suitable for the use of SuDS. These sites may be suitable for use of SuDS based on the available information, however, unlike the sites identified as likely to be suitable, there are further potential constraints. Such constraints include, topography, presence of impermeable geology, or other sources of flood risk (primarily groundwater) which could prove prohibitive. For these sites, the developer should attempt to use infiltration SuDS in the first instance, however this would be subject to further consideration of site-specific ground conditions and the proposed site master plan. For brownfield sites and those that fall within an SPZ, further water treatment measures are likely to be required.

Sites with limited options for SuDS

In correlation with the areas of highest flood risk determined by the screening exercise in Section 3, several of the sites appear to have limited options for SuDS. These sites are concentrated within Lewes, and particularly in areas of fluvial/tidal Flood Zones and groundwater flooding. Additionally, East Sussex County Council has identified these sites to fall within Drainage Risk Area 4. This does not mean to definitively say that these sites are unsuitable for SuDS, but that there is very limited potential. It is possible that attenuation (and treatment) with discharge to the existing surface water sewer network may be the only viable solution.

6.2.6 It should be noted that the results presented in Table 6.1 are indicative only, to provide initial guidance on SuDS suitability for the individual sites. Further detailed assessment of site SuDS suitability should be carried out at the development master-planning stage to include ground testing results and/or incorporation of appropriate levels of treatment. This information, along with additional requirements advised by the LLFA (see section 6.1 for relevant document references) should be presented within the site-specific FRA/drainage assessment submitted as part of a planning application.

6.2.7 The site-specific flood information sheets (Appendix B) provide further detailed assessment of SuDS suitability, for those sites screened into the assessment.

6.2.8 In addition to the recommendations for the applications of SuDS presented in Box 6.1, more widely applicable SuDS policy recommendations are presented in Box 6.2, and requirements for site specific FRAs with respect to SuDS are presented in Box 6.3.

Allocation ID	Allocation Name	LLFA	Settlement	Site Area (ha)	Allocation	Geology	Topography	Groundwater SPZ	Land Use (Greenfield or Brownfield)	Flood Risk	Local Flood Risk Information	SuDS Suitability	Potential SuDS
South Downs Local Plan Development Allocations													
SD58	Former Allotments	East Sussex	Alfriston	0.42	5 - 10	Grey Chalk (Zig Zag Chalk Formation). Superficial alluvium.	Floodplain of River Cuckmere (flat).	No	Greenfield/Brownfield (Some development within site boundary).	Flood Zone	Site within ESCC Drainage Risk Area Drainage Risk Area 4. Historic flooding recorded in wider area but not within the site boundary.	**Limited.**	Attenuation and discharge to existing surface water sewer.
SD59	Kings Ride	East Sussex	Alfriston	0.38	6 to 8	White Chalk (New Pit Chalk Formation). No superficial deposits.	Located on valley side (steep).	No	Brownfield.	None	Site within ESCC Drainage Risk Area 1. Historic flooding recorded in wider areabut not within the site boundary.	**High.**	Infiltration/ attenuation.
SD60	Land at Clements Close	Hampshire	Binsted	0.53	10 to 12	Upper Greensand (sandstone). No superficial deposits.	Located on valley side (steep).	No	Greenfield.	None	None	**High.**	Infiltration/ attenuation.
SD62	Land at Greenway Lane	Hampshire	Buriton	0.51	8 to 12	Grey Chalk (West Melbury Marly Chalk Formation). No superficial deposits.	Located on valley side (steep).	No	Greenfield.	None	None	**High.**	Infiltration/ attenuation.
SD63	Land South of the A272 at Hinton Marsh	Hampshire	Cheriton	0.86	12 to 15	White Chalk (New Pit Chalk Formation). Alluvium at northern edge of site and head deposits within the northern part of the site.	Valley floor (flat).	No	Greenfield/Brownfield.	Groundwater	None	**Moderate.**	Attenuation.
SD64	Land South of London Road	West Sussex	Coldwaltham	3.88	35 to 40	Lower Greensand (Folkestone Formation). Head deposits.	Located on valley side (steep).	Yes	Greenfield.	None	None	**High.**	Infiltration/ attenuation.
SD66	Land at Park Lane	Hampshire	Droxford	1.04	26-32	White Chalk (Seaford Chalk Formation). Head deposits.	Dry valley feature (steep).	No	Greenfield/Brownfield.	Groundwater	None	**Moderate.**	Attenuation.
SD67	Cowdray Works Yard	West Sussex	Easebourne	0.94	Mixed use 16-20	Lower Greensand (Easebourne Member). No superficial deposits.	Dry valley feature (steep).	No	Brownfield.	Groundwater	Historic flooding recorded in wider area but not within the site boundary.	**Moderate.**	Attenuation.
SD68	Land at Egmont Road	West Sussex	Easebourne	0.68	16-20	Lower Greensand (Easebourne Member). No superficial deposits.	Dry valley feature (steep).	No	Greenfield/Brownfield.	Groundwater	Historic flooding recorded in wider area but not within the site boundary.	**Moderate.**	Attenuation.
SD69	Former Easebourne School	West Sussex	Easebourne	2.14	16-20	Lower Greensand (Easebourne Member). No superficial deposits.	Dry valley feature (steep).	No	Brownfield.	Groundwater	Historic flooding recorded in wider area but not within the site boundary.	**Moderate.**	Attenuation.
SD71	Land at Elm Rise	West Sussex	Findon	0.73	15-20	White Chalk (Seaford Chalk Formation). No superficial deposits.	Located on valley side (steep).	Yes	Greenfield.	None	Historic flooding recorded in wider area but not within the site boundary.	**High.**	Infiltration/ attenuation.
SD72	Soldiers Field House	West Sussex	Findon	0.60	10 to 12	White Chalk (Seaford Chalk Formation). No superficial deposits.	Dry valley feature (steep).	Yes	Brownfield.	Groundwater	None	**Moderate.**	Infiltration/ attenuation.
SD73	Land at Petersfield Road	Hampshire	Greatham	2.37	35-40	Lower Greensand (Folkestone Formation). No superficial deposits.	Located on valley side (steep).	Yes	Greenfield.	None	None	**High.**	Infiltration/ attenuation.
SD76	Land at Itchen Abbas House	Hampshire	Itchen Abbas	0.66	8 to 10	White Chalk (Seaford Chalk Formation). No superficial deposits.	Located on valley side (steep).	No	Greenfield.	None	None	**High.**	Infiltration/ attenuation.
SD77	Land at Castelmer Fruit Farm	East Sussex	Kingston Near Lewes	0.72	10 to 12	Grey Chalk (Zig Zag Chalk Formation). No superficial deposits.	Dry valley feature (steep).	Yes	Brownfield.	Groundwater	ESCC Drainage Risk Areas 1 and 4. Historic flooding recorded in wider area but not within the site boundary.	**Moderate.**	Infiltration/ attenuation.
SD79	Land at Old Malling Farm	East Sussex	Lewes	9.97	220-240	White Chalk (Holywell Nodular Chalk Formation) and Grey Chalk (Zig Zag Formation).	Floodplain (flat).	No	Greenfield.	Flood Zone and Groundwater	Site within ESCC Drainage Risk Area 1. Historic flooding recorded in wider area but not within the site boundary.	**Limited.**	Attenuation and discharge to existing surface water sewer.
SD81	Depot and former Brickworks site	West Sussex	Midhurst	4.07	65-90	Lower Greensand (Folkestone Formation). No superficial deposits.	Floodplain (flat).	No	Brownfield.	None	Historic flooding recorded in wider area but not within the site boundary.	**High.**	Infiltration/ attenuation.
SD82	Holmbush Caravan Park	West Sussex	Midhurst	4.96	50 to 70	Lower Greensand (Folkestone Formation). No superficial deposits.	Flat, lake on site.	No	Brownfield.	Flood Zone	None	**Moderate.**	Infiltration/ attenuation.
SD83	Land at the Fairway	West Sussex	Midhurst	0.11	8 to 10	Lower Greensand (Folkestone Formation). No superficial deposits.	Floodplain (flat).	No	Brownfield.	None	None	**High.**	Infiltration/ attenuation.

Allocation ID	Allocation Name	LLFA	Settlement	Site Area (ha)	Allocation	Geology	Topography	Groundwater SPZ	Land Use (Greenfield or Brownfield)	Flood Risk	Local Flood Risk Information	SuDS Suitability	Potential SuDS
SD84	Land at Lamberts Lane	West Sussex	Midhurst	0.43	20	Lower Greensand (Selham Ironshot Sands Member). River terrace deposits.	Interfluve (steep).	No	Brownfield.	None	Historic flooding recorded in wider area but not within the site boundary.	**High.**	Infiltration/ attenuation.
SD85	Land at Park Crescent	West Sussex	Midhurst	0.34	8 to 12	Lower Greensand (Selham Ironshot Sands Member). No superficial deposits.	Interfluve (steep).	No	Brownfield.	None	Historic flooding recorded in wider area but not within the site boundary.	**High.**	Infiltration/ attenuation.
SD87	Land at Church Lane	West Sussex	Pyecombe	0.98	8	White Chalk (Holywell Nodular Chalk Formation) and New Pit Chalk Formation. Head deposits.	Dry valley feature (steep).	Yes	Greenfield.	Groundwater	None	**Moderate.**	Attenuation.
SD88	Land at Ketchers Field	Hampshire	Selborne	0.24	5 to 6	Upper Greensand Formation. No superficial deposits.	Valley side location (steep).	No	Greenfield.	None	None	**High.**	Infiltration/ attenuation.
SD89	Land at Pulens Lane	Hampshire	Sheet	3.59	30 to 32	Lower Greensand (Hythe Formation and Rogate Member). River Terrace deposits.	Valley floor, partially within floodplain (flat).	Yes	Greenfield.	Flood Zone and Groundwater	None	**Moderate.**	Attenuation.
SD90	Land at Loppers Ash	West Sussex	South Harting	0.60	6 to 8	Grey Chalk (West Melbury Marly Chalk Formation). No superficial deposits.	Interfluve (steep).	No	Greenfield.	None	Historic flooding recorded in wider area but not within the site boundary.	**High.**	Infiltration/ attenuation.
SD91	Land North of the Forge	West Sussex	South Harting	0.12	5 to 6	Upper Greensand Formation (No superficial deposits).	Valley side (steep).	No	Greenfield.	None	Historic flooding recorded in wider area but not within the site boundary.	**High.**	Infiltration/ attenuation.
SD92	Stedham Sawmill	West Sussex	Stedham	1.28	30	Lower Greensand (Marehill Clay Member and Pulborough Sandrock Member). No superficial deposits.	Interfluve (steep).	No	Brownfield.	None	None	**High.**	Infiltration/ attenuation.
SD93	Land South of Church Road	Hampshire	Steep	0.68	8 to 12	Gault Formation (clay). No superficial deposits.	Valley side (steep).	No	Brownfield.	None	None	**Moderate.**	Attenuation.
SD94	Land at Ramsdean Road	Hampshire	Stroud	1.44	26 - 30	Gault Formation (clay). No superficial deposits.	Valley side (steep).	No	Greenfield.	None	None	**Moderate.**	Attenuation.
SD95	Land South of Heather Close	West Sussex	West Ashling	0.68	15	White Chalk (Lews Nodular Chalk Formation). River Terrace deposits.	Perched above floodplain (flat).	No	Greenfield.	None	Historic flooding recorded in wider area but not within the site boundary.	**High.**	Infiltration/ attenuation.
SD96	Land at Long Priors	Hampshire	West Meon	0.48	10 to 12	White Chalk (Newhaven Chalk Formation). Some head deposits.	Valley side (steep).	Yes	Greenfield.	Groundwater	None	**Moderate.**	Attenuation.
South Downs Local Plan Strategic Sites													
SD056	Shoreham Cement Works	West Sussex	Shoreham	44.36	Mixed uses numbers/floor space not specified	White Chalk (Lewes Nodular Chalk Formation and Seaford Chalk Formation). Some alluvium and head deposits.	Disused quarry, valley side to floodplain (steep/flat).	No	Brownfield.	Flood Zone and Groundwater	Historic flooding recorded over-lapping site boundary.	**Moderate.**	Infiltration/ attenuation.
Gypsy and Traveller Allocation													
SD61	New Barn Stables, The Street	East Hampshire	Binsted	0.17	2	Upper Greensand. No superficial deposits.	Valley side (steep).	No	Brownfield.	None	None	**High.**	Infiltration/ attenuation.
SD74	Land at Fern Farm	East Hampshire	Greatham	0.79	4	Lower Greensand (Folkesetone Formation). No superficial depoits.	Perched above floodplain (flat).	Yes	Brownfield.	None	None	**High.**	Infiltration/ attenuation.
SD75	Half Acre	East Hampshire	Hawkley	0.24	3	Gault Formation (clay). No superficial deposits.	Valley floor/floodplain (flat).	No	Greenfield.	None	None	**High.**	Infiltration/ attenuation.
SD78	The Pump House	East Sussex	Kingston near Lewes	0.09	1	White Chalk (Holywell Nodular Chalk Formation). No superficial deposits.	Valley side (steep).	Yes	Brownfield.	None	Site within ESCC Drainage Risk Area 1.	**Moderate.**	Infiltration/ attenuation.
SD86	Offham Barns	East Sussex	Offham and Cooksbridge	0.3	4	Grey Chalk (West Melbury Marly Chalk Formation). No superficial deposits.	Valley floor/floodplain (flat).	No	Greenfield.	Groundwater	Site within ESCC Drainage Risk Areas 1 and 3.	**Moderate.**	Infiltration/ attenuation.
Lewes Local Neighbourhood Plan Allocations													
PL1 (02)	Land at Astley House and police garage	East Sussex	Lewes	0.18	25	White Chalk (Seaford Chalk Formation). No superficial deposits.	Valley side (steep).	Yes	Brownfield.	None	Site within ESCC Drainage Risk Area 1. Historic flooding recorded in wider area but not within the site boundary.	**Moderate.**	Infiltration/ attenuation.

Allocation ID	Allocation Name	LLFA	Settlement	Site Area (ha)	Allocation	Geology	Topography	Groundwater SPZ	Land Use (Greenfield or Brownfield)	Flood Risk	Local Flood Risk Information	SuDS Suitability	Potential SuDS
PL1 (03)	Land at the Auction Rooms	East Sussex	Lewes	0.16	11	White Chalk (Lewes Nodular Chalk Formation). Alluvium.	Valley side (steep).	Yes	Brownfield.	Flood Zone and Groundwater	Site within ESCC Drainage Risk Areas 1 and 4. Historic flooding recorded in wider area but not within the site boundary.	**Limited.**	Attenuation and discharge to existing surface water sewer.
PL1 (04)	Land at Blois Road, garage site north	East Sussex	Lewes	0.11	6	White Chalk (Lewes Nodular Chalk Formation and New Pit Chalk Formation). No superficial deposits.	Valley side (steep).	Yes	Brownfield.	None	Site withinESCC Drainage Risk Areas 1 and 3.	**Moderate.**	Infiltration/ attenuation.
PL1 (05)	Land at Blois Road, garage site south	East Sussex	Lewes	0.10	6	White Chalk (Lewes Nodular Chalk Formation and New Pit Chalk Formation). No superficial deposits.	Valley side (steep).	Yes	Brownfield.	None	Site withinESCC Drainage Risk Areas 1 and 3.	**Moderate.**	Infiltration/ attenuation.
PL1 (08)	Land at Buckwell Court, garage site	East Sussex	Lewes	0.04	6	White Chalk (Holywell Nodular Chalk Formation). No superficial deposits.	Valley side (steep).	Yes	Brownfield.	Flood Zone and Groundwater	Site within ESCC Drainage Risk Areas 3 and 4.	**Moderate.**	Infiltration/ attenuation.
PL1 (13)	Land at the former Wenban Smith Site	East Sussex	Lewes	0.42	11	White Chalk Formation (New Pit Chalk Formation). Alluvium.	Floodplain (flat).	Yes	Brownfield.	Flood Zone and Groundwater	Site within ESCC Drainage Risk Area 4.	**Limited.**	Attenuation and discharge to existing surface water sewer.
PL1 (21)	Land at Kingsley Road garage site	East Sussex	Lewes	0.06	6	White Chalk (Lewes Nodular Chalk Formation). No superficial deposits.	Valley side (steep).	Yes	Brownfield.	None	Site within SCC Drainage Risk Area 1.	**Moderate.**	Infiltration/ attenuation.
PL1 (30)	Land at Landport Road garage site	East Sussex	Lewes	0.09	6	White Chalk (Holywell Nodular Chalk Formation). No superficial deposits.	Valley floor/floodplain (flat).	No	Brownfield.	Flood Zone and Groundwater	Site within ESCC Drainage Risk Area 4.	**Limited.**	Attenuation and discharge to existing surface water sewer.
PL1 (34)	Land at Little East Street car park, corner of North and East Street	East Sussex	Lewes	0.08	11	White Chalk (Lewes Nodular Chalk Formation). No superficial deposits.	Valley side (steep).	Yes	Brownfield.	None	Site within ESCC Drainage Risk Area 1 and 4.	**Moderate.**	Infiltration/ attenuation.
PL1 (35)	Land at the Lytchets garage site	East Sussex	Lewes	0.05	6	White Chalk (Holywell Nodular Chalk Formation). No superficial deposits.	Valley side (steep).	No	Brownfield.	None	Site within ESCC Drainage Risk Area 1.	**Moderate.**	Infiltration/ attenuation.
PL1 (36)	Land at Magistrates Court Car Park, Court Road	East Sussex	Lewes	0.13	9	White Chalk (Lewes Nodular Chalk Formation). Alluvium.	Valley side (steep).	Yes	Brownfield.	Flood Zone and Groundwater	Site within ESCC Drainage Risk Area 4.	**Limited.**	Attenuation and discharge to existing surface water sewer.
PL1 (39)	Land at former petrol station, Malling Street	East Sussex	Lewes	0.05	5	White Chalk (New Pit Chalk Formation). No superficial deposits.	Valley floor/floodplain (flat).	Yes	Brownfield.	Flood Zone and Groundwater	Site within ESCC Drainage Risk Area 4. Historic flooding recorded in wider area but not within the site boundary.	**Limited.**	Attenuation and discharge to existing surface water sewer.
PL1 (44)	Land at Princes Charles Road garage site	East Sussex	Lewes	0.01	6	Grey Chalk (Zig Zag Chalk Formation). No superficial deposits.	Valley side (steep).	No	Brownfield.	None	Site within ESCC Drainage Risk Area 1.	**Moderate.**	Infiltration/ attenuation.
PL1 (46)	Land at Queens Road garage site	East Sussex	Lewes	0.18	10	Grey Chalk (Zig Zag Chalk Formation). No superficial deposits.	Valley side (steep).	No	Brownfield.	None	Site within ESCC Drainage Risk Area 1.	**Moderate.**	Infiltration/ attenuation.
PL1 (48)	Land at former Ambulance Headquarters, Friars Walk	East Sussex	Lewes	0.07	18	White Chalk (Lewes Nodular Chalk Formation). No superficial deposits.	Valley floor/floodplain (flat).	Yes	Brownfield.	Flood Zone and Groundwater	Site within ESCC Drainage Risk Area 4. Historic flooding recorded in wider area, including within the site boundary.	**Limited.**	Attenuation and discharge to existing surface water sewer.
PL1 (52)	Land at St Anne's Crescent	East Sussex	Lewes	0.18	12	White Chalk (Seaford Chalk Formation). No superficial deposits.	Valley side (steep).	Yes	Brownfield.	None	Site within ESCC Drainage Risk Area 1. Historic flooding recorded in wider area, including within the site boundary.	**Moderate.**	Infiltration/ attenuation.
PL1 (53)	Former St Anne's School Site	East Sussex	Lewes	1.68	26 but could accmmodate much more	White Chalk (Seaford Chalk Formation). No superficial deposits.	Valley floor/floodplain (flat).	Yes	Brownfield.	Groundwater	Site within ESCC Drainage Risk Area 1. Historic flooding recorded in wider area, including within the site boundary.	**Moderate.**	Attenuation.
PL1 (57)	Lewes railway station car park	East Sussex	Lewes	0.36	20	White Chalk (Lewes Nodular Chalk Formation). Alluvium.	Valley side (steep).	Yes	Brownfield.	Flood Zone and Groundwater	Site within ESCC Drainage Risk Area 4. Historic flooding recorded in wider area, including within the site boundary.	**Limited.**	Attenuation and discharge to existing surface water sewer.
Twyford Local Neighbourhood Plan Allocation													
Twyford_NDP_26	Land at Hazeley Road	Hampshire	Twyford	0.63	20	White Chalk (Seaford Chalk Formation). Head deposits.	Valley side (steep).	Yes	Greenfield.	Groundwater	None	**Moderate.**	Attenuation.

Box 6.2: SuDS Policy recommendations

The following SuDS policies have been developed as a result of the site-specific SuDS suitability assessment, and should be applied across all of the allocation sites:

- Drainage for proposed development should incorporate SuDS elements that are appropriate for site characteristics (in-line with the SuDS hierarchy outlined in the CIRIA SuDS Manual (C753));
- New development should minimise impermeable surfaces as far as possible; instead, permeable surfaces and soft landscaping should be incorporated to maximise infiltration and minimise surface water run-off;
- Adopt a sequential approach to site layout, with SuDS being located in Flood Zone 1 unless not possible. For sites entirely within Flood Zone 2/3, appropriate SuDS measures should be incorporated;
- Where use of infiltration is not applicable, attenuation should be considered to attenuate both rate and volume runoff. This will have implications for the land take required to incorporate SuDS and the cost viability of the development; and
- Surface water discharge rates from developments should aim to match the pre-development (greenfield) rates, and opportunities for betterment should be sought wherever possible. For brownfield sites, it may not be possible to achieve the greenfield rate. In this instance, an acceptable rate of discharge should be confirmed with the appropriate statutory body (LLFA/EA/IDB/water company);
- Drainage system design for sites in SPZs and potentially contaminated sites should consider EA guidance on groundwater protection27 and incorporate measures into the site plan;
- Maintenance and adoption must be considered early on in the SuDS design process, to cover the construction phase to the anticipated end of the development lifetime.

Box 6.3: SuDS requirements for site-specific FRAs

In order to achieve the SuDS policy recommendations, site-specific flood risk assessments should provide the following:

- Assessment of pre-existing surface water run-off rates;
- Confirmation of suitability or otherwise for infiltration SuDS through infiltration testing, and assessment of ground stability and contamination;
- Where infiltration and/or attenuation measures are required, provide calculations for the proposed size of SuDS features (including storage/attenuation volumes);
- Site plans illustrating the location of the proposed drainage system and outfall location;
- Demonstration that proposed SuDS can be located outside of flood risk areas (fluvial/tidal and groundwater), and can accommodate tide-locking in accordance with LLFA requirements, where applicable;
- Evidence of design for drainage system exceedance;
- For brownfield sites and/or groundwater SPZs, demonstration that appropriate SuDS and water treatment measures have been incorporated into drainage design, as advised by the EA or LLFA; and
- Where applicable, demonstration that the proposed discharge rates and water treatment measures have been agreed with the relevant stakeholder (e.g. the EA, LLFA and/or water company);
- Clearly set out proposed maintenance and adoption measures from the construction phase to the end of the development lifecycle, with reference to relevant LLFA guidance.

7. Summary, Conclusions and Recommendations

This final section provides a summary of the assessments carried out in previous sections, summarising the key recommendations made. It also makes recommendations for how the assessment could be applied to the evaluation of planning applications for unallocated sites, and makes any recommendations for further work to improve understanding of flood risk in the National Park.

7.1 Flood Risk Assessment for Potential Allocation Sites in the South Downs Local Plan and the Lewes and Twyford NDPs

7.1.1 A strategic assessment of 56 potential allocation sites, comprising of 37 sites from the South Downs Local Plan, 18 Lewes NDP sites and one site from the Twyford NDP, has been undertaken (Figures 3.1 and 3.2 show the site locations). These sites have been screened against tidal, fluvial, surface water and groundwater flood risk mapping and data (see Table 3.2). Detailed assessment of all allocation sites screened in is provided in Table 3.3. The screening process identified that 41 sites are at risk from one or more sources of flooding, with 15 sites being screened out on the basis of there being minimal risk of flooding at these sites. Nine further sites were excluded from further assessment on the basis that these sites had a minor surface water/groundwater flood risk to access only. Consequently, 32 sites, comprising 21 sites from the South Downs Local Plan, 10 sites from the Lewes NDP and the single site from the Twyford NDP, were taken forward for the more detailed site-specific assessments that are presented in the Flood Risk Information Sheets in Appendix B.

7.1.2 For the South Downs Local Plan allocation sites, this screening information, together with the more detailed site-specific assessments in Appendix B, will help to inform the Sequential Test which is being carried out as part of the Sustainability Appraisal for the five sites where potential fluvial and/or tidal flood risks have been identified in this study. The Sequential Test directs development to areas with the lowest risk of flooding. In doing so, a suitable Search Area is defined, to focus the test on potential sites relevant to the development in question. Given the National Park status, development will be necessarily focused within existing settlements, rather than the wider authority area. In cases where sites with flood risk constraints are the only viable site for vulnerable development, the Exception Test will need to be applied.

7.1.3 The Sequential Test will also need to be applied for the final selection of sites for the Lewes NDP. The area of search will need to be appropriately defined (e.g. for 'town centre' development to only include relevant sites in central Lewes) to correctly apply the Sequential Test. In undertaking the Sequential Test within the area of search, a range of alternative sites and their availability for development will need to be considered. In order to achieve the overall quantity of development (i.e. yield of housing), multiple sites may be required, including some at higher risk of flooding. For example, if a site with a lower risk of flooding is not 'reasonably available', development may need to be directed to other sites with a greater degree of flood risk. In these cases, application of the Exception Test is essential to ensure that the development contributes to sustainable development more widely, that the proposed development is safe both now, and will remain safe over its lifetime accounting for climate change, and that the development should not increase flood risk overall.

7.1.4 Full details of recommendations for future, site-specific FRAs are provided in the Flood Risk Information Sheets provided in Appendix B for all sites screened in to the assessment. The impacts of climate change on fluvial and/or tidal flood risk has been considered in this study using existing EA model outputs, which were based on now outdated guidance on climate change impacts. Further sensitivity analysis was presented in Section 4.2 to assess the potential effects of more severe climate change effects on fluvial flood risk. However, remodelling of fluvial flood risk with current climate change allowances has not been carried out. Consequently, an important recommendation for all sites is that any site-specific FRA should evaluate future flood risk and

design levels for developments using current EA guidance on climate change for FRA[7], as discussed further below in Section 7.5.

7.2 Flood Risk Management Recommendations

7.2.1 Flood risk management recommendations for each allocation site are summarised in Table 5.3. Where ticked, these recommendations are key considerations for the site in question. However, application of these principles is good practice for all new developments. These measures are intended to guide the approach to managing flood risk at the site from the earliest stages of site assessment, through to finalisation of the masterplan and development form. Key recommendations are summarised in Box 5.1, and focus on:

- Ensuring appropriate consideration of climate change when setting design levels for new development;
- Application of the sequential approach to setting out development;
- Managing for exceedance (i.e. ensuring the consequences of events more extreme than the design event are managed);
- Ensuring surface water flood risk is appropriately considered. For all sites with surface water flood risk, a sequential approach to the development layout and master planning process should be applied to avoid risk areas as far as is practicable. For some sites with large areas at high risk of surface water flooding, risk should be treated in a similar manner to that from tidal/fluvial sources. For sites at lesser risk from this source of flooding, it may be possible to use landscaping re-profiling and incorporate SuDS to reduce the risk;
- Appropriate consideration of safe access and egress; and
- Level-for-level compensation provided for areas of proposed land raising.

7.2.2 Further site specific information is provided in the Flood Risk Information Sheets in Appendix B that enables each site to be assessed on the basis of what proportion of the allocation is within each of the Flood Zones.

7.3 Use of SuDS

7.3.1 SuDS should be incorporated in all developments, as far as practically possible. For sites with fewer constraints on drainage, a broad range of SuDS techniques may be applicable. Conversely, the range of SuDS options may be limited where there are constraints, particularly brownfield sites or within areas of flood risk. In all cases, pre-planning consultation with the organisation responsible for the receiving watercourse or drainage system will be needed to agree acceptable rates and volumes for the site's runoff. If SuDS are genuinely unfeasible, agreement will need to be reached at this stage.

7.3.2 The developer should make reference to SuDS guidance (see section 6.1). In particular, the CIRIA SuDS Manual (C753)[25] provides detailed guidance on how to incorporate SuDS techniques into new developments. Developers of sites should consider and incorporate SuDS at the outset of site master planning, in order to best incorporate SuDS and design well-conceived sites with quality green and blue infrastructure. Early consultation with the LLFA is required to agree the principles for a site drainage system and to determine any site-specific drainage measures. This process will also need to consider key design parameters, as set out in Defra's SuDS Non-Statutory Technical Standards guidance[24]. SuDS design should consider the management of exceedance flows for events that exceed the design standard for the SuDS system. Proposed measures for maintenance and adoption must be considered throughout the design process, and set out in accordance with LLFA guidance for planning applications.

7.3.3 Across the National Park, extensive areas of the chalk and other permeable geologies are classified as SPZs in order to protect abstractions for public water supply. In these areas, specific

arrangements will be required for infiltration SuDS, and the developer should consult with the EA and LLFA. Infiltration may be limited to roof water only, or extra treatments stages maybe needed with pollution prevention measures.

7.4 Evaluation of Planning Applications for Unallocated Sites

7.4.1 In addition to the identified allocation sites, 'windfall' opportunity sites are likely to be identified in future. For these sites, the same process of applying NPPF's Sequential and Exception Tests will need to be applied. The promoter of these sites, will need to agree an appropriate area of search for undertaking the Sequential Test with the SDNPA. As set out in Section 7.1 the area of search will need to be appropriately defined to the nature of the development opportunity. Within the defined area of search, alternative comparator sites and their availability for development will need to be considered. Alternative comparator sites must be broadly similar in area or potential development yield to the site in question. Defining 'reasonably available' will initially involve checking records of potential development land held by the SDNPA. In some cases, developers may need to make enquiries with the owners of suitable alternative development land to confirm whether it is 'reasonable available'. Understanding whether equivalent sites at lesser risk of flooding are reasonably available in the area of search will then allow the Sequential Test process to be undertaken. Alternative sites can then be prioritised, or if the identified site is considered suitable, the Exception Test undertaken.

7.5 Further Work to Improve Understanding of Flood Risks

7.5.1 The most significant uncertainty from the analysis performed in this report is associated with future fluvial flood risk due to updates climate change guidance[7]. Where modelled data were available they incorporated a now out dated 20 % uplift to the 1 in 100 AEP fluvial flows. Additional assessment using the present day 1 in 1000 event as a proxy for a more severe climate change impact on the 1 in 100 AEP event (equivalent to a 67% increase in flow) has been carried out for sites at fluvial flood risk in Lewes. In addition, a simple exercise of putting a 15m buffer around Flood Zone 2 to represent the extent of an extreme future fluvial event has also been carried out for all sites where a fluvial flood risk was identified. However, it is a requirement for all sites where a fluvial flood risk has been identified that a site specific FRA should be undertaken to account for the latest climate change guidance[7].

7.5.2 A range of other site-specific knowledge gaps have been identified, and would benefit from further investigation. These include:

- South Downs Local Plan sites:
  - Hydraulic modelling to define the extent of Flood Zone 3b for the Land at Pulens Lane (SD89) and Holmbush Caravan Park (SD82) on the River Rother and the Former Allotments at Alfriston (SD58), adjacent to the Cuckmere River. In the absence of such information, it is recommended that the entirety of Flood Zone 3 is treated as Flood Zone 3b for these sites.
- Lewes NDP sites:
  - To fully understand the fluvial flood risk to the Land at the Auction Rooms (PL1 (3)) and Lewes Railway Station Car Park site (PL1 (57)), modelling will need to account of the probability of flooding from both the Winterbourne Stream and the River Ouse. It is understood that a hydraulic model is currently being developed by the EA for the Lewes Winterbourne Stream. Although the scope of this model and timescales for completion are not yet known, this is likely to be of benefit for future site-specific FRAs for these sites;
  - A simple breach analysis was performed for the site Land at Former Petrol Station, Malling Street (PL1(39)), estimated using distance from the defence and depth of water behind for the fluvial 1 in 100 AEP plus 20 % climate change. The hazard to the site is likely overestimated as the method assumes a flat flood plain, whereas land levels in fact rise up

with distance away from the defences. A more-detailed assessment should be undertaken as part of any site specific FRA; and

- The impact of flood defence investment in Lewes on future development sites elsewhere in the town (i.e. Landport Road PL1 (30)), will need to be considered. New flood defences could raise water levels elsewhere, which will need to factored into the FRA process for sites that subsequently come forward for development.

Appendix A
Summaries of Relevant Flood Risk Management Plans, Policies and Strategies

Appendix A – this will be incorporated into the report Word document

Table A.1 Summary of South East River Basin District Flood Risk Management Plan (2015 – 2021)

Author and date	Test and Itchen catchment	East Hampshire catchment	Arun and West Streams catchment	Adur and Ouse catchment	Cuckmere and Pevensey Levels catchment
Environment Agency (2016)	Groundwater baseflow from unconfined chalk aquifers produces streams and springs at margins of the South Downs. High water table can result in prolonged surface water and groundwater flooding, following periods of high rainfall. Surface water can occur throughout the catchment, but is most problematic in urban areas; mainly outside of the National Park. Flood alleviation schemes (improved flood warning systems and increased community awareness) are being developed, primarily outside of outside the National Park.	Flooding is strongly influenced by underlying chalk geology (groundwater) and clays/gravels (fluvial and surface water). Groundwater and surface water flooding are the main flood risk in rural areas. Catchment largely located outside the National Park.	In recent years there has been increased development across the catchment which has presented challenges to planning authorities and developers to ensure there is no increased risk of flooding to third parties. Surface water flooding is known to occur in urban areas across the catchment, with the greatest risk being in the flatter, coastal areas, where drainage can be poor. Groundwater flooding widespread across the catchment but particularly in the River Meon valley. Aim to maintain and improve flood warnings in East Hampshire.	A large proportion of the catchment is within the National Park. Fluvial and tidal flood risk concentrated along the Rivers, Arun Adur and Rother. Surface water flooding a known issue in Chichester. Flood of autumn 2000 led to flood defence improvements in Lewes. Aim to develop multi-agency plan for flood resilience.	Non-tidal reaches of the River Cuckmere do not benefit from flood defences. Fluvial and groundwater flooding is problematic in Alfriston. Majority of proposed protection measures are located outside the National Park.

Table A.2 Summary of Preliminary Flood Risk Assessments (PFRAs)

Author and date	Past flood risk	Future flood risk
East Sussex County Council (June 2016)	Records of historic flood risk incidents provided in Appendix A of the report. Key areas affected include Lewes (surface water and the River Ouse), the River Cuckmere and the Pevensey Levels.	Map B.2 illustrates potential future flood risk areas.
West Sussex County Council (June 2016)	Historic flood records are distributed throughout the county.	Clusters of high future flood risk area located outside of the National Park.
Hampshire County Council (June 2011)	Historic flood risk predominantly associated with River Itchen (fluvial) and groundwater flooding from winterbournes.	Provides mapping of future surface water flood risk.
Brighton and Hove City Council (June 2011)	Historic flood incidents are predominantly recorded outside of the National Park, with the closest occurring at Patcham.	Annex 2 (of Appendix B) details the areas of highest susceptibility to future flood risk.

Table A.3 Summary of Local Flood Risk Management Strategies (LFMRSs)

Local authority and date	Fluvial/tidal flood risk	Groundwater flood risk	Surface water flood risk and drainage
East Sussex County Council (September 2016)	Highest in floodplain locations in the south of the catchment (e.g. Lewes).	During extended wet periods, springs emerge along the base of the South Downs, causing localised flooding. This can be a particular problem around Alfriston where the Cuckmere River cuts through the South Downs.	Identifies four Drainage Risk Areas within the National Park study area. For each it provides specific guidance on drainage requirements for new development. Incomplete records of underground drainage systems in East Sussex. Without the knowledge of location, ownership or condition of these drainage systems, development proposals may cause flood risk issues should they seek to connect into, or build above these features. As plans and documents have been lost over time, there is a need to 'recreate the evidence base'. These systems are often complex, and expensive to survey, but without this information the understanding of urban flood mechanisms will remain incomplete.
West Sussex County Council (May 2013)	Main flood risk associated with the Arun, Ouse and Adur (within the National Park).	The lower slopes of the South Downs are most susceptible to groundwater flooding due to permeable chalk.	The management of the land drainage network is vital in reducing flood risk. In rural areas, due to the landscape and topography of the South Downs, downland run-off can also cause flooding.
Hampshire County Council (July 2013)	Fluvial flooding is predominantly focused outside the National Park boundary.	Groundwater is a significant cause of flooding in Hampshire.	Surface water flooding has occurred throughout the county and on occasion has combined with foul flooding as the drainage systems are overwhelmed by heavy rainfall.
Brighton and Hove City Council (February, 2015)	Only recorded incidents of coastal flooding located outside of the National Park boundary.	Historic groundwater flooding noted where the Downs meet the northern edge of Brighton. Records of groundwater flooding in the Patcham area date back to 1877.	Patcham is identified as s hotspot for surface water flooding.

Table A.4 Summary of Surface Water Management Plans (SWMPs)

Local authority and date	Historic flood events	Flood mechanisms	Drainage
Easebourne (January 2015)	October 2000 – properties flooded and North Mill Bridge closed. Significant soil erosion. December 2002 – flooding in Easebourne Street and Hollist Lane (heavy soil erosion). January/February 2004 – flooding on Easebourne Street. September 2006 – flooding on Wick Lane and Easebourne Street. October 2006 – Easebourne Lane flooded between Vanzell and Egmont Road. North Mill Bridge flooded. November/December 2012 – repeat flooding with silt deposition on Easebourne Lane/Easebourne Street and North Mill Bridge. December 2013 to February 2014 – pluvial flooding along Dodsley Lane, Easebourne Street, Easebourne Lane and North Mill Bridge.	Easebourne is subject to water flowing from springs (and groundwater seepage) and pluvial runoff arising upstream of the village. The flooding problem in Easebourne falls primarily into two areas: 1. The A286, Dodsley Lane, from opposite Budgenor Lodge to North Mill Bridge, and; 2. Easebourne Street from Wick Lane to the A272, Easebourne Lane, followed by Easebourne Lane to North Mill Bridge. During heavy rainfall water flows from the farmland upstream of Easebourne to lower parts of the catchment. During heavy rainfall the upper catchment becomes saturated (despite permeable soils) generating overland flow. This often results in high levels of erosion.	Known drainage capacity issues within the highway drainage network along Dodsley Lane, Easebourne Street.

Local authority and date	Historic flood events	Flood mechanisms	Drainage
Lewes SWMP (unpublished draft)	Appendix B documents flood events (from fluvial, surface water, sewer, groundwater and unclassified sources) for the period 1994 – 2016.	Lewes experiences flooding from surface water, groundwater and sewer systems flooding, with often complex mechanisms of flooding. The steep topography of the South Downs, which surround Lewes, encourages the overland flow of surface water, which is directed into the town through existing dry valleys, or coombes, towards the River Ouse. There is a particular surface water flow path in the west of Lewes, which originates on the Downs behind the Nevill Estate and flows to The Paddock. Ponding of surface water occurs on the flatter topography floodplain of the Ouse, affecting areas of Cliffe High Street, the North Street Quarter and Malling. The greatest areas of surface water flood risk in Lewes occur alongside the Winterbourne Stream, and in a long, continuous flow path from Landport Bottom to The Paddock. BGS mapping suggests that this latter flow path is a dry channel, formed by debris flows off the South Downs, which acts as a conduit for surface water.	Highway drainage issues (gulley blockage) is the most reported cause of flooding in Lewes. High groundwater levels can provide constraints on the use of SuDS within Lewes. As Lewes is located within a SPZ, sufficient treatment of surface water from developments via the SuDS management train is necessary before discharge. Dry valleys should be preserved within a development site, as building over them poses a flood risk to the proposed development and adjacent properties. Flooding hotspots include: • Grange Road • Lewes High Street • Nevill Estate • South Street • Southover Road • Castle Banks • Junction of Offham Road/ The Avenue • North Street • Bell Lane
Lidsey SWMP (West Sussex County Council, October 2014);	Historic flood records are concentrated outside of the National Park Area.	Surface water likely to be generated at Slindon due to the steep topography.	No issues reported within the National Park Area.

Table A.5 Summary of Groundwater Management Plans (GWMPs)

Local authority and date	Purpose	Historical information	Risk Assessment and measures
Hampshire County Council (October 2013)	The GWMP combines elements of the strategic, intermediate and detailed SWMPs, specific to groundwater flood risk management. It is a SWMP style document, but also combines more detailed action plans for settlements most at risk.	Hampshire has a known history of groundwater flooding. During winter 2000/2001, over 100 towns and villages across the county suffered significant flooding with over 400 properties flooded with significant disruption and damage to infrastructure. There have also been other less extensive and severe groundwater flooding events recorded in the county (e.g. in 1994/95 and 2002/2003). The worst affected areas appear to have been in the eastern part of the county in the Wallington and Lavant catchments.	Information from historical records of flooding, previous reports on flooding events, as well as documents such as PFRA, SWMP and LFDMS have been combined to develop a risk ranking for settlements. The ten most at risk villages are: Hambledon, Rowlands Castle, Kings Worthy, Finchdean and Deanlane End, Hursely, Bishops Sutton, Appleshaw, Bourne Rivulet villages, West Meon, and Preston Candover. A series of measures are proposed including: generic measures, development planning, local planning, infiltration drainage and soakaways, emergency planning, drainage infrastructure maintenance, flood resistance and resilience, dewatering, management of sewer flooding, road traffic management, and managing residual risk.

Table A.6 Summary of adjoining District Council Strategic Flood Risk Assessments (SFRAs)

Local authority	Fluvial flood risk	Tidal flood risk	Groundwater flood risk	Surface water flood risk	Sewer flood risk	Flood risk from artificial sources
Arun District Council Level 1 and Level 2 SFRA (updated version, November 2016	Fluvial flood risk primarily comes from the River Arun, which flows within the National Park. Numerous tributaries of the Arun, and other ordinary watercourses and drainage ditches flow through the National Park.	Located outside of the National Park.	Significant flooding has occurred across the Arun District.	The Arun District regularly experiences flooding from this source and due to drainage exceedance. Figure 5-6 shows surface water flooding records within the Arun District Boundary. A handful of these fall within the National Park.	315 records of sewer flood incidents are recorded within the DG5 register (as of 25/002/16). Based on postcode, eight of these recorded flood events occurred within the Arundel area (some of which is within the National Park boundary).	Flood risk from Swanbourne Lake, Bilsham Farm reservoir and Pagham Reservoir.

Local authority	Fluvial flood risk	Tidal flood risk	Groundwater flood risk	Surface water flood risk	Sewer flood risk	Flood risk from artificial sources
Mid Sussex District Council Level 1 SFRA (June 2015)	Rural areas in Hassocks (just north of the National Park boundary) is at a low to moderate risk of flooding. Mid Sussex District Council intends to store water and manage run-off in these locations in order to reduce flood risk.	Not within SFRA study area.	The majority of the district has a medium risk of groundwater flooding, however a small area within the National Park is at high risk.	Over the last century there have been several severe flood events within the River Adur catchment, caused by surface water run-off generated from the South Downs.	Records appear to be predominantly outside of the National Park.	Outside of the National Park.

Table A.7 Summary of Minerals and Waste Planning Authority Strategic Flood Risk Assessments (SFRAs)

Local authority and date	Fluvial/tidal flood risk	Groundwater flood risk	Surface water flood risk	Sewer flood risk	Flood risk from artificial sources
West Sussex SFRA (2010)	Provides mapped flood zones for the West Sussex Area, including assessment of residual risk (breach and failure hazard). Provides a risk-based sequential approach to the selection of the mineral and waste sites in support of the Minerals and Waste Development Framework.	Chalk bands across West Sussex pose a widespread flood risk across the county. However, there are few records of groundwater flooding within the county. Groundwater flooding in the Adur catchment noted in 1974, 1983/84, 2000/01 and 2002/02.	Assesses surface water flooding based on Environment Agency flood risk mapping data. Low-lying land at the coast is at highest risk of flooding on account of flat topography and impermeable (clay) geology.	Identified based on historic flood records and are mapped within the report.	No detailed assessment, however, the location of canals and reservoirs is mapped to inform site-specific assessment.

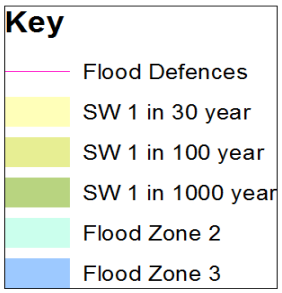
Local authority and date	Fluvial/tidal flood risk	Groundwater flood risk	Surface water flood risk	Sewer flood risk	Flood risk from artificial sources
West Sussex and SDNPA SFRA Update (2017)	Largest area of flood risk is associated with the River Adur, River Arun and their tributaries. These rivers are tidal in their lower reaches. Summarises flood risk to the Potential Mineral Sites.	Hydrogeology has a significant bearing on the suitability of sites for mineral working.	Incorporates updated Environment Agency surface water flood risk mapping data.	Update of historic flood records from 2010 SFRA.	Unchanged from 2010 SFRA.
East Sussex County Council, South Downs and Brighton and Hove Waste and Minerals Sites Plan (2017)	Sets out the location of minerals and waste sites, along with policy approaches and flood risk management measures for these sites. Sites within the National Park include SPWCA/O Greystone Quarry, Southerham, Lewes and SPWCA/X Lewes HWRC, both of which are Safeguarded Waste Sites and for which no specific flood risk information is provided.				
Hampshire (Portsmouth, Southampton, New Forest National Park and South Downs National Park) Minerals and Waste Plan (Adopted October 2013).	Sets out the location of minerals and waste sites, along with policy approaches and flood risk management measures for these sites. Policy 11: Flood risk and prevention states that mineral and waste development in areas of flood risk should: a) Not result in an increased flood risk elsewhere, and where possible, will reduce flood risk overall; b) Incorporate appropriate flood protection, resilience and resistance measures in keeping with the character and biodiversity of the area and specific site requirements; c) Incorporate drainage systems to account for events in excess of the 'normal' design standard; d) Not increase net surface water run-off; e) If appropriate, incorporate SuDs to manage surface water drainage, and set out management and maintenance arrangements over the full lifetime of the development. Of the sites listed in Appendix A Selbourne Brickworks is within the National Park area. Appendix B also identifies several Safeguarded sites at Petersfield. No further flood risk information is provided.				

Appendix B
Site-specific Flood Risk Information Sheets

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet - How to Use

General information			
Site ID		*General information about the site provided by SDNPA, plus a snapshot map of the site.*	
Site name			
Area (ha)			
Allocation type			
Proposed no. of units			
Settlement			
District			
Lead Local Flood Authority			
Plan			



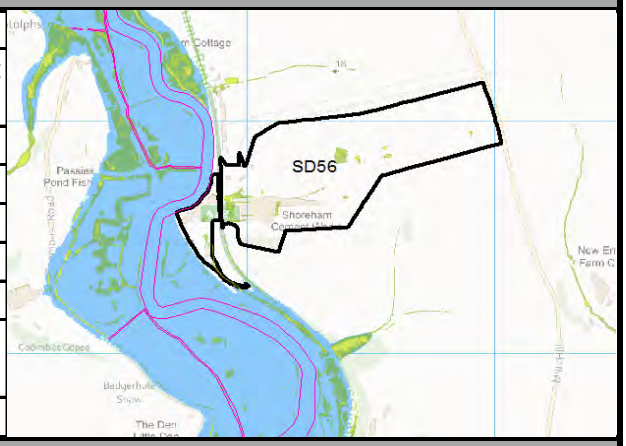
Flood risk assessment			
Fluvial/tidal *Based primarily on information provided by the EA.*			
Watercourse	*Principal source of fluvial/tidal flood risk to the site*	% site in Flood Zone 3a	*Based on EA model outputs. A distinction between Flood Zones 3a and 3b is only provided where there are modelling data to estimate the extent of Flood Zone 3b. Where these data are not available, a single value is provided for the percentage of the site in Flood Zone 3 overall.*
% site in Flood Zone 1	*Percentages of site in flood zones are estimated from the EA's*	% site in Flood Zone 3b	
% site in Flood Zone 2		% site in area benefitting from defences	*Based on Flood Map for Planning data.*
Flood defence type	*Flood defence type and standard based on EA NFCDD data.*	Flood defence standard of protection (AEP)	*Flood defence type and standard based on EA NFCDD data.*
Historical information	*Any information from EA historical flood maps or other sources relevant to the site.*		

Current max 1 in 100 AEP flood depth (m)	*Present data 1 in 100 AEP fluvial flood level, as derived from EA model data.*	Future max 1 in 100 AEP flood depth (m)	*Future 1 in 100 AEP fluvial flood level, incorporating a 20% increase in flow to account for climate change. Based on EA model data.*
Flood hazard in site	*Based on EA modelled data for 1 in 100 AEP fluvial event and*		
Flood hazard to access	*Based on EA model data for 1 in 100 fluvial event and application of*		
Residual risk from defence failure	*Where a flood defence offers a standard of protection equal to or in excess of the 1 in 100 AEP event, the danger to people arising from*		
Contextual commentary	*Additional contextual commentary around fluvial and tidal flood risk, covering relative importance of fluvial versus tidal flood sources, effect of flood defences, and impacts of climate change.*		
Surface Water *Surface water flood risk assessment primarily based on EA Risk of Flooding from Surface Water Map.*			
% site at high risk (1:30 AEP)	*Estimates of percentage of site area at surface water flood risk at different event frequencies based on EA mapping.*	% site at medium risk (1:100 AEP)	*Estimates of percentage of site area at surface water flood risk at different event frequencies based on EA mapping.*
% site at low risk (1:1000 AEP)		% site with no mapped risk	
Historical information	*Any additional information, for example, from LLFA SWMPs.*		
Flood hazard in site (1:100 AEP event)	*Flood hazard based on EA surface water flood map and application of FD2321 method.*		
Flood hazard to access (1:100 AEP event)	*Flood hazard based on EA surface water flood map and application of FD2321 method.*		
Contextual commentary	*Contextual commentary and interpretation.*		
Groundwater			
Source of risk	*Commentary on underlying geology.*		
Historical information	*Any historical information to suggest a tendency for groundwater*		
Extent and likelihood of risk to site	*Qualitative assessment of potential extent and likelihood of groundwater flooding to site.*		
Extent and likelihood of risk to access	*Qualitative assessment of potential extent and likelihood of groundwater flooding to site access.*		
Contextual commentary	*Additional contextual commentary on groundwater flood risk.*		
Other sources of flooding			
Contextual commentary	*Other potential sources of flooding, e.g. from reservoir failure, culvert blockage or sewer flooding are identified here.*		

Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type Sequential Test required? Exception Test required?	*Commentary is provided on the suitability of the proposed development at this site, in the context of the flood vulnerability classification of the proposed development and its compatibility with the identified flood zones, as provided in Tables 2 and 3 of the NPPF Planning Practice Guidance for Flood Risk and Coastal Change.*
Flood Risk Management *Flood risk management recommendations for proposed development at the site are provided here.*	
Policy recommendations for flood risk management	*These are flood risk management policy recommendations which could be incorporated into the site entry in the Local Plan or Neighbourhood Development Plan.*
Requirements for site-specific FRA	*These are requirements for a site-specific FRA, to accompany any planning application for development at the site. These requirements are intended to address any gaps in the understanding of baseline flood risk for the site, and to provide details on proposed flood mitigation measures for the site, including any impacts on third party receptors arising from development at the site.*
Sustainable Drainage Systems	
Indicative SuDS suitability	*Commentary on the potential suitability of the site for SuDS, considering underlying geology, flood risk, previous land use, and potential discharge routes.*
Policy recommendations for SuDS	*SuDS policy recommendations which could be incorporated into the site entry in the Local Plan or Neighbourhood Development Plan.*
Requirements for site-specific FRA	*These are requirements for a site-specific FRA, to accompany any planning application for development at the site. These requirements are intended to address any gaps in the understanding of SuDS suitability for the site, and demonstrate to the LLFA that a drainage strategy for the site can be developed that is appropriate for site characteristics, and will not increase (and preferably reduce) surface water runoff rates from the site.*

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information			
Site ID	SD56		
Site name	Shoreham Cement Works		
Area (ha)	44.36		
Allocation type	Mixed Use		
Proposed no. of units	No information		
Settlement	Shoreham		
District	Adur		
Lead Local Flood Authority	W. Sussex		
Plan	South Downs LP		

Flood risk assessment			
Fluvial/tidal			
Watercourse	River Adur	% site in Flood Zone 3a	<1
% site in Flood Zone 1	>99	% site in Flood Zone 3b	0
% site in Flood Zone 2	<1	% site in area benefitting from defences	0
Flood defence type	Earth embankment and concrete wall	Flood defence standard of protection (AEP)	1 in 30
Historical information	No information provided to indicate previous fluvial/tidal flooding.		
Current max 1 in 100 AEP flood depth (m)	0	Future max 1 in 100 AEP flood depth (m)	1.37
Flood hazard in site	Very Low		
Flood hazard to access	Very Low		
Residual risk from defence failure	Not applicable - standard of protection does not meet expected design standard for new development		
Contextual commentary	EA modelling indicates that the River Adur adjacent to the allocation is tidal, though the site is not demonstrated as being affected by tide locking with the 1 in 25 AEP fluvial and 1 in 20 AEP tidal, combined scenario. The majority of the site is sufficiently elevated as to be at no fluvial/tidal risk now or in the future. No flood risk is shown for the site for either fluvial or tidal scenarios with current defences. However, a small area that largely coincides with the access track heading north west from the A283 and the western most boundary, are identified as susceptible to flooding with climate change allowances. Maximum modelled water depth at the site for the 1 in 100 AEP + 20% CC fluvial event is 1.37m and 1.69m for the 1 in 200 AEP + 360 mm CC tidal event.		
Surface Water			
% site at high risk (1:30 AEP)	<1	% site at medium risk (1:100 AEP)	<1

% site at low risk (1:1000 AEP)	4	% site with no mapped risk	95
Historical information	No information		
Flood hazard in site (1:100 AEP event)	N/A		
Flood hazard to access (1:100 AEP event)	Danger for most		
Contextual commentary	Most of site is not mapped as being at risk of surface water flooding. However, the lowermost part of the site adjacent to the existing access, and the wider road network in the vicinity is at risk of surface water flooding. Climate change may increase this risk over the lifetime of the development.		
Groundwater			
Source of risk	Alluvial sediment overlying Chalk aquifer (White Chalk - Lewes Nodular Chalk Formation and Seaford Chalk Formation) in R Adur valley floor.		
Historical information	None		
Extent and likelihood of risk to site	Groundwater emergence most likely at the lowest, westernmost part of site, between the R Adur and the A283, where the site coincides with the edge of the floodplain.		
Extent and likelihood of risk to access	Access road (A283) runs along the edge of the valley floor, groundwater emergence possible along the break in slope, or from alluvial sediments.		
Contextual commentary	Groundwater emergence is most likely in the floodplain of the R Adur, where water table is always close to the ground surface, and could rise above ground level during wet periods. The presence of flood embankments and tidal locking of outfalls to the river could prevent the drainage of groundwater flooding from affected areas. However, as even the lowest parts of the site appear to be slightly raised above the floodplain, this risk is considered to be low. Aerial photography does not show any water features within the former quarry void, suggesting that the base of the void remains above the chalk water table.		
Other sources of flooding			
Contextual commentary	None identified		
Policy and recommendations			
Sequential and Exception Test Requirements			
Suitability for proposed development type	Housing is a More Vulnerable land use and most commercial development is a Less Vulnerable land use. These land uses are suitable for this site, subject to application of Sequential and Exception Tests, and development of appropriate mitigation measures for the flood risks identified.		
Sequential Test required?	Yes, to demonstrate no suitable sites at lower flood risk, if development within areas of Flood Zones 2 or 3a is proposed.		

Exception Test required?	Yes, if More Vulnerable housing development in areas of Flood Zone 3a within the site is proposed.
Flood Risk Management	
Policy recommendations for flood risk management	1) All housing development to be located in Flood Zone 1. 2) Commercial development may be appropriate for areas of Flood Zones 2 and 3a within the site, subject to the development of appropriate mitigation measures. 3) The development layout should preferably avoid other low-lying areas within the site in Flood Zone 1 which are potentially prone to surface water flooding, or should incorporate appropriate mitigation measures for this risk. If necessary, the least vulnerable (i.e. Commercial) parts of the development should be directed to these areas. 4) Finished floor levels of habitable areas to be in excess of 1:100 AEP plus climate change plus freeboard level. 5) Flood compensation storage to be provided for any ground raising or built development in fluvial Flood Zone 3 (including allowance for future climate change). 6) Safe means of emergency access and egress during flooding to be demonstrated for all developed areas of the site.
Requirements for site-specific FRA	1) Updated modelling of fluvial and tidal flood risk for the site, incorporating current climate change allowances (EA, 2017). 2) Assessment of the effects of any ground raising or build development in Flood Zone 3, including effects of climate change, and the development of appropriate proposals for compensation storage. 3) Further assessment of surface and groundwater flood risk, including the effects of climate change over the lifetime of the development.
Sustainable Drainage Systems	
Indicative SuDS suitability	Underlying chalk geology suggests good potential for infiltration SuDS for much of site, with possible exception of lower-lying areas between A283 and River Adur. Given the extensive areas of hard standing on the site at present, this represents a considerable opportunity for betterment in terms of runoff rates from the site. However, further site-specific investigation required of infiltration rates and groundwater levels below site, and potential for ground contamination arising from the previous use of site is required to confirm its suitability for infiltration SuDS. If required, attenuation SuDS should be sited away from areas of fluvial flood risk in lowest parts of site. Given the size of the site, it should be possible to integrate the SuDS into any amenity areas. Discharge from the site to the River Adur is likely to be possible, but discharge may be subject to tide-locking.

Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. Opportunities should be sought to integrate SuDS into amenity, landscaping and nature conservation areas for the proposed development. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Given the extensive areas of hardstanding that currently characterise the site, drainage strategies for development proposals should demonstrate a considerable reduction in overall runoff rates compared to the current baseline condition.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, assessment of any potential ground contamination and further assessment of groundwater levels below site. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site outside of areas at risk of fluvial flooding and identify most appropriate route for discharge from site, most likely to the River Adur. 3) Agree maximum discharge rates from site with the LLFA for attenuation SuDS. 4) Agree any requirements for ground remediation for contaminated areas, or water treatment for infiltration SuDS with the EA to protect groundwater quality in the underlying chalk aquifer.

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information

Site ID	SD58
Site name	Former Allotments
Area (ha)	0.42
Allocation type	Housing
Proposed no. of units	5 to 10
Settlement	Alfriston
District	Wealden
Lead Local Flood Authority	E. Sussex
Plan	South Downs LP

Flood risk assessment

Fluvial/tidal

Watercourse	Cuckmere River	% site in Flood Zone 3	10
% site in Flood Zone 1	85		
% site in Flood Zone 2	5	% site in area benefitting from defences	0
Flood defence type	Embankment	Flood defence standard of protection (AEP)	1 in 75
Historical information	Historical mapping shows flooding has affected the site (dates unknown).		
Current max 1 in 100 AEP flood depth (m)	No data	Future max 1 in 100 AEP flood depth (m)	No data
Flood hazard in site	No data		
Flood hazard to access	No data		
Residual risk from defence failure	Not applicable - standard of protection does not meet expected design standard for new development		
Contextual commentary	Fluvial flood risk with tide-locking component. No EA model data available. Most of site at low risk of fluvial flooding (FZ1), but proposed site access appears to be in lowest part of site in FZ2/3. Climate change could increase this risk over the lifetime of the development.		

Surface Water

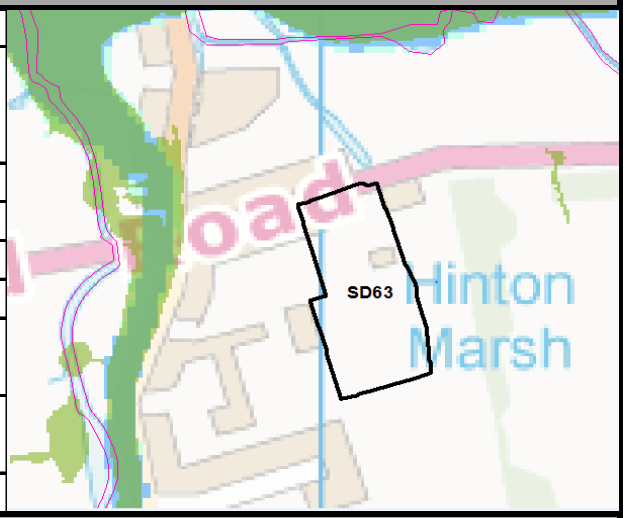
% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	0
% site at low risk (1:1000 AEP)	5	% site with no mapped risk	95
Historical information	The Level 1 SFRA and the East Sussex County Council SWMP both make reference to endemic surface water problems in Alfriston.		
Impact of climate change	Difference in extents between 1:100 and 1:1000 AEP events suggests there is potential for climate change to increase surface water flood risk to site.		

Flood hazard in site (1:100 AEP event)	N/A
Flood hazard to access (1:100 AEP event)	Danger for some
Contextual commentary	The majority of the site is not mapped as being at risk of surface water flooding. However, the lowermost part of the site, and the proposed site access is at risk of surface water flooding, as well as fluvial flooding. Climate change may increase this risk over the lifetime of the development.
Groundwater	
Source of risk	Chalk aquifer and overlying alluvial sediment in valley floor.
Historical information	EA South East Flood Risk Management Plan, Eastbourne SFRA and E. Sussex draft LFRMS all make reference to instances of localised groundwater flooding in Alfriston.
Extent and likelihood of risk to site	Groundwater emergence most likely in lowermost part of site, at edge of river floodplain
Extent and likelihood of risk to access	Access crosses river floodplain and may be prone to groundwater emergence.
Contextual commentary	Groundwater emergence is most likely in floodplain of Cuckmere River, where water table is always close to the ground surface, and could rise above ground level during wet periods. The presence of flood embankments and tidal locking of outfalls to the river could prevent the drainage of groundwater flooding from affected areas.
Other sources of flooding	
Contextual commentary	Residual risk of flooding in case of failure of embankment at Arlington Reservoir, in Cuckmere River valley upstream of Alfriston. EA Reservoir Flood Risk Map suggests reservoir flooding extent very similar to fluvial flood extent, and could affect lowermost part of site and access.
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, which is suitable at this site, subject to application of Sequential and Exception Tests, and development of appropriate flood mitigation measures.
Sequential Test required?	Yes, to demonstrate no suitable sites in Flood Zones 2 or 1.
Exception Test required?	Yes, because housing proposed in site partially located in Flood Zone 3, and which may also be affected by surface and groundwater flooding.

Flood Risk Management	
Policy recommendations for flood risk management	1) Housing to be located in Flood Zone 1 areas of site 2) Finished floor levels of habitable areas to be in excess of 1:100 AEP plus climate change plus freeboard level. 3) Flood compensation storage to be provided for any ground raising or built development in fluvial Flood Zone 3 (including allowance for future climate change). 4) Safe means of emergency access and egress to be secured to and from site during flooding.
Requirements for site-specific FRA	1) Design flood level for site to be defined using current climate change allowances (EA, 2017). 2) Assessment of the effects of any ground raising or build development in Flood Zone 3, including effects of climate change, and the development of appropriate proposals for compensation storage. 3) Hazard associated with flooding of access and egress from the site to be determined.
Sustainable Drainage Systems	
Indicative SuDS suitability	Relatively low-lying site with shallow groundwater and potential for groundwater flooding. Site within ESCC Drainage Risk Area 4. Unlikely to be suitable for infiltration SuDS. Attenuation SuDS probably the most suitable option, but attenuation storage will need to be sited away from areas of fluvial and surface water flood risk in lowest parts of site. Discharge from the site to a network of ditches in the Cuckmere River floodplain is likely to be possible, but discharge from these ditches to the river may be subject to tide-locking. These ditches are within the jurisdiction of the Pevensey and Cuckmere Water Level Management Board (PCWLMB), whose advice should be sought in relation to maximum surface water discharges from the site.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing. 2) If required, demonstrate sufficient attenuation storage can be accommodated within site outside of fluvial flood risk areas. 3) Agree maximum discharge rates from site to adjacent ordinary watercourses with the PCWLMB.

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information		
Site ID	SD63	
Site name	Land South of the A272 at Hinton Marsh	
Area (ha)	0.86	
Allocation type	Housing	
Proposed no. of units	12 to 15	
Settlement	Cheriton	
District	City of Winchester	
Lead Local Flood Authority	Hampshire	
Plan	South Downs LP	

Flood risk assessment			
Fluvial/tidal			
Watercourse	River Itchen	% site in Flood Zone 3a	0
% site in Flood Zone 1	100	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	N/A	Flood defence standard of protection (AEP)	N/A
Historical information	No information		
Current max 1 in 100 AEP flood depth (m)	N/A	Future max 1 in 100 AEP flood depth (m)	N/A
Flood hazard in site	N/A		
Flood hazard to access	N/A		
Residual risk from defence failure	N/A		
Contextual commentary	Situated approximately 100m from FZ3		
Surface Water			
% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	0
% site at low risk (1:1000 AEP)	0	% site with no mapped risk	100
Historical information	No information		
Flood hazard in site (1:100 AEP event)	N/A		
Flood hazard to access (1:100 AEP event)	N/A		
Contextual commentary	The site is not mapped to be at risk of surface water flooding. In the wider area, there is a risk of surface water flooding associated with the River Itchen and its unnamed tributary. Based on current surface water flood outlines, there appears to be limited potential for climate change to increase this risk.		

Groundwater	
Source of risk	Chalk aquifer and overlying alluvial sediment and head deposits.
Historical information	Records of a tube well (drilled 1898) on the site note that the drilling took place "where the first springs rise", and that "water overflowed for about a week".
Extent and likelihood of risk to site	Groundwater emergence possible across site, most likely where springs have previously occurred, the location of these is not known.
Extent and likelihood of risk to access	Access road runs alongside the headwaters of the R. Itchen, close to a series of springs. Groundwater emergence during wet periods may flood the access roads.
Contextual commentary	The site is situated partly in the valley floor of the R. Itchen and a unnamed watercourse, and within 200m of springs associated with the source of the R Itchen. Both these watercourses are mapped as winterbournes. Groundwater emergence is most likely along mapped spring and watercourse locations, but may also occur in the wider valley floor and valley edges. Historical borehole records indicate a spring was present on site around 1900. This may reactivate during wet periods.
Other sources of flooding	
Contextual commentary	None identified.

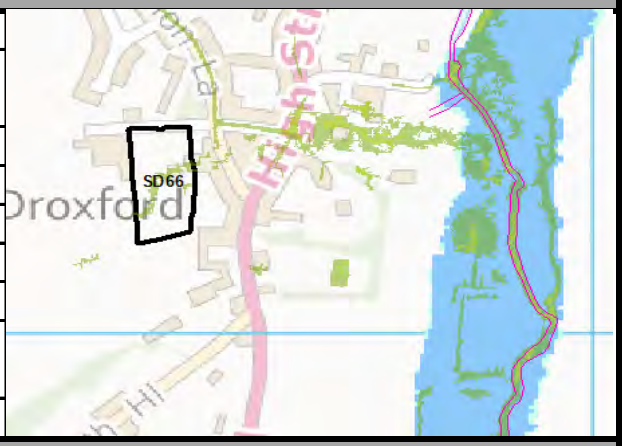
Policy and recommendations

Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, and is appropriate for this site, subject to the development of appropriate mitigation measures for the flood risks identified.
Sequential Test required?	No
Exception Test required?	No
Flood Risk Management	
Policy recommendations for flood risk management	1) Housing to be located outside low-lying areas potentially prone to groundwater emergence. 2) Access to site and internal site access roads to be designed to be compatible with potential groundwater flood risk.

Requirements for site-specific FRA	1) Further site-specific assessment groundwater flood risk including collation of baseline hydrogeological data (e.g. spring survey, groundwater level data), to establish a conceptual model of the site to better understand groundwater flooding mechanisms, considering potential climate change impacts over the lifetime of the development.
Sustainable Drainage Systems	
Indicative SuDS suitability	Relatively low-lying site with potential for groundwater flooding. Unlikely to be suitable for infiltration SuDS but testing should be carried out to rule this out. Attenuation SuDS probably the most suitable option, with discharge being made to the River Itchen or tributaries. Surface water discharge to the sewer network should only be considered if discharge to a surface watercourse is not possible.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, and further assessment of groundwater levels below site. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site. 3) Identify most appropriate route for discharge from site 4) Agree maximum discharge rates from site with the LLFA or Southern Water, as appropriate to discharge route (ordinary watercourse or sewer).

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information			
Site ID	SD66		
Site name	Land at Park Lane		
Area (ha)	1.04		
Allocation type	Housing		
Proposed no. of units	26 to 32		
Settlement	Droxford		
District	Winchester		
Lead Local Flood Authority	Hampshire		
Plan	South Downs LP		

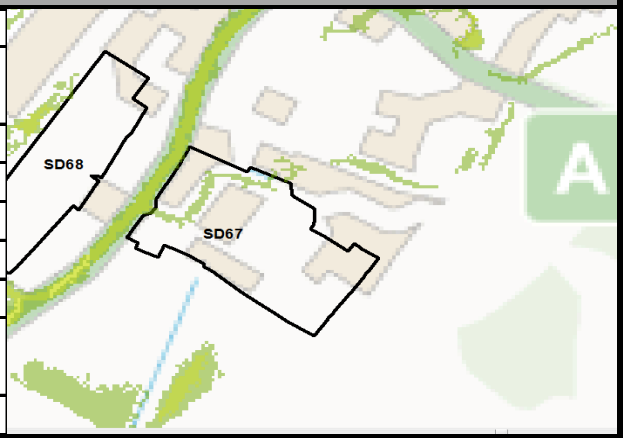
Flood risk assessment			
Fluvial/tidal			
Watercourse	River Meon	% site in Flood Zone 3a	0
% site in Flood Zone 1	100	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	N/A	Flood defence standard of protection (AEP)	N/A
Historical information	N/A		
Current max 1 in 100 AEP flood depth (m)	N/A	Future max 1 in 100 AEP flood depth (m)	N/A
Flood hazard in site	N/A		
Flood hazard to access	N/A		
Residual risk from defence failure	N/A		
Contextual commentary	The site is 300 m from FZ2. Climate change unlikely to increase the fluvial/tidal flood risk at this site.		
Surface Water			
% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	0
% site at low risk (1:1000 AEP)	10	% site with no mapped risk	90
Historical information	No historic records of flooding at the site.		
Flood hazard in site (1:100 AEP event)	N/A		
Flood hazard to access (1:100 AEP event)	N/A		
Contextual commentary	Most of site is not mapped as being at risk of surface water flooding. However, a surface water flow pathway is identified through the centre of the site, running from west to east towards Station Lane. The risk of flooding from this source is currently low (1:1000 AEP), but climate change may increase this risk over the lifetime of the development.		

Groundwater	
Source of risk	Chalk aquifer (White Chalk - Seaford Chalk Formation) with a linear band of superficial head deposits (clay, silt, sand and gravels).
Historical information	Hampshire LFRMS and Groundwater Management Plan identify Droxford to be at a high risk of groundwater flooding.
Extent and likelihood of risk to site	Groundwater emergence most likely in central lowermost part of site.
Extent and likelihood of risk to access	Access along local road network may potentially be compromised by groundwater flooding.
Contextual commentary	Groundwater emergence is most likely at the central low point of the site, along the base of the dry valley (coincides with the mapped surface water flow pathway), where the water table could rise above ground level during wet periods.
Other sources of flooding	
Contextual commentary	Residual risk of flooding in case of failure of underground reservoir, on Fir Down 900m west but upstream of the site. Flood risk from this source is not mapped on the EA Reservoir Flood Risk Map and therefore remains uncertain. Qualitatively can be considered to have a very low likelihood if occurrence.
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, and is appropriate for this site, subject to the development of appropriate mitigation measures for the flood risks identified.
Sequential Test required?	No
Exception Test required?	No
Flood Risk Management	
Policy recommendations for flood risk management	1) Housing to be located outside surface water flood extent and area of potential groundwater emergence. 2) Access to site and internal site access roads to be designed to be compatible with surface water and groundwater flood risk.
Requirements for site-specific FRA	1) Further site-specific assessment of surface and groundwater flood risk, considering potential climate change impacts over the lifetime of the development. 2) Further consideration of residual risk of flooding from reservoir failure.

Sustainable Drainage Systems	
Indicative SuDS suitability	Chalk geology suggests infiltration SuDS may be possible, but further detail required on potential for groundwater emergence in lowermost part of site needed to confirm this. If not suitable for infiltration SuDS, attenuation storage will need take into account surface water flow pathway across site, and potential for inflows from upslope areas. No surface water drainage network within immediate site vicinity and so discharge may have to be made to the existing surface water sewer network to the east. Agreement on maximum discharge rates required from either the LLFA or Southern Water, depending on discharge location.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, and further assessment of groundwater levels below site. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site, taking into account potential surface water and groundwater flood risk. 3) If required, identify most appropriate route for discharge from site 4) Agree maximum discharge rates from site with the LLFA or Southern Water, as appropriate to discharge route (ordinary watercourse or sewer).

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

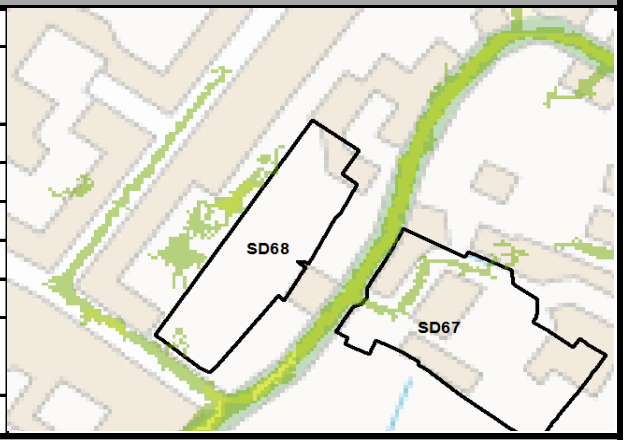
General information			
Site ID	SD67		
Site name	Cowdray Works Yard		
Area (ha)	0.94		
Allocation type	Mixed use		
Proposed no. of units	16 to 20		
Settlement	Easebourne		
District	Chichester		
Lead Local Flood Authority	W. Sussex		
Plan	South Downs LP		
Flood risk assessment			
Fluvial/tidal			
Watercourse	River Rother	% site in Flood Zone 3a	0
% site in Flood Zone 1	100	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	N/A	Flood defence standard of protection (AEP)	N/A
Historical information	N/A		
Current max 1 in 100 AEP flood depth (m)	N/A	Future max 1 in 100 AEP flood depth (m)	N/A
Flood hazard in site	N/A		
Flood hazard to access	N/A		
Residual risk from defence failure	N/A		
Contextual commentary	Over 200 m from FZ2. Climate change unlikely to increase the fluvial/tidal flood risk at this site.		
Surface Water			
% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	0
% site at low risk (1:1000 AEP)	5	% site with no mapped risk	95
Historical information	Flooding problems associated with highway drainage on Easebourne Lane, to the immediate west of the site noted in West Sussex County Council SWMP and historic flood records.		
Flood hazard in site (1:100 AEP event)	N/A		
Flood hazard to access (1:100 AEP event)	Danger for some		

Contextual commentary	Most of site is not mapped as being at risk of surface water flooding. However, a surface water flow pathway is identified through the western part of the site. The risk of flooding in this area is currently low (1:1000 AEP), but climate change may increase this risk over the lifetime of the development.
Groundwater	
Source of risk	Lower Greensand aquifer (Eastbourne Member), dry valley.
Historical information	The Easebourne SWMP identifies Easebourne Street and Easebourne Lane to have a flooding problem, relating to springs, groundwater seepage, and pluvial runoff. Groundwater issuing from seepages from the underlying aquifer is said to contribute significantly to the overall flow of water. Following the December 2013 flooding, there were reports of water flowing on Easebourne Street at the end of January 2014, indicating the significant contribution of groundwater flows within the catchment.
Extent and likelihood of risk to site	Western and central part of site closest to the axis of the dry valley.
Extent and likelihood of risk to access	Access along Easebourne Street and Easebourne Lane may be prone to groundwater emergence.
Contextual commentary	Groundwater emergence associated with the dry valley aligned with Easebourne Lane and Easebourne Street. The water table could rise above ground level during wet periods. Mapped watercourse immediately to the south of the site could extend into the site during wet periods.
Other sources of flooding	
Contextual commentary	None identified
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, whilst commercial development is a Less Vulnerable land use. Both uses are appropriate for this site, subject to the development of appropriate mitigation measures for the flood risks identified.
Sequential Test required?	No
Exception Test required?	No
Flood Risk Management	

Policy recommendations for flood risk management	1) Housing to be located outside surface water flood extent or low-lying areas potentially prone to groundwater emergence. 2) Access to site and internal site access roads to be designed to be compatible with potential surface water and groundwater flood risk. 3) The development layout should preferably avoid low-lying areas within the site which are potentially prone to surface water flooding, or should incorporate appropriate mitigation measures for this risk. If necessary, the least vulnerable (i.e. Commercial) parts of the development should be directed to these areas.
Requirements for site-specific FRA	1) Further site-specific assessment of surface and groundwater flood risk, considering potential climate change impacts over the lifetime of the development.
Sustainable Drainage Systems	
Indicative SuDS suitability	Known groundwater flood risk in the locality suggests the site is unlikely to be suitable for infiltration SuDS. Attenuation SuDS probably the most suitable option; attenuation storage should be sized in order to accommodate any surface water run-on to the site. Surface water discharge from the site to the drainage ditch to the south may be possible; connection to the sewer network should only be considered as a last resort.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, and further assessment of groundwater levels below site. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site, taking into account potential surface water and groundwater flood risk. 3) If required, identify most appropriate route for discharge from site 4) Agree maximum discharge rates from site with the LLFA or Southern Water, as appropriate to discharge route (ordinary watercourse or sewer).

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information			
Site ID	SD68		
Site name	Land at Egmont Road		
Area (ha)	0.68		
Allocation type	Housing		
Proposed no. of units	16 to 20		
Settlement	Easebourne		
District	Chichester		
Lead Local Flood Authority	W. Sussex		
Plan	South Downs LP		

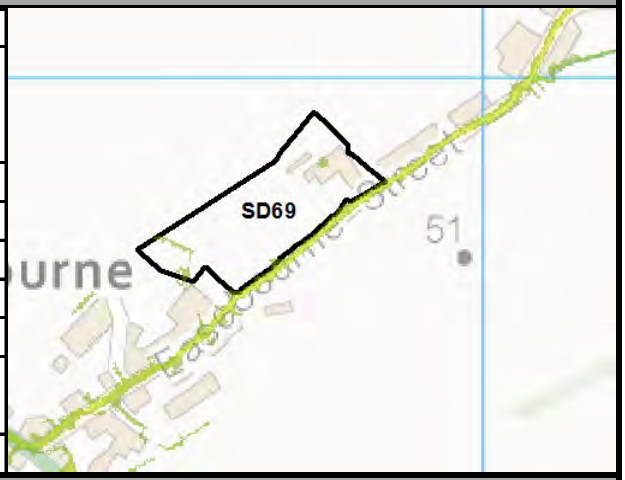
Flood risk assessment			
Fluvial/tidal			
Watercourse	River Rother	% site in Flood Zone 3a	0
% site in Flood Zone 1	100	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	N/A	Flood defence standard of protection (AEP)	N/A
Historical information	N/A		
Current max 1 in 100 AEP flood depth (m)	0	Future max 1 in 100 AEP flood depth (m)	0
Flood hazard in site	N/A		
Flood hazard to access	N/A		
Residual risk from defence failure	N/A		
Contextual commentary	Located approximately 100m from a tributary of the River Rother.		
Surface Water			
% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	0
% site at low risk (1:1000 AEP)	1	% site with no mapped risk	99
Historical information	Flooding problems associated with highway drainage on Easebourne Lane, to the immediate east of the site noted in West Sussex County Council SWMP and historic flood records.		
Flood hazard in site (1:100 AEP event)	N/A		
Flood hazard to access (1:100 AEP event)	Danger for some		

Contextual commentary	Most of site is not mapped as being at risk of surface water flooding. However, the lowermost part of the site, and the proposed site access is at risk of surface water flooding. Climate change may increase this risk over the lifetime of the development.
Groundwater	
Source of risk	Lower Greensand aquifer (Eastbourne Member), dry valley.
Historical information	The Easebourne SWMP identifies Easebourne Street and Easebourne Lane to have a flooding problem, relating to springs, groundwater seepage, and pluvial runoff. Groundwater issuing from seepages from the underlying aquifer is said to contribute significantly to the overall flow of water. Following the December 2013 flooding, there were reports of water flowing on Easebourne Street at the end of January 2014, indicating the significant contribution of groundwater flows within the catchment.
Extent and likelihood of risk to site	Groundwater flood risk is most significant along Easebourne Lane and Egmont Lane. Although less likely than along the lanes, groundwater emergence within the site cannot be ruled out.
Extent and likelihood of risk to access	Access along Easebourne Lane and Egmont Lane may be prone to groundwater emergence.
Contextual commentary	Groundwater emergence associated with the dry valley aligned with Easebourne Street and Easebourne Lane. The water table could rise above ground level during wet periods. The greatest risk is posed to the site access, but there is also a lower risk of groundwater emergence within the site itself.
Other sources of flooding	
Contextual commentary	None identified
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, and is appropriate for this site, subject to the development of appropriate mitigation measures for the flood risks identified.
Sequential Test required?	No
Exception Test required?	No
Flood Risk Management	
Policy recommendations for flood risk management	1) Housing to be located outside surface water flood extent or low-lying areas potentially prone to groundwater emergence. 2) Access to site and internal site access roads to be designed to be compatible with potential surface water and groundwater flood risk.
Requirements for site-specific FRA	1) Further site-specific assessment of surface and groundwater flood risk, considering potential climate change impacts over the lifetime of the development.

Sustainable Drainage Systems	
Indicative SuDS suitability	Known groundwater flood risk in the locality suggests the site is unlikely to be suitable for infiltration SuDS. Attenuation SuDS probably the most suitable option; attenuation storage should be sized in order to accommodate any surface water run-on to the site. Location of site in an existing built-up area suggests surface water discharge to sewer may be the only alternative, if site is unsuitable for infiltration SuDS. However, discharge to nearby ordinary watercourses should still be investigated.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, and further assessment of groundwater levels below site. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site, taking into account potential surface water and groundwater flood risk. 3) If required, identify most appropriate route for discharge from site 4) Agree maximum discharge rates from site with the LLFA or Southern Water, as appropriate to discharge route (ordinary watercourse or sewer).

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information		
Site ID	SD69	
Site name	Former Easebourne School	
Area (ha)	2.14	
Allocation type	Housing	
Proposed no. of units	16 to 20	
Settlement	Easebourne	
District	Chichester	
Lead Local Flood Authority	W. Sussex	
Plan	South Downs LP	

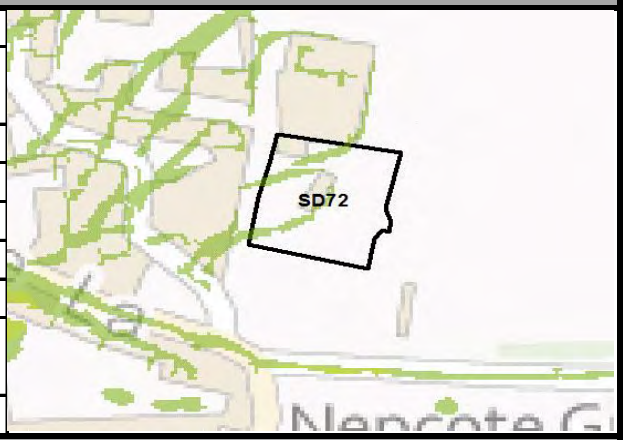
Flood risk assessment			
Fluvial/tidal			
Watercourse	River Rother	% site in Flood Zone 3a	0
% site in Flood Zone 1	100	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	N/A	Flood defence standard of protection (AEP)	N/A
Historical information	N/A		
Current max 1 in 100 AEP flood depth (m)	0	Future max 1 in 100 AEP flood depth (m)	0
Flood hazard in site	N/A		
Flood hazard to access	N/A		
Residual risk from defence failure	N/A		
Contextual commentary	N/A		
Surface Water			
% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	0
% site at low risk (1:1000 AEP)	2	% site with no mapped risk	98
Historical information	Flooding problems associated with highway drainage on Easebourne Street, to the immediate south and east of the site noted in West Sussex County Council SWMP and historic flood records.		
Flood hazard in site (1:100 AEP event)	Danger for some		
Flood hazard to access (1:100 AEP event)	Danger for some		

Contextual commentary	Most of site is not mapped as being at risk of surface water flooding. However, several discrete points, and the proposed site access is at risk of surface water flooding (1:100 and 1:1000 year events). Climate change may increase this risk over the lifetime of the development.
Groundwater	
Source of risk	Lower Greensand aquifer (Eastbourne Member), dry valley.
Historical information	The Easebourne SWMP identifies Easebourne Street and Easebourne Lane to have a flooding problem, relating to springs, groundwater seepage, and pluvial runoff. Groundwater issuing from seepages from the underlying aquifer is said to contribute significantly to the overall flow of water. Following the December 2013 flooding, there were reports of water flowing on Easebourne Street at the end of January 2014, indicating the significant contribution of groundwater flows within the catchment.
Extent and likelihood of risk to site	Groundwater flood risk is most significant along Easebourne Street, which borders the south eastern boundary of the site. Although less likely than along the road, groundwater emergence within the site cannot be ruled out.
Extent and likelihood of risk to access	Access along Easebourne Street may be prone to groundwater emergence. This street is sunken below the land to either site, so will act as a focal point for groundwater emergence.
Contextual commentary	Groundwater emergence associated with the dry valley aligned with Easebourne Street and Easebourne Lane. The water table could rise above ground level during wet periods. The greatest risk is posed to the site access, but there is also a lower risk of groundwater emergence within the site itself.
Other sources of flooding	
Contextual commentary	Culverted watercourse passes very close to the site (approximately 200m upstream), and based on assessment of OS and aerial mapping, appears to flow south-west under Easebourne Street. Residual risk of flooding along Easebourne Street in the event of blockage, with potential to prohibit site access.
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, and is appropriate for this site, subject to the development of appropriate mitigation measures for the flood risks identified.
Sequential Test required?	No
Exception Test required?	No
Flood Risk Management	

Policy recommendations for flood risk management	1) Housing to be located outside surface water flood extent and/or low-lying areas potentially prone to groundwater emergence. 2) Access to site and internal site access roads to be designed to be compatible with potential surface water and groundwater flood risk.
Requirements for site-specific FRA	1) Further site-specific assessment of surface and groundwater flood risk, considering potential climate change impacts over the lifetime of the development.
Sustainable Drainage Systems	
Indicative SuDS suitability	Known groundwater flood risk in the locality suggests the site is unlikely to be suitable for infiltration SuDS. Attenuation SuDS probably the most suitable option. Absence of watercourses in downstream vicinity and location of site in an existing built-up area suggests surface water discharge to sewer may be the only alternative, if site is unsuitable for infiltration SuDS. However, discharge to nearby ordinary watercourses should still be investigated.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, and further assessment of groundwater levels below site. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site, taking into account potential surface water and groundwater flood risk. 3) If required, identify most appropriate route for discharge from site 4) Agree maximum discharge rates from site with the LLFA or Southern Water, as appropriate to discharge route (ordinary watercourse or sewer).

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information			
Site ID	SD72		
Site name	Soldiers Field House		
Area (ha)	0.6		
Allocation type	Housing		
Proposed no. of units	10 to 12		
Settlement	Findon		
District	Arun		
Lead Local Flood Authority	W. Sussex		
Plan	South Downs LP		
Flood risk assessment			
Fluvial/tidal			
Watercourse	N/A	% site in Flood Zone 3a	0
% site in Flood Zone 1	100	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	N/A	Flood defence standard of protection (AEP)	N/A
Historical information	N/A		
Current max 1 in 100 AEP flood depth (m)	N/A	Future max 1 in 100 AEP flood depth (m)	N/A
Flood hazard in site	N/A		
Flood hazard to access	N/A		
Residual risk from defence failure	N/A		
Contextual commentary	Over 100 m from FZ2. Climate change will not increase the fluvial/tidal flood risk at this site.		
Surface Water			
% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	0
% site at low risk (1:1000 AEP)	11	% site with no mapped risk	89
Historical information	No information		
Flood hazard in site (1:100 AEP event)	N/A		
Flood hazard to access (1:100 AEP event)	N/A		
Contextual commentary	Surface water flood mapping identifies two potential surface water flow pathways across the site. The risk of flooding from this source is currently low (1:1000 AEP), but climate change may increase this risk over the lifetime of the development.		
Groundwater			
Source of risk	Chalk aquifer (White Chalk - Seaford Chalk Formation), dry valley.		

Historical information	None
Extent and likelihood of risk to site	Groundwater emergence most likely along mapped surface water flow pathways.
Extent and likelihood of risk to access	Some local roads are aligned along the axis of the dry valley, and may be prone to groundwater emergence.
Contextual commentary	The site is situated on the valley side of a dry valley feature. Groundwater emergence from the Chalk aquifer is most likely along the mapped surface water flow pathways along slight topographical hollows within the site.
Other sources of flooding	
Contextual commentary	None identified
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, and is appropriate for this site, subject to the development of appropriate mitigation measures for the flood risks identified.
Sequential Test required?	No
Exception Test required?	No
Flood Risk Management	
Policy recommendations for flood risk management	1) Housing to be located outside surface water flood extent and/or low-lying areas potentially prone to groundwater emergence. 2) Access to site and internal site access roads to be designed to be compatible with potential surface water and groundwater flood risk.
Requirements for site-specific FRA	1) Further site-specific assessment of surface and groundwater flood risk, considering potential climate change impacts over the lifetime of
Sustainable Drainage Systems	
Indicative SuDS suitability	Underlying Chalk geology suggests infiltration SuDS should be suitable for most of site, but the potential for groundwater emergence in the lowermost areas should be investigated further to confirm this. If an element of attenuation SuDS is required, storage volumes should be sized in order to account for any surface water run-on to the site. A lack of surface watercourses in the vicinity suggests that discharge from the site, if required, would need to be via the sewer network.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.

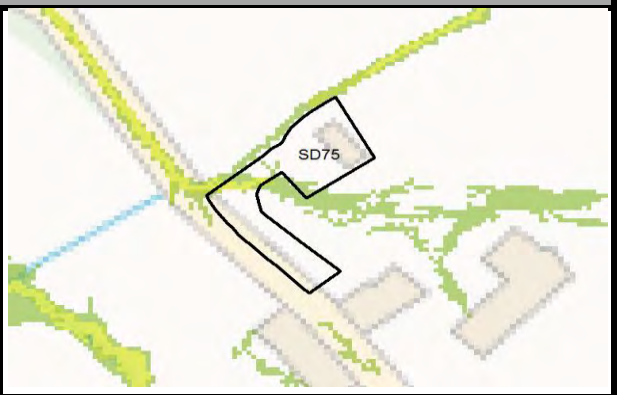
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, and further assessment of groundwater levels below site. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site, taking into account potential surface water and groundwater flood risk. 3) If required, identify most appropriate route for discharge from site 4) Agree maximum discharge rates from site with the LLFA or Southern Water, as appropriate to discharge route (ordinary watercourse or sewer).

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information

Site ID	SD75
Site name	Half Acre
Area (ha)	0.24
Allocation type	Traveller site
Proposed no. of units	3
Settlement	Hawkley
District	East Hampshire
Lead Local Flood Authority	Hampshire
Plan	South Downs LP



Flood risk assessment

Fluvial/tidal

Watercourse	N/A	% site in Flood Zone 3a	0
% site in Flood Zone 1	100	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	N/A	Flood defence standard of protection (AEP)	N/A
Historical information	N/A		
Current max 1 in 100 AEP flood depth (m)	0	Future max 1 in 100 AEP flood depth (m)	0
Flood hazard in site	N/A		
Flood hazard to access	N/A		
Residual risk from defence failure	N/A		
Contextual commentary	Site is over 500m from nearest mapped flood zones. There are minor, ordinary watercourses in the vicinity, which do not have mapped flood zones associated with them because their catchment area is less than the minimum 3km2 threshold for flood zone mapping. The flood risk associated with these minor watercourses is discussed below under surface water flood risk.		

Surface Water

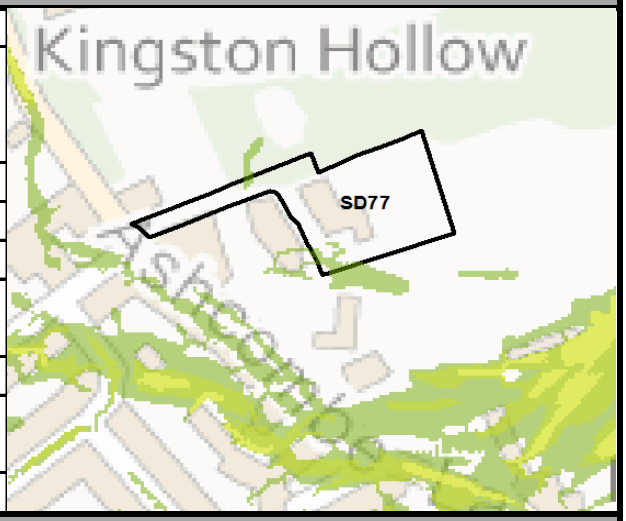
% site at high risk (1:30 AEP)	2	% site at medium risk (1:100 AEP)	1
% site at low risk (1:1000 AEP)	6	% site with no mapped risk	91
Historical information	No information		
Flood hazard in site (1:100 AEP event)	Caution		
Flood hazard to access (1:100 AEP event)	Danger for Most		

Contextual commentary	Surface water flood mapping indicates a concentrated flow pathway towards the site along Hawkley Road from the northwest. This appears to bifurcate at the north western corner of the site, with one pathway following the northern boundary of the site, and another cutting across its centre. Climate change could increase this flood risk over the lifetime of the development.
Groundwater	
Source of risk	Site on Gault Formation (non-aquifer). Groundwater flooding considered to be unlikely.
Historical information	N/A
Extent and likelihood of risk to site	N/A
Extent and likelihood of risk to access	N/A
Contextual commentary	N/A
Other sources of flooding	
Contextual commentary	None identified
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Caravans, mobile homes and park homes for permanent residential use is a Highly Vulnerable land use, which is appropriate for this site, subject to the development of suitable flood mitigation measures to address the potential flood risk identified.
Sequential Test required?	No
Exception Test required?	No
Flood Risk Management	
Policy recommendations for flood risk management	1) Residential areas to be located outside surface water flood extent and/or low-lying areas potentially prone to groundwater emergence. 2) Access to site and internal site access roads to be designed to be compatible with potential surface water and groundwater flood risk. 3) Investigate measures to divert the identified surface water flow pathway around, rather than through, the site
Requirements for site-specific FRA	1) Further site-specific assessment of surface water flood risk, considering potential climate change impacts over the lifetime of the development. 2) A specific investigation into the feasibility of diverting surface water flow pathways around the site.

Sustainable Drainage Systems	
Indicative SuDS suitability	Site unlikely to be suitable for infiltration SuDS based on underlying impermeable geology. Attenuation SuDS would probably constitute the most suitable option for this site. Discharge to one of the ordinary watercourses in the vicinity of the site should be possible. Runoff rates from the developed site should be agreed with the LLFA, and should not exceed current rates.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site and identify most appropriate route for discharge from site, most likely a nearby ordinary watercourse. 3) Agree maximum discharge rates from site with the LLFA.

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information		
Site ID	SD77	
Site name	Land at Castelmer Fruit Farm	
Area (ha)	0.72	
Allocation type	Housing	
Proposed no. of units	10 to 12	
Settlement	Kingston Near Lewes	
District	Lewes	
Lead Local Flood Authority	E. Sussex	
Plan	South Downs LP	

Flood risk assessment			
Fluvial/tidal			
Watercourse	N/A	% site in Flood Zone 3a	0
% site in Flood Zone 1	100	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	N/A	Flood defence standard of protection (AEP)	N/A
Historical information	N/A		
Current max 1 in 100 AEP flood depth (m)	N/A	Future max 1 in 100 AEP flood depth (m)	N/A
Flood hazard in site	N/A		
Flood hazard to access	N/A		
Residual risk from defence failure	N/A		
Contextual commentary	Over 100 m from FZ2. Climate change will not increase the fluvial/tidal flood risk at this site.		
Surface Water			
% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	0
% site at low risk (1:1000 AEP)	3	% site with no mapped risk	97
Historical information	No information		
Flood hazard in site (1:100 AEP event)	N/A		
Flood hazard to access (1:100 AEP event)	Caution		
Contextual commentary	Most of site is not mapped as being at risk of surface water flooding. A very small proportion of the site is at risk of flooding from the 1:1000 AEP event, and the access route is at risk from the 1:100 AEP event. Climate change may increase this risk over the lifetime of the development.		

Groundwater	
Source of risk	Chalk aquifer (Grey Chalk - Zig Zag Chalk Formation), dry valley.
Historical information	None
Extent and likelihood of risk to site	Groundwater emergence most likely along mapped surface water flow pathways
Extent and likelihood of risk to access	Some local roads cross the head of the dry valley, groundwater emergence possible.
Contextual commentary	The site is situated on the valley side of a dry valley feature. Groundwater emergence from the Chalk aquifer is most likely along the mapped surface water flow pathways along slight topographical hollows around the edge of the site.
Other sources of flooding	
Contextual commentary	None identified

Policy and recommendations

Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, and is appropriate for this site, subject to the development of appropriate mitigation measures for the flood risks identified.
Sequential Test required?	No
Exception Test required?	No
Flood Risk Management	
Policy recommendations for flood risk management	1) Housing to be located outside surface water flood extent and/or low-lying areas potentially prone to groundwater emergence. 2) Access to site and internal site access roads to be designed to be compatible with potential surface water and groundwater flood risk.
Requirements for site-specific FRA	1) Further site-specific assessment of surface and groundwater flood risk, considering potential climate change impacts over the lifetime of the development.
Sustainable Drainage Systems	
Indicative SuDS suitability	Underlying Chalk geology suggests infiltration SuDS should be suitable for most of site, but the potential for groundwater emergence in the lowermost areas should be investigated further to confirm this. If an element of attenuation SuDS is required, storage volumes should be sized in order to account for any surface water run-on to the site. A lack of surface watercourses in the vicinity suggests that discharge from the site, if required, would need to be via the sewer network.

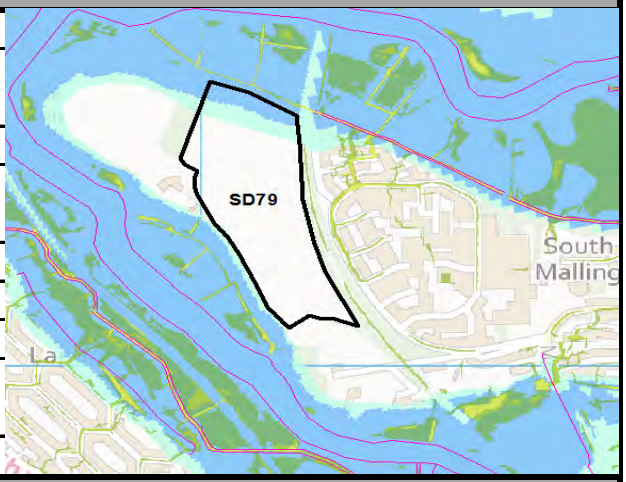
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, and further assessment of groundwater levels below site. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site. 3) If required, identify most appropriate route for discharge from site 4) Agree maximum discharge rates from site with the LLFA or Southern Water, as appropriate to discharge route (ordinary watercourse or sewer).

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information

Site ID	SD79
Site name	Land at Old Malling Farm
Area (ha)	9.97
Allocation type	Strategic Allocation
Proposed no. of units	220 to 240
Settlement	Lewes
District	Lewes
Lead Local Flood Authority	E. Sussex
Plan	South Downs LP



Flood risk assessment

Fluvial/tidal

Watercourse	River Ouse	% site in Flood Zone 3a	2
% site in Flood Zone 1	85	% site in Flood Zone 3b	5
% site in Flood Zone 2	8	% site in area benefitting from defences	0
Flood defence type	Embankment	Flood defence standard of protection (AEP)	1 in 50
Historical information	The northern part of the site has historically flooded (dates unknown). The extent of historical flooding corresponds to the Flood Zone 2 extent.		
Current max 1 in 100 AEP flood depth (m)	2.03	Future max 1 in 100 AEP flood depth (m)	2.4
Flood hazard in site	Danger for All		
Flood hazard to access	Very Low		
Residual risk from defence failure	Not applicable - standard of protection does not meet expected design standard for new development		
Contextual commentary	Fluvial flood risk with tide-locking component. EA model data available. Most of site at low risk of fluvial flooding (Flood Zone 1), but the area closest to the northern boundary is below 5mAOD and is prone to both fluvial and tidal flooding. The site is at a dis-benefit due to flood defence in Lewes, with defended model scenario results yielding greater flood depths than the undefended scenario. Flood hazard for most of the site, including potential access routes, is Very Low, but the area adjacent to the northern boundary has a hazard of Danger For All. Climate change is likely to increase the depth of flooding in Ouse floodplain in the northern part of the site, but not to significantly increase flood extents, because the edge of the floodplain is topographically well-defined.		

Surface Water			
% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	0
% site at low risk (1:1000 AEP)	0	% site with no mapped risk	100
Historical information	No information		
Flood hazard in site (1:100 AEP event)	N/A		
Flood hazard to access (1:100 AEP event)	Caution		
Contextual commentary	Site not identified to be at surface water flood risk, but site access at risk from 1:100 AEP surface water event. Climate change may result in future flood risk over the lifetime of the development.		
Groundwater			
Source of risk	Chalk aquifer (White Chalk (Holywell Nodular Chalk Formation) and Grey Chalk (Zig Zag Chalk Formation)) and river terrace sediment in valley floor.		
Historical information	None		
Extent and likelihood of risk to site	Groundwater emergence most likely in northernmost part of site, within the floodplain of the R Ouse. May also occur in the centre and around the edge of the site associated with springs along the boundary between the Grey and White Chalk.		
Extent and likelihood of risk to access	Access is currently eastwards along higher ground, where groundwater emergence is less likely.		
Contextual commentary	Groundwater emergence is most likely in the north of the site within the floodplain of R Ouse, where the water table is always close to the ground surface, and could rise above ground level during wet periods. The presence of flood embankments and tide-locking of outfalls to the river could prevent the drainage of groundwater flooding from affected areas. The boundary between the lower permeability Grey Chalk and higher permeability White Chalk is present on site, and at times of higher groundwater levels springs may emerge along this boundary.		
Other sources of flooding			
Contextual commentary	Discharge from ordinary watercourse network in River Ouse floodplain area to immediate north of site likely to be prone to tide-locking. EA Reservoir Flood Risk Map suggests reservoir flooding extent very similar to fluvial flood extent, and could affect lowermost part of site adjacent to the river.		

Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, which is suitable for most parts of this site (i.e. those areas of Flood Zones 1, 2 and 3a), subject to application of Sequential and Exception Tests, and development of appropriate mitigation measures for the flood risks identified. Housing is not permitted in Flood Zone 3b.
Sequential Test required?	Yes, to demonstrate no suitable sites at lower flood risk, if development within areas of Flood Zones 2 or 3a is proposed.
Exception Test required?	Yes, if development in areas of Flood Zone 3a within the site are proposed.
Flood Risk Management	
Policy recommendations for flood risk management	1) Housing to be located in Flood Zone 1 areas of site. 2) No development other than Essential Infrastructure or Water Compatible development in FZ3b 3) Finished floor levels of habitable areas to be in excess of 1:100 AEP plus climate change plus freeboard level. 4) Flood compensation storage to be provided for any ground raising or built development in fluvial Flood Zone 3 (including allowance for future climate change). 5) Safe means of emergency access and egress to be secured to and from site during flooding.
Requirements for site-specific FRA	1) Design flood level for site to be defined using current climate change allowances (EA, 2017). 2) Assessment of the effects of any ground raising or build development in Flood Zone 3, including effects of climate change, and the development of appropriate proposals for compensation storage. 3) The potential for groundwater emergence at the White/Grey Chalk interface within the site should be investigated.
Sustainable Drainage Systems	

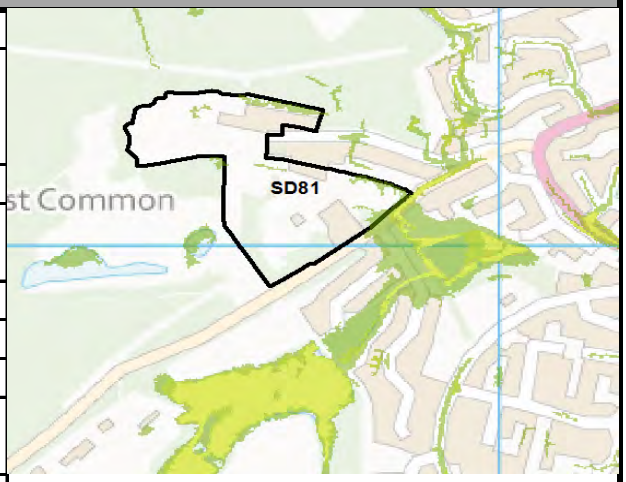
Indicative SuDS suitability	Relatively low-lying site, partially in floodplain with potentially shallow groundwater. Site within ESCC Drainage Risk Area 1. High groundwater tables are known to inhibit use of SuDS in Lewes due to potential for groundwater ingress. Subsidence is also a known issue within the wider area. Lewes is also designated as a source protection zone and therefore surface water infiltration measures will need to incorporate an appropriate level of water treatment. Floodplain environment likely to prohibit use of infiltration SuDS for at least the lower-lying parts of the site. Attenuation SuDS may be suitable but storage ponds will need to be sited away from areas of fluvial flood risk. Discharge from the site to the network of ditches in the River Ouse floodplain should be possible, however, discharge from these ditches to the river may be subject to tide-locking.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, ground stability assessment and further assessment of groundwater levels below site. 2) If infiltration SuDS are proposed, appropriate measures should be incorporated into their design to protect the underlying Source Protection Zone, which would be subject to agreement with the EA. 3) If required, demonstrate sufficient attenuation storage can be accommodated within the site, including taking into account the potential tide-locking of discharge outfalls and identify most appropriate route for discharge from site 4) Agree maximum discharge rates from site with the LLFA for discharge to ordinary watercourses in vicinity of the site.

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information

Site ID	SD81
Site name	Depot and Former Brickworks Site
Area (ha)	4.07
Allocation type	Mixed use allocation
Proposed no. of units	65to 90
Settlement	Midhurst
District	Chichester
Lead Local Flood Authority	W. Sussex
Plan	South Downs LP



Flood risk assessment

Fluvial/tidal

Watercourse	N/A	% site in Flood Zone 3a	0
% site in Flood Zone 1	100	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	N/A	Flood defence standard of protection (AEP)	N/A
Historical information	N/A		
Current max 1 in 100 AEP flood depth (m)	N/A	Future max 1 in 100 AEP flood depth (m)	N/A
Flood hazard in site	N/A		
Flood hazard to access	N/A		
Residual risk from defence failure	N/A		
Contextual commentary	Over 100 m from FZ2. Climate change will not increase the fluvial/tidal flood risk at this site.		

Surface Water

% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	0
% site at low risk (1:1000 AEP)	5	% site with no mapped risk	95
Historical information	Flooding problems associated with highway drainage on New Road, to the south the site noted in West Sussex County Council historic flood records.		
Flood hazard in site (1:100 AEP event)	N/A		
Flood hazard to access (1:100 AEP event)	N/A		

Contextual commentary	Most of site is not mapped as being at risk of surface water flooding. However, several discrete low points within the site are at risk of surface water flooding, although the current likelihood of occurrence is low (0.1% AEP event only). Climate change may increase this risk over the lifetime of the development.
Groundwater	
Source of risk	On Lower Greensand aquifer, but topographic context suggests groundwater flooding unlikely.
Historical information	None
Extent and likelihood of risk to site	N/A
Extent and likelihood of risk to access	N/A
Contextual commentary	N/A
Other sources of flooding	
Contextual commentary	None identified
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, and is appropriate for this site, subject to the development of appropriate mitigation measures for the flood risks identified.
Sequential Test required?	No
Exception Test required?	No
Flood Risk Management	
Policy recommendations for flood risk management	1) Housing to be located outside localised areas of potential surface water flood risk 2) Access to site and internal site access roads to be designed to be compatible with potential surface water flood risk.
Requirements for site-specific FRA	1) Further site-specific assessment of surface water flood risk, considering potential climate change impacts over the lifetime of the development.
Sustainable Drainage Systems	
Indicative SuDS suitability	Site may be suitable for infiltration SuDS, although any potential ground contamination associated with the former industrial use of the site should be investigated. Should attenuation SuDS prove more suitable, discharge to nearby ordinary watercourses may be possible. Surface water discharge to the sewer should only be considered as a last resort.

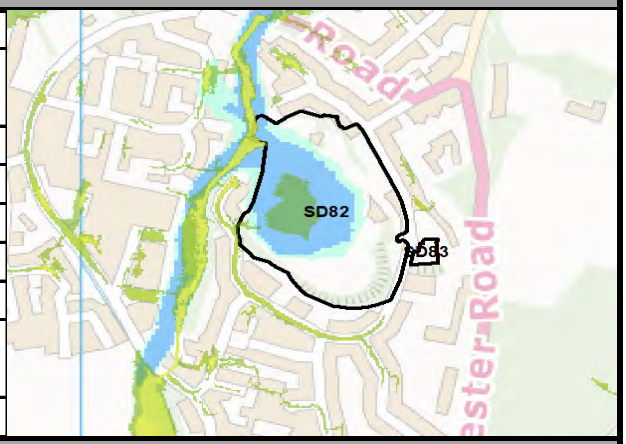
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, assessment of any potential ground contamination and further assessment of groundwater levels below site. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site and identify most appropriate route for discharge from site 3) Agree maximum discharge rates from site with the LLFA or Southern Water, as appropriate to discharge route (ordinary watercourse or sewer).

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information

Site ID	SD82
Site name	Holmbush Caravan Park
Area (ha)	4.96
Allocation type	Housing
Proposed no. of units	50 to 70
Settlement	Midhurst
District	Chichester
Lead Local Flood Authority	W. Sussex
Plan	South Downs LP



Flood risk assessment

Fluvial/tidal

Watercourse	Unnamed watercourse	% site in Flood Zone 3	38
% site in Flood Zone 1	53		
% site in Flood Zone 2	9	% site in area benefitting from defences	0
Flood defence type	N/A	Flood defence standard of protection (AEP)	N/A
Historical information	No information		
Current max 1 in 100 AEP flood depth (m)	No data	Future max 1 in 100 AEP flood depth (m)	No data
Flood hazard in site	No data		
Flood hazard to access	No data		
Residual risk from defence failure	N/A		
Contextual commentary	Fluvial flood risk identified for the site, however, no EA model data are available to provide further information. Over half of the site at low risk of fluvial flooding (FZ1). There is a fluvial risk coinciding with an on site pond connecting to the adjacent tributary of the River Rother. Climate change could increase this risk over the lifetime of the development. However, based on the difference in extent from FZ2 to FZ3 this likely to be limited to the land adjacent to the pond.		

Surface Water

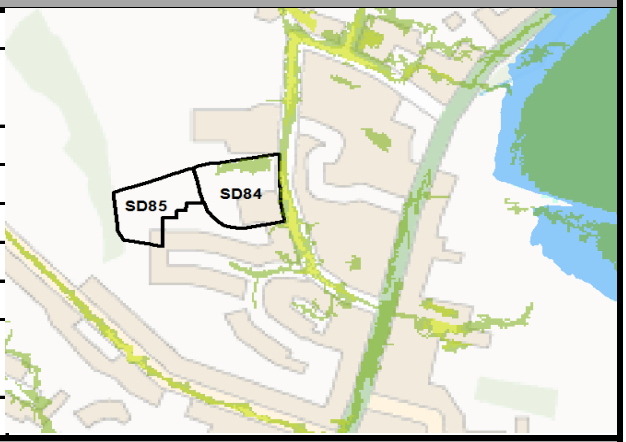
% site at high risk (1:30 AEP)	<1	% site at medium risk (1:100 AEP)	<1
% site at low risk (1:1000 AEP)	10	% site with no mapped risk	>89
Historical information	No information		
Flood hazard in site (1:100 AEP event)	Danger for Most		
Flood hazard to access (1:100 AEP event)	Very Low		

Contextual commentary	Most of site is not mapped as being at risk of surface water flooding. However, small areas the lowermost part of the site, adjacent to the western boundary, are at risk of surface water flooding, as well as fluvial flooding. Climate change may increase this risk over the lifetime of the development.
Groundwater	
Source of risk	Lower Greensand (Folkestone Formation) aquifer
Historical information	Site appears to be an historic quarry. Site identified as at risk from groundwater flooding in the SDNPA Draft Local Plan.
Extent and likelihood of risk to site	Groundwater flooding may occur in association with the pond on site.
Extent and likelihood of risk to access	Access is on higher ground to the east and unlikely to be at risk from groundwater flooding.
Contextual commentary	The site appears to be a former mineral extraction site - most likely sands from the Lower Greensand. The pond on site may represent the water table within the Lower Greensand aquifer, and at during wet periods this may rise. Significant rise in the water table is unlikely due to the high storage capacity of the sandstone aquifer and the likely good hydraulic connection to the stream to the west of the site.
Other sources of flooding	
Contextual commentary	None identified
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, which is suitable for most parts of this site (i.e. those areas of Flood Zones 1, 2 and 3a), subject to application of Sequential and Exception Tests, and development of appropriate mitigation measures for the flood risks identified. Housing is not permitted in Flood Zone 3b.
Sequential Test required?	Yes, to demonstrate no suitable sites at lower flood risk, if development within areas of Flood Zones 2 or 3a is proposed.
Exception Test required?	Yes, if development in areas of Flood Zone 3a within the site are proposed.
Flood Risk Management	
Policy recommendations for flood risk management	1) Housing to be located in Flood Zone 1 areas of site 2) Finished floor levels of habitable areas to be in excess of 1:100 AEP plus climate change plus freeboard level. 3) Flood compensation storage to be provided for any ground raising or built development in fluvial Flood Zone 3 (including allowance for future climate change). 4) Safe means of emergency access and egress during flooding to be demonstrated for all developed areas of the site.

Requirements for site-specific FRA	1) Design flood level for site to be defined using current climate change allowances (EA, 2017). 2) Assessment of the effects of any ground raising or build development in Flood Zone 3, including effects of climate change, and the development of appropriate proposals for compensation storage. 3) Hazard associated with flooding of the site to be determined. 4) If any development is proposed within Flood Zone 3, further assessment will need to be carried out to distinguish between Flood Zones 3a and 3b. Under NPPF, housing is not permitted in Flood Zone 3b.
Sustainable Drainage Systems	
Indicative SuDS suitability	Site may not be suitable for infiltration SuDS due to potential for high groundwater table. Attenuation SuDS probably the most suitable option, but attenuation storage will need to be sited away from areas of fluvial flood risk in lowest parts of site. Discharge from the site to the watercourse to the west of the site is likely to be possible.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing and further assessment of groundwater levels below site. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site outside of fluvial flood risk areas and identify most appropriate route for discharge from site, which is likely to be the ordinary watercourse to the west of the site. 3) Agree maximum discharge rates from the site with the LLFA.

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

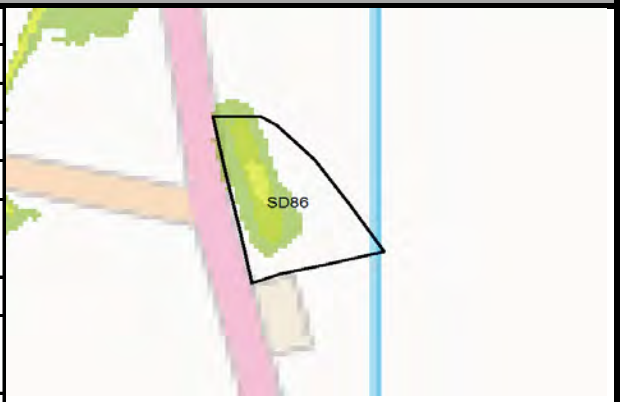
General information			
Site ID	SD84		
Site name	Land at Lamberts Lane		
Area (ha)	0.43		
Allocation type	Housing		
Proposed no. of units	20		
Settlement	Midhurst		
District	Chichester		
Lead Local Flood Authority	W. Sussex		
Plan	South Downs LP		
Flood risk assessment			
Fluvial/tidal			
Watercourse	N/A	% site in Flood Zone 3a	0
% site in Flood Zone 1	100	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	N/A	Flood defence standard of protection (AEP)	N/A
Historical information	N/A		
Current max 1 in 100 AEP flood depth (m)	N/A	Future max 1 in 100 AEP flood depth (m)	N/A
Flood hazard in site	N/A		
Flood hazard to access	N/A		
Residual risk from defence failure	N/A		
Contextual commentary	Over 100 m from FZ2. Climate change will not increase the fluvial/tidal flood risk at this site.		
Surface Water			
% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	0
% site at low risk (1:1000 AEP)	13	% site with no mapped risk	87
Historical information	No information		
Flood hazard in site (1:100 AEP event)	N/A		
Flood hazard to access (1:100 AEP event)	Danger for some		
Contextual commentary	Most of site is not mapped as being at risk of surface water flooding. However, the lowermost part of the site, and the proposed site access is at risk of surface water flooding for the 1:1000 AEP event. Climate change may increase this risk over the lifetime of the development.		

Groundwater	
Source of risk	On Lower Greensand aquifer, but topographic context suggests groundwater flooding unlikely.
Historical information	N/A
Extent and likelihood of risk to site	N/A
Extent and likelihood of risk to access	N/A
Contextual commentary	N/A
Other sources of flooding	
Contextual commentary	None identified
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, and is appropriate for this site, subject to the development of appropriate mitigation measures for the flood risks identified.
Sequential Test required?	No
Exception Test required?	No
Flood Risk Management	
Policy recommendations for flood risk management	1) Housing to be located outside localised areas of potential surface water flood risk 2) Access to site and internal site access roads to be designed to be compatible with potential surface water flood risk.
Requirements for site-specific FRA	1) Further site-specific assessment of surface water flood risk, considering potential climate change impacts over the lifetime of the development.
Sustainable Drainage Systems	
Indicative SuDS suitability	Site may be suitable for infiltration SuDS, although any potential ground contamination associated with the former use of the site should be investigated. If attenuation SuDS are the most suitable option, discharge from the site may need to be made to the sewer network, due to a lack of nearby watercourses.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.

Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, assessment of any potential ground contamination and further assessment of groundwater levels below site. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site and identify most appropriate route for discharge from site. 3) Agree maximum discharge rates from site with the LLFA or Southern Water, as appropriate to discharge route (ordinary watercourse or sewer).

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information		
Site ID	SD86	
Site name	Offham Barns	
Area (ha)	0.3	
Allocation type	Traveller site	
Proposed no. of units	4	
Settlement	Offham and Cooksbridge	
District	Lewes	
Lead Local Flood Authority	East Sussex	
Plan	South Downs LP	

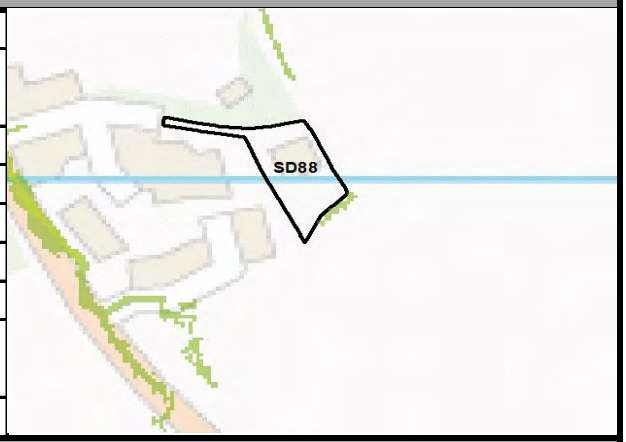
Flood risk assessment			
Fluvial/tidal			
Watercourse	N/A	% site in Flood Zone 3a	0
% site in Flood Zone 1	100	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	N/A	Flood defence standard of protection (AEP)	N/A
Historical information	N/A		
Current max 1 in 100 AEP flood depth (m)	0	Future max 1 in 100 AEP flood depth (m)	0
Flood hazard in site	N/A		
Flood hazard to access	N/A		
Residual risk from defence failure	N/A		
Contextual commentary	Site is approx. 1km from nearest mapped flood zones and is not considered to be at significant risk of fluvial or tidal flooding.		
Surface Water			
% site at high risk (1:30 AEP)	4	% site at medium risk (1:100 AEP)	13
% site at low risk (1:1000 AEP)	26	% site with no mapped risk	57
Historical information	No information		
Flood hazard in site (1:100 AEP event)	Danger for Some		
Flood hazard to access (1:100 AEP event)	Danger for Some		

Contextual commentary	Surface water flood mapping indicates a localised area of ponding that occupies a significant part of the site. Land slopes from the east across the site, and surface water appears to accumulate against the A275, which runs along its western boundary, suggesting a localised depression alongside a slightly raised highway. it is possible that there may be drainage underneath the road at this location, but this will not have been captured by the EA's surface water modelling. If this flood risk is accurately represented, it is likely to increase over the lifetime of the development due to climate change.
Groundwater	
Source of risk	Chalk aquifer (Grey Chalk - West Melbury Marly Chalk Formation), dry valley feature.
Historical information	None.
Extent and likelihood of risk to site	Appears to be near the head of a dry valley feature. Groundwater emergence possible across the site, but particularly in depression in western part of site adjacent to A275.
Extent and likelihood of risk to access	No immediate issue for direct access from site to A275, but this road does appear to follow the dry valley northwards, and may be prone to groundwater flooding during wet periods.
Contextual commentary	The site is situated on the valley side of a dry valley. While most groundwater emergence will occur in the base of the valley, spring flow may also occur on the valley sides in particularly wet periods.
Other sources of flooding	
Contextual commentary	N/A
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Caravans, mobile homes and park homes for permanent residential use is a Highly Vulnerable land use, which is appropriate for this site, subject to the development of suitable flood mitigation measures to address the potential flood risks identified.
Sequential Test required?	No
Exception Test required?	No
Flood Risk Management	
Policy recommendations for flood risk management	1) Residential areas to be located outside surface water flood extent and/or low-lying areas potentially prone to groundwater emergence. 2) Access to site and internal site access roads to be designed to be compatible with potential surface water and groundwater flood risk.
Requirements for site-specific FRA	1) Further site-specific assessment of surface and groundwater flood risk, considering potential climate change impacts over the lifetime of the development.

Sustainable Drainage Systems	
Indicative SuDS suitability	Underlying Chalk geology suggests infiltration SuDS should be suitable for most of site, but the potential for groundwater emergence in the lowermost areas should be investigated further to confirm this. If an element of attenuation SuDS is required, storage volumes should be sized in order to account for any surface water run-on to the site. Post-development runoff rates from the site should not exceed existing rates. Discharge route to be confirmed, but may be to adjacent highway drainage or to an ordinary watercourse to the north of the site. The LLFA should be consulted on appropriate runoff rates from the site and discharge routes.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, and further assessment of groundwater levels below site. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site and identify most appropriate route for discharge from site 3) Agree maximum discharge rates from site with the LLFA.

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information			
Site ID	SD88		
Site name	Land at Ketchers Field		
Area (ha)	0.24		
Allocation type	Housing		
Proposed no. of units	5 to 6		
Settlement	Selbourne		
District	E. Hampshire		
Lead Local Flood Authority	Hampshire		
Plan	South Downs LP		
Flood risk assessment			
Fluvial/tidal			
Watercourse	N/A	% site in Flood Zone 3a	0
% site in Flood Zone 1	100	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	N/A	Flood defence standard of protection (AEP)	N/A
Historical information	N/A		
Current max 1 in 100 AEP flood depth (m)	N/A	Future max 1 in 100 AEP flood depth (m)	N/A
Flood hazard in site	N/A		
Flood hazard to access	N/A		
Residual risk from defence failure	N/A		
Contextual commentary	Over 100 m from FZ2. Climate change will not increase the fluvial/tidal flood risk at this site.		
Surface Water			
% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	0
% site at low risk (1:1000 AEP)	<1	% site with no mapped risk	>99
Historical information	No information		
Flood hazard in site (1:100 AEP event)	N/A		
Flood hazard to access (1:100 AEP event)	Danger for some		
Contextual commentary	Most of site is not mapped as being at risk of surface water flooding. However, a small area in the lowermost part of the site, along the its south eastern boundary, is at low risk of flooding from this source (1:1000 AEP event). The proposed site access is also at risk of surface water flooding. Climate change may increase this risk over the lifetime of the development.		

Groundwater	
Source of risk	On Lower Greensand aquifer, but topographic context suggests groundwater flooding unlikely.
Historical information	N/A
Extent and likelihood of risk to site	N/A
Extent and likelihood of risk to access	N/A
Contextual commentary	N/A
Other sources of flooding	
Contextual commentary	None identified
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, and is appropriate for this site, subject to the development of appropriate mitigation measures for the flood risks identified.
Sequential Test required?	No
Exception Test required?	No
Flood Risk Management	
Policy recommendations for flood risk management	1) Housing to be located outside localised areas of potential surface water flood risk 2) Access to site and internal site access roads to be designed to be compatible with potential surface water flood risk.
Requirements for site-specific FRA	1) Further site-specific assessment of surface water flood risk, considering potential climate change impacts over the lifetime of the development.
Sustainable Drainage Systems	
Indicative SuDS suitability	Site may be suitable for infiltration SuDS, although any potential ground contamination associated with the former use of the site should be investigated. If attenuation SuDS are the most suitable option, discharge to nearby ordinary watercourses would be preferred. Discharge to the sewer network should be a last resort.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.

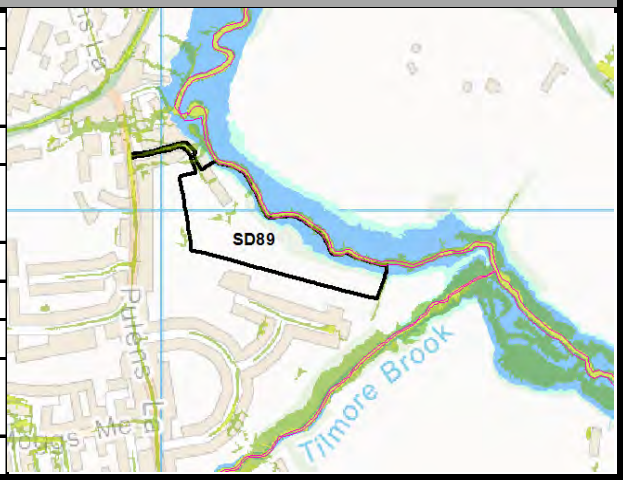
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, assessment of any potential ground contamination and further assessment of groundwater levels below site. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site and identify most appropriate route for discharge from site. 3) Agree maximum discharge rates from site with the LLFA or Southern Water, as appropriate to discharge route (ordinary watercourse or sewer).

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information

Site ID	SD89
Site name	Land at Pulens Lane
Area (ha)	3.59
Allocation type	Mixed use allocation
Proposed no. of units	30 to 32
Settlement	Sheet
District	E. Hampshire
Lead Local Flood Authority	Hampshire
Plan	South Downs LP



Flood risk assessment

Fluvial/tidal

Watercourse	River Rother	% site in Flood Zone 3	14
% site in Flood Zone 1	82		
% site in Flood Zone 2	4	% site in area benefitting from defences	0
Flood defence type	None	Flood defence standard of protection (AEP)	N/A
Historical information	No record of historical flooding provided.		
Current max 1 in 100 AEP flood level (mAOD)	49.42	Future max 1 in 100 AEP flood level (mAOD)	49.54
Flood hazard in site	Danger for Most - Estimated from model results		
Flood hazard to access	Very Low - Estimated from model results		
Residual risk from defence failure	N/A		
Contextual commentary	Fluvial flood risk at the allocation. Tabulated EA model data available, but provides only flood elevations, not depths, and does not allow estimation of flood Zone 3b extent. Most of allocation at low risk of fluvial flooding (FZ1). Approximately 26% (~0.95ha) of the allocation is below an elevation of 50mAOD with extracted model results of 49.42mAOD for the 1 in 100 AEP event and 49.54mAOD for the 1 in 100 AEP + CC (ISIS node 2.010, EA River Rother Model, 2007).		

Surface Water

% site at high risk (1:30 AEP)	1	% site at medium risk (1:100 AEP)	1
% site at low risk (1:1000 AEP)	6	% site with no mapped risk	93
Historical information	No information		
Flood hazard in site (1:100 AEP event)	Caution		
Flood hazard to access (1:100 AEP event)	Caution		

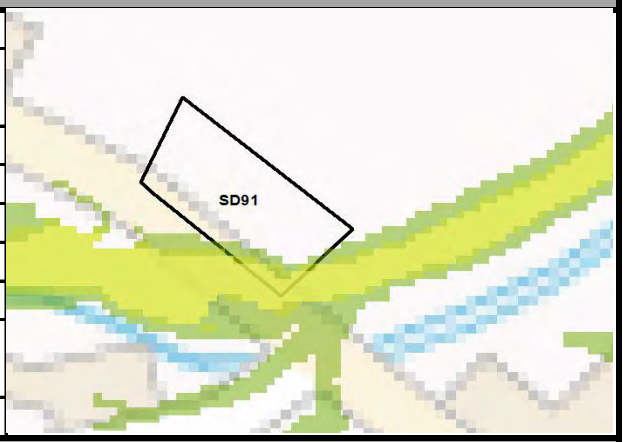
Contextual commentary	Most of site is not mapped as being at risk of surface water flooding. However, surface water flood mapping indicates that several isolated low points, including along the site access road, are at risk. Climate change may increase this risk over the lifetime of the development.
Groundwater	
Source of risk	Alluvial and river terrace sediments overlying the Lower Greensand aquifer (Hythe Formation and Rogate Member) in valley floor of R Rother.
Historical information	None
Extent and likelihood of risk to site	Groundwater emergence most likely in north eastern part of site, within R. Rother floodplain, coincident with areas of fluvial flood risk.
Extent and likelihood of risk to access	Access is to the west, on higher ground and out of the flood plain, unlikely to be prone to groundwater emergence.
Contextual commentary	Groundwater emergence is most likely in floodplain of the River Rother, where the water table is always close to the ground surface, and could rise above ground level during wet periods. The presence of flood embankments could prevent the drainage of groundwater flooding from affected areas.
Other sources of flooding	
Contextual commentary	EA Reservoir Flood Risk Map suggests reservoir flooding, less extensive than fluvial flood extent, and could affect part of site.
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, which is suitable for most parts of this site (i.e. those areas of Flood Zones 1, 2 and 3a), subject to application of Sequential and Exception Tests, and development of appropriate mitigation measures for the flood risks identified. Housing is not permitted in Flood Zone 3b.
Sequential Test required?	Yes, to demonstrate no suitable sites at lower flood risk, if development within areas of Flood Zones 2 or 3a is proposed.
Exception Test required?	Yes, if development in areas of Flood Zone 3a within the site are proposed.

Flood Risk Management	
Policy recommendations for flood risk management	1) All development to be located in Flood Zone 1. Flood Zones 2 and 3 should be reserved as public open space / amenity / conservation uses. 2) Finished floor levels of habitable areas to be in excess of 1:100 AEP plus climate change plus freeboard level. 3) Flood compensation storage to be provided for any ground raising or built development in fluvial Flood Zone 3 (including allowance for future climate change). 4) Safe means of emergency access and egress during flooding to be demonstrated for all developed areas of the site.
Requirements for site-specific FRA	1) Design flood level for site to be defined using current climate change allowances (EA, 2017). 2) Assessment of the effects of any ground raising or build development in Flood Zone 3, including effects of climate change, and the development of appropriate proposals for compensation storage. 3) Hazard associated with flooding of the site to be determined. 4) If any development is proposed within Flood Zone 3, further assessment will need to be carried out to distinguish between Flood Zones 3a and 3b. Under NPPF, housing is not permitted in Flood Zone 3b. 5) Developer to consider incorporating a buffer strip between the development and Flood Zone 3b, the extent of which should be investigated as part of the master planning process. 6) Further site-specific assessment of surface water flood risk to access, considering potential climate change impacts over the lifetime of the development. 7) Safe means of emergency access and egress during flooding to be demonstrated for all developed areas of the site.
Sustainable Drainage Systems	
Indicative SuDS suitability	Higher parts of site may be suitable for infiltration SuDS, but this might not be possible for lower-lying areas due to potential for high groundwater table. Attenuation storage will need to be sited away from areas of fluvial flood risk in lowest parts of site. Discharge of surface water from the site to the adjacent River Rother should be possible.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.

Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing and further assessment of groundwater levels below site. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site outside of fluvial flood risk areas and identify most appropriate route for discharge from site, which is likely to be to the River Rother. 3) Agree maximum discharge rates from the site with the LLFA.

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information			
Site ID	SD91		
Site name	Land North of the Forge		
Area (ha)	0.12		
Allocation type	Housing		
Proposed no. of units	5 to 6		
Settlement	South Harting		
District	Chichester		
Lead Local Flood Authority	W. Sussex		
Plan	South Downs LP		

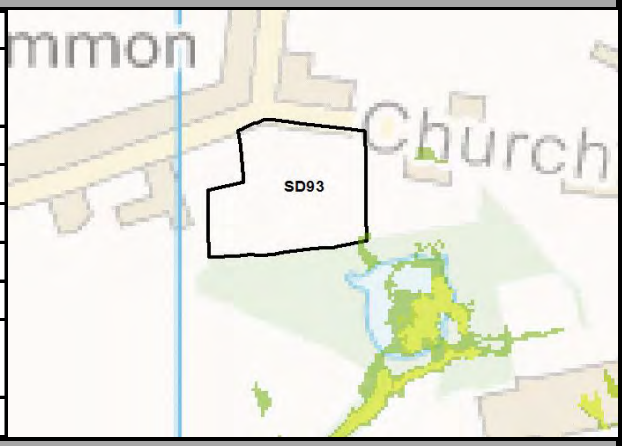
Flood risk assessment			
Fluvial/tidal			
Watercourse	Unnamed watercourse	% site in Flood Zone 3a	0
% site in Flood Zone 1	100	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	N/A	Flood defence standard of protection (AEP)	N/A
Historical information	N/A		
Current max 1 in 100 AEP flood depth (m)	N/A	Future max 1 in 100 AEP flood depth (m)	N/A
Flood hazard in site	N/A		
Flood hazard to access	N/A		
Residual risk from defence failure	N/A		
Contextual commentary	Site close to an ordinary watercourse (unnamed tributary of the River Rother). No mapped fluvial flood extents, probably because the upstream catchment area is less than the minimum 3km2 threshold used for fluvial flood mapping. However, surface water flood extents give a good impression of the likely flood risk associated with this watercourse, as discussed below.		
Surface Water			
% site at high risk (1:30 AEP)	4	% site at medium risk (1:100 AEP)	3
% site at low risk (1:1000 AEP)	5	% site with no mapped risk	88
Historical information	Flooding problems associated with highway drainage on roads to the south the site noted in West Sussex County Council historic flood records.		
Flood hazard in site (1:100 AEP event)	Caution		

Flood hazard to access (1:100 AEP event)	Danger for most
Contextual commentary	The lowermost part of the site (southern corner) is mapped as being at risk of surface water flooding. Climate change may increase this risk over the lifetime of the development. However, comparing the surface water flood maps with the background mapping for this location suggests a georeferencing error, with the flood extents being offset from the mapped course of the stream it should be associated with. This suggests that the surface water flood mapping overestimates the actual risk to this site.
Groundwater	
Source of risk	On Lower Greensand aquifer, but topographic context suggests little potential for groundwater flooding over most of site.
Historical information	N/A
Extent and likelihood of risk to site	N/A
Extent and likelihood of risk to access	N/A
Contextual commentary	Any groundwater flood risk in lowermost part of site likely to be confined to immediate vicinity of nearby minor watercourse, and extent of flood likely to be similar to surface water extent, which, as noted above, may be overestimated by the mapping for this site.
Other sources of flooding	
Contextual commentary	Residual risk of flooding in event of exceedance/culvert blockage could potentially exacerbate flood risk to lowest parts of the site.
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, and is appropriate for this site, subject to the development of appropriate mitigation measures for the flood risks identified.
Sequential Test required?	No
Exception Test required?	No
Flood Risk Management	
Policy recommendations for flood risk management	1) Housing to be located outside localised areas of potential surface water flood risk 2) Access to site and internal site access roads to be designed to be compatible with potential surface water flood risk.
Requirements for site-specific FRA	1) Further site-specific assessment of ordinary watercourse/ surface water flood risk, considering potential climate change impacts over the lifetime of the development, and considering potential effects of culvert blockage.

Sustainable Drainage Systems	
Indicative SuDS suitability	Site on valley side, with potential for the use of infiltration SuDS. However, attenuation SuDS may prove the most suitable option for the lowermost part of the site. Discharge from the site to the ordinary watercourse south of the site should be possible.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, assessment of any potential ground contamination and further assessment of groundwater levels below site. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site and identify most appropriate route for discharge from site, most likely the nearby ordinary watercourse. 3) Agree maximum discharge rates from site with the LLFA.

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information		
Site ID	SD93	
Site name	Land South of Church Road	
Area (ha)	0.68	
Allocation type	Housing	
Proposed no. of units	8 to 12	
Settlement	Steep	
District	E. Hampshire	
Lead Local Flood Authority	Hampshire	
Plan	South Downs LP	

Flood risk assessment			
Fluvial/tidal			
Watercourse	N/A	% site in Flood Zone 3a	0
% site in Flood Zone 1	100	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	N/A	Flood defence standard of protection (AEP)	N/A
Historical information	N/A		
Current max 1 in 100 AEP flood depth (m)	N/A	Future max 1 in 100 AEP flood depth (m)	N/A
Flood hazard in site	N/A		
Flood hazard to access	N/A		
Residual risk from defence failure	N/A		
Contextual commentary	Over 100 m from FZ2. Climate change will not increase the fluvial/tidal flood risk at this site.		
Surface Water			
% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	0
% site at low risk (1:1000 AEP)	<1	% site with no mapped risk	>99
Historical information	No information		
Flood hazard in site (1:100 AEP event)	N/A		
Flood hazard to access (1:100 AEP event)	N/A		
Contextual commentary	Minimal proportion of the site at south eastern corner is shown to be at risk of surface water flooding for 1:1000 AEP event. However, climate change may increase surface water flood risk over the lifetime of the development.		

Groundwater	
Source of risk	On Gault Formation (non-aquifer), suggesting groundwater flooding unlikely.
Historical information	N/A
Extent and likelihood of risk to site	N/A
Extent and likelihood of risk to access	N/A
Contextual commentary	N/A
Other sources of flooding	
Contextual commentary	None identified
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, and is appropriate for this site, subject to the development of appropriate mitigation measures for the flood risks identified.
Sequential Test required?	No
Exception Test required?	No
Flood Risk Management	
Policy recommendations for flood risk management	1) Housing to be located outside localised areas of potential surface water flood risk 2) Access to site and internal site access roads to be designed to be compatible with potential surface water flood risk.
Requirements for site-specific FRA	1) Further site-specific assessment of surface water flood risk, considering potential climate change impacts over the lifetime of the development.
Sustainable Drainage Systems	
Indicative SuDS suitability	Site unlikely to be suitable for infiltration SuDS based on underlying impermeable geology. Instead, attenuation SuDS at the lowest point of the site, would likely constitute the most suitable option. Discharge to the pond/ordinary watercourse immediately to the south of the site should be possible. Discharge to the sewer network should be a last resort.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.

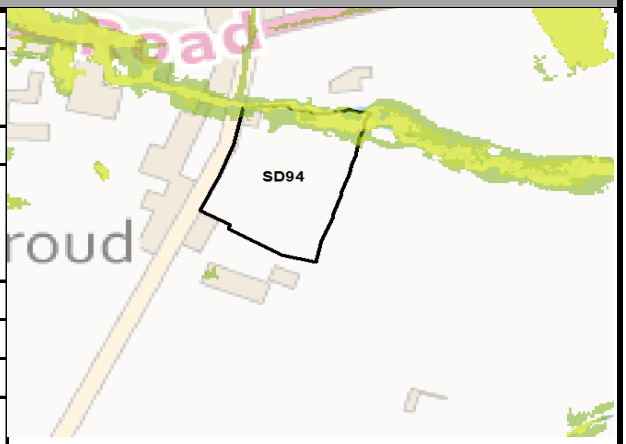
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site and identify most appropriate route for discharge from site, most likely the nearby ordinary watercourse. 3) Agree maximum discharge rates from site with the LLFA.

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information

Site ID	SD94
Site name	Land at Ramsdean Road
Area (ha)	1.44
Allocation type	Housing and community building
Proposed no. of units	26 to 30
Settlement	Stroud
District	Stroud
Lead Local Flood Authority	Hampshire
Plan	South Downs LP



Flood risk assessment

Fluvial/tidal

Watercourse	N/A	% site in Flood Zone 3a	0
% site in Flood Zone 1	100	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	N/A	Flood defence standard of protection (AEP)	N/A
Historical information	N/A		
Current max 1 in 100 AEP flood depth (m)	N/A	Future max 1 in 100 AEP flood depth (m)	N/A
Flood hazard in site	N/A		
Flood hazard to access	N/A		
Residual risk from defence failure	N/A		
Contextual commentary	An ordinary watercourse runs along the northern boundary of the site (Tilmore Brook, tributary of the River Rother). No mapped fluvial flood extents, probably because the upstream catchment area is less than the minimum 3km2 threshold used for fluvial flood mapping. However, surface water flood extents give a good impression of the likely flood risk associated with this watercourse, as discussed below.		

Surface Water

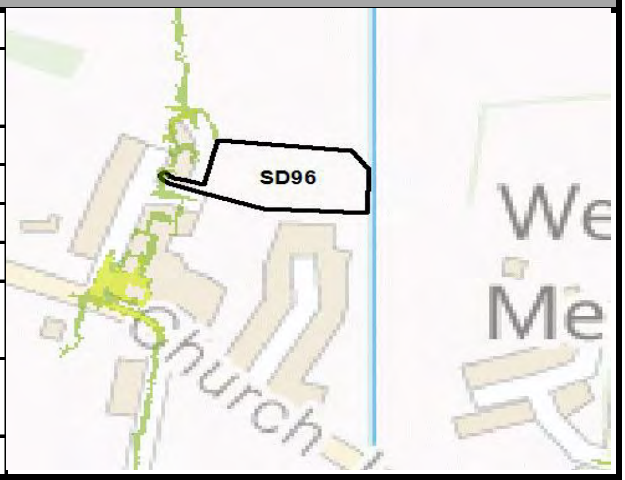
% site at high risk (1:30 AEP)	1	% site at medium risk (1:100 AEP)	8
% site at low risk (1:1000 AEP)	6	% site with no mapped risk	85
Historical information	No information		
Flood hazard in site (1:100 AEP event)	Danger for most		
Flood hazard to access (1:100 AEP event)	Danger for most		

Contextual commentary	Mapped surface water flood risk actually associated with an ordinary watercourse running along the northern boundary of the site. This risk affects ~15% of the site at present, but climate change may increase this. This flood risk also affects the adjacent Ramsdean Road from which access is gained to the site.
Groundwater	
Source of risk	On Gault Formation (non-aquifer), suggesting groundwater flooding
Historical information	N/A
Extent and likelihood of risk to site	N/A
Extent and likelihood of risk to access	N/A
Contextual commentary	N/A
Other sources of flooding	
Contextual commentary	The ordinary watercourse appears to run beneath Ramsdean Road in a culvert at the northeast corner of the site. Incapacity or blockage of this culvert could exacerbate the flood risk to the site.
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, and is appropriate for this site, subject to the development of appropriate mitigation measures
Sequential Test required?	No
Exception Test required?	No
Flood Risk Management	
Policy recommendations for flood risk management	1) All development to be located outside areas at risk of flooding from the ordinary watercourse forming the northern boundary of the site. 2) Finished floor levels of habitable areas to be in excess of 1:100 AEP plus climate change plus freeboard level. 3) Safe means of emergency access and egress during flooding to be demonstrated for all developed areas of the site.
Requirements for site-specific FRA	1) Modelling of ordinary watercourse forming northern boundary of site to determine flood depths, extents and hazard to site. Should consider potential for blockage of culvert under Ramsdean Road, and should use current climate change allowances (EA, 2017). 2) Impacts of any ground raising and requirements for compensatory storage to determined.

Sustainable Drainage Systems	
Indicative SuDS suitability	Site unlikely to be suitable for infiltration SuDS based on underlying impermeable geology. Instead, attenuation SuDS at the lowest point of the site, would likely constitute the most suitable option. Discharge to the ordinary watercourse immediately to the north of the site should be possible. Discharge to the sewer network should be a last resort.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site and identify most appropriate route for discharge from site, most likely the nearby ordinary watercourse. Ensure attenuation storage is located outside areas at risk of flooding from the ordinary watercourse 3) Agree maximum discharge rates from site with the LLFA.

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information			
Site ID	SD96		
Site name	Land at Long Priors		
Area (ha)	0.48		
Allocation type	Housing		
Proposed no. of units	10 to 12		
Settlement	West Meon		
District	City of Winchester		
Lead Local Flood Authority	Hampshire		
Plan	South Downs LP		

Flood risk assessment			
Fluvial/tidal			
Watercourse	N/A	% site in Flood Zone 3a	0
% site in Flood Zone 1	100	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	N/A	Flood defence standard of protection (AEP)	N/A
Historical information	N/A		
Current max 1 in 100 AEP flood depth (m)	N/A	Future max 1 in 100 AEP flood depth (m)	N/A
Flood hazard in site	N/A		
Flood hazard to access	N/A		
Residual risk from defence failure	N/A		
Contextual commentary	Over 100 m from FZ2. Climate change will not increase the fluvial/tidal flood risk at this site.		
Surface Water			
% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	0
% site at low risk (1:1000 AEP)	1	% site with no mapped risk	99
Historical information	No information		
Flood hazard in site (1:100 AEP event)	N/A		
Flood hazard to access (1:100 AEP event)	Danger for most		
Contextual commentary	Most of site is not mapped as being at risk of surface water flooding. However, the lowermost part of the site adjacent and the existing access, and the wider road network in the vicinity is at risk of surface water flooding. Climate change may increase this risk over the lifetime of the development.		

Groundwater	
Source of risk	Chalk aquifer (White Chalk - Newhaven Chalk Formation), dry valley feature.
Historical information	West Meon identified as an area at risk of groundwater flooding in the Hampshire CC LFRMS and GWMP.
Extent and likelihood of risk to site	Groundwater emergence most likely in westernmost part of site, closest to the axis of the dry valley.
Extent and likelihood of risk to access	Access crosses the axis of the dry valley, and a surface water flow pathway is mapped along this line, indicating groundwater emergence may occur along the access road.
Contextual commentary	Groundwater emergence is most likely towards the western, lower part of the site, close the base of the dry valley (coincides with the mapped surface water flow pathway), where the Chalk water table could rise above ground level during wet periods.
Other sources of flooding	
Contextual commentary	None identified
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, and is appropriate for this site, subject to the development of appropriate mitigation measures
Sequential Test required?	No
Exception Test required?	No
Flood Risk Management	
Policy recommendations for flood risk management	1) Housing to be located outside surface water flood extent and/or low-lying areas potentially prone to groundwater emergence. 2) Access to site and internal site access roads to be designed to be compatible with potential surface water and groundwater flood risk.
Requirements for site-specific FRA	1) Further site-specific assessment of surface and groundwater flood risk, considering potential climate change impacts over the lifetime of the development.
Sustainable Drainage Systems	
Indicative SuDS suitability	Underlying Chalk geology suggests infiltration SuDS should be suitable for this site, but the potential for groundwater emergence in the lowermost areas should be investigated further to confirm this. A lack of surface watercourses in the vicinity suggests that discharge from the site, if required, would need to be via the sewer network.

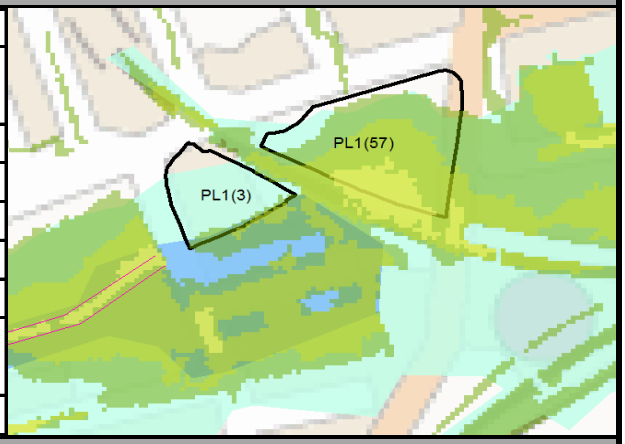
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, and further assessment of groundwater levels below site. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site, taking into account potential surface water and groundwater flood risk and identify most appropriate route for discharge from site 3) Agree maximum discharge rates from site with the LLFA or Southern Water, as appropriate to discharge route (ordinary watercourse or sewer).

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information

Site ID	PL1 (03)
Site name	Land at the Auction Rooms
Area (ha)	0.16
Allocation type	Housing
Proposed no. of units	11
Settlement	Lewes
District	Lewes
Lead Local Flood Authority	E. Sussex
Plan	Lewes NDP



Flood risk assessment

Fluvial/tidal

Watercourse	River Ouse and Winterbourne Stream	% site in Flood Zone 3a	5
% site in Flood Zone 1	16	% site in Flood Zone 3b	0
% site in Flood Zone 2	79	% site in area benefitting from defences	0
Flood defence type	Not Defended	Flood defence standard of protection (AEP)	-
Historical information	Historical mapping shows approximately 90 % of the allocation has previously been affected by flooding, although dates were not provided.		
Current max 1 in 100 AEP flood depth (m)	0	Future max 1 in 100 AEP flood depth (m) (with defences)	0.1
Flood hazard in site (1:100	Very Low		
Flood hazard to access	Very Low		
Residual risk from defence failure	N/A		
Contextual commentary	EA model data are available for Lewes, however, the Winterbourne stream adjacent to this allocation is not explicitly modelled which will likely under represent the flood risk. Most of the site is identified as at risk of fluvial flooding (FZ2) However, site access along Southover Road is in FZ1. Climate change increases the flood risk over the lifetime of the development, and model results suggest this is exacerbated by the presence of existing defences protecting other areas within the Lower River Ouse catchment. The Winterbourne Stream runs in a culvert from Garden Street, at the southwestern corner of this site, for several hundred metres before re-emerging into an open channel downstream of the railway station.		

Surface Water			
% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	1
% site at low risk (1:1000 AEP)	8	% site with no mapped risk	91
Historical information	Wider Lewes area identified to be at risk of surface water flooding (Lewes draft SWMP)		
Flood hazard in site (1:100 AEP event)	Danger for Most		
Flood hazard to access (1:100 AEP event)	Danger for Most		
Contextual commentary	Most of site is not mapped as being at risk of surface water flooding. However, the lowermost part of the site, and the proposed site access is at risk of surface water flooding, as well as fluvial flooding. Climate change may increase this risk over the lifetime of the development.		
Groundwater			
Source of risk	Alluvial sediment overlying Chalk aquifer (White Chalk - Lewes Nodular Chalk Formation)in Winterbourne valley floor.		
Historical information	The EA South East Flood Risk Management Plan describes the Lewes Winterbourne as an ephemeral chalk stream, subject to monitoring and flood alert warnings by the EA. The draft Lewes Stage 1 SWMP identifies the Southover area to be at risk from groundwater flooding, and that the water table is within 3m of the ground surface at the site.		
Extent and likelihood of risk to site	Groundwater emergence possible across the site, associated with alluvial deposits.		
Extent and likelihood of risk to access	Access is adjacent to the site and a similar risk of groundwater emergence is present for access as for the site.		
Contextual commentary	Groundwater emergence is associated with the Lewes Winterbourne. During wet periods the water table in the chalk will rise and emerge along the Winterbourne. The Winterbourne appears to be culverted adjacent to the site, but alluvial deposits which are likely to be in hydraulic connection with the chalk, may facilitate emergence of groundwater within the site. The presence of flood embankments along parts of the Winterbourne could prevent the drainage of groundwater flooding from affected areas.		
Other sources of flooding			
Contextual commentary	Possible residual risks of flooding in event of blockage of Winterbourne Stream culverts, and backing up of sewer network during high flows.		

Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, which is suitable for most parts of this site (i.e. those areas of Flood Zones 1, 2 and 3a), subject to application of Sequential and Exception Tests, and development of appropriate mitigation measures for the flood risks identified.
Sequential Test required?	Yes, to demonstrate no suitable sites at lower flood risk, if development within areas of Flood Zones 2 or 3a is proposed.
Exception Test required?	Yes, if development in areas of Flood Zone 3a within the site are proposed.
Flood Risk Management	
Policy recommendations for flood risk management	1) Adopt a sequential approach to site layout, ensuring housing and other sensitive aspects of infrastructure are located in areas of lowest risk within the site. Reserve higher risk areas for least flood vulnerable aspects of the development, such as car parking and public open space. 2) Finished floor levels of habitable areas to be in excess of 1:100 AEP plus climate change plus freeboard level. 3) Compensatory measures to be provided for any flood defence measures such as ground raising or new flood defences that have the potential to increase flood risk elsewhere. 4) Safe means of emergency access and egress during flooding to be demonstrated for all developed areas of the site.
Requirements for site-specific FRA	1) Site-specific hydraulic modelling needs to explicitly include the flood risk posed by the Winterbourne Stream, including the possible residual risk associated with culvert blockage, and the implications of the dis-benefit from flood defences elsewhere in Lewes. It should also be considered whether the de-culverting of the Winterbourne Stream in and around the site would be an effective flood risk reduction measure. 2) Design flood level for site to be defined using current climate change allowances (EA, 2017). 3) The effects of any new flood defences or ground raising needs to be evaluated, and compensatory storage provided as appropriate. 4) Further site-specific evaluation of, and development of mitigation for other flood risks, including groundwater, surface water and sewer flooding.

Sustainable Drainage Systems	
Indicative SuDS suitability	Relatively low-lying site in floodplain and with a high likelihood of groundwater flooding. Site within ESCC Drainage Risk Areas 1 and 4. High groundwater tables are known to inhibit use of SuDS in Lewes due to potential for groundwater ingress. Subsidence is also a known issue, within the wider area, and specifically in the floodplain of Winterbourne Stream. Furthermore, Lewes is designated as a groundwater source protection zone and therefore infiltration measures would require an appropriate level of water treatment. Use of infiltration SuDS may therefore not be appropriate at this site. Attenuation SuDS with discharge to the adjacent Winterbourne Stream may be a viable option, although fluvial flood risk to the site and the blocking of discharge during fluvial flood conditions could be an issue. Discharge to the public sewer network should only be considered as a last resort, but may be the only viable option. As a minimum, rates of surface water discharge should not be increased above current rates, and opportunities for betterment should be sought through the implementation of source control measures such as permeable paving and green roofs. Consultation with the LLFA and Southern Water should be made at the earliest opportunity to identify appropriate drainage measures, permitted rates and points of discharge and potential impact on the foul and surface water drainage issues.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) As a minimum, surface water discharge rates from the development should not exceed pre-development rates, and opportunities to reduce runoff rates overall should be sought.

Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, assessment of any potential ground contamination and further assessment of groundwater levels below site. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site outside of areas at risk of fluvial flooding and identify most appropriate route for discharge from site. 3) Agree maximum discharge rates from the site with the LLFA for the Winterbourne Stream, or with Southern Water if discharge to the sewer network is the only viable option. 4) If infiltration SuDS are viable, agree any requirements for ground remediation for contaminated areas, or water treatment for infiltration SuDS with the EA to protect groundwater quality in the underlying chalk aquifer.

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information

Site ID	PL1 (08)
Site name	Land at Buckwell Court, garage site
Area (ha)	0.04
Allocation type	Housing
Proposed no. of units	6
Settlement	Lewes
District	Lewes
Lead Local Flood Authority	E. Sussex
Plan	Lewes NDP

Flood risk assessment

Fluvial/tidal

Watercourse	~20 m from R. Ouse FZ3	% site in Flood Zone 3a	0
% site in Flood Zone 1	100	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	Not Defended	Flood defence standard of protection (AEP)	N/A
Historical information	No information provided to indicate previous fluvial/tidal flooding.		
Current max 1 in 100 AEP flood depth (m)	0	Future max 1 in 100 AEP flood depth (m)	0
Flood hazard in site - 1 in	N/A		
Flood hazard to access - 1 in 100 AEP	N/A		
Residual risk from defence failure	N/A		
Contextual commentary	Although within ~20m of FZ3, this site is located beyond the well-defined edge of the River Ouse floodplain, just to the north of Landport Farm Road. The site is considered to be at low risk of fluvial flooding, even when climate change is taken into account over the lifetime of the development.		

Surface Water

% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	0
% site at low risk (1:1000 AEP)	0	% site with no mapped risk	100
Historical information	Wider Lewes area identified to be at risk of surface water flooding (Lewes draft SWMP)		
Flood hazard in site (1:100 AEP event)	N/A		

Flood hazard to access (1:100 AEP event)	N/A
Contextual commentary	The site is not mapped as being at risk of surface water flooding. Climate change could increase this risk over the lifetime of the development, but the site appears to be on a gentle slope which suggests that the risk of surface water flooding will remain low.
Groundwater	
Source of risk	Alluvial sediment overlying Chalk aquifer (White Chalk - Holywell Nodular Chalk Formation) in valley floor.
Historical information	The draft Lewes Stage 1 SWMP identifies the Landport area to be at risk from groundwater flooding, and that the water table is within 3m of the ground surface at the site.
Extent and likelihood of risk to site	Site appears to be slightly elevated above Ouse floodplain, suggesting limited potential for groundwater emergence.
Extent and likelihood of risk to access	If access is taken from south along Landport Farm Road, groundwater emergence at edge of floodplain could be an issue. Access via other routes is likely to be unaffected.
Contextual commentary	Groundwater emergence is likely in floodplain of R Ouse and Papermill Cut, where water table is always close to the ground surface, and could rise above ground level during wet periods. The site is just outside the floodplain, but there is a low risk it, or its access, could be affected by groundwater emergence from adjacent alluvial deposits or underlying chalk. The presence of flood embankments and tidal locking of outfalls to the river could prevent the drainage of groundwater flooding from affected areas.
Other sources of flooding	
Contextual commentary	None identified
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, which is suitable at this site.
Sequential Test required?	No
Exception Test required?	No
Flood Risk Management	
Policy recommendations for flood risk management	No specific flood risk management recommendations for this site.

Requirements for site-specific FRA	1) Future fluvial flood levels for the adjacent River Ouse floodplain should be re-evaluated using the current NPPF climate change guidance (EA, 2017) for both the current , and future defences throughout Lewes; in light of the new flood defences proposed for the North Street Quarter development. Though the North Street Quarter defences may never be built and should not be relied upon. 2) Further site-specific investigation of the potential for groundwater flooding to the site and its access.
Sustainable Drainage Systems	
Indicative SuDS suitability	The site appears to be slightly above the level of the River Ouse floodplain on a gentle slope, which suggests that infiltration SuDS may be possible at this site. Site within ESCC Drainage Risk Areas 3 and 4. High groundwater tables are known to inhibit use of SuDS in Lewes. Subsidence is also a known issue, within the wider area. Lewes is also designated as a source protection zone and therefore site drainage measures will require an appropriate level of water treatment. Therefore, further site-specific investigation will be required to confirm the suitability of the site for infiltration SuDS. If infiltration is not viable, source control measures and sufficient attenuation should be provided within the site to limit discharge rates to current rates or lower. Discharge from the site may be possible to the Papermill Cut, an ordinary watercourse in the River Ouse floodplain to the northwest of Landport Farm Road. Discharge to the sewer network should only be considered if this is not possible. Consultation with the LLFA and Southern Water should be made at the earliest opportunity to identify appropriate drainage measures, permitted rates and points of discharge and potential impact on the foul and surface water drainage issues.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) As a minimum, surface water discharge rates from the development should not exceed pre-development rates, and opportunities to reduce runoff rates overall should be sought.

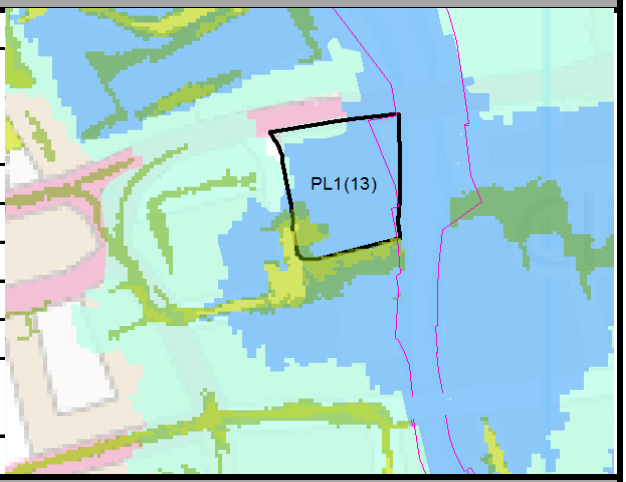
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, assessment of any potential ground contamination and further assessment of groundwater levels below site. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site and identify the most appropriate route for discharge from site. 3) Agree maximum discharge rates from site with the LLFA for the Papermill Cut, or with Southern Water if discharge to the sewer network is the only viable option. 4) If infiltration SuDS are viable, agree any requirements for ground remediation for contaminated areas, or water treatment for infiltration SuDS with the EA to protect groundwater quality in the underlying chalk aquifer.

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information

Site ID	PL1 (13)
Site name	Land at the former Wenban Smith Site
Area (ha)	0.42
Allocation type	Mixed use
Proposed no. of units	11
Settlement	Lewes
District	Lewes
Lead Local Flood Authority	E. Sussex
Plan	Lewes NDP



Flood risk assessment

Fluvial/tidal

Watercourse	River Ouse	% site in Flood Zone 3a	82
% site in Flood Zone 1	1	% site in Flood Zone 3b	9
% site in Flood Zone 2	8	% site in area benefitting from defences	0
Flood defence type	River bank and flood wall	Flood defence standard of protection (AEP)	1 in 50
Historical information	Historical mapping shows site previously affected by flooding. No date information provided.		
Current max 1 in 100 AEP flood depth (m)	1.05	Future max 1 in 100 AEP flood depth (m)	1.41
Flood hazard in site	Danger for most		
Flood hazard to access	Very Low		
Residual risk from defence failure	Not applicable - standard of protection does not meet expected design standard for new developments.		
Contextual commentary	The site is affected by fluvial flooding with a tide locking element and by tidal flooding. The River Ouse is tidal in the reach adjacent to the site with approximately 9% of the site mapped at tidal risk for the 1 in 200 AEP event with existing defences, including for the 2115 future climate change allowances. Though this site is identified as being defended, the defence is set back a little and there is an area on the river side of the flood defence within the site boundary. The site is identified as being at fluvial risk (1 in 75 AEP Defended) and identified as being at a dis-benefit from defences elsewhere in Lewes with a defended maximum water level of 1.41 m compared to the undefended at 1.16 m, for the 1 in 100 AEP + 20% climate change event.		

Surface Water

% site at high risk (1:30 AEP)	<1	% site at medium risk (1:100 AEP)	4

% site at low risk (1:1000 AEP)	4	% site with no mapped risk	92
Historical information	Wider Lewes area identified to be at risk of surface water flooding (Lewes draft SWMP)		
Flood hazard in site (1:100 AEP event)	Danger for most		
Flood hazard to access (1:100 AEP event)	Danger for most		
Contextual commentary	Majority of the site is shown not to be at risk of surface water flooding, However, an area of surface water ponding does extend onto the site from the south and west, and climate change may increase this risk over the lifetime of the development.		
Groundwater			
Source of risk	Chalk aquifer (White Chalk - New Pit Chalk Formation) and overlying alluvial sediment in valley floor.		
Historical information	The draft Lewes Stage 1 SWMP identifies the Lewes town centre to be at risk from groundwater flooding, and that the water table is within 3m of the ground surface at the site.		
Extent and likelihood of risk to site	Groundwater emergence likely across the site.		
Extent and likelihood of risk to access	Access is adjacent to the site and a similar risk of groundwater emergence is present for access as for the site.		
Contextual commentary	Groundwater emergence is likely in floodplain of the R Ouse, where water table is always close to the ground surface, and could rise above ground level during wet periods. The presence of flood embankments and tidal locking of outfalls to the river could prevent the drainage of groundwater flooding from affected areas.		
Other sources of flooding			
Contextual commentary	Although no specific information is available, flooding of sewer networks may also occur in combination with other flooding mechanisms in this urban location. EA Reservoir Flood Risk Map suggests reservoir flooding extent affecting approximately 60 % of the site. There is a residual risk of fluvial and tidal locking of flows from the site.		
Policy and recommendations			
Sequential and Exception Test Requirements			
Suitability for proposed development type	Housing is a More Vulnerable land use, which is suitable for most parts of this site (i.e. those areas of Flood Zones 1, 2 and 3a), subject to application of Sequential and Exception Tests, and development of appropriate mitigation measures for the flood risks identified. Housing is not permitted in Flood Zone 3b.		

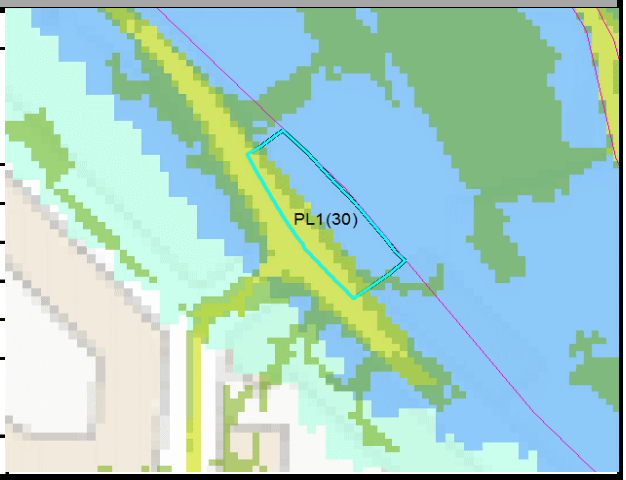
Sequential Test required?	Yes, to demonstrate no suitable sites at lower flood risk.
Exception Test required?	Yes, if housing development in areas of Flood Zone 3a within the site are proposed.

Flood Risk Management	
Policy recommendations for flood risk management	1) Adopt a sequential approach to site layout, ensuring housing and other sensitive aspects of infrastructure are located in areas of lowest risk within the site. Reserve higher risk areas for least flood vulnerable aspects of the development, such as car parking and public open space. 2) No development other than Essential Infrastructure or Water Compatible development in FZ3b. 3) Finished floor levels of habitable areas to be in excess of 1:100 AEP plus climate change plus freeboard level. 4) Compensatory measures to be provided for any flood defence measures such as ground raising or new flood defences that have the potential to increase flood risk elsewhere. 5) Safe means of emergency access and egress during flooding to be demonstrated for all developed areas of the site.
Requirements for site-specific FRA	1) Design flood level for site to be defined using current climate change allowances (EA, 2017), and in the light of the new flood defences proposed for the adjacent North Street Quarter development. Though the North Street Quarter defences may never be built and should not be relied upon, though they are not designed to protect this site. 2) Impacts of any ground raising or new flood defences for this site and requirements for compensatory storage to determined. 3) Hazard associated with flooding of access and egress from the site to be determined, with new or proposed defences in place, and considering current climate change allowances over the lifetime of the development. 4) Further site-specific evaluation of, and development of mitigation for other flood risks, including groundwater, surface water and sewer flooding.
Sustainable Drainage Systems	
Indicative SuDS suitability	Very limited potential for use of infiltration or above-ground attenuation SuDS on account of high groundwater table and the overwhelming majority of the site being at risk of tidal/fluvial flooding. Site within ESCC Drainage Risk Area 4. Nevertheless, opportunities to reduce surface water runoff rates from the site should be sought through the integration of source control measures into the development, such as permeable paving and green roofs. Any surface water discharge from the site to the adjacent River Ouse would be probably be subject to tide locking during high river flows or tidal conditions, so the most appropriate drainage solution for this site is probably to discharge into the sewer network. Consultation with the LLFA and Southern Water should be made at the earliest opportunity to identify appropriate drainage measures, permitted rates and points of discharge and potential impact on the foul and surface water drainage issues.

Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) As a minimum, surface water discharge rates from the development should not exceed pre-development rates, and opportunities to reduce runoff rates overall should be sought.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, assessment of any potential ground contamination and further assessment of groundwater levels below site as appropriate. 2) If infiltration elements are appropriate, demonstrate that an appropriate level of water treatment is provided to protect groundwater quality. 3) Identify most appropriate route for surface water discharge from site and agree maximum discharge rates from the site with the LLFA or with Southern Water as appropriate to discharge route (watercourse or sewer). 4) Demonstrate that sufficient attenuation storage can be accommodated within the proposed site drainage system to meet maximum discharge rate restriction, including taking into account of fluvial flood or tide-locking effects in the case of direct discharge to the River Ouse.

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information		
Site ID	PL1 (30)	
Site name	Land at Landport Road garage site	
Area (ha)	0.087	
Allocation type	Housing	
Proposed no. of units	6	
Settlement	Lewes	
District	Lewes	
Lead Local Flood Authority	E. Sussex	
Plan	Lewes NDP	

Flood risk assessment			
Fluvial/tidal			
Watercourse	River Ouse	% site in Flood Zone 3a	100
% site in Flood Zone 1	0	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	Embankment	Flood defence standard of protection (AEP)	1 in 25
Historical information	Historical mapping shows flooding has affected the site (dates unknown).		
Current max 1 in 100 AEP flood depth (m)	0.97	Future max 1 in 100 AEP flood depth (m)	1.33
Flood hazard in site	Danger for Most		
Flood hazard to access	Danger for Most		
Residual risk from defence failure	Not applicable - standard of protection does not meet expected design standard for new development		
Contextual commentary	Fluvial flood risk with tide-locking component, EA model results indicate maximum water depths within the site of 0.35 m for the combined 1 in 20 AEP fluvial and 20 AEP tidal event. No solely tidal risk is mapped for the 1 in 200 AEP event with or without existing defences, including for the 2115 future climate change allowances. This allocation is identified as being at fluvial risk and as being at a dis-benefit from defences elsewhere in Lewes with defended maximum water levels of, 1.33 m, compared to the undefended at 1.00 m, for the 1 in 100 AEP + 20% climate change event.		
Surface Water			
% site at high risk (1:30 AEP)	22	% site at medium risk (1:100 AEP)	17
% site at low risk (1:1000 AEP)	4	% site with no mapped risk	57
Historical information	Wider Lewes area identified to be at risk of surface water flooding (Lewes draft SWMP)		

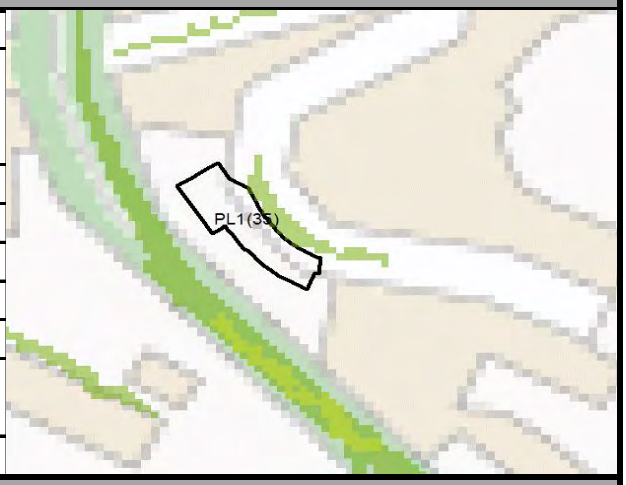
Flood hazard in site (1:100 AEP event)	Danger for Some
Flood hazard to access (1:100 AEP event)	Danger for Some
Contextual commentary	A significant part of the site is mapped as being at surface water flood risk, with access off Landport Road being at high risk (1:30 AEP). Climate change may increase this risk still further over the lifetime of the development.
Groundwater	
Source of risk	Alluvial sediment overlying Chalk aquifer (White Chalk - Holywell Nodular Chalk Formation) in valley floor.
Historical information	The draft Lewes Stage 1 SWMP identifies the Landport area to be at risk from groundwater flooding, and that the water table is within 3m of the ground surface at the site.
Extent and likelihood of risk to site	Groundwater emergence most likely in western part of site, along surface water flow pathways close to break in slope at edge of river floodplain, and away from flood defences.
Extent and likelihood of risk to access	Access is adjacent to the site and a similar risk of groundwater emergence is present for access as for the site.
Contextual commentary	Groundwater emergence is likely in floodplain of R Ouse and Papermill Cut, where water table is always close to the ground surface, and could rise above ground level during wet periods. The presence of flood embankments and tidal locking of outfalls to the river could prevent the drainage of groundwater flooding from affected areas.
Other sources of flooding	
Contextual commentary	Although no specific information is available, flooding of sewer networks may also occur in combination with other flooding mechanisms in this urban location.
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, which is suitable at this site, subject to application of Sequential and Exception Tests, and to the development of appropriate mitigation measures for the flood risks identified.
Sequential Test required?	Yes, to demonstrate no suitable sites at lower flood risk.
Exception Test required?	Yes, if housing development in areas of Flood Zone 3a within the site are proposed.

Flood Risk Management	
Policy recommendations for flood risk management	1) Adopt a sequential approach to site layout, ensuring housing and other sensitive aspects of infrastructure are located in areas of lowest risk within the site. Reserve higher risk areas for least flood vulnerable aspects of the development, such as car parking and public open space. 2) Finished floor levels of habitable areas to be in excess of 1:100 AEP plus climate change plus freeboard level. 3) Compensatory measures to be provided for any flood defence measures such as ground raising or new flood defences that have the potential to increase flood risk elsewhere. 4) Safe means of emergency access and egress during flooding to be demonstrated for all developed areas of the site.
Requirements for site-specific FRA	1) Design flood level for site to be defined using current climate change allowances (EA, 2017). 2) Impacts of any ground raising or new flood defences for this site and requirements for compensatory storage to determined. 3) Hazard associated with flooding of access and egress from the site to be determined, with site-specific mitigation measures in place, and considering current climate change allowances over the lifetime of the development. 4) Further site-specific evaluation of, and development of mitigation for other flood risks, including groundwater, surface water and sewer flooding.
Sustainable Drainage Systems	
Indicative SuDS suitability	Site within ESCC Drainage Risk Area 4. Very limited potential for use of either infiltration or attenuation SuDS as the whole of the site is in fluvial/tidal flood zone and is also probably at risk of groundwater flooding. Options to discharge to nearby ordinary watercourses associated with Papermill Cut should be investigated, but may prove problematic due to tide locking and high water levels in the floodplain during fluvial flood events. The most likely discharge route would be to the sewer network, which presumably already serves this brownfield site. Nevertheless, opportunities to reduce surface water runoff rates from the site should be sought through the integration of source control measures into the development, such as permeable paving and green roofs. Consultation with the LLFA and Southern Water should be made at the earliest opportunity to identify appropriate drainage measures, permitted rates and points of discharge and potential impact on the foul and surface water drainage issues.

Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) As a minimum, surface water discharge rates from the development should not exceed pre-development rates, and opportunities to reduce runoff rates overall should be sought.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, assessment of any potential ground contamination and further assessment of groundwater levels below site as appropriate. 2) If infiltration elements are appropriate, demonstrate that an appropriate level of water treatment is provided to protect groundwater quality. 3) Identify most appropriate route for surface water discharge from site and agree maximum discharge rates from the site with the LLFA or with Southern Water as appropriate to discharge route (watercourse or sewer). 4) Demonstrate that sufficient attenuation storage can be accommodated within the proposed site drainage system to meet maximum discharge rate restrictions, including taking into account fluvial flood or tide-locking effects in the case of direct discharge to ordinary watercourses in the River Ouse floodplain.

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information		
Site ID	PL1 (35)	
Site name	Land at the Lytchets garage site	
Area (ha)	0.05	
Allocation type	Housing	
Proposed no. of units	6	
Settlement	Lewes	
District	Lewes	
Lead Local Flood Authority	E. Sussex	
Plan	Lewes NDP	

Flood risk assessment			
Fluvial/tidal			
Watercourse	N/A	% site in Flood Zone 3a	0
% site in Flood Zone 1	100	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	N/A	Flood defence standard of protection (AEP)	N/A
Historical information	No Information		
Current max 1 in 100 AEP flood depth (m)	0	Future max 1 in 100 AEP flood depth (m)	0
Flood hazard in site	N/A		
Flood hazard to access	N/A		
Residual risk from defence failure	N/A		
Contextual commentary	Situated on a valley side slope outside of modelled fluvial and tidal flood extents. Low risk of fluvial or tidal flooding (Flood Zone 1).		
Surface Water			
% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	0
% site at low risk (1:1000 AEP)	1	% site with no mapped risk	99
Historical information	Wider Lewes area identified to be at risk of surface water flooding (Lewes draft SWMP)		
Flood hazard in site (1:100 AEP event)	N/A		
Flood hazard to access (1:100 AEP event)	Caution		
Contextual commentary	A very small (<1%) proportion of the site is mapped to be at risk of surface water flooding. The site access is within a surface water flow path and at risk from the 1:100 AEP event. Climate change may increase this risk over the lifetime of the development.		

Groundwater	
Source of risk	On chalk aquifer, but topographic context suggests little or no risk to site
Historical information	N/A
Extent and likelihood of risk to site	N/A
Extent and likelihood of risk to access	N/A
Contextual commentary	N/A
Other sources of flooding	
Contextual commentary	None identified.
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, and is appropriate for this site, subject to the development of appropriate mitigation measures for the flood risks identified.
Sequential Test required?	No
Exception Test required?	No
Flood Risk Management	
Policy recommendations for flood risk management	1) Housing to be located outside localised areas of potential surface water flood risk 2) Access to site and internal site access roads to be designed to be compatible with potential surface water flood risk.
Requirements for site-specific FRA	1) Further site-specific assessment of surface water flood risk, considering potential climate change impacts over the lifetime of the development.
Sustainable Drainage Systems	
Indicative SuDS suitability	Site located at foot of Malling hill with low risk of flooding from all sources. Site within ESCC Drainage Risk Area 1. Underlying chalk geology and slightly elevated location suggests some potential for infiltration, although this may be limited by the small site area. Nevertheless, source control measures should be used as appropriate and the extent of impermeable surfaces limited, with the aim of achieving a reduction in surface water discharge rates from the site. Discharge to the sewer network may be the only viable solution for disposal of surface runoff, as there are no watercourses in the vicinity of the site. Consultation with the LLFA and Southern Water should be made at the earliest opportunity to identify appropriate drainage measures, permitted rates and points of discharge and potential impact on the foul and surface water drainage issues.

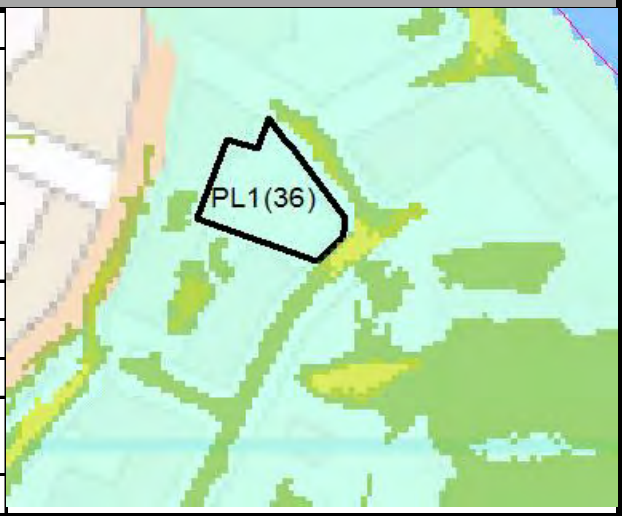
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) As a minimum, surface water discharge rates from the development should not exceed pre-development rates, and opportunities to reduce runoff rates overall should be sought.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, assessment of any potential ground contamination and further assessment of groundwater levels below site as appropriate. 2) If infiltration elements are appropriate, demonstrate that an appropriate level of water treatment is provided to protect groundwater quality. 3) Identify most appropriate route for surface water discharge from site and agree maximum discharge rates from the site with the LLFA or with Southern Water as appropriate to discharge route (watercourse or sewer). 4) Demonstrate that sufficient attenuation storage can be accommodated within the proposed site drainage system to meet maximum discharge rate restrictions.

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information

Site ID	PL1 (36)
Site name	Land at Magistrates Court Car Park, Court Road
Area (ha)	0.13
Allocation type	Housing
Proposed no. of units	9
Settlement	Lewes
District	Lewes
Lead Local Flood Authority	E. Sussex
Plan	Lewes NDP



Flood risk assessment

Fluvial/tidal

Watercourse	River Ouse	% site in Flood Zone 3a	0
% site in Flood Zone 1	0	% site in Flood Zone 3b	0
% site in Flood Zone 2	100	% site in area benefitting from defences	0
Flood defence type	None	Flood defence standard of protection (AEP)	N/A
Historical information	Historical mapping shows flooding has affected the site (dates unknown)		
Current max 1 in 100 AEP flood depth (m)	0	Future max 1 in 100 AEP flood depth (m)	0.13
Flood hazard in site	Very Low		
Flood hazard to access	Danger for most		
Residual risk from defence failure	Not applicable - standard of protection does not meet expected design standard for new development		
Contextual commentary	Allocation located 100m from the River Ouse, and completely within Flood Zone 2. EA Modelling suggests that the site is not currently at risk of flooding from the 1 in 100 fluvial flood event. However climate change increases the flood risk over the lifetime of the development, and model results suggest this is exacerbated by the presence of existing defences protecting other areas within the Lower River Ouse catchment (estimated water depths of 0.13 m for the defended 1 in 100 AEP +20% climate change event). The surrounding roads and perimeter of the allocation appear to be at risk from increased tidal levels due to climate change with an 0.01m depth of water at the site boundary for the tidal 1 in 200 AEP climate change to 2115 model scenario.		

Surface Water

% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	0

% site at low risk (1:1000 AEP)	0	% site with no mapped risk	100
Historical information	Wider Lewes area identified to be at risk of surface water flooding (Lewes draft SWMP)		
Flood hazard in site (1:100 AEP event)	N/A		
Flood hazard to access (1:100 AEP event)	Danger for Most		
Contextual commentary	The site is not mapped as being at risk of surface water flooding. However, the potential site access routes area at risk of surface water flooding. Climate change may increase this risk over the lifetime of the development.		
Groundwater			
Source of risk	Alluvial sediment overlying Chalk aquifer (White Chalk - Lewes Nodular Chalk Formation) in valley floor of R Ouse.		
Historical information	The draft Lewes Stage 1 SWMP identifies the Lewes town centre to be at risk from groundwater flooding, and that the water table is within 3m of the ground surface at the site.		
Extent and likelihood of risk to site	Groundwater emergence likely across the site.		
Extent and likelihood of risk to access	Access is adjacent to the site and a similar risk of groundwater emergence is present for access as for the site.		
Contextual commentary	Groundwater emergence is likely in floodplain of R Ouse, where water table is always close to the ground surface, and could rise above ground level during wet periods. The presence of flood embankments and tidal locking of outfalls to the river could prevent the drainage of groundwater flooding from affected areas.		
Other sources of flooding			
Contextual commentary	Although no specific information is available, flooding of sewer networks may also occur in combination with other flooding mechanisms in this urban location.		
Policy and recommendations			
Sequential and Exception Test Requirements			
Suitability for proposed development type	Housing is a More Vulnerable land use, and is appropriate for this site, subject to application of Sequential and Exception Tests, and development of appropriate mitigation measures for the flood risks identified.		
Sequential Test required?	Yes, to demonstrate no suitable sites in Flood Zones 1, or at lower flood risk in Flood Zone 2.		
Exception Test required?	No, not required for More Vulnerable developments in Flood Zone 2.		

Flood Risk Management	
Policy recommendations for flood risk management	1) Adopt a sequential approach to site layout, ensuring housing and other sensitive aspects of infrastructure are located in areas of lowest risk within the site. Reserve higher risk areas for least flood vulnerable aspects of the development, such as car parking and public open space. 2) Finished floor levels of habitable areas to be in excess of 1:100 AEP plus climate change plus freeboard level. 3) Compensatory measures to be provided for any flood defence measures such as ground raising or new flood defences that have the potential to increase flood risk elsewhere. 4) Safe means of emergency access and egress during flooding to be demonstrated for all developed areas of the site.
Requirements for site-specific FRA	1) Design flood level for site to be defined using current climate change allowances (EA, 2017). 2) Impacts of any ground raising or new flood defences for this site and requirements for compensatory storage to determined. 3) Hazard associated with flooding of access and egress from the site to be determined, with site-specific mitigation measures in place, and considering current climate change allowances over the lifetime of the development. 4) Further site-specific evaluation of, and development of mitigation for other flood risks, including groundwater, surface water and sewer flooding.
Sustainable Drainage Systems	
Indicative SuDS suitability	Site within ESCC Drainage Risk Area 44.Very limited potential for use of either infiltration or attenuation SuDS as the whole of the site is in fluvial/tidal flood zone and is also probably at risk of groundwater flooding. Furthermore, site area is very small, limiting space available for SuDS features. Nevertheless, source control measures should be used as appropriate and the extent of impermeable surfaces limited, with the aim of achieving a reduction in surface water discharge rates from the site. Given the urban setting of the site, discharge to the sewer network may be the only viable solution for disposal of surface runoff. Consultation with the LLFA and Southern Water should be made at the earliest opportunity to identify appropriate drainage measures, permitted rates and points of discharge and potential impact on the foul and surface water drainage issues.

Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) As a minimum, surface water discharge rates from the development should not exceed pre-development rates, and opportunities to reduce runoff rates overall should be sought.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, assessment of potential ground contamination, ground stability and groundwater levels below site as appropriate. 2) If infiltration elements are appropriate, demonstrate that an appropriate level of water treatment is provided to protect groundwater quality. 3) Identify most appropriate route for surface water discharge from site and agree maximum discharge rates from the site with the LLFA or with Southern Water as appropriate to discharge route (watercourse or sewer). 4) Demonstrate that sufficient attenuation storage can be accommodated within the proposed site drainage system to meet maximum discharge rate restrictions.

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information

Site ID	Pl1 (39)
Site name	Land at former petrol station, Malling Street
Area (ha)	0.046
Allocation type	Housing
Proposed no. of units	5
Settlement	Lewes
District	Lewes
Lead Local Flood Authority	E. Sussex
Plan	Lewes NDP

Flood risk assessment

Fluvial/tidal

Watercourse	River Ouse	% site in Flood Zone 3a	62
% site in Flood Zone 1	0	% site in Flood Zone 3b	0
% site in Flood Zone 2	38	% site in area benefitting from defences	61
Flood defence type	River bank/wall	Flood defence standard of protection (AEP)	1 in 200
Historical information	Historical mapping shows flooding has affected the site (dates unknown).		
Current max 1 in 100 AEP flood depth (m)	0	Future max 1 in 100 AEP flood depth (m)	0
Flood hazard in site	Very Low		
Flood hazard to access	Very Low		
Residual risk from defence failure	The site is approximately 450m from the defence at the closest point, where there is a depth of approximately 0.9m on the river side of the defence for the 1 in 100 AEP + 20% climate change fluvial event. Deeper water is associated (~1.7m; 1 in 100 AEP + CC) with the more northern extent of the defence , approximately 630m from the site. The danger to people associated with breach is 'Danger for Some' in both cases. The defence of this site is not shown to be overtopped by the 1 in 100 AEP + 20% climate change fluvial event or the 1 in 200 + 2115 AEP tidal event.		
Contextual commentary	Allocation situated 300m from the River Ouse and defended up to a 1 in 200 AEP event. No tidal risk is predicted for the allocation into the future form the available EA model. The undefended EA model scenarios show approximately 60% of the allocation would be affected by the 1 in 100 AEP fluvial event.		

Surface Water

% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	0

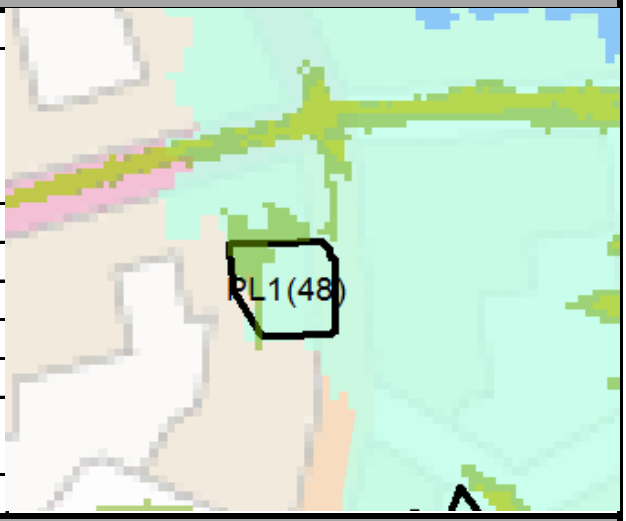
% site at low risk (1:1000 AEP)	0	% site with no mapped risk	100
Historical information	Wider Lewes area identified to be at risk of surface water flooding (Lewes draft SWMP)		
Flood hazard in site (1:100 AEP event)	N/A		
Flood hazard to access (1:100 AEP event)	N/A		
Contextual commentary	Site and access are not mapped as being at risk of surface water flooding. However, a significant proportion of the site falls within fluvial flood zone, which could pose drainage constraints. Climate change could result in an increased surface water flood risk over the lifetime of the development.		
Groundwater			
Source of risk	Alluvial sediment overlying Chalk aquifer (White Chalk - New Pit Chalk Formation) in valley floor of R Ouse. Site itself is free from superficial deposits but alluvium is present immediately to the north.		
Historical information	The draft Lewes Stage 1 SWMP identifies the Malling Brooks area to be at risk from groundwater flooding, and that the water table is within 3m of the ground surface at the site. In addition there is a record of groundwater flooding due to "elevated water table/River Ouse floodwaters flowing into property through airbricks" at a residential property at Malling Street in 2000.		
Extent and likelihood of risk to site	Groundwater emergence most likely from the alluvial deposits to the north, or associated with Chalk spring flows from the break in slope at the edge of the flood plain to the south.		
Extent and likelihood of risk to access	Access is adjacent to the site and a similar risk of groundwater emergence is present for access as for the site.		
Contextual commentary	Groundwater emergence is likely in floodplain of R Ouse, where water table is always close to the ground surface, and could rise above ground level during wet periods. The site is at the base of "The Combe", a dry Chalk valley to the east which will channel groundwater emergence in wet periods towards the site. The presence of flood embankments and tidal locking of outfalls to the river could prevent the drainage of groundwater flooding from affected areas.		
Other sources of flooding			
Contextual commentary	Although no specific information is available, flooding of sewer networks may also occur in combination with other flooding mechanisms in this urban location.		

Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, which is suitable at this site, subject to application of Sequential and Exception Tests, and to the development of appropriate mitigation measures for the flood risks identified.
Sequential Test required?	Yes, to demonstrate no suitable sites at lower flood risk.
Exception Test required?	Yes, if housing development in areas of Flood Zone 3a within the site are proposed.
Flood Risk Management	
Policy recommendations for flood risk management	1) Adopt a sequential approach to site layout, ensuring housing and other sensitive aspects of infrastructure are located in areas of lowest risk within the site. Reserve higher risk areas for least flood vulnerable aspects of the development, such as car parking and public open space. 2) Finished floor levels of habitable areas to be in excess of 1:100 AEP plus climate change plus freeboard level. 3) Compensatory measures to be provided for any flood defence measures such as ground raising or new flood defences that have the potential to increase flood risk elsewhere. 4) Safe means of emergency access and egress during flooding to be demonstrated for all developed areas of the site.
Requirements for site-specific FRA	1) Design flood level for site to be defined using current climate change allowances (EA, 2017). 2) Impacts of any ground raising or new flood defences for this site and requirements for compensatory storage to determined. 3) Hazard associated with flooding of access and egress from the site to be determined, with site-specific mitigation measures in place, and considering current climate change allowances over the lifetime of the development. 4) Further site-specific evaluation of, and development of mitigation for other flood risks, including groundwater, surface water and sewer flooding.

Sustainable Drainage Systems	
Indicative SuDS suitability	Site within ESCC Drainage Risk Area 4. Very limited potential for use of either infiltration or attenuation SuDS as the whole of the site is in fluvial/tidal flood zone and is also probably at risk of groundwater flooding. Furthermore, site area is very small, limiting space available for SuDS features. Nevertheless, source control measures should be used as appropriate and the extent of impermeable surfaces limited, with the aim of achieving a reduction in surface water discharge rates from the site. Given the urban setting of the site, discharge to the sewer network may be the only viable solution for disposal of surface runoff. Consultation with the LLFA and Southern Water should be made at the earliest opportunity to identify appropriate drainage measures, permitted rates and points of discharge and potential impact on the foul and surface water drainage issues.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) As a minimum, surface water discharge rates from the development should not exceed pre-development rates, and opportunities to reduce runoff rates overall should be sought.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, assessment of potential ground contamination, ground stability and groundwater levels below site as appropriate. 2) If infiltration elements are appropriate, demonstrate that an appropriate level of water treatment is provided to protect groundwater quality. 3) Identify most appropriate route for surface water discharge from site and agree maximum discharge rates from the site with the LLFA or with Southern Water as appropriate to discharge route (watercourse or sewer). 4) Demonstrate that sufficient attenuation storage can be accommodated within the proposed site drainage system to meet maximum discharge rate restrictions.

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information			
Site ID	PL1 (48)		
Site name	Land at former Ambulance Headquarters, Friars Walk		
Area (ha)	0.074		
Allocation type	Housing		
Proposed no. of units	18		
Settlement	Lewes		
District	Lewes		
Lead Local Flood Authority	E. Sussex		
Plan	Lewes NDP		
Flood risk assessment			
Fluvial/tidal			
Watercourse	River Ouse	% site in Flood Zone 3a	0
% site in Flood Zone 1	8	% site in Flood Zone 3b	0
% site in Flood Zone 2	92	% site in area benefitting from defences	0
Flood defence type	None	Flood defence standard of protection (AEP)	N/A
Historical information	Historical flood mapping shows the site has been flooded (dates unknown).		
Current max 1 in 100 AEP flood depth (m)	0	Future max 1 in 100 AEP flood depth (m)	0.07
Flood hazard in site	Very Low		
Flood hazard to access	Very Low		
Residual risk from defence failure	Not applicable - standard of protection does not meet expected design standard for new development		
Contextual commentary	The site is situated 110m from the River Ouse. EA modelling indicates the allocation is at a dis-benefit due to flood defences elsewhere in Lewes. The defended 1 in 100 AEP + 20% CC event show some flooding possible to the northern boundary. No tidal risk shown for the site.		
Surface Water			
% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	0
% site at low risk (1:1000 AEP)	20	% site with no mapped risk	80
Historical information	Wider Lewes area identified to be at risk of surface water flooding		
Flood hazard in site (1:100 AEP event)	N/A		
Flood hazard to access (1:100 AEP event)	Caution		

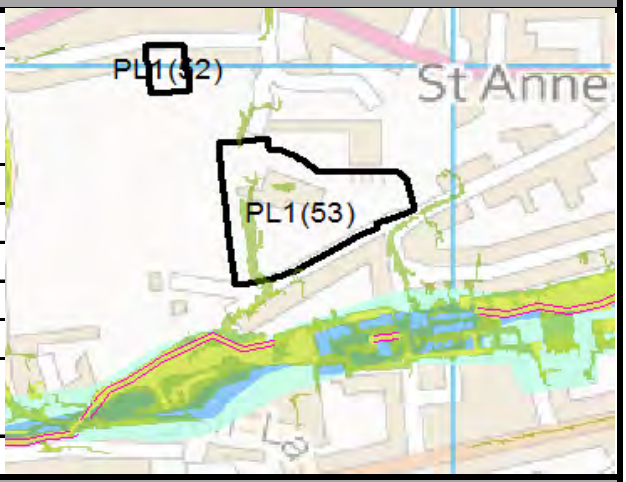
Contextual commentary	One fifth of the site is mapped as being at low (1:1000 AEP) risk of surface water flooding, with the remainder not a risk. The site access may also be at surface water flood risk. Climate change could increase this risk over the lifetime of the development.
Groundwater	
Source of risk	Alluvial sediment overlying Chalk aquifer (White Chalk- Lewes Nodular Chalk Formation) in valley floor.
Historical information	The draft Lewes Stage 1 SWMP identifies the Lewes town centre to be at risk from groundwater flooding, and that the water table is between 3m and 5m below the ground surface at the site.
Extent and likelihood of risk to site	Groundwater emergence possible across the site.
Extent and likelihood of risk to access	Access is adjacent to the site and a similar risk of groundwater emergence is present for access as for the site.
Contextual commentary	Groundwater emergence is likely in floodplain of R Ouse, where water table is always close to the ground surface, and could rise above ground level during wet periods. The site is free from alluvial deposits, but they are present immediately to the east as the site is situated on the edge of the R Ouse flood plain. The presence of flood embankments and tidal locking of outfalls to the river could prevent the drainage of groundwater flooding from affected areas.
Other sources of flooding	
Contextual commentary	Although no specific information is available, flooding of sewer networks may also occur in combination with other flooding mechanisms in this urban location.
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, and is appropriate for this site, subject to application of Sequential and Exception Tests, and development of appropriate mitigation measures for the flood risks identified.
Sequential Test required?	Yes, to demonstrate no suitable sites in Flood Zones 1, or at lower flood risk in Flood Zone 2.
Exception Test required?	No, not required for More Vulnerable developments in Flood Zone 2.

Flood Risk Management	
Policy recommendations for flood risk management	1) Adopt a sequential approach to site layout, ensuring housing and other sensitive aspects of infrastructure are located in areas of lowest risk within the site. Reserve higher risk areas for least flood vulnerable aspects of the development, such as car parking and public open space. 2) Finished floor levels of habitable areas to be in excess of 1:100 AEP plus climate change plus freeboard level. 3) Compensatory measures to be provided for any flood defence measures such as ground raising or new flood defences that have the potential to increase flood risk elsewhere. 4) Safe means of emergency access and egress during flooding to be demonstrated for all developed areas of the site.
Requirements for site-specific FRA	1) Design flood level for site to be defined using current climate change allowances (EA, 2017). 2) Impacts of any ground raising or new flood defences for this site and requirements for compensatory storage to determined. 3) Hazard associated with flooding of access and egress from the site to be determined, with site-specific mitigation measures in place, and considering current climate change allowances over the lifetime of the development. 4) Further site-specific evaluation of, and development of mitigation for other flood risks, including groundwater, surface water and sewer flooding.
Sustainable Drainage Systems	
Indicative SuDS suitability	Site within ESCC Drainage Risk Area 4. Very limited potential for use of either infiltration or attenuation SuDS as the whole of the site is in fluvial/tidal flood zone and is also probably at risk of groundwater flooding. Furthermore, site area is very small, limiting space available for SuDS features. Nevertheless, source control measures should be used as appropriate and the extent of impermeable surfaces limited, with the aim of achieving a reduction in surface water discharge rates from the site. Given the urban setting of the site, discharge to the sewer network may be the only viable solution for disposal of surface runoff. Consultation with the LLFA and Southern Water should be made at the earliest opportunity to identify appropriate drainage measures, permitted rates and points of discharge and potential impact on the foul and surface water drainage issues.

Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) As a minimum, surface water discharge rates from the development should not exceed pre-development rates, and opportunities to reduce runoff rates overall should be sought.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, assessment of potential ground contamination, ground stability and groundwater levels below site as appropriate. 2) If infiltration elements are appropriate, demonstrate that an appropriate level of water treatment is provided to protect groundwater quality. 3) Identify most appropriate route for surface water discharge from site and agree maximum discharge rates from the site with the LLFA or with Southern Water as appropriate to discharge route (watercourse or sewer). 4) Demonstrate that sufficient attenuation storage can be accommodated within the proposed site drainage system to meet maximum discharge rate restrictions.

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information			
Site ID	PL1 (53)		
Site name	Former St Anne's School Site		
Area (ha)	1.68		
Allocation type	Housing		
Proposed no. of units	26		
Settlement	Lewes		
District	Lewes		
Lead Local Flood Authority	E. Sussex		
Plan	Lewes NDP		
Flood risk assessment			
Fluvial/tidal			
Watercourse	Winterbourne Stream, a tributary of the River Ouse	% site in Flood Zone 3a	0
% site in Flood Zone 1	100	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	None	Flood defence standard of protection (AEP)	N/A
Historical information	No information provided to indicate previous fluvial/tidal flooding.		
Current max 1 in 100 AEP flood depth (m)	0	Future max 1 in 100 AEP flood depth (m)	0
Flood hazard in site	N/A		
Flood hazard to access	N/A		
Residual risk from defence failure	N/A		
Contextual commentary	Allocation located approximately 55m from the Winterbourne Stream. Allocation wholly within FZ1.		
Surface Water			
% site at high risk (1:30 AEP)	0	% site at medium risk (1:100 AEP)	0
% site at low risk (1:1000 AEP)	7	% site with no mapped risk	93
Historical information	Wider Lewes area identified to be at risk of surface water flooding (Lewes draft SWMP)		
Flood hazard in site (1:100 AEP event)	N/A		
Flood hazard to access (1:100 AEP event)	Danger for Some		

Contextual commentary	Most of site is not mapped as being at risk of surface water flooding, but there does appear to be a surface runoff pathway in the west of the site, which could become active for low likelihood events (1:1000 AEP). The potential site access is also at low risk of surface water flooding. Climate change may increase this risk over the lifetime of the development.
Groundwater	
Source of risk	Chalk aquifer (White Chalk - Seaford Chalk Formation) on valley side of the Lewes Winterbourne.
Historical information	None.
Extent and likelihood of risk to site	Groundwater emergence possible within the site, particularly associated with topographical hollows.
Extent and likelihood of risk to access	The Lewes Winterbourne flows alongside the access road to the south of the site, and may be prone to groundwater flooding from the Winterbourne during wet periods.
Contextual commentary	The site is situated on the valley side of the Lewes Winterbourne. While most groundwater emergence will occur in the base of the valley, spring flow may also occur on the valley sides in particularly wet periods. Mapped surface water flow pathways and topographical hollows within the site may be a location where shallow groundwater flow converges and emergence occurs.
Other sources of flooding	
Contextual commentary	Although no specific information is available, flooding of sewer networks may also occur in combination with other flooding mechanisms in this urban location.
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, and is appropriate for this site, subject to the development of appropriate mitigation measures for the flood risks identified.
Sequential Test required?	No
Exception Test required?	No
Flood Risk Management	
Policy recommendations for flood risk management	1) Housing to be located outside localised areas of potential surface water or groundwater flood risk 2) Access to site and internal site access roads to be designed to be compatible with potential surface water or groundwater flood risk.
Requirements for site-specific FRA	1) Further site-specific assessment of surface water and groundwater flood risk, considering potential climate change impacts over the lifetime of the development.

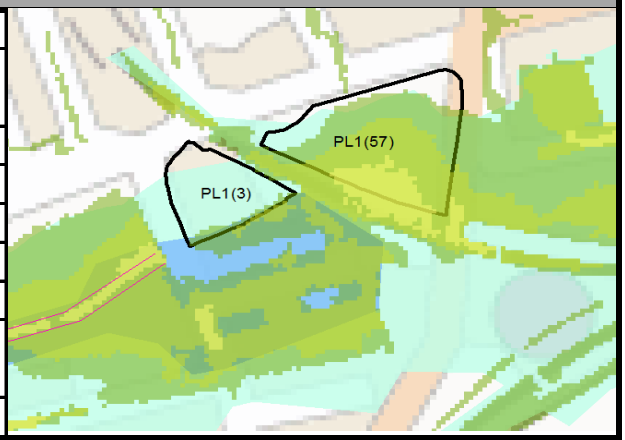
Sustainable Drainage Systems	
Indicative SuDS suitability	Site within ESCC Drainage Risk Area 1. Underlying chalk geology and relatively elevated position on valley side suggests infiltration SuDS may be suitable for most of site, but the potential for groundwater emergence in the lowermost areas should be investigated further to confirm this. As a minimum, source control should be incorporated into the development and hard surfaces minimised in order to reduce runoff rates from previously developed areas of the site. A lack of surface watercourses in the vicinity suggests that surface water discharge from the site, if required, would need to be via the sewer network. Consultation with the LLFA and Southern Water should be made at the earliest opportunity to identify appropriate drainage measures, permitted rates and points of discharge and potential impact on the foul and surface water drainage issues.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, assessment of potential ground contamination, ground stability and groundwater levels below site as appropriate. 2) If infiltration elements are appropriate, demonstrate that an appropriate level of water treatment is provided to protect groundwater quality. 3) Identify most appropriate route for surface water discharge from site and agree maximum discharge rates from the site with the LLFA or with Southern Water as appropriate to discharge route (watercourse or sewer). 4) Demonstrate that sufficient attenuation storage can be accommodated within the proposed site drainage system to meet maximum discharge rate restrictions.

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information

Site ID	PL1 (57)
Site name	Lewes railway station car park
Area (ha)	0.36
Allocation type	Housing
Proposed no. of units	20
Settlement	Lewes
District	Lewes
Lead Local Flood Authority	E. Sussex
Plan	Lewes NDP



Flood risk assessment

Fluvial/tidal

Watercourse	Winterbourne Stream and River Ouse	% site in Flood Zone 3a	0
% site in Flood Zone 1	17	% site in Flood Zone 3b	0
% site in Flood Zone 2	83	% site in area benefitting from defences	0
Flood defence type	N/A	Flood defence standard of protection (AEP)	N/A
Historical information	Historical flood mapping shows the site has been flooded (dates unknown).		
Current max 1 in 100 AEP flood depth (m)	0	Future max 1 in 100 AEP flood depth (m)	0.68
Flood hazard in site	Danger for most		
Flood hazard to access	Very Low		
Residual risk from defence failure	Not applicable - standard of protection does not meet expected design standard for new development		
Contextual commentary	There is no tidal risk to the site. EA modelling indicates that climate change will increase the fluvial flood risk to the site for the 1:100 AEP event and that this is exacerbated by the presence of flood defences protecting other parts of Lewes with the defended 1 in 100 AEP +20% climate change modelled event flooding to a maximum depth 0.68m whilst the undefended 1 in 100 AEP +20% climate change scenario does not cause any flooding. The Winterbourne Stream appears to run in a culvert either beneath, or close to this site.		

Surface Water

% site at high risk (1:30 AEP)	13	% site at medium risk (1:100 AEP)	35
% site at low risk (1:1000 AEP)	30	% site with no mapped risk	22

Historical information	Wider Lewes area identified to be at risk of surface water flooding (Lewes draft SWMP)
Flood hazard in site (1:100 AEP event)	Danger for Most
Flood hazard to access (1:100 AEP event)	Danger for Most
Contextual commentary	The majority of the site is mapped as being at risk of surface water flooding from all AEP events. The potential site access is also at risk of surface water flooding. Climate change may increase this risk over the lifetime of the development.
Groundwater	
Source of risk	Alluvial sediment overlying Chalk aquifer (White Chalk - Lewes Nodular Chalk Formation) in valley floor of the Lewes Winterbourne.
Historical information	The EA South East Flood Risk Management Plan describes the Lewes Winterbourne as an ephemeral chalk stream, subject to monitoring and flood alert warnings by the EA. The draft Lewes Stage 1 SWMP identifies the Southover area to be at risk from groundwater flooding, and that the water table is 3m to 5m below the ground surface at the site.
Extent and likelihood of risk to site	Groundwater emergence possible across the site, associated with alluvial deposits.
Extent and likelihood of risk to access	Access is adjacent to the site and a similar risk of groundwater emergence is present for access as for the site.
Contextual commentary	Groundwater emergence is associated with the Lewes Winterbourne. During wet periods the water table in the Chalk will rise and emerge along the winterbourne. The Winterbourne appears to be culverted adjacent to the site, but alluvial deposits (which are likely to be in hydraulic connection with the Chalk), may facilitate emergence of groundwater within the site. The presence of flood embankments along parts of the Winterbourne could prevent the drainage of groundwater flooding from affected areas.
Other sources of flooding	
Contextual commentary	Possible residual risks of flooding in event of blockage of Winterbourne Stream culverts, and backing up of sewer network during high flows.
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, and is appropriate for this site, subject to application of Sequential and Exception Tests, and development of appropriate mitigation measures for the flood risks identified.
Sequential Test required?	Yes, to demonstrate no suitable sites in Flood Zones 1, or at lower flood risk in Flood Zone 2.

Exception Test required?	No, not required for More Vulnerable developments in Flood Zone 2.
Flood Risk Management	
Policy recommendations for flood risk management	1) Adopt a sequential approach to site layout, ensuring housing and other sensitive aspects of infrastructure are located in areas of lowest risk within the site. Reserve higher risk areas for least flood vulnerable aspects of the development, such as car parking and public open space. 2) Finished floor levels of habitable areas to be in excess of 1:100 AEP plus climate change plus freeboard level. 3) Compensatory measures to be provided for any flood defence measures such as ground raising or new flood defences that have the potential to increase flood risk elsewhere. 4) Safe means of emergency access and egress during flooding to be demonstrated for all developed areas of the site.
Requirements for site-specific FRA	1) Site-specific hydraulic modelling needs to explicitly include the flood risk posed by the Winterbourne Stream, including the possible residual risk associated with culvert blockage, and the implications of the dis-benefit from flood defences elsewhere in Lewes. It should also be considered whether the de-culverting of the Winterbourne Stream in and around the site would be an effective flood risk reduction measure. 2) Design flood level for site to be defined using current climate change allowances (EA, 2017). 3) The effects of any new flood defences or ground raising needs to be evaluated, and compensatory storage provided as appropriate.

Sustainable Drainage Systems	
Indicative SuDS suitability	Site within ESCC Drainage Risk Area 1. Relatively low-lying site in floodplain and with a high likelihood of groundwater flooding. High groundwater tables are known to inhibit use of SuDS in Lewes due to potential for groundwater ingress. Subsidence is also a known issue, within the wider area, and specifically in the floodplain of Winterbourne Stream. Furthermore, Lewes is designated as a groundwater source protection zone and therefore infiltration measures would require an appropriate level of water treatment. Use of infiltration SuDS may therefore not be appropriate at this site. Attenuation SuDS with discharge to the adjacent Winterbourne Stream may be a viable option, although fluvial flood risk to the site and the blocking of discharge during fluvial flood conditions could be an issue. Discharge to the public sewer network should only be considered as a last resort, but may be the only viable option. As a minimum, rates of surface water discharge should not be increased above current rates, and opportunities for betterment should be sought through the implementation of source control measures such as permeable paving and green roofs. Consultation with the LLFA and Southern Water should be made at the earliest opportunity to identify appropriate drainage measures, permitted rates and points of discharge and potential impact on the foul and surface water drainage issues.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) As a minimum, surface water discharge rates from the development should not exceed pre-development rates, and opportunities to reduce runoff rates overall should be sought.

Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, assessment of any potential ground contamination and further assessment of groundwater levels below site. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site outside of areas at risk of fluvial flooding and identify most appropriate route for discharge from site. 3) Agree maximum discharge rates from the site with the LLFA for the Winterbourne Stream, or with Southern Water if discharge to the sewer network is the only viable option. 4) If infiltration SuDS are viable, agree any requirements for ground remediation for contaminated areas, or water treatment for infiltration SuDS with the EA to protect groundwater quality in the underlying chalk aquifer.

South Downs National Park Level 2 SFRA

Flood Risk Information Sheet

General information		
Site ID	Twyford_NDP_26	
Site name	Land at Hazeley Road	
Area (ha)	0.63	
Allocation type	Housing	
Proposed no. of units	20	
Settlement	Twyford	
District	City of Winchester	
Lead Local Flood Authority	Hampshire	
Plan	Twyford NDP	

Flood risk assessment			
Fluvial/tidal			
Watercourse	River Itchen	% site in Flood Zone 3a	0
% site in Flood Zone 1	100	% site in Flood Zone 3b	0
% site in Flood Zone 2	0	% site in area benefitting from defences	0
Flood defence type	N/A	Flood defence standard of protection (AEP)	N/A
Historical information	N/A		
Current max 1 in 100 AEP flood depth (m)	N/A	Future max 1 in 100 AEP flood depth (m)	N/A
Flood hazard in site	N/A		
Flood hazard to access	N/A		
Residual risk from defence failure	N/A		
Contextual commentary	Over 100 m from FZ2. Climate change will not increase the fluvial/tidal flood risk at this site.		
Surface Water			
% site at high risk (1:30 AEP)	2	% site at medium risk (1:100 AEP)	3
% site at low risk (1:1000 AEP)	4	% site with no mapped risk	91
Historical information	Hampshire County Council has advised that the area is historically prone to flooding from both surface water and groundwater sources.		
Flood hazard in site (1:100 AEP event)	Danger for Some		
Flood hazard to access (1:100 AEP event)	Danger for Some		

Contextual commentary	Site situated on hillside and is flanked by overland flow paths to the north west along Searles Hill and to the south east along Hazeley Road. The Hazeley Road flow pathway appears to coincide with a well defined dry valley feature/winterbourne. The site itself is largely at a low risk of flooding, with overlapping areas of low, medium and high risk within its south eastern extent. Access to either Searles Hill or Hazeley Road is also at risk of flooding. Climate change may increase this risk over the lifetime of the development.
Groundwater	
Source of risk	Chalk aquifer (White Chalk - Seaford Chalk Formation) and overlying head deposits, dry valley feature.
Historical information	The Twyford Parish Council Community Emergency Plan (2013) describes how the winterbourne forms in the fields of Hazeley Farm (approx. 2km to the east of the site), then extends westwards towards the River Itchen (this may take several days). Springs also form in the lower end of Hazeley Road.
Extent and likelihood of risk to site	Groundwater emergence most likely in the lowest, southernmost part of site, closest to the axis of the dry valley.
Extent and likelihood of risk to access	Access road to south (Hazeley Road) runs close to the axis of the dry valley and may be prone to groundwater emergence.
Contextual commentary	Groundwater emergence is most likely at the southernmost low point of the site, along the base of the dry valley (coincides with the mapped surface water flow pathway), where the water table could rise above ground level during wet periods.
Other sources of flooding	
Contextual commentary	Culverted winterbourne passes below Finches Road to the southwest of the site. Based on assessment of OS and aerial mapping, appears to follow the road to the west before discharging into the River Itchen. Residual risk of flooding in the event of blockage, with potential to prohibit site access.
Policy and recommendations	
Sequential and Exception Test Requirements	
Suitability for proposed development type	Housing is a More Vulnerable land use, and is appropriate for this site, subject to the development of appropriate mitigation measures for the flood risks identified.
Sequential Test required?	No
Exception Test required?	No
Flood Risk Management	

Policy recommendations for flood risk management	1) Housing to be located outside localised areas of potential surface water or groundwater flood risk 2) Access to site and internal site access roads to be designed to avoid potential surface water and groundwater flood risk if possible, or to incorporate mitigation measures . 3) Developer to investigate potential to allocate partnership funding/resources towards flood risk mitigation projects within the wider catchment (especially downstream of the site) .
Requirements for site-specific FRA	1) Further site-specific assessment of surface water and groundwater flood risk, considering potential climate change impacts over the lifetime of the development. This should include the potential for surface water run-on from off-site.

Sustainable Drainage Systems	
Indicative SuDS suitability	Underlying Chalk geology suggests infiltration SuDS should be suitable for most of site, but the potential for groundwater emergence in the lowermost areas should be investigated further to confirm this. If an element of attenuation SuDS is required, storage volumes should be sized in order to account for any surface water run-on to the site. A lack of surface watercourses in the vicinity suggests that discharge from the site, if required, would need to be via the sewer network.
Policy recommendations for SuDS	1) Drainage for the proposed development should incorporate sustainable drainage elements that are appropriate for site characteristics. 2) Minimise impermeable areas on site; use permeable surfaces and soft landscaping where possible to maximise infiltration and minimise surface water run-off. 3) Surface water discharge rates from the development should not exceed pre-development rates.
Requirements for site-specific FRA	1) Confirm suitability or otherwise for infiltration SuDS through infiltration testing, and further assessment of groundwater levels below site. 2) If required, demonstrate sufficient attenuation storage can be accommodated within the site, taking into account potential surface water and groundwater flood risk. 3) If required, identify most appropriate route for discharge from site 4) Agree maximum discharge rates from site with the LLFA or Southern Water, as appropriate to discharge route (ordinary watercourse or sewer).