Nuneaton and Bedworth Borough Council Strategic Flood Risk Assessment - Level 2

FINAL REPORT

December 2012

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Revision History

Revision Ref / Date Issued	Amendments	Issued to
Draft version 1.0		• Gemma Yardley (Nuneaton and Bedworth Borough Council) • Darren Henry (Nuneaton and Bedworth Borough Council) • Becky Clarke (Environment Agency)
Final version 1.0	Amendments based on EA and Nuneaton and Bedworth Borough Council comments	• Gemma Yardley (Nuneaton and Bedworth Borough Council) • Darren Henry (Nuneaton and Bedworth Borough Council)
Final version 1.0	Minor adjustments to Appendix A and Appendix D based on Nuneaton and Bedworth Borough Council comments	• Gemma Yardley (Nuneaton and Bedworth Borough Council) • Darren Henry (Nuneaton and Bedworth Borough Council)

Contract

This report describes work commissioned by Nuneaton and Bedworth Borough Council. Nuneaton and Bedworth Borough Council's representative for the contract was Darren Henry. Claire Gardner, Andrew Waite and David Kearney of JBA Consulting carried out this work.

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Purpose

This document has been prepared as a Final Report for Nuneaton and Bedworth Borough Council. JBA Consulting accepts no responsibility or liability for any use that is made of this

document other than by the Client for the purposes for which it was originally commissioned and prepared.

The modelling undertaken for the SFRA is of a strategic nature and more detailed FRAs should seek to refine the understanding of flood risk from all sources to any particular site.

JBA Consulting has no liability regarding the use of this report except to Nuneaton and Bedworth Borough Council.

Acknowledgements

JBA would like to acknowledge the support of Gemma Yardley and Darren Henry of Nuneaton and Bedworth Borough Council and Chris Clarke and Becky Clarke of the Environment Agency.

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Executive Summary

Nuneaton and Bedworth Borough Council is required to undertake a Level 2 Strategic Flood Risk Assessment (SFRA) as an essential part of the evidence gathering stage of the Local Plan and Local Development Plan Documents (LDPDs). The SFRA provides baseline information for use in the preparation of the Sustainability Appraisal (SA).

The requirement for the preparation of SFRAs is outlined in the National Planning Policy Framework (NPPF) and Technical Guidance. This requires Local Planning Authorities (LPAs) to take a lead role in local flood risk and development planning. This is needed in order to demonstrate that sufficient consideration has been given to flood risk at all stages of the planning process. The objective is to avoid inappropriate development in higher risk areas.

The SFRA constitutes one of a number of planning tools that enables the Local Authorities to select and develop sustainable site allocations away from areas of greatest vulnerability of flooding in the Nuneaton and Bedworth Borough. The assessment includes allocations sites that are proposed for the Borough Plan.

The report discusses the flood risk within Nuneaton and Bedworth Borough as a whole, allowing informed decisions to be taken when allocating future development sites, and sets out the procedure to be followed when assessing sites in the future. The SFRA will form part of the evidence base used to inform the Borough Plan and assist the authority to make the spatial planning decisions required.

Changes to high level planning, policy and guidance since the Level 1 SFRA have been identified and taken into account in preparing this SFRA.

A review of existing information and execution of additional flood modelling work has identified the level of flood risk in the Nuneaton and Bedworth Borough from fluvial and other sources. An assessment of the impact of climate change on flood risk in the catchment has also been assessed. A review of flood defence and flood risk management measures has also been undertaken, including an assessment of residual and future risk.

Canal breach assessment has been undertaken for proposed development sites where the canal flows through, or bounds, the site. Breach extent, depth, hazard and velocity mapping has been provided with the report. In addition the residual risk from Seeswood Pool reservoir has been considered.

The Flood Map for Surface Water has been used in this SFRA to determine the level of risk from surface water. This is consistent with the Locally Agreed Surface Water Information defined in the Warwickshire Preliminary Flood Risk Assessment. In addition critical drainage areas have been identified and Green Infrastructure assessed.

Maps and GIS layers have been provided with the report showing the extents of Flood Zones 2, 3a and 3b, and the effects of climate change on the extent of Flood Zone 3a.

An overview of flood risk within the Borough has been undertaken, allowing the Council to apply the Sequential Test. This SFRA provides advice on any site-specific requirements for a flood risk assessment, and advises the Council on the use of the Exception Test should the Sequential Test be passed.

In addition, concise outline information has been included that describes the requirements for developers preparing Flood Risk Assessments, with supporting guidance on reducing flood risk and making development safe, including Sustainable Urban Drainage Systems (SUDS) and flood mitigation measures. Advice is also given on environmental improvement opportunities and other issues to consider as part of a development proposal.

Recommendations

- It is recommended that the mapping produced for the Level 2 SFRA is used in preference to the Level 1 SFRA when identifying flood risk within the Nuneaton and Bedworth Borough.
- It is recommended that developers refer to the FRA recommendations provided in the proposed development site summary tables in Section 7.3 as well as the general guidance on flood risk assessment in Section 11.

The key requirements for future development are summarised below:

- All sites within Zones 2 and 3 will require a detailed Flood Risk Assessment in accordance with NPPF, making reference to Sections 7.3 and 11, and associated maps of this report. Consultation with the Environment Agency is strongly recommended at an early stage in the FRA process.
- The layout of buildings and access routes should adopt a sequential approach, steering buildings (and hence people) towards areas of lowest risk within the boundaries of the site. This will also ensure that the risk of flooding is not worsened by, for example, blocked flood flow routes.
- The FRA requirements defined in Section 11 of this Level 2 SFRA must be considered for all future development brought forward.

- Investigation of further flood defence measures within the Borough is recommended as part of the LLFA' Local Flood Risk Management Strategy. Suggested measures for investigation include storage or wetland areas upstream on the Wem or Bar Pool Brooks.
- Any development adjacent to the canals should take account of residual risk from breach or failure and it is recommended the development incorporates a buffer zone next to the canal to allow access for maintenance and repair, should it be required.
- Any development downstream of Seeswood Pool, shown to be at risk on the EA's reservoir flood map, should take account of this residual risk and consider using the areas of the sites potentially affected by reservoir failure as public open space.
- Where critical structures/features have been identified it is recommended the council investigate ownership of these structures/features, and undertake further assessment where required, to determine whether designation of the structure/feature is needed.
- Nuneaton and Bedworth Borough Council, the Environment Agency, Severn Trent Water and Warwickshire County Council should work closely together, using the Critical Drainage Area outputs from the SFRA as a starting point, to identify any requirement for, potential locations of, and priorities for SWMPs . They should identify particular hotspots where surface water solutions can be identified or more detailed modelling is needed.
- The evidence base provided in the Level 2 SFRA should be used to enhance the Nuneaton and Bedworth Green Infrastructure Plan[1]. River corridors identified as functional floodplains are an excellent linkage of GI and can provide storage during a flood event. Areas identified within the urban environment or upstream of a critical surface water flood area should be incorporated into council GI strategies. Opening up land to create flow paths or flood storage areas can help protect current and future property.
- The Level SFRA is a living document and should be periodically updated when new information on flood risk, flood warning or new planning guidance or legislation becomes available.

Use of SFRA Data

Whilst all data used in the preparation of this SFRA has been supplied to the LPA (including, for example, reports, mapping, GIS and modelled data) there is a need to maintain controls over the data and how it is applied and modified. It is anticipated that the SFRA and associated maps will be published on the Council's website as PDFs. As the central source of SFRA data, these maps will be available to download.

The LPA will be able to use the modelled output (depths, hazards and outlines) for internal use. The use of this information must consider the context within which it was produced. The use of this data will fall under the license agreement between the LPA and the Environment Agency as it has been produced using Environment Agency data. It should be remembered that the modelling undertaken for the SFRA is of a strategic nature and more detailed FRAs should seek to refine the understanding of flood risk from all sources to any particular site.

SFRA data should not be passed on to third parties outside of the LPA. Any third party wishing to use existing Environment Agency flood risk datasets should contact External Relations in the Environment Agency Midlands Region.

[1] Nuneaton and Bedworth Green Infrastructure Plan: Final Report (Nuneaton and Bedworth Borough Council, 2009)

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Abbreviations and Glossary of Terms

Term	Definition
1D model	One-dimensional hydraulic model
2D model	Two-dimensional hydraulic model
AEP	Annual Exceedance Probability
CC	Climate change- Long term variations in global temperature and weather patterns caused by natural and human actions.
CDA	Critical Drainage Area - A discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather thereby affecting people, property or local infrastructure.
CFMP	Catchment Flood Management Plan- A high-level planning strategy through which the Environment Agency works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
CIRIA	Construction Industry Research and Information Association
Cumecs	The cumec is a measure of flow rate. One cumec is shorthand for cubic metre per second; also m^3/s ($m^3s{-}1$).
Defra	Department for Environment, Food and Rural Affairs
DEM	Digital Elevation Model
Designated Feature	A form of legal protection or status reserved for certain key structures or features that are privately owned and maintained, but which make a contribution to the flood or coastal erosion risk management of people and property at a particular location.
DG5 Register	A water-company held register of properties which have experienced sewer flooding due to hydraulic overload, or properties which are 'at risk' of sewer flooding more frequently than once in 20 years.
DPD	Development Plan Documents
DTM	Digital Terrain Model
EA	Environment Agency
EU	European Union
FEH	Flood Estimation Handbook
FMfSW	Flood Map for Surface Water
Flood defence	Infrastructure used to protect an area against floods as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Flood Risk Area	An area determined as having a significant risk of flooding in accordance with guidance published by Defra and WAG (Welsh Assembly Government).
Flood Risk Regulations	Transposition of the EU Floods Directive into UK law. The EU Floods Directive is a piece of European Community (EC) legislation to specifically address flood risk by prescribing a common framework for its measurement and management.
Floods and Water Management Act	Part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which is to clarify the legislative framework for managing surface water flood risk in England.
Fluvial Flooding	Flooding resulting from water levels exceeding the bank level of a main river
FRA	Flood Risk Assessment - A site specific assessment of all forms of flood risk to the site and the impact of development of the site to flood risk in the area.
FRM	Flood Risk Management
FZ	Flood Zones
GI	Green Infrastructure – a network of natural environmental components and green spaces that intersperse and connect the urban centres, suburbs and urban fringe
Ha	Hectare
HOST	A delineation of UK soil types according to their hydrological properties to produce the 29-class Hydrology of Soil Types (HOST) classification. It is available as a 1km grid.
IDB	Internal Drainage Board

JBA	Jeremy Benn Associates
LDDs	Local Development Documents
LDF	Local Development Framework
LFRMS	Local Food Risk Management Strategy
LIDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority - Local Authority responsible for taking the lead on local flood risk management
LPA	Local Planning Authority
mAOD	metres Above Ordnance Datum
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers
NBBC	Nuneaton and Bedworth Borough Council
NFCDD	National Flood and Coastal Defence Database
NPPF	National Planning Policy Framework
NRD	National Receptor Dataset – a collection of risk receptors produced by the Environment Agency
Ordinary Watercourse	All watercourses that are not designated Main River. Local Authorities or, where they exist, IDBs have similar permissive powers as the Environment Agency in relation to flood defence work. However, the riparian owner has the responsibility of maintenance.
OS NGR	Ordnance Survey National Grid Reference
PFRA	Preliminary Flood Risk Assessment
Pitt Review	Comprehensive independent review of the 2007 summer floods by Sir Michael Pitt, which provided recommendations to improve flood risk management in England.
PPG	Planning Policy Guidance – superseded by the NPPF
PPS25	Planning and Policy Statement 25: Development and Flood Risk
ReFH	Revitalised Flood Hydrograph
Resilience Measures	Measures designed to reduce the impact of water that enters property and businesses; could include measures such as raising electrical appliances.
Resistance Measures	Measures designed to keep flood water out of properties and businesses; could include flood guards for example.
Risk	In flood risk management, risk is defined as a product of the probability or likelihood of a flood occurring, and the consequence of the flood.
Return Period	Is an estimate of the interval of time between events of a certain intensity or size, in this instance it refers to flood events. It is a statistical measurement denoting the average recurrence interval over an extended period of time.
SAB	SUDS Approval Body - responsible for approving, adopting and maintaining drainage plans and SUDS schemes that meet the National Standards
Sewer flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
SHLAA	Strategic Housing Land Availability Assessment - The Strategic Housing Land Availability Assessment (SHLAA) is a technical piece of evidence to support the Core Strategy and Sites & Policies Development Plan Documents (DPDs). Its purpose is to demonstrate that there is a supply of housing land in the District which is suitable and deliverable.
SFRA	Strategic Flood Risk Assessment
Stakeholder	A person or organisation affected by the problem or solution, or interested in the problem or solution. They can be individuals or organisations, includes the public and communities.
SPRHOST	Standard Percentage Runoff (%) associated with each HOST soil class
SUDS	Sustainable Drainage Systems - Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques
Surface water flooding	Flooding as a result of surface water runoff as a result of high intensity rainfall when water is ponding or flowing over the ground surface before it enters the underground drainage network or watercourse, or cannot enter it because the network is full to capacity, thus causing what is known as pluvial flooding.
SWMP	Surface Water Management Plan - The SWMP plan should outline the preferred surface water management strategy and identify the actions, timescales and responsibilities of each partner. It is the principal output from the SWMP study.
WFD	Water Framework Directive

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1 Introduction

1.1 About this report

Nuneaton and Bedworth Borough Council's Level 2 Strategic Flood Risk Assessment (SFRA) report compliments the supporting document "Strategic Flood Risk Assessment for Local Development Framework Level 1, January 2008". This Level 2 SFRA has been prepared to build on the work that was included in the Level 1 SFRA and provide appropriate supporting evidence for the Nuneaton and Bedworth Borough Plan.

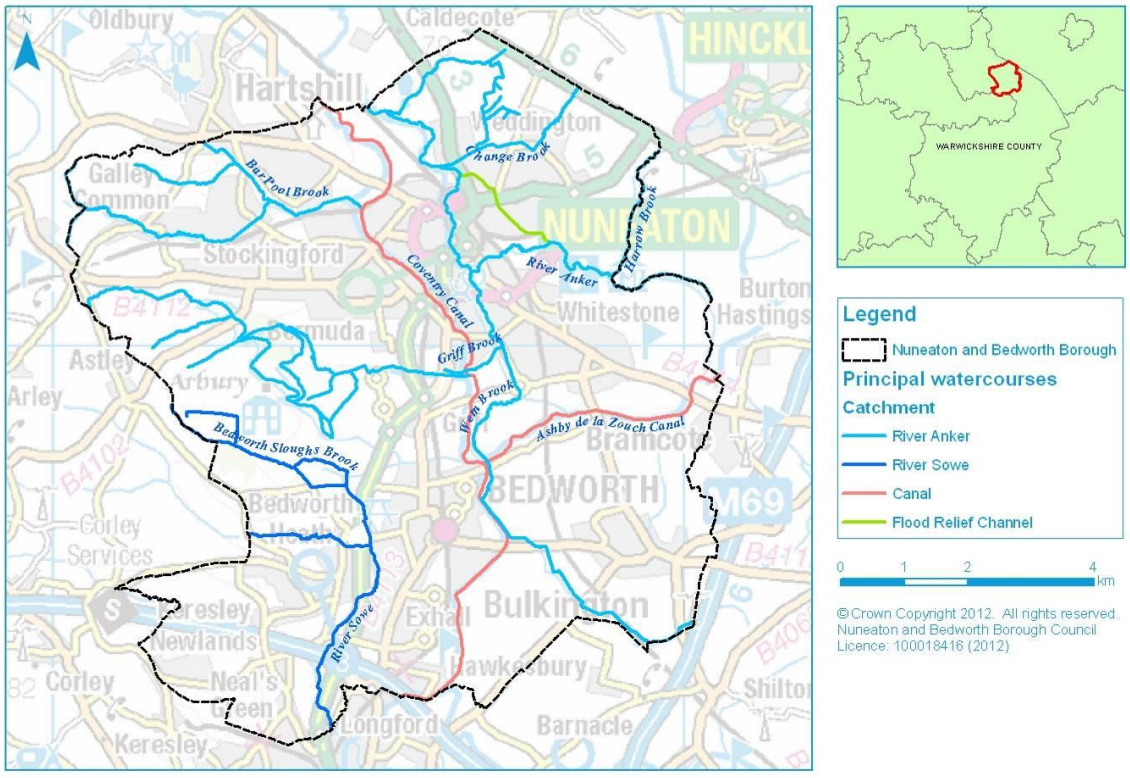
In particular Nuneaton and Bedworth Borough Council have identified that the Level 2 SFRA should provide a detailed assessment of the following areas, taking into consideration the Council's future growth and the onset of climate change.

- Provide a detailed assessment of the flood hazard within the flood zone
- Provide information on existing defences and flood risk management measures
- Provide information on breaching and overtopping of flood defences

This document has been prepared under the requirements of the National Planning Policy Framework (NPPF) and accompanying Technical Guidance to the National Planning Policy Framework published in March 2012.

The extent of the study area, including the principal watercourses, is shown in Figure 1-1.

Figure 1-1: Study extent



1.2 SFRA objectives

The SFRA will form an integral part of the Council's evidence base in terms of identifying locations for development and preparation of flood risk policies in the Local Development Framework. The primary objective of the SFRA is to be part of the evidence base supporting the Borough Plan to inform Core Strategy allocations so they are in accordance with the NPPF[2].

[2] National Planning Policy Framework (Department for Communities and Local Government, March 2012)

In order to achieve this, the Technical Guidance[3] states that SFRAs need to provide sufficient detail on all types of flood risk to enable the Local Planning Authority (LPA) to:

- Apply the Sequential and, where necessary, Exception Tests in determining land use allocations
- Refine information on the areas that may flood, taking into account other sources of flooding and the impacts of climate change;
- Inform the Sustainability Appraisal of local development documents
- Prepare appropriate policies for flood risk management for these areas
- Identify the level of detail required for site-specific flood risk assessments
- Determine the acceptability of flood risk in relation to emergency planning capability.

The SFRA should also

- Identify strategic measures (if required) that are needed to support new development
- Influence and provide evidence that assists when making decisions on windfall planning applications.

1.3 SFRA user guide

Table 1-1 summarises the contents of this report.

Table 1-1: SFRA Report Contents

Section	Contents
1. Introduction	Provides a background to the study, defines objectives, outlines the approach adopted and the consultation performed
2 The Planning Framework and Flood Risk Policy	Provides details on recent changes to planning and flood risk policies.
3. Understanding flood risk in Nuneaton and Bedworth	Gives an introduction to the assessment of flood risk and provides an overview of the characteristics of flooding affecting the Nuneaton and Bedworth area. Provides a summary of responses that can be made to flood risk, together with policy and institutional issues that should be considered.
4. How Flood Risk is Assessed	Provides an overview of flooding and risk and flood zones
5. Mapping and Risk-based Approach	Summary of the modelling used for the assessment. Description of mapping that should be used for Sequential and Exception testing. Application of the Sequential Approach and Sequential/Exception Test process.
6. Overview of future development	Summarises the development proposals for the Nuneaton and Bedworth area
7. Summary assessment of proposed development sites	Summary of risk to site allocations proposed in the Borough Plan. Tabulated information and maps summarising risks to site allocations located within Flood Zones, including specific requirements for FRAs.
8. Flood risk from canals	Summarises main flood risk from canals, assessment methodology and canal breach flood risk to proposed development sites, where applicable.

[3] Technical Guidance to the National Planning Policy Framework (Department for Communities and Local Government, March 2012)

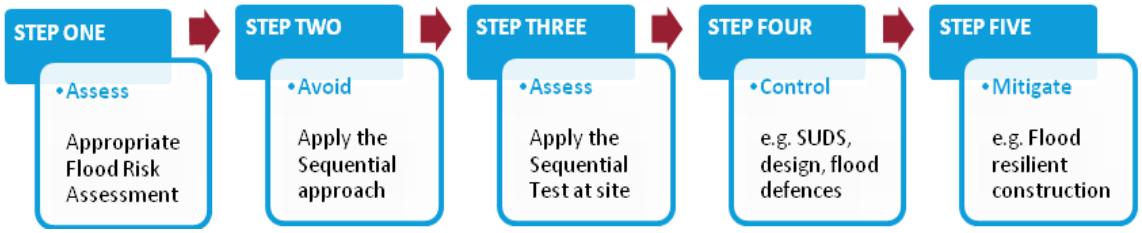
Section	Contents
9. Flood defences and "critical structures"	Assessment of residual risk from flood defences, including future protection from climate change. Identification of possible 'designated features' that affect flood risk.
10. Critical Drainage Areas and Green Infrastructure	Identification of Critical Drainage Areas (CDAs) which, if developed, may significantly increase flood risk downstream or to the wider community.
11. FRA requirements	Identifies the scope of the assessments that must be submitted in FRAs supporting applications for new development.
12. Summary and recommendations	Reviews Level 2 SFRA and its implications.

1.4 Approach

1.4.1 General Assessment of Flood Risk

The NPPF Technical Guidance retains key elements of Planning Policy Statement 25. The SFRA adopts the flood risk management hierarchy originally laid out in the PPS25 Practice Guide summarised in Figure 1-2.

Figure 1-2: Flood Risk Management Hierarchy



Based on flood risk management hierarchy outlines in PPS25 Practice Guide[4]

This hierarchy underpins the risk based approach and must be the basis for making all decisions involving development and flood risk. When using the hierarchy, account should be taken of:

- The nature of the flood risk (the ***source*** of the flooding)
- The spatial distribution of the flood risk (the ***pathways*** and areas affected by flooding)
- Climate change impacts, and
- The degree of vulnerability of different types of development (the ***receptors***)

Site allocations should reflect the application of the Sequential Test using the maps produced for this Level 2 SFRA. The information in this SFRA should be used as evidence and, where necessary, reference should also be made to relevant evidence in the documents described in Section 5.2 of this chapter. The Flood Zone maps and flood risk information on other sources of flooding contained in this SFRA should be used where appropriate to apply the Sequential Test.

Where other sustainability criteria outweigh flood risk issues, the decision making process should be transparent. Information from this SFRA should be used to justify decisions to allocate land in areas at high risk of flooding. This report contains information on the level of flood hazard at the allocated sites proposed by Nuneaton and Bedworth Borough Council within the Core Strategy.

1.4.2 Technical Assessment of Flood Hazards

Flood risk within the Nuneaton and Bedworth Borough has been assessed by using and enhancing computer models supplied by the Environment Agency, existing Environment Agency Flood Zone mapping, and additional modelling undertaken as part of this SFRA. In particular:

- The River Anker hydraulic model, supplied by the Environment Agency, has been run for a suite of return periods to improve understanding of flood risk along the River Anker.

[4] Planning Policy Statement 25: Development and Flood Risk Practice Guide (Department for Communities and Local Government, December 2009)

- Modelled outlines using Jflow+ have been developed to determine Flood Zone 3a, Flood Zone 3b and Flood Zone 2 for the following watercourses
    - Change Brook
    - Un-named drains flowing into Seeswood Pool
    - Un-named drains at Arbury Park and Dennis Farm
    - Un-named drains at Arbury Mill Farm and Griff Lodge
    - Un-named drain to the north of Nuneaton, flowing from the A5 south west to join the Anker downstream of Weddington.
    - Un-named drain flowing southwards joining the Change Brook at Glenfield Avenue, Weddington
    - Un-named drain joining Bedworth Sloughs Brook downstream of Bedworth Sloughs
- The Flood Map for Surface Water (FMfSW) has been used to assess the level of risk from surface water

1.4.3 Scope of Assessment

Paragraph 7 of the Technical Guidance to the NPPF advises:

"Initially the Strategic Flood Risk Assessment will be used to refine information on the areas that may flood, taking into account other sources of flooding and impacts of climate change, in addition to the information in the flood map. These should form the basis for preparing appropriate policies for flood risk management for these areas. The Strategic Flood Risk Assessment should be used to inform the sustainability appraisal of local development documents, and will provide the basis from which to apply the Sequential Test and Exception Test in the development allocation and development control process."

A Level 1 SFRA was completed in January 2008, comprising of a desk-based study using existing information to allow application of the Sequential Test and identify whether application of the Exception Test is likely to be necessary. Nuneaton and Bedworth Borough Council has undertaken an initial Sequential Test to identify sites with medium and high flood risk.

To progress with or discount these sites, it is necessary to undertake an increased level of assessment throughout the study area. This Level 2 SFRA has been prepared to satisfy the requirements of Paragraph 8 of the Technical Guidance that states:

"Where local planning authorities have been unable to allocate all proposed development and infrastructure in accordance with the Sequential Test, taking account of the flood vulnerability category of the intended use, it will be necessary to increase the scope of the Strategic Flood Risk Assessment to provide the information necessary for application of the Exception test...The increased scope of the SFRA will enable the production of mapping showing flood outlines for different probabilities, impact, speed of onset, depth and velocity variance of flooding, taking account of the presence and likely performance of flood risk management infrastructure."

1.5 Consultation

The following parties (external to Nuneaton and Bedworth Borough Council) have been consulted during the preparation of this version of the SFRA:

- The Environment Agency
- Severn Trent Water

Warwickshire County Council has also provided data for use in this study.

2 The Planning Framework and Flood Risk Policy

2.1 Introduction

The over arching aim of planning policy on development and flood risk is to ensure that flood risk is taken into account at all stages of the planning process. The purpose of this section of the report is to highlight the main changes to the planning framework and flood risk responsibilities since the Level 1 SFRA was published in 2008. These changes have been taken into account in preparing this Level 2 SFRA.

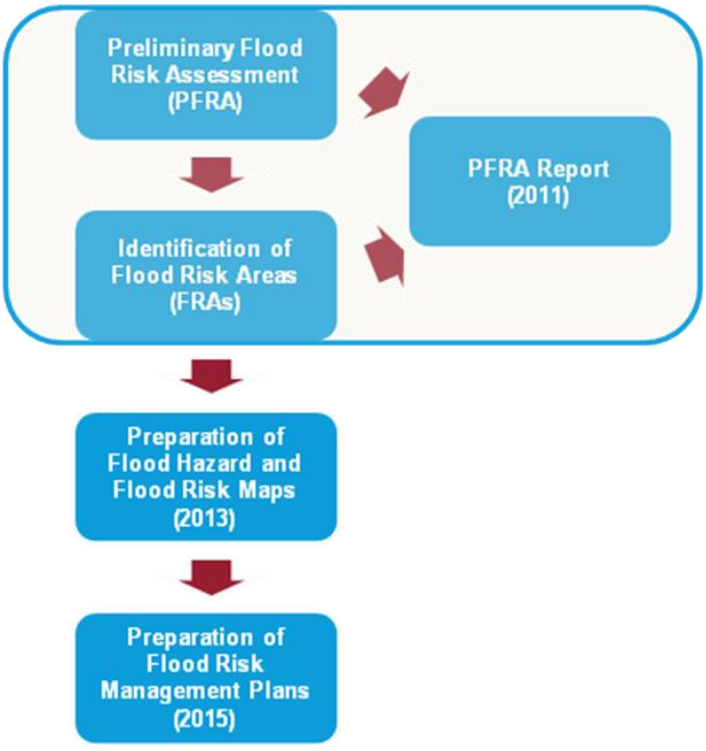
2.2 Flood Risk Regulations (2009) and Flood and Water Management Act (2010)

2.2.1 Background

The Flood Risk Regulations transpose the EU "Floods Directive" into UK law and place responsibility upon all Lead Local Flood Authorities (LLFAs) to manage local flood risk. Under the Regulations the Environment Agency is responsible for flooding from rivers, the sea and reservoirs with Lead Local Flood Authorities (in this instance Warwickshire County Council) being responsible for local and all other sources of flooding.

Figure 2-1 sets out the requirements and timescales for implementing the requirements of the Directive.

Figure 2-1: Flood Risk Regulation Requirements



Lead Local Flood Authorities prepared the PFRA reports in accordance with the regulations and Warwickshire County Council has published the document that covers the local authority area. With respect to local flood risk there are no areas of significant flood risk in the county (flood risk areas), as determined for the purpose of preparing the PFRA and there is no need to prepare hazard maps, risk maps and local flood risk management plans.

The Environment Agency did not prepare a PFRA as they exercised an 'exception' that was permitted under the Regulations. Having exercised this exception the Environment Agency will now have to prepare Flood Hazard and Flood Risk Maps and Flood Risk Management Plans for rivers, the sea and reservoirs and issued a consultation document on the approach to this in August 2012 (return of consultation comments by the end of October 2012).

The Flood and Water Management Act (FWMA) received Royal Assent in April 2010. The FWMA aims to create a simpler and more effective means of managing the risk of flood and coastal erosion and implements Sir Michael Pitt's recommendations following his review of the 2007 floods.

The FWMA also calls for the establishment of a SUDS Approving Body (SAB) to be set up in county, county borough or unitary local authorities. This requires SAB approval of drainage systems for new and redeveloped sites to be obtained before construction can commence. Additionally the proposed drainage system must meet the new National Standards for design, construction, operation and maintenance. The SAB will be responsible for approving, adopting and maintaining drainage plans and SUDS schemes that meet the National Standards. The responsibilities of the SAB are likely to rest with the LLFA (in this case, Warwickshire County Council), although there is flexibility in the FWMA if it considered more effective for another body to take on the role.

2.2.2 Warwickshire Preliminary Flood Risk Assessment

In the first instance, the regulations required Warwickshire County Council (as the LLFA) to prepare and publish a Preliminary Flood Risk Assessment (PFRA) on past and future flood risk from local sources of flooding. The Regulations also require the LLFA to identify significant Flood Risk Areas. The PFRA reports on significant past and future flooding from all sources except Main River and Reservoir (covered by Environment Agency) and sub-standard performance of the adopted sewer network (under the remit of Severn Trent Water).

Key outputs of the Warwickshire PFRA include[5]:

- Six past flooding events in Warwickshire were noted as having significant harmful consequences:
  - January 1992 (flooding known to have occurred in Nuneaton)
  - Easter 1998
  - August 1999
  - June 2005
  - Summer 2007
  - December 2008 (flooding known to have occurred in Bedworth)
- No Indicative Flood Risk Areas (IFRAs) were identified, although proximity to the West Midlands IFRA has been recognised.
- Flood risk 'clusters' affecting Nuneaton, Rugby and Leamington Spa were recognised, although these did meet the IFRA criteria of a population greater than 30,000 at risk of flooding.

2.3 Localism Act

The Localism Act was given Royal Assent on 15 November 2011 with the purpose of moving the balance of decision making from central government back to councils, communities and individuals.

Additionally Provision 110 of the Act places a duty to cooperate on local authorities in relation to planning of sustainable development. This duty to cooperate requires local authorities to "engage constructively, actively and on an ongoing basis in any process by means of which development plan documents are prepared so far as relating to a strategic matter"[6].

The Localism Act also provides new rights to allow local communities to shape new development by coming together to prepare neighbourhood plans. This means local people can decide where new homes and businesses should go and what they should look like. Local planning authorities will be required to provide technical advice and support as neighbourhoods draw up their proposals.

[5] Warwickshire Preliminary Flood Risk Assessment (Warwickshire County Council, May 2011)

[6] Localism Act 2011: Section 110. http://www.legislation.gov.uk/ukpga/2011/20/section/110

2.4 National Planning Policy Framework

The National Planning Policy Framework (NPPF) was issued on 27th March 2012 to replace the previous documentation, as part of reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. It replaces most of the Planning Policy Guidance Notes (PPGs) and Planning Policy Statements (PPSs).

The NPPF is guidance for local planning authorities to help them prepare Local Plans. Paragraph 100 of the NPPF states "Local Plans should be supported by a strategic flood risk assessment and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as Lead Local Flood Authorities and Internal Drainage Boards. Local Plans should apply a sequential, risk-based approach to the location of development to avoid, where possible, flood risk to people and property and manage any residual risk, taking account of the impacts of climate change"[2].

Technical guidance on flood risk has been published alongside the NPPF and sets out how the policy should be implemented, although it is stated that this is an interim measure.

Whilst the NPPF concentrates on high level national policy and avoids prescriptive guidance, Environment Agency guidance published in May 2012 states the PPS25 Practice Guide is still extant[7] (it has been assumed that this Environment Agency statement on policy is appropriate).

2.5 Water Cycle Strategy

A Water Cycle Strategy (WCS) for the Nuneaton and Bedworth Borough was completed in 2010[8]. As part of the Water Cycle Strategy, assessment was made of Severn Trent Water's infrastructure to identify any need for extra capacity and where surface water connections to existing infrastructure are appropriate. If new development was implemented so that there were separate pipe systems to convey surface and foul flows respectively this would have implications for flood risk management strategies and could be used as a means of reducing sewer flooding.

New homes require the provision of clean water, safe disposal of wastewater and protection from flooding. A large number of homes may cause existing infrastructure to be overwhelmed and can adversely affect the environment. Climate change brings with it new challenges such as increased rainfall that can put greater pressure on the existing infrastructure; planning for water has to take this into account.

The WCS aims to assist local authorities to select and develop sustainable development allocations where there is minimal impact on the environment, water quality, water resources, infrastructure, and flood risk. This can be achieved by identifying areas where there may be conflict between any proposed new development and the requirements and capacity of the environment and using this information to select potential solutions.

Nuneaton and Bedworth Borough Council are continuing to consult with Severn Trent Water to identify appropriate infrastructure requirements.

2.6 Surface Water Management Plans

Surface Water Management Plans (SWMPs) outline the preferred surface water management strategy in a given location and are undertaken, when required, by LLFAs in consultation with key local partners who are responsible for surface water management and drainage in their area. SWMPs establish a long-term action plan to manage surface water in an area and should influence future capital investment, drainage maintenance, public engagement and understanding, land-use planning, emergency planning and future developments. There are currently no published SWMPs for the Nuneaton and Bedworth Borough area.

As part of the Level 2 SFRA, an assessment has been prepared to identify Critical Drainage Areas (CDAs). The CDAs can provide a good indication of areas that, if developed, may significantly increase flood risk downstream or to the wider community by the generation of

[7] Quick Guide 364_12: National Planning Policy Framework – Flood and Coastal Change Risk Management (Environment Agency, 2012)

[8] Warwickshire sub-regional Water Cycle Study: Nuneaton and Bedworth Borough Council Final Report (Halcrow Group Ltd, March 2010)

increased surface runoff. The identification of CDAs will aid the development of SWMPs by highlighting areas with surface water sewer flooding issues.

2.7 Association of British Insurers: Guidance on Insurance and Planning in Flood Risk Areas for Local Planning Authorities in England

The Association of British Insurers (ABI) and the National Flood Forum have published guidance for local authorities on planning in flood risk areas. The guidance aims to help local authorities in England when producing local plans and dealing with planning applications in flood risk areas. The guidance complements the National Planning Policy Framework. The key recommendations from the guidance are[9]:

- Ensure strong relationships with technical experts on flood risk
- Consider flooding from all sources, taking account of climate change
- Take potential impacts on drainage infrastructure seriously
- Ensure that flood risk is mitigated to acceptable levels for proposed developments
- Make sure Local Plans take account of all relevant costs and are regularly reviewed

2.8 Implications for Nuneaton and Bedworth

The new and emerging responsibilities under the Flood and Water Management Act and the Flood Risk Regulations are summarised in Table 2-1.

Table 2-1: Roles and Responsibilities in Warwickshire

Risk Management Authority (RMA)	Strategic Level	Operational Level
Environment Agency	National Statutory Strategy Reporting and supervision (overview role)	Main rivers, reservoirs • Preliminary Flood Risk Assessment (per River Basin District)[1] • Identify Significant Flood Risk Area[1] • Flood Risk and Hazard Maps[2] • Flood Risk Management Plan[3] Enforcement authority for Reservoirs Act 1975
Lead Local Flood Authority (Warwickshire County Council)	Input to national strategy. Formulate and implement local flood risk management strategy.	Surface water, groundwater, other sources of flooding • Prepare and publish a PFRA • Identify Flood Risk Areas[4] • Prepare Flood Hazard and Flood Risk Maps[4] • Prepare Flood Risk Management Plans[4] SUDS Approval Body
Borough Councils (Nuneaton and Bedworth Borough Council)	Input to National and Local Authority Plans and Strategy (e.g. Local Development Framework Documents) • Nuneaton and Bedworth Borough Plan	• Ordinary watercourse

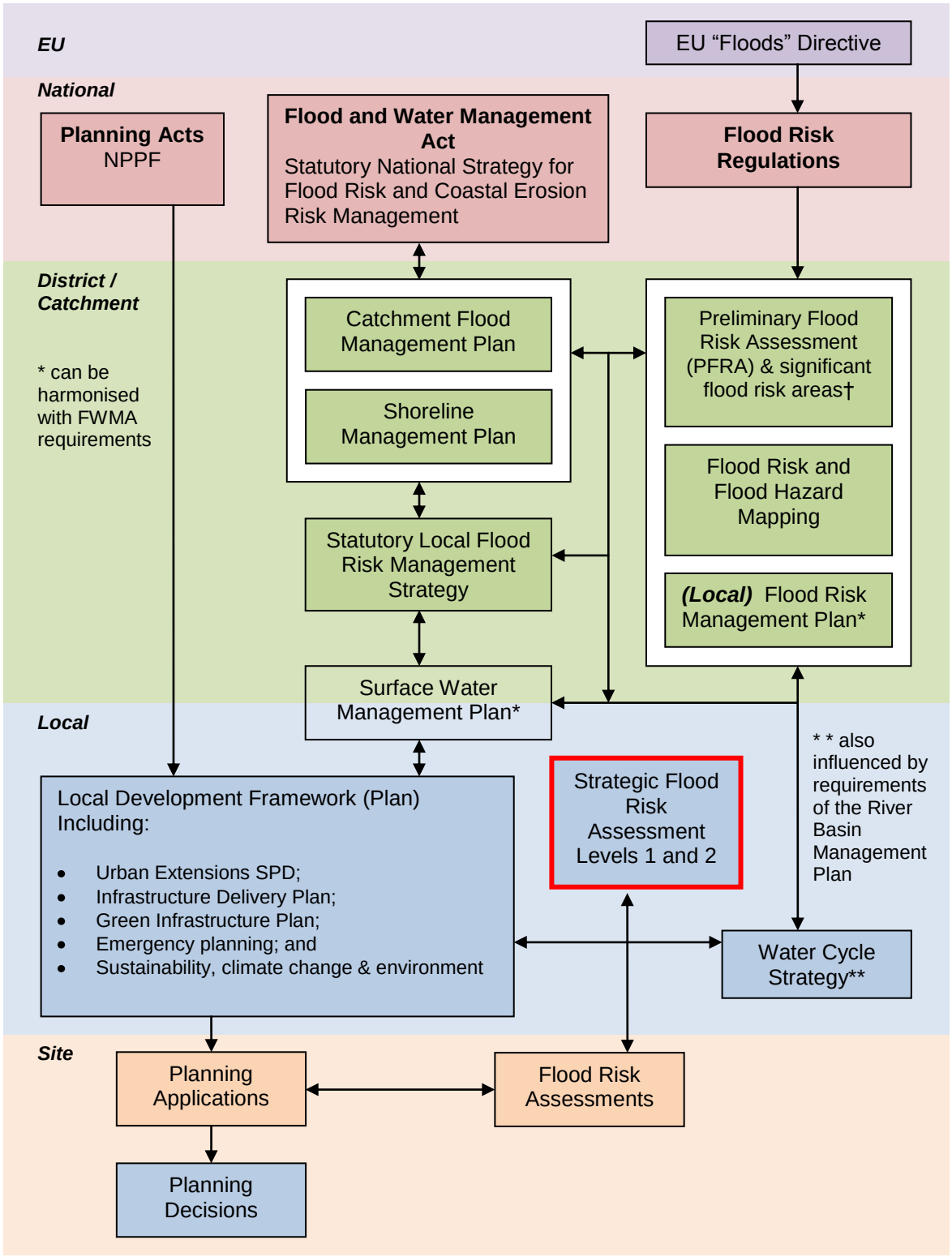
1 – Environment Agency did not prepare a PFRA; instead they submitted an exception permitted under the Regulations
2 – Environment Agency will be preparing flood risk and hazard maps by 2013
3 – Environment Agency consulting on scope of Flood Risk Management Plans from August to October 2012
4 – Since the level of risk in NBBC is below the threshold for an area of significant flood risk (flood risk area) then there is no requirement to prepare flood hazard and flood risk maps and a flood risk management plan

[9] Guidance on Insurance and Planning in Flood Risk Areas for Local Planning Authorities in England (Association of British Insurers and National Flood Forum, April 2012)

F**igure 2-2** shows the key strategic planning links for flood risk and associated documents. It shows how the Flood Risk Regulations and Flood and Water Management Act, in conjunction with the Localism Act's "duty to cooperate", introduce a wider requirement for the exchange of information and the preparation of strategies and management plans.

SFRAs contain information that should be referred to in responding to the Flood Risk Regulations and the formulation of local flood risk management strategies and plans. SFRAs are also linked to the preparation of Catchment Flood Management Plans (CFMPs), Shoreline Management Plans (SMPs) and Surface Water management plans (SWMPs) and water cycle strategies.

Figure 2-2: Strategic Planning Links and Key Documents for Flood Risk



Legend: Responsibilities are indicated using colour coding as follows

European Union	National Government	Local Planning Authority	EA/LLFA/Maritime Local Authorities	Developer

† See Table 2-1 for roles and responsibilities for preparation of information

3 Understanding flood risk in Nuneaton and Bedworth

3.1 Historic flooding

The Level 1 Nuneaton and Bedworth SFRA published in 2008 included an assessment of historic flooding in the county. To summarise, it describes how there have been a number of large scale flood events, most notably October 1998, autumn 2000, February 2002, New Year 2003, February 2004 and in the summer of 2007. Major flooding occurred in 1968, after which a flood relief channel was constructed to protect the town.[10] Since the publication of the Level 1 SFRA, there has also been flooding in Bedworth in December 2008.

As described in section 2.2, Warwickshire County Council was required to assess past flooding as part of the Warwickshire PFRA. As part of this assessment information was gathered from a number of sources including:

- Parish Councils
- Key interviews
- Strategic Flood Risk Assessments
- Partner organisations (including, the Environment Agency, British Waterways and Severn Trent Water.

3.2 Topography, geology, soils and hydrology

The Nuneaton and Bedworth Borough encompasses an area of 78.9 km^2. For the purposes of this SFRA, the borough can be separated into two catchments, the River Anker and the River Sowe.

3.2.1 River Anker catchment

Topography and geology

The topography of the borough is comprised of higher elevations and steeper slopes in the west. In the north and east there are gradual changes in elevation, whilst the elevation in the centre of Nuneaton is lower and less steep[10].

The geology of a catchment can be an important influencing factor on the way that a catchment responds to rainfall due to variations in permeability of the strata. According to the Level 1 SFRA, the River Anker catchment is represented by major geological periods from the Pre-Cambrian to the younger Triassic period. The catchment is dominated by clay based soils that have lower permeability.

Soils

The Level 1 SFRA identifies that the catchment is mainly composed of loamy and clay soil types. This type of soil can have slow permeability and is seasonal wet, with a tendency to become waterlogged in the winter months. Although the main geology is moderately permeable, the drainage is impeded by the underlining loamy clay soils, resulting in a lowering of permeability. This coupled with high rainfall events could lead to increases in surface runoff. In particular the north and east of the Borough are effect by the clay soils.

Hydrology

The River Trent CFMP[11] indicates that the River Anker catchment is approximately 415km^2 in its entirety and is one of eight major tributaries of the River Trent. The river rises near Nuneaton and flows in a north western direction to Tamworth running in parallel with the Coventry Canal. The river drains the Charnwood area that encompasses Hinckley and Coalville as well as Nuneaton along it route.

[10] Nuneaton and Bedworth Borough Council Strategic Flood Risk Assessment Level 1 (Halcrow Group Ltd, January 2008)

[11] River Trent Catchment Flood Management Plan (Environment Agency, December 2010)

There are a number of smaller watercourses that join the River Anker in the Borough including:

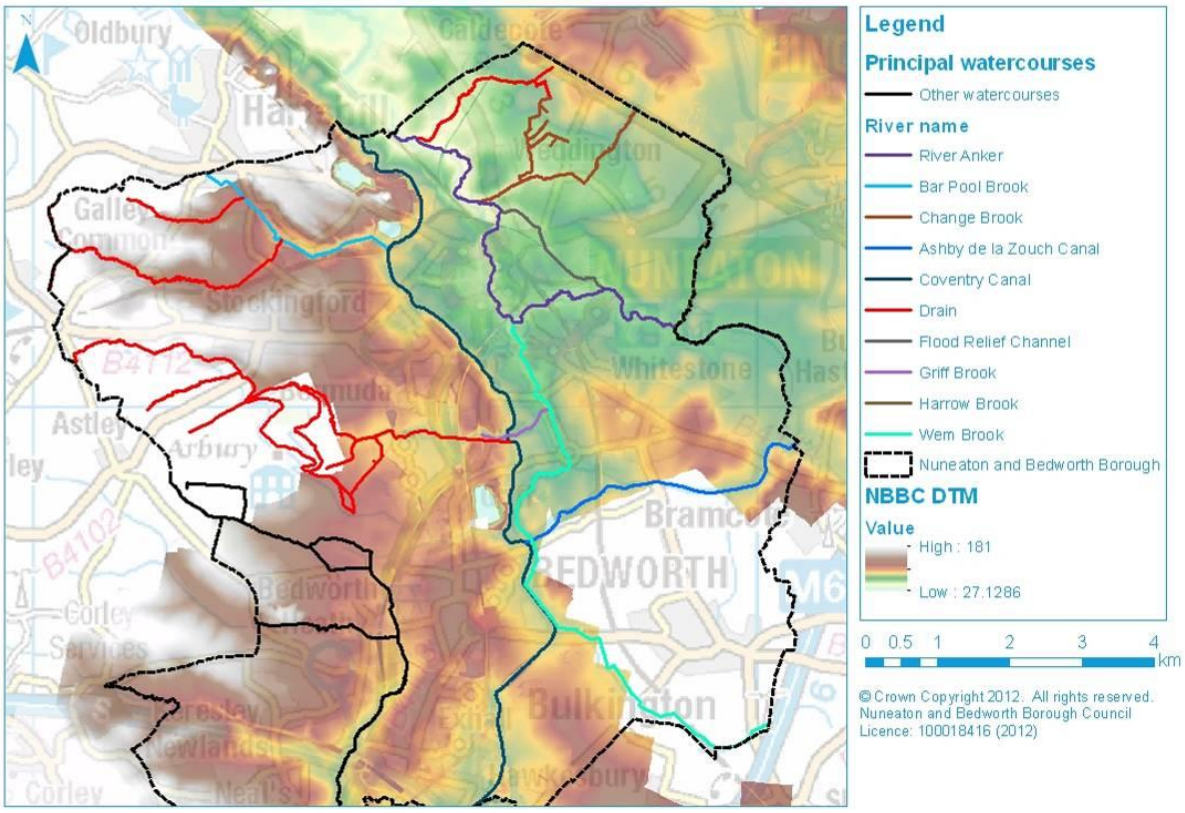
- Harrow Brook (main river)
- Wem Brook (non main river in upper reaches)
- Change Brook (main river)
- Bar Pool Brook (non main river)
- Griff Brook (non main river)

The extent of the River Anker and associated watercourses is shown in Figure 3-1.

After severe flooding in Nuneaton in 1968 a flood relief channel was built to protect the town centre. The Level 1 SFRA suggests the purpose of this channel is to divert excessive runoff volumes from Nuneaton and is designed to handle up to 1 in 80 year rainfall events, protecting up to a 1,000 properties. The flood relief channel can be found to the north east of Attleborough and runs for approximately 1.9km before rejoining the River Anker.

The Coventry Canal and the Ashby-de-la-Zouch Canal also run through the catchment. The Coventry Canal runs directly through the centre of the Borough, passing through Nuneaton Centre. The Ashby-de-la-Zouch Canal starts at the junction with the Coventry Canal south of Nuneaton and travels north east through the town of Hinckley. According to the Level 1 SFRA and Warwickshire PFRA, there have been no recorded canal breaches in the Nuneaton and Bedworth Boroughs.

Figure 3-1: Extent of River Anker & Associated Watercourses



3.2.2 River Sowe catchment

Topography

The topography of the River Sowe catchment shows slight and graduate changes in elevation with the highest elevation found in the west of the catchment. Analysis of LIDAR information shows for this particular catchment that Bedworth is a region of less dramatic and lower elevations.

Geology

The River Sowe catchment comprises of similar geological conditions to the River Anker. The geology has been influence by four major geology periods; Pre-Cambrian, Cambrian, Carboniferous and Triassic periods and is dominated by loamy clay based soils that are seasonally wet and have low permeability.

Soils

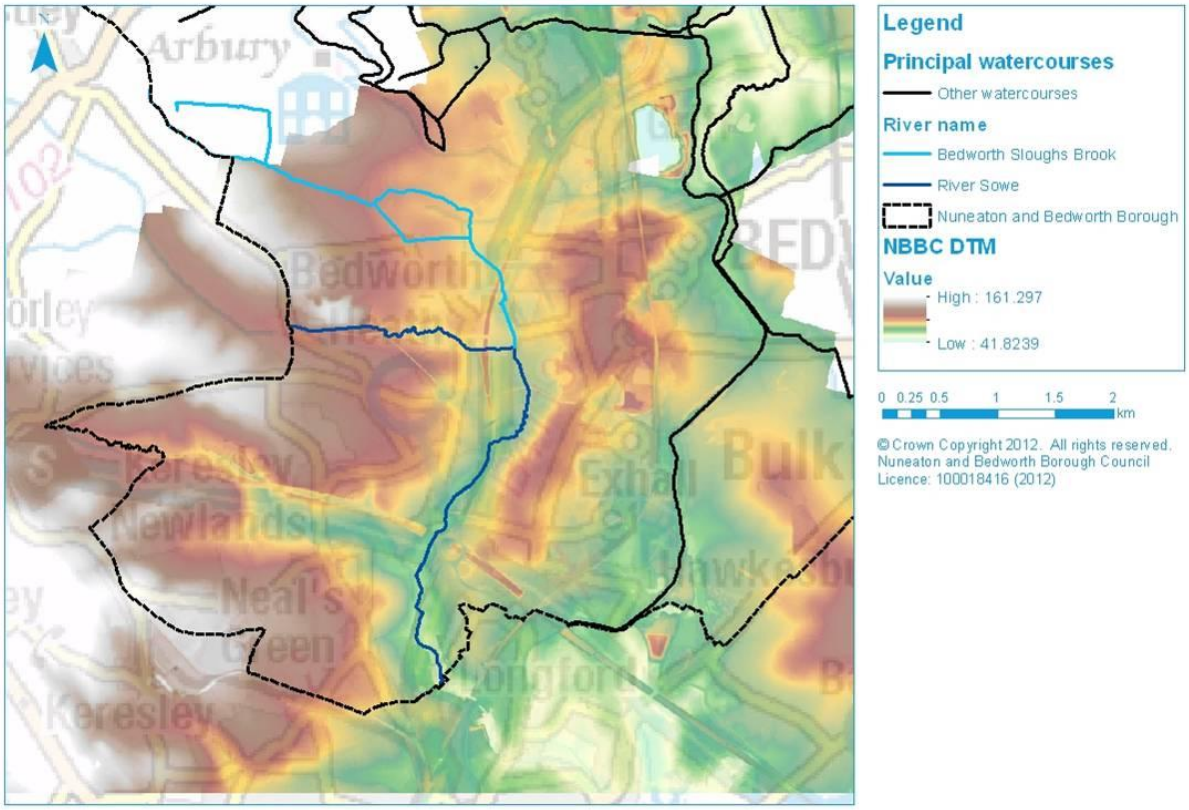
The Level 1 SFRA for the Borough describes the majority of the River Sowe catchment as being composed of loamy and clay soil types. Although the main geology is moderately permeable, the drainage is impeded by the underlining loamy clay soils, resulting in a lowering of permeability. This would impede drainage and result in greater runoff being generated from rainfall.

Hydrology

The River Sowe is one of the tributaries of the River Avon. During its course it passes through the town of Bedworth before proceeding south, running through the eastern suburbs of Coventry before joining the River Avon south of Nuneaton and Bedworth Borough.

A number of small watercourses flow into the River Sowe with the most significant being the Bedworth Slough Brook. This brook is located downstream of the Bedworth Sloughs and flows in a southerly direction before eventually becoming the River Sowe. Another brook, Breach Brook, enters from the south west and flows in an easterly direction before joining the River Sowe near Bedworth Heath. An overview of the River Sowe and associated watercourses is shown in Figure 3-2.

Figure 3-2: Extent of River Sowe & Associated Watercourses



3.3 Catchment Flood Management Plans

Catchment Flood Management Plans (CFMPs) are a high-level strategic plan providing an overview of flood risk across each river catchment. The Environment Agency will use CFMPs to work with other key-decision makers to identify and agree long-term policies for sustainable flood risk management.

There are six pre-defined national policies provided in the CFMP guidance and these are applied to specific locations through the identification of 'Policy Units'. These policies are intended to

cover the full range of long term flood risk management options in the catchment that can be applied to different locations.

The six national policies are:

1. No active intervention (including flood warning and maintenance). Continue to monitor and advise
2. Reducing existing flood risk management actions
3. Continue with existing or alternative actions to manage flood risk at the current level
4. Take further action to sustain the current level of flood risk
5. Take action to reduce flood risk (now and/or in the future)
6. Take action to increase the frequency of flooding to deliver benefits locally or elsewhere (through use of flood storage areas, wetlands etc)

3.3.1 Trent CFMP

The policy unit of importance to Nuneaton and Bedworth is Policy Unit 9. Within this policy unit the CFMP states that Policy 4 applies, which is, take further action to sustain current scale of flood risk into the future (responding to the potential in flood risk from urban development, land use change and climate change. This policy unit covers a wider area than Nuneaton and Bedworth, and in comparison Nuneaton and Bedworth is considered an area at low risk of flooding.

3.3.2 Severn CFMP

The policy unit of importance to Nuneaton and Bedworth is Policy Unit 13. Within this policy unit the CFMP states that Policy 5 applies, which is take further actions to reduce risk (now and/or in the future). Only a small section to the south of the Nuneaton and Bedworth Borough at Bedworth (the River Sowe) falls within the Severn CFMP.

3.4 Defences

3.4.1 Summary

A high level review of formal flood defences was carried out for the Level 1 SFRA. This review described how the standard of protection provided by the Nuneaton and Bedworth flood relief channel varies through the town centre. The majority of the town centre is thought to be protected to a 1 in 100 year flood event, whilst the museum and Sainsbury buildings in Attleborough are considered to have a lower standard, 1 in 25 years in places.

As part of this Level 2 SFRA, an assessment of the formal flood defences and their condition has been undertaken. Details of the flood defences, their standard of protection and condition were provided by the Environment Agency for the purpose of preparing this assessment.

A summary of the grading system used by the Environment Agency is provided in Table 3-1. This information is supplemented with a summary of the formal flood defences in Nuneaton and Bedworth as shown in Table 3-2. The location of these structures is shown in Figure 3-3 and Figure 3-4.

Table 3-1: Defence asset condition rating

Grade	Rating	Description
1	Very Good	Cosmetic defects that will have no effect on performance:
2	Good	Minor defects that will not reduce the overall performance of the assets.
3	Fair	Defects that could reduce performance of assets.
4	Poor	Defects that would significantly reduce the performance of the asset. Further investigation required.
5	Very Poor	Severe defects resulting in complete performance failure.
Source: Condition Assessment Manual - Environment Agency 2006		

Table 3-2: Summary of flood defences in Nuneaton and Bedworth

Defence	Description	Location	Year Built	Standard of Protection	Overall Condition	Worst Condition
Nuneaton						
Flood relief channel	Inlet weir structure	SP3786 9166	1978 – 1979	1 in 100 year	Grade 2	Grade 2
	Cut off embankments				Grade 2	Grade 3
	Channel and flood walls				Grade 2	Grade 4
	Outfall Piling				Grade 2	Grade 3
Long Shoot defences	Flood bank tying onto concrete flood wall	SP3910 9281	2006	1 in 100 year	Grade 2	Grade 2
	Concrete flood wall				Grade 2	Grade 2
Bedworth						
Channel and flood wall	Roughly 86m of channel and flood walls	SP3486 8684	2011	1 in 100 year	Grade 1	Grade 1

Figure 3-3: Nuneaton flood defences

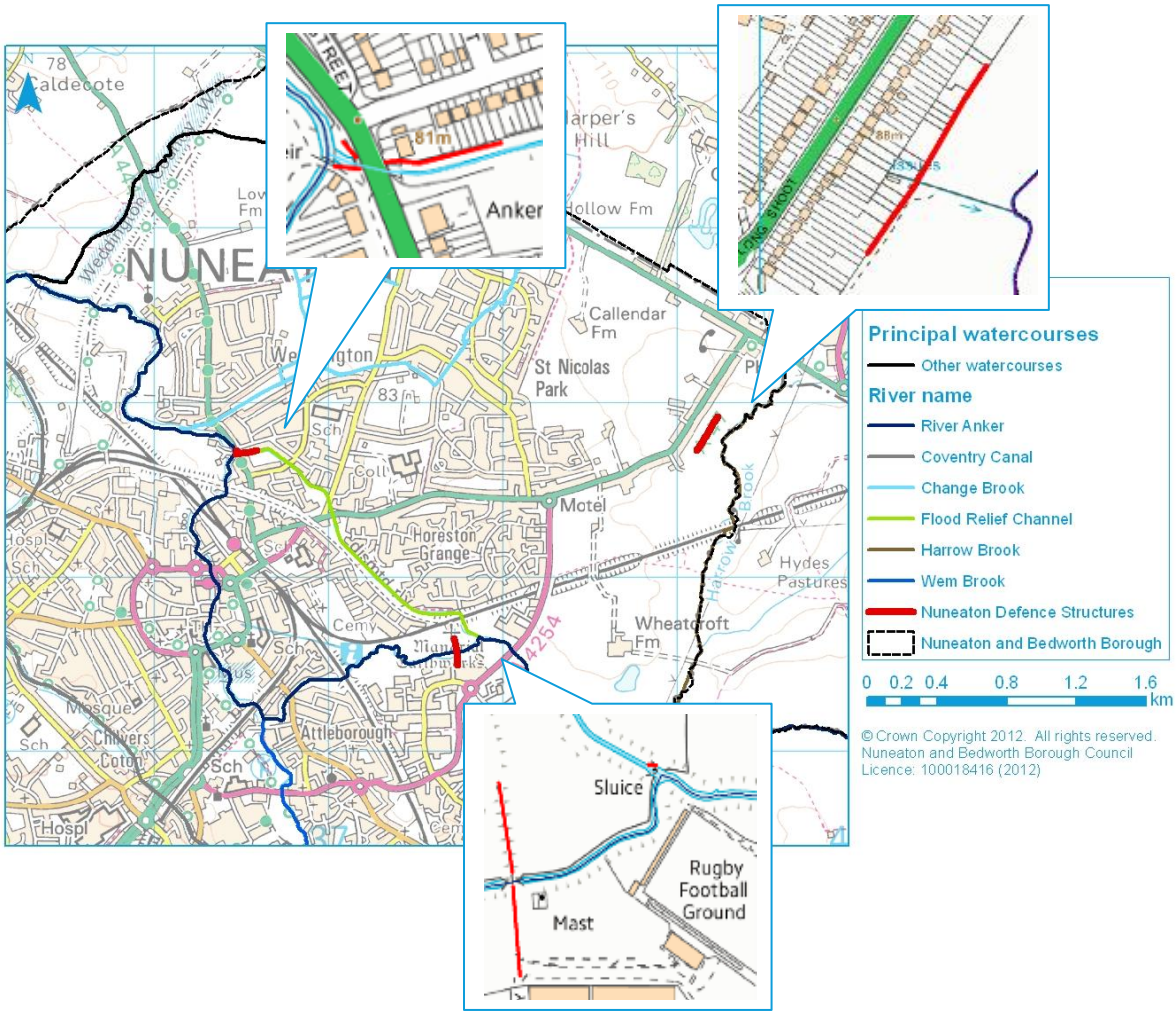
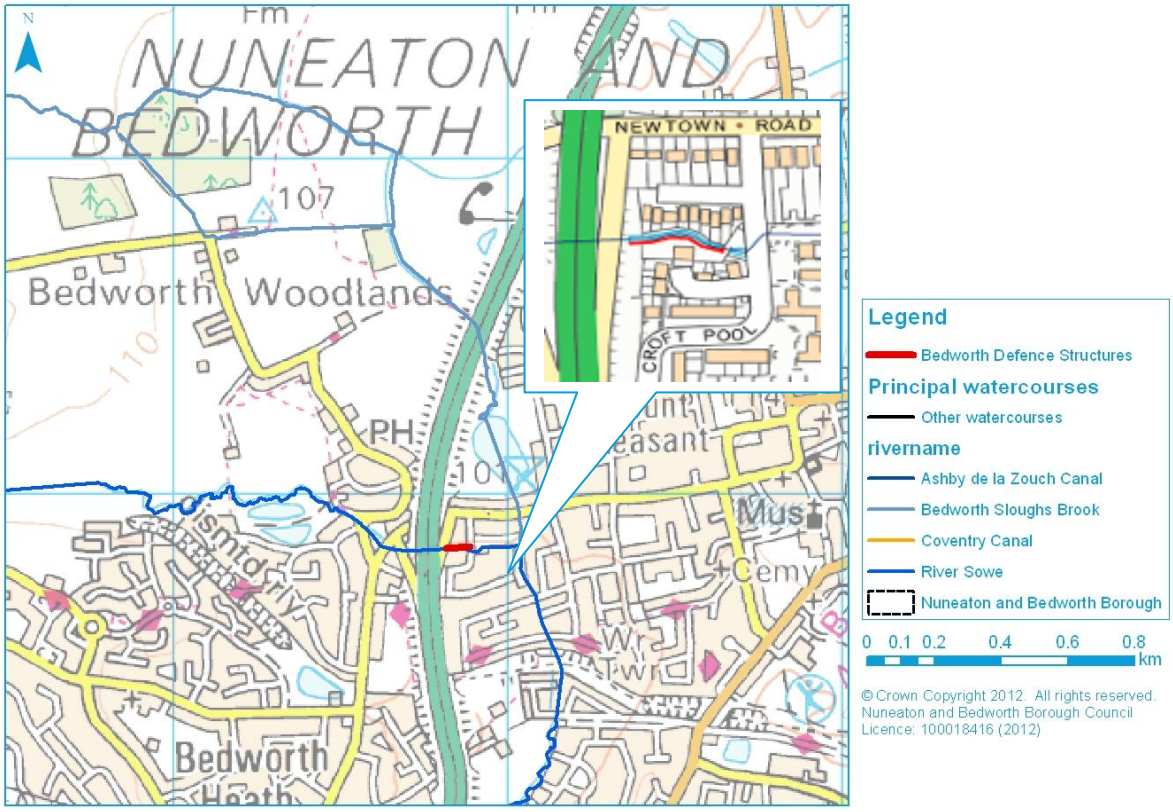


Figure 3-4: Bedworth flood defences



The Environment Agency has confirmed the flood relief channel has scheduled inspections every six months, and grass cutting is undertaken every three months. In addition, debris clearance is carried out as and when it is required.

Large debris in the relief channel may reduce the effectiveness or block the channel and increase the risk of flooding. To report a blockage incident please call the Environment Agency's **incident hotline** on **0800 80 70 60** (24 hour service). You should not use e-mail to report an incident, as this could delay the response.

The River Trent CFMP assigned a Policy 4 to the Nuneaton and Bedworth area. This policy requires the current level of flood risk to be sustained in the future. An assessment has been undertaken, as part of this Level 2 SFRA, to determine the areas benefitting from the defences within Nuneaton and Bedworth and whether the level of protection provided by the defences can be sustained in the future. Where this assessment suggests the current standard of protection afforded by the defences is not sufficient to sustain the same level of protection in the future, recommendations have been made on the measures that could be taken to meet the policy requirement.

3.5 Flood Warning Areas

Nuneaton is currently covered by the following Flood Alert and Flood Warning Areas (FWAs):

Flood Alert

River Anker

- **033WAF307** – River Anker and River Sence

River Sowe

- **A33WAF202** – River Sowe, River Sherbourne and Canley Brook

Flood Warnings

River Anker

- **033FWF3ANKR001** – River Anker at Attleborough, Nuneaton including Hemdale Business Park, Ribbonbrook and Seymour Road area
- **033FWF3ANKR002** – River Anker at Nuneaton Town Centre
- **033FWF3ANKR003** – River Anker at Weddington including Cleaver Gardens, Church Lane and Ankerfields business area

River Sowe

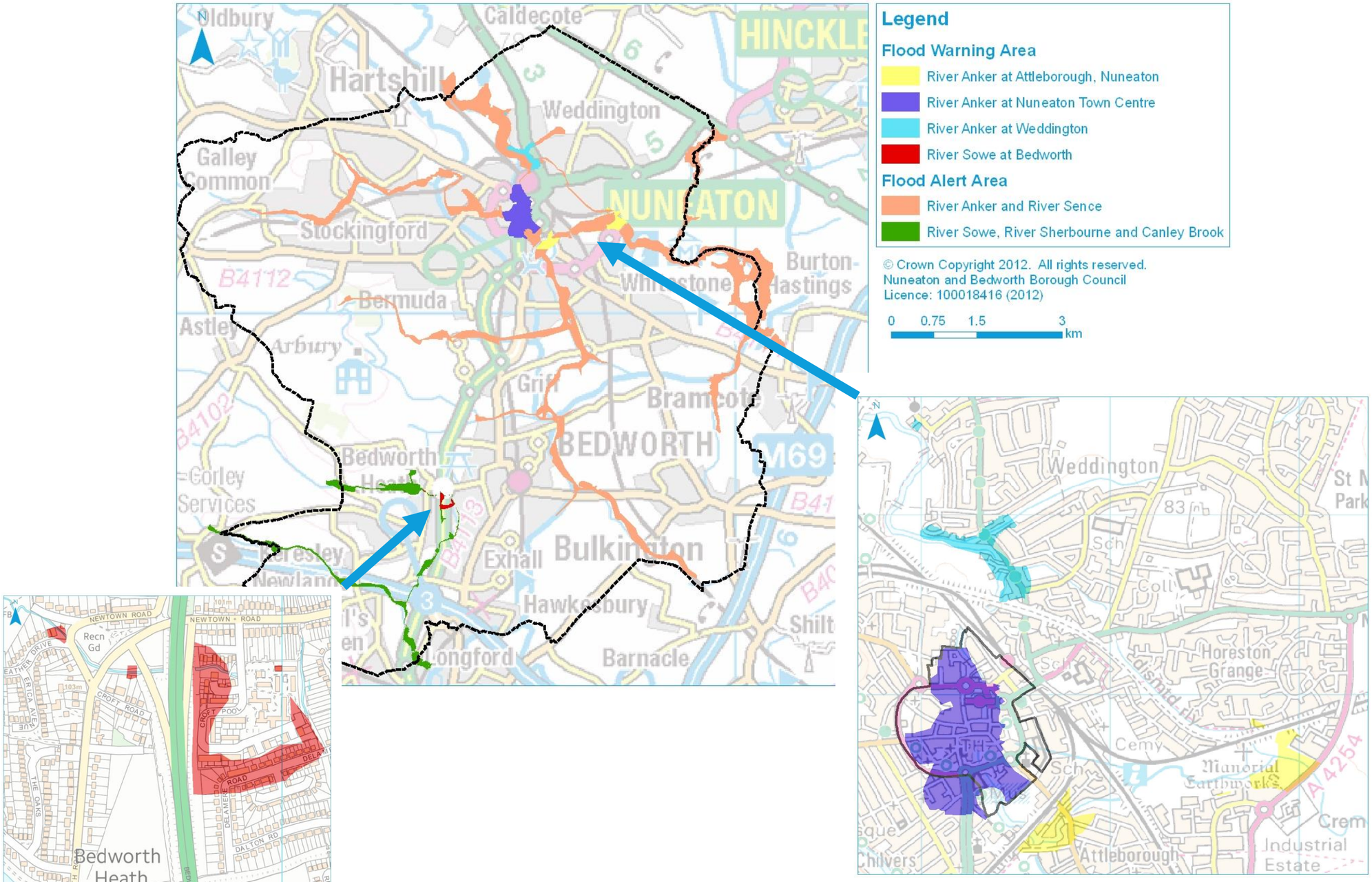
- **033FWF3SOWE001** – River Sowe at Bedworth including Heather Drive, Brooklea, Croft Pool and Delamere Road areas

The location of the Flood Alert and Flood Warning Areas are shown in Figure 3-5.

Flood Alerts are used to warn people of the possibility of flooding and encourage them to be alert, stay vigilant and make early preparations. It is issued earlier than a flood warning, to give customers advice notice of the possibility of flooding, but before we are fully confident that flooding in Flood Warning Areas is expected.

Flood Warnings warn people of expected flooding and encourage them to take action to protect themselves and their property.

Figure 3-5: Flood Warning Areas



4 How flood risk is assessed

4.1 Definitions

4.1.1 Flood

Section1 (subsection 1) of the FWMA defines a flood as:

'any case where land not normally covered by water becomes covered by water'.

Section1 (subsection 2) states 'it does not matter for the purposes of subsection (1) whether a flood is caused by –

(a) Heavy rainfall

(b) A river overflowing or its banks being breached

(c) A dam overflowing or being breached

(d) Today waters

(e) Groundwater, or

(f) Anything else (including any combination of factors).

Note: Source does not include the following – flood from any part of a sewerage system, unless caused by an increase in the volume of rainwater, entering or affecting the system, or a flood caused by a burst water main.

4.1.2 Flood Risk

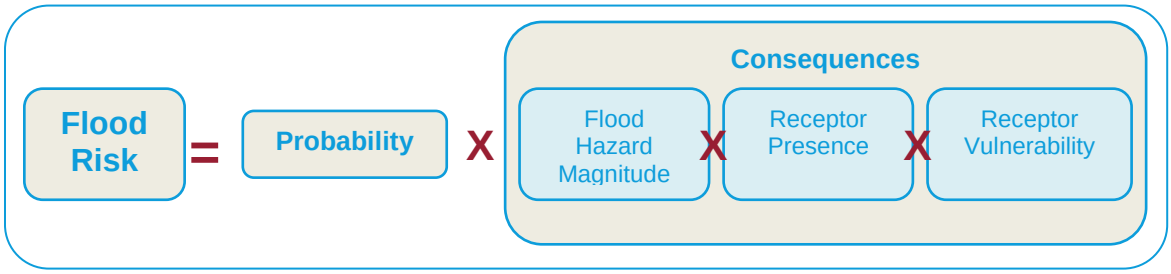
Section 3 (subsection 1) of the FWMA defined flood risk as:

'a risk in respect of an occurrence assessed and expressed (as for insurance and scientific purposes) as a combination of the probability of the occurrence with its potential consequences.'

Thus it is possible to define flood risk as:

Flood Risk = (Probability of a flood) x (Scale of the Consequences)

On that basis it is useful to express the definition as follows:



Using this definition it can be seen that

- **Increasing the probability or chance of a flood being experienced increases the flood risk.** In situations where the probability of a flood being experienced increases gradually over time, for example due to the effects of climate change, then the severity of the flood risk will increase (flooding becomes more frequent or has increased effect).
- **The scale of the consequences can increase the flood risk.**
    - Flood Hazard Magnitude: If the direct hazard posed by the depth of flooding, velocity of flow, the speed of onset, rate of risk in flood water or duration of inundation is increased, then the consequences of flooding, and therefore risk, is increased.
    - Receptor presence: The consequences of a flood will be increased if there are more receptors affected, for example with an increase in extent or frequency of

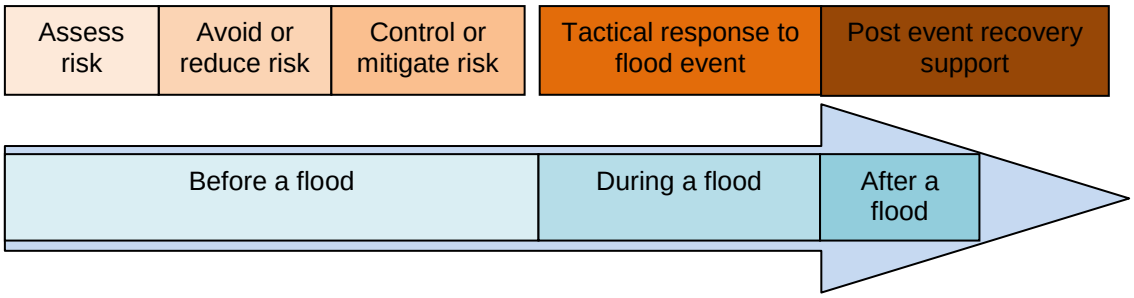
flooding. Additionally, if there is new development that increases the probability of flooding (for example, increase in volume of runoff due to increased impermeable surfaces) or increased density of infrastructure then consequences will also be increased.

- Receptor vulnerability: If the vulnerability of the people, property or infrastructure is increased then the consequences are increased. For example, old or young people are more vulnerable if there is a flood.

4.2 Using SFRA risk information

This Level 2 SFRA contains information that can be used at strategic, operational and tactical levels as shown in Figure 4-1.

Figure 4-1: Uses of SFRA information



The SFRA will be an important source of information in the preparation of the Local Flood Risk Management Strategy prepared by the Lead Local Flood Authority (Warwickshire County Council).

The assessment of flood risk in the SFRA is primarily based on the following three types of information

4.2.1 Flood Zones

The SFRA includes maps that show the flood zones. These zones describe the land that would flood if there were no defences present. The NPPF Guidance identifies the following Flood Zones and these are used in the Nuneaton and Bedworth Level 2 SFRA, see Figure 4-2 and Table 4-1.

Figure 4-2: Flood Zone definition

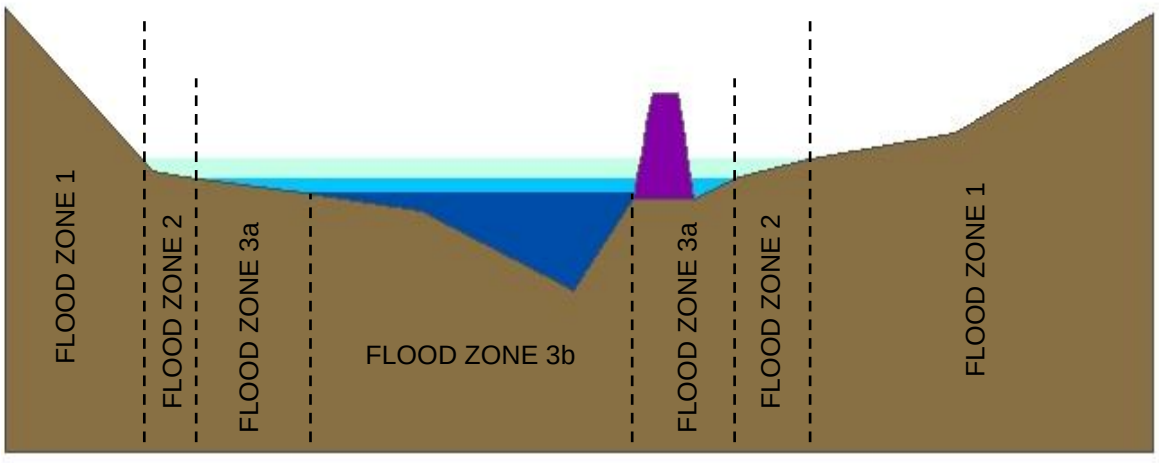


Table 4-1: Flood Zone descriptions

Probability		Description
Zone 1	Low	This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).
Zone 2	Medium	This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (0.1% - 1%) or between 1 in 200 and 1 in 1000 annual probability of sea flooding (0.1% – 0.5%) in any year.
Zone 3a	High	This zone comprises land assessed as having a greater than 1 in 100 annual probability of river flooding (>1.0%) or a greater than 1 in 200 annual probability of flooding from the sea (>0.5%) in any year.
Zone 3b	Function Floodplain	This zone comprises land where water has to flow or be stored in times of flood. SFRAs should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes.

The preference when allocating land is, whenever possible, to place all new development on land in Zone 1. Since the Zones identify land that is not reliant on flood defences then placing development on Zone 1 land means that in future there is no commitment to spending money on Flood banks or flood alleviation measures and not committing future generations to costly long term expenditure that would become increasingly unsustainable as the effects of climate change increase. However, the runoff from development on Zone 1 land can potentially cause an increase in the probability of flooding to existing downstream development. Information in the SFRA should be used to address this issue.

4.2.2 Actual Flood Risk

If it has not been possible for all future development to be situated in Zone 1 then a more detailed assessment is needed to understand the implications of locating proposed development in Zones 2 or 3. This is accomplished by considering information on the "actual risk" of flooding. The assessment of actual risk takes account of the presence of flood defences and provides a picture of the safety of existing and proposed development. It should be understood that the standard of protection afforded by flood defences is not constant and it is presumed that the required minimum standards for new development are:

- Residential development should be protected against and flooding with an annual probability of river flooding of 1% in any year; and
- Residential development should be protected against flooding with an annual probability of tidal (sea) flooding of 0.5% in any year.

The assessment of the actual risk should take the following issues into account:

- The level of protection afforded by existing defences might be less than the appropriate standards and hence may need to be improved if further growth is contemplated;
- The flood risk management policy for the defences will provide information on the level of future commitment to maintain existing standards of protection. If there is a conflict between the proposed level of commitment and the future needs to support growth then it will be a priority for the Flood Risk Management Strategy to be reviewed;

- The standard of safety must be maintained for the intended lifetime of the development (assumed to be 100 years for residential development). Over time the effects of climate change will erode the present day standard of protection afforded by defences and so commitment is needed to invest in the maintenance and upgrade of defences if the present day levels of protection are to be maintained; and
- The assessment of actual risk can include consideration of the magnitude of the hazard posed by flooding. By understanding the depth, velocity, speed of onset and rate of rise of floodwater it is possible to assess the level of hazard posed by flood events from the respective sources. This assessment will be needed in circumstances where consideration is given to the mitigation of the consequences of flooding or where it is proposed to place lower vulnerability development in areas that are at risk from inundation.

Those using the Warwickshire Level 2 SFRA should refer to the Environment Agency's National Flood and Coastal Defence Dataset (NFCDD) for details on the standard of protection of defences.

4.2.3 Residual Risk

The residual risk refers to the risks that remain in circumstances where measures have been taken to alleviate flooding. It is important that these risks are quantified to confirm that the consequences can be safely managed. The residual risk can be:

- The effects of a flood with a magnitude greater than that for which the defences or management measures have been designed to alleviate. This can result in over topping of flood banks, failure of flood gates to cope with the level of flow or failure of pumping systems to cope with the incoming discharges; or
- Failure of the defences or flood risk management measures to perform their intended duty. This could be breach failure of flood embankments, failure of flood gates to operate in the intended manner or failure of pumping stations.

The assessment of residual risk demands that attention be given to the vulnerability of the receptors and the response to managing the resultant flood emergency. In this instance attention should be paid to the characteristics of flood emergencies and the roles and responsibilities during such events.

4.3 Possible responses to flooding

4.3.1 Assess

The first response to flooding must be to understand the nature and frequency of the risk. The assessment of risk is not just performed as a "one off" during the process, but rather the assessment of risk should be performed during all subsequent stages of responding to flooding.

4.3.2 Avoid

The sequential approach requires that the first requirement is to avoid the hazard. If it is possible to place all new growth in areas at a low probability of flooding then the flood risk management considerations will relate solely to ensuring that proposed development does not increase the probability of flooding to others. This can be achieved by implementing SUDS systems and other measures to control and manage run-off. In some circumstances it might be possible to include measures within proposed growth areas that reduce the probability of flooding to others and assist existing communities to adapt to the effects of climate change. In such circumstances the growth proposals should include features that can deliver the necessary levels of mitigation so that the standards of protection and probability of flooding are not reduced by the effects of climate change. In Nuneaton and Bedworth, consideration should be given not only to the peak flows generated by new development but also to the volumes generated during longer duration storm events

4.3.3 Substitute, Control and Mitigate

These responses all involve management of the flood risk and thus require an understanding of the consequences (the magnitude of the flood hazard and the vulnerability of the receptor).

There are opportunities to reduce the flood risk by lowering the vulnerability of the proposed development. For instance changing existing residential land to commercial uses will reduce the risk provided that the residential land can then be located on land in a lower risk flood zone.

Flood risk management responses in circumstances where there is a need to consider growth or regeneration in areas that are affected by a medium or high probability will include:

- Strategic measures to maintain or improve the standard of flood protection so that the growth can be implemented safely for the lifetime of the development (must include provisions to invest in infrastructure that can adapt to the increased chance and severity of flooding presented by climate change);
- Design and implement measures so that the proposed development includes features that enables the infrastructure to adapt to the increased probability and severity of flooding whilst ensuring that new communities are safe and that the risk to others is not increased (preferably reduced);
- Flood resilient measures that reduce the consequences of flooding to infrastructure so that the magnitude of the consequences is reduced. Such measures would need to be considered alongside improved flood warning, evacuation and welfare procedures so that occupants affected by flooding could be safe for the duration of a flood event and rapidly return to properties after an event had been experienced.

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5 Mapping and risk based approach

5.1 Summary of mapping for all sources of flood risk

5.1.1 Fluvial

The data used to prepare mapping is based on the results from hydraulic models either provided by the Environment Agency or prepared for the purposes of this Level 2 SFRA.

- Detailed 1D-2D modelling of the River Anker
- 1D modelling of the River Sowe
- Modelled outlines using Jflow+ have been developed to determine Flood Zone 3a, Flood Zone 3b and Flood Zone 2 for the following watercourses, as well as the effects of climate change.
    - Change Brook
    - Un-named drains flowing into Seeswood Pool
    - Un-named drains at Arbury Park and Dennis Farm
    - Un-named drains at Arbury Mill Farm and Griff Lodge
    - Un-named drain to the north of Nuneaton, flowing from the A5 south west to join the Anker downstream of Weddington.
    - Un-named drain flowing southwards joining the Change Brook at Glenfield Avenue, Weddington
    - Un-named drain joining Bedworth Sloughs Brook downstream of Bedworth Sloughs

5.1.2 Canal Breach

The Coventry canal and Ashby-de-la-Zouch canal run through the Nuneaton and Bedworth borough. Where the canals run through or adjacent to a proposed development site, breach modelling has been undertaken using Jflow+ to produce breach flood extent, depth, velocity and hazard maps.

5.1.3 Surface Water

Mapping of surface water flood risk has been taken from the locally agreed surface water information prepared by Warwickshire Council and described in the PFRA. The information is based on a national scale map (Flood Map for Surface Water) identifying those areas where surface water flooding poses a risk. The mapping is based on two rainfall events, one with a 1 in 30 and the other with a 1 in 200 chance of occurring in any year.

5.1.4 Hazard Maps

Hazard mapping has also been produced for the potential development areas. The hazard rating is calculated directly within the Jflow modelling package and utilises the classifications of hazard presented in DEFRA R&D Technical Note FD2320: Flood Risk Assessment.

It should be noted that the hazard mapping prepared for the SFRA using JFlow+ will need to be refined when more detailed consideration is given to preparing development proposals at the respective sites where development is proposed. This should be done at the detailed Flood Risk Assessment (FRA) stage. At that time it is likely that more detailed 1D - 2D modelling will have to be prepared to enable results with an appropriate level of detail and resolution.

5.1.5 Suite of Maps

All of the mapping can be found in the appendices and is presented in the following structure

- Flood Zones, including flooding from ordinary watercourses, modelled as part of the Level 2 SFRA
- Climate change outlines
- Hazard Mapping

- Canal Breach Mapping
- Surface Water Flood Risk Mapping

5.2 Other relevant flood risk information

The mapping prepared for this Level 2 SFRA provides information on

- The extent of flooding
- The depth of flooding
- Flood water velocity
- Hazard from flood water

Other relevant information on flood risk should be referred to by users of this SFRA, where available and appropriate. This information includes

- Nuneaton and Bedworth Strategic Flood Risk Assessment: Level 1 (2008) – Nuneaton and Bedworth Borough Council
- Warwickshire Preliminary Flood Risk Assessment (2011) – Warwickshire County Council
- River Trent Catchment Flood Management Plan (2010) – Environment Agency
- River Basin Management Plan: Severn River Basin District (2009) – Environment Agency
- Hazard and Risk Mapping prepared for the Flood Risk Regulations (available in 2013) – Environment Agency
- Flood Risk Management Plan in accordance with the Flood Risk Regulations (available in 2015) – Environment Agency and Lead Local Flood Authority
- Surface Water Management Plans – Warwickshire County Council in consultation with Nuneaton and Bedworth Borough Council, should it be considered a SWMP is required.
- Environment Agency's National Flood and Coastal Defences Dataset (NFCDD) – users should note that recently completed schemes may not yet be included in this dataset.

5.3 Sequential approach

It is often the case that it is not possible for all new development to be allocated on land that is not at risk from flooding. In these circumstances the Flood Zone maps (that show the extent of inundation assuming that there are no defences) are too simplistic. A greater understanding of the scale and nature of the flood risks are required. To help achieve this, more detailed modelling has been undertaken, including depth, hazard and velocity outputs.

The ability to manage flood risk for new development must consider a wide range of issues, which includes how any evacuation of the occupants would be handled, how the new development fits in with the existing flood management provision and, should there be an event, how quickly the wider area would recover and return to normal. Some areas, either through natural or artificial topography, are easier to integrate flood management measures into the new development, without causing a significant alteration in its design and its place setting. These measures can have the potential to cause an alteration to the flood risk to adjacent property or in flood cells on the opposite bank.

5.4 Sequential Test

The Sequential Test must be performed when considering the placement of future development and for planning application proposals. The Technical Guidance to the NPPF gives detailed instructions on how to perform the test. These instructions on how to perform the test should be used with the following information from the SFRA:

- Identify the area to be assessed (including alternatives) on the Flood Zone Maps that are provided with this assessment;
- Establish the risk of flooding from other sources again using the Maps in this SFRA; and
- Follow the instructions given in the Technical Guidance.

The Sequential Test is used to direct all new development (through the site allocation process) to locations at least risk of flooding, giving highest priority to Flood Zone 1. MHDC, WDC and WCC have sequentially tested the development sites in the Core Strategy.

The Level 2 SFRA provides further flood risk evidence which the councils can use to assess whether it is necessary to revisit/update the Sequential Test. The Environment Agency (2009)[12] recommends that the following approach is used by local planning authorities to apply the Sequential Test to planning applications located in Flood Zones 2 or 3. There are three stages to the test, as follows:

- Stage 1 – Strategic application & development vulnerability
- Stage 2 – Defining the evidence base
- Stage 3 – Applying the Sequential Test

Stage 1 – Strategic Application & Development Vulnerability

The Sequential Test can be considered adequately demonstrated if both of the following criteria are met:

- The Sequential Test has already been carried out for the site (for the same development type) at the strategic level (development plan) in line with procedures agreed within the National Planning Policy Framework; and
- The development vulnerability is appropriate to the Flood Zone (see Table 3 of NPPF Technical Guidance)

1.1 Has the Sequential Test already been carried out for this development at the development plan level? If yes, reference should be provided to the site allocation and Development Plan Document (DPD) in question.

1.2 Is the flood risk vulnerability classification of the proposal appropriate to the Flood Zone in which the site is located according to Tables 1 and 3 of the NPPF Technical Guidance? The vulnerability of the development should be clearly stated.

Finish here if the answer is 'Yes' to both questions 1.1 and 1.2.

Only complete Stages 2 and 3 if the answer to either questions 1.1 and 1.2 is 'No'.

Stage 2 – Defining the Evidence Base

2.1 State the geographical area over which the test is to be applied.

2.2 If greater or less than the boundary of Nuneaton and Bedworth justify why the geographical area for applying the test has been chosen.

Identify the geographical area of search over which the test is to be applied:

This will usually be over the whole of Nuneaton and Bedworth but may be reduced where justified by the functional arrangements of the development (e.g. catchment area for a school or doctors surgery) or relevant objectives in the Local Plan. For example, if a local need such as affordable housing or town centre renewal has been identified as part of the Sustainability Appraisal process that has reached `submission' stage, this might mean that the geographical area of search is restricted to a specific regeneration area. Equally, in some circumstances it may be appropriate to expand the search area beyond the council boundary for uses that have a national market.

2.3 Identify the source of reasonable available sites, either:

- Background / evidence base documents (state which), or if not available
- Other sites known to the councils that meet the functional requirements of the application

[12] Environment Agency (2009) Demonstrating the flood risk (PPS25) Sequential Test for Planning Applications, PPS25 FRSA (national) version 2.0 Advise issued on 27 January 2009

Identify the source of 'reasonably available' alternative sites:

These sites will usually be drawn from the evidence base / background documents that have been produced to inform the emerging Local Plan. For example, an important source of information for housing sites and development land will be provided by the SHLAA and the Employment Land Review (ELR).

In the absence of background documents, `reasonably available' sites would include any sites that are known to the LPA and that meet the functional requirements of the application in question, and where necessary, meet the Local Plan Policy criterion for windfall development (see below).

Windfall sites:

These are sites which have not been specifically identified as available in the Local Plan process. They normally comprise previously developed sites that have unexpectedly become available.

The Environment Agency recommend that the acceptability of windfall applications in flood risk areas should be considered at the strategic level through a policy setting out broad locations and quantities of windfall development that would be acceptable or not in Sequential Test terms.

In the absence of a flood risk windfall policy, it may be possible (where the data is sufficiently robust) for the LPA to apply the Sequential Test taking into account historic windfall rates and their distribution across the district relative to Flood Zones. Where historic and future trends evidence indicate that housing need in the district through windfall can be met largely/entirely by development outside high flood risk areas, this may provide grounds for factoring this into the consideration of `reasonably available' alternative sites at the planning application stage.

2.4 State the method used for comparing the flood risk between sites, whether it is this SFRA or an alternative (e.g. Environment Agency flood map, site specific flood risk assessment) as new information becomes available.

Identify the means of comparing flood risk between each site:

As a starting point this will be the Environment Agency Map showing the Flood Zones. If comparing sites within the same Flood Zone it is necessary to use a SFRA showing a variation in risk throughout the Flood Zone or site specific FRAs where these are available and suitable for the purpose.

Stage 3 – Applying the Sequential Test

Compare the reasonably available sites identified under stage 2 with the application site:

Sites should be compared in relation to flood risk; development plan status; capacity; and constraints to delivery including availability, policy restrictions, physical problems or limitations, potential impacts of the development, and future environmental conditions that would be experienced by the inhabitants of the development.

3.1 State the name and location of the reasonably available site options being compared to the application site

3.2 Indicate whether flood risk on the reasonable available options is higher or lower than the application site. State the Flood Zone or SFRA classification for each site.

3.3 State whether the reasonably available options being considered are allocated in the Development Plan. Confirm the status of the plan.

3.4 State the approximate capacity of each reasonably available site being considered. This should be based on:

- the density policy within the Local Plan

- the current Strategic Housing Land Availability Assessment (SHLAA)
- past performance

3.5 Detail any constraints to the delivery of identified reasonably available options; for example, availability within a given time period or lack of appropriate infrastructure i.e. flood defences which protect the site through its design lifetime. This part of the test should include recommendations on how these constraints should be overcome and when.

Sequential Test Conclusion

Are there any reasonably available sites in areas with a lower probability of flooding, which would be appropriate to the type of development or land use proposed?

Next Steps

Exception Test:
Where necessary, the Exception Test should now be applied in the circumstances set out by Tables 1 and 3 of NPPG Technical Guidance.

Applying the sequential approach at the site level:
In addition to the formal Sequential Test, developers should apply the sequential approach to locating development within the site.
The following questions should be considered:

- Can risk be avoided through substituting less vulnerable uses or by amending the site lay-out?
- Has the applicant demonstrated that less vulnerable uses for the site have been considered and reasonably discounted?
- Can layout be varied to reduce the number of people or flood risk vulnerability or building units located in higher risk parts of the site?

5.5 Exception Test

If, following application of the Sequential Test, it is not possible for the development to be located in areas with a lower probability of flooding then the Exception Test can be applied, if appropriate. The aim of the Exception Test is to ensure that more vulnerable property types, such as residential development, are not located in areas at high risk of flooding. For the Test to be passed, both the following elements have to be passed for development to be allocated or permitted:

- It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared, and
- A site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime, taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

If it is proposed that development should include provision of an emergency plan then consultations should be held with the appropriate emergency services and advice sought.

The NPPF and Technical Guidance give detailed information on how the Test can be applied and should be used in conjunction with the mapping created for this Level 2 SFRA.

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6 Overview of future development

6.1 Review of future development

The Nuneaton and Bedworth Borough Plan will outline how Nuneaton and Bedworth will change over the next 17 years. The Plan will determine future planning policies within the Borough.

The dwelling and employment land targets for the borough are provided in Table 6-1.

Table 6-1: Nuneaton and Bedworth Borough Targets

Dwellings	Employment Land (ha)
7,900	80

Of the 7,900 dwellings targeted for the borough, 5,000 to 6,000 will need to be from the proposed allocation sites assessed for the Level 2 SFRA. The remaining dwellings will be in existing urban areas.

The hectares of employment land will all be from the proposed sites assessed in the Level 2 SFRA.

The Level 2 SFRA assessment will form part of the evidence base used by the Council when deciding future allocations and sites.

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7 Summary assessment of proposed development sites

7.1 Introduction

An initial scoping assessment of the sites was undertaken to identify the level of flood risk and potential requirement for further, more detailed, assessment. The sites were compared against Flood Zones 1, 2 and 3 and the Flood Map for Surface Water. The sites were placed into one of four categories.

- Sites in Flood Zone One but not shown at risk from surface water
- Sites in Flood Zone One and shown as being at risk from surface water
- Sites in Flood Zone Two
- Sites in Flood Zone Two and Three
- Sites with ordinary watercourses flowing through, or nearby, not included in flood zones which require further assessment of risk

A summary of these findings are provided in Table 7-1.

Table 7-1: Summary of risk to proposed development sites

Number of Sites			
Flood Zone One only	Flood Zone One and FMfSW	Flood Zone Two	Flood Zone Three
4	7	3	12

Note: Environment Agency guidance provided with the Flood Map with Surface Water places limitations on the base map scale and zoom scale at which it can be displayed as scales larger than these implies an inappropriate degree of accuracy which may lead to increased risk of misinformed decision making.

Thus when using the maps it should be appreciated that the level of detail of the analysis does not reflect the high resolution inferred by the scale of the mapping. To understand the risk of flooding at an individual property scale would require more detailed modelling to be prepared.

7.2 Surface Water Drainage Assessment

A simple scoping assessment was conducted to provide a broad and generalised assessment of the hydraulic and geological characteristics of each development site to determine the constraining factors for surface water management at the proposed development sites. This assessment is designed to inform the early-stage site planning process and is not intended to replace site-specific detailed drainage assessments.

Greenfield runoff rates for each ward have been calculated using the Revitalised Flood Hydrograph (ReFH) method for non-permeable areas and the FEH Statistical method for permeable areas. The data required for these calculations was derived on a ward-by-ward basis using the FEH CD-ROM, a database of numerical descriptors representing the hydrological characteristics of watercourse catchments in the UK. Catchments were chosen which were considered to be representative of the ward, generally with a small area and fully contained within the ward boundaries. The catchment descriptors used are as follows:

BFIHOST	A measure of the catchment permeability (%)
DPLBAR	A measure of drainage path length and a function of site area (km)
DPSBAR	A measure of the average catchment slope (m/km)
SAAR4170	A measure of the average annual rainfall (mm)

The required attenuation volume was estimated using the Quick Storage Estimate tool in the software package WinDES by MicroDrainage. This tool derives a range of attenuation volumes by comparing post development runoff rates with maximum allowable discharge rates (i.e. greenfield runoff rates) for two extreme drainage outfall schematisations, assuming one large storage feature serving the entire site. For the purposes of this scoping assessment it has been assumed that development of the sites will create 75% impervious surfaces.

From the catchment characteristics derived above and additional datasets (areas susceptible to groundwater flooding map, Soil map of England and Wales, Environment Agency 'What's in your Backyard' online mapping) a broad criterion for the applicability of SUDS techniques was determined. These criteria were then used to carry out a simple assessment of the likely feasibility of different types of SUDS techniques at each of the proposed development sites. SUDS techniques were categorized into 5 main groups as follows.

Table 7-2: Summary of SUDS Categories

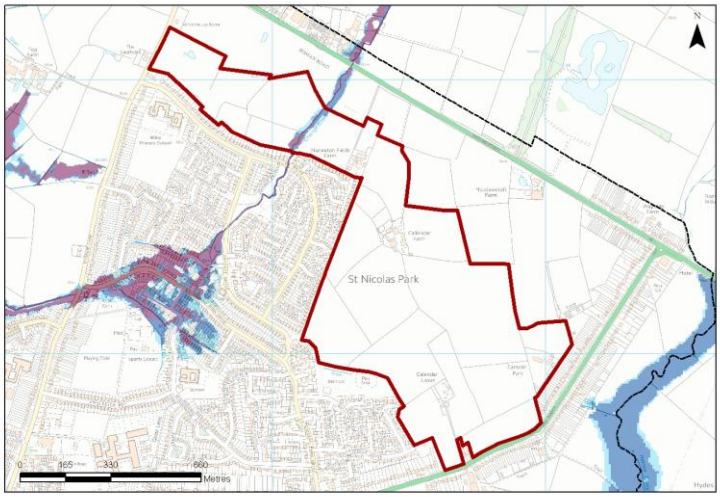
SUDS Type	Technique
Source Controls	Green Roof, Rainwater Harvesting, Pervious Pavements, Rain Gardens
Infiltration	Infiltration Trench, Infiltration Basin, Soakaway
Detention	Pond, Wetland, Subsurface Storage, Shallow Wetland, Extended Detention Wetland, Pocket Wetland, Submerged Gravel Wetland, Wetland Channel, Detention Basin
Filtration	Surface Sand filter, Sub-Surface Sand Filter, Perimeter Sand Filter, Bioretention, Filter Strip, Filter Trench
Conveyance	Dry Swale, Underdrained Swale, Wet Swale

The suitability of each SUDS type for the proposed developments has been displayed using a traffic light colour system in the summary tables.

Suitability	Description
	The SUDS Group and its associated techniques are unlikely to be suitable at the development site based on the results of this assessment More detailed assessment may demonstrate that this type of SUDS is suitable for use at this site
	The SUDS Group and its associated techniques may be suitable at the development but is likely to require additional engineering works. Some techniques from this group may not be suitable for use at the development.
	The SUDS Group and its associated techniques are likely to be suitable at the development site based on the results of this assessment. More detailed assessments should be carried out during the site planning stage to confirm the feasibility of this type of SUDS.

7.3 Summary tables and maps

The following tables summarise the flood risk to proposed developments sites.

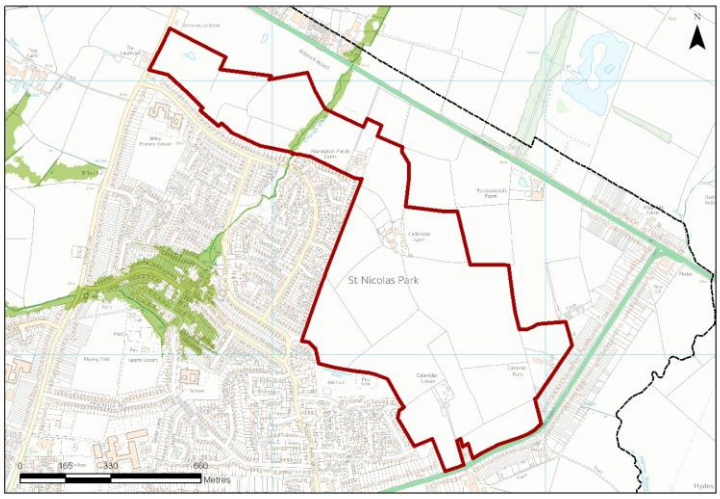
Table 7-3: PDA1				
OS NGR: SP384933	**Area:** 76.9ha		**Brown/Greenfield:** Predominately Greenfield	
Flood Zone Coverage:	**FZ3a:** 1%	**FZ3b:** 1%	**FZ2:** 1%	**FZ1:** 97%
Exception Test required? Yes, for Essential infrastructure development in FZ3b, Essential infrastructure and More Vulnerable development in FZ3a and Highly Vulnerable development in FZ2. Highly Vulnerable infrastructure should not be permitted within FZ3a. Highly Vulnerable, More Vulnerable and Less Vulnerable infrastructure should not be permitted within FZ3b.				
Requirements for passing the Exception Test: • To pass Part 'b' of the Exception Test, a FRA should demonstrate that the development will be safe, will avoid increasing flood risk elsewhere and will reduce flood risk overall. • Preference should be given to locating development outside the flooded areas, to the south of Change Brook, which flows through a northern section of the development site. It should be possible to reduce flood risk at this location by using sequential design to locate more vulnerable development towards higher ground, through building design and by meeting drainage requirements. Some resilience measures may be required if buildings are situated in the flood risk area. • Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage.				
Flood Zone Map: Local Authority Boundary Potential Development Area **Flood Zones** Flood Zone 3b Flood Zone 3a Flood Zone 2 Contains Ordnance Survey data © Crown copyright and database right 2012				

Climate Change:

Local Authority Boundary

Potential Development Area

Flood Zone 3 with Climate Change



Surface Water Map:

Local Authority Boundary

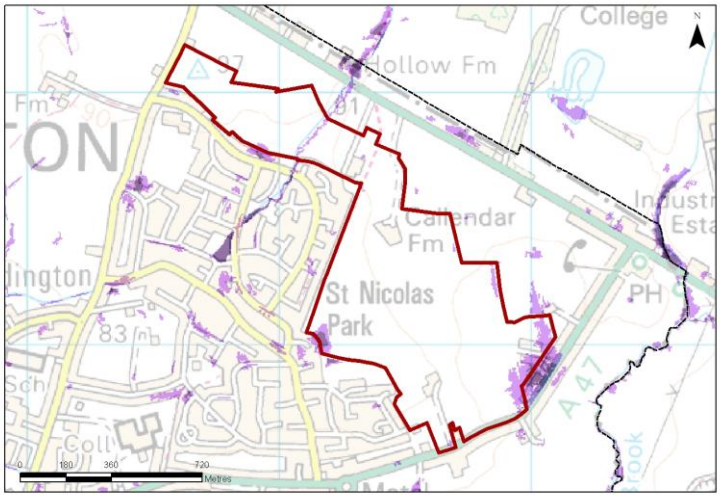
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

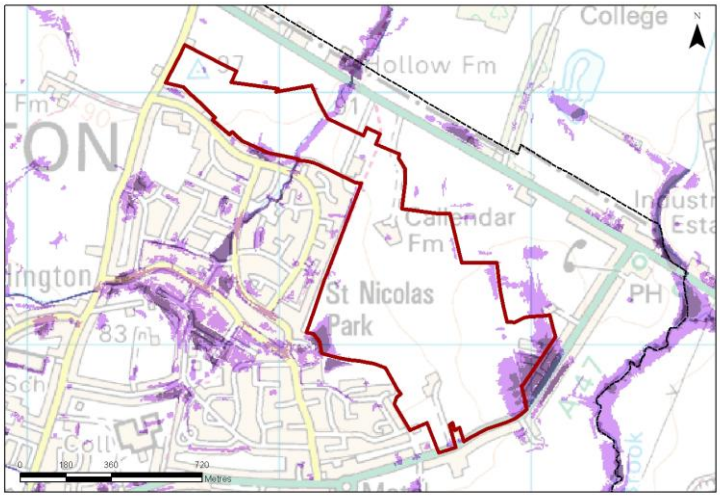
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Primary flood risk fluvial from Change Brook, resulting from overtopping of the watercourse channel. Change Brook flows in a south easterly direction through the northern section of the development site.
- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Colluvium, Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	8.2
	1 in 100 year (plus climate change)	32.7
Estimated Attenuation Storage Volume (m3)	17610.1-26530.5	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that the slopes are suitable for forms of detention to be used on site.
Filtration		All forms of filtration are likely to be suitable.
Conveyance		All forms of conveyance are likely to be suitable

- The site is not located within a groundwater source protection zone.
- Residential developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

None

Effects of Climate Change:

Increased water levels in Change Brook. Increased storm intensities.

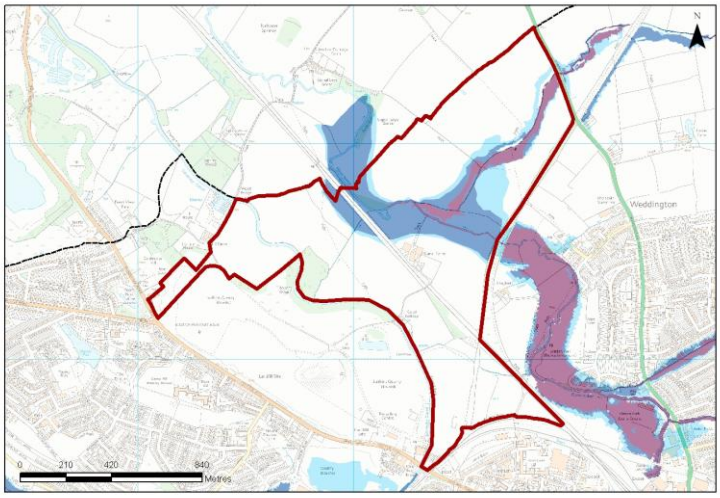
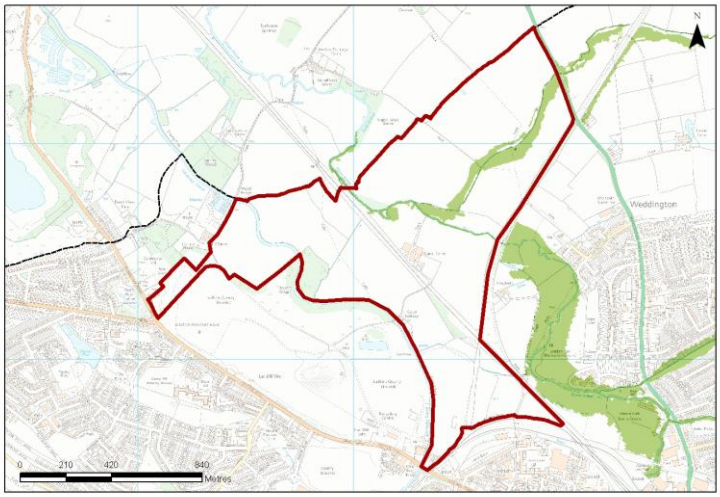
Flood Risk Implications for Development:

- Only a small proportion of the development site is affected by flood levels, therefore all development should be located within Flood Zone 1, unless appropriate in accordance with NPPF Technical Guidance. Also with a larger region in the south of the development site is located in Flood Zone 2 new infrastructure should be designed to not increase flood risk in these regions during large rainfall events.
- Consideration of the peak flows on the Change Brook and its durations required when considering drainage.
- A site specific flood risk assessment will be required for any development in Flood Zone 2 and 3.
- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the

site for example by:

- Reducing volume and rate of runoff
- Relocating development to zones with lower flood risk
- Creating space for flooding.

- Consider using Flood Zone 2 as public open space.

Table 7-4: PDA2a				
OS NGR: SP352935	**Area:** 131.3ha		**Brown/Greenfield:** Both	
Flood Zone Coverage:	**FZ3a:** 13%	**FZ3b:** 1%	**FZ2:** 5%	**FZ1:** 81%
Exception Test required? Yes, for Essential infrastructure development in FZ3b, Essential infrastructure and More Vulnerable development in FZ3a and Highly Vulnerable development in FZ2. Highly Vulnerable infrastructure should not be permitted within FZ3a. Highly Vulnerable, More Vulnerable and Less Vulnerable infrastructure should not be permitted within FZ3b.				
Requirements for passing the Exception Test: • To pass Part 'b' of the Exception Test, a FRA should demonstrate that the development will be safe, will avoid increasing flood risk elsewhere and will reduce flood risk overall. • Preference should be firstly given to locating development in the western areas of site; secondary preference should be given to locating developments in areas that do not show risk of flooding. It should be possible to reduce flood risk at this location by using sequential design to locate more vulnerable development towards higher ground, through building design and by meeting drainage requirements. Some resilience measures may be required if buildings are situated in the flood risk area. • Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage.				
Flood Zone Map: Local Authority Boundary Potential Development Area **Flood Zones** Flood Zone 3b Flood Zone 3a Flood Zone 2 Contains Ordnance Survey data © Crown copyright and database right 2012				
Climate Change: Local Authority Boundary Potential Development Area **Flood Zone 3 with Climate Change** Contains Ordnance Survey data © Crown copyright and database right 2012				

Surface Water Map:

Local Authority Boundary

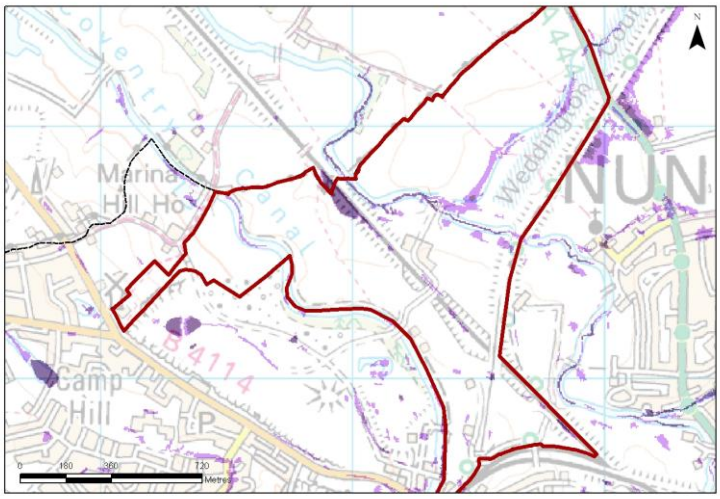
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

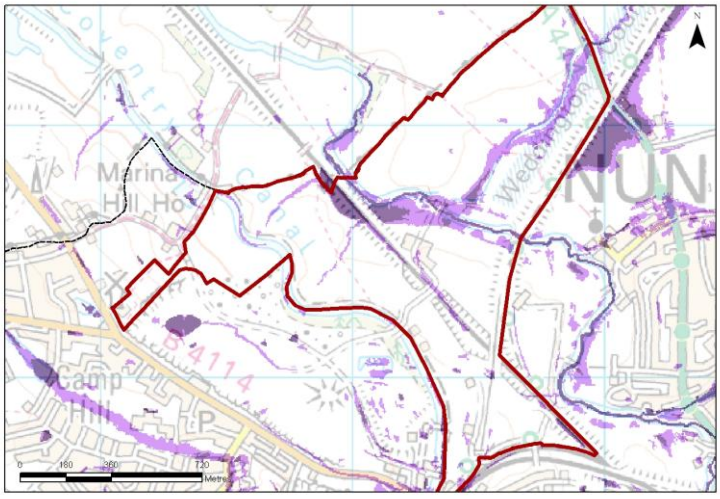
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Primary flood risk to the site is fluvial from the River Anker and an unnamed drain, resulting from overtopping of the watercourses channel. The River Anker flows in a westerly direction through the development site. The unnamed drain flows in a south westerly direction from the north east of the development site before joining the River Anker. Additional flood risk is posed by the Coventry Canal which flows along the western site boundary, crossing through a small portion of the site.
- With further developments and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Colluvium, Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	8.9

	1 in 100 year (plus climate change)	35.8
Estimated Attenuation Storage Volume (m3)	29148.6-44612.4	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that site slopes are steep and detention storage therefore will not be suitable
Filtration		All forms of filtration are likely to be suitable.
Conveyance		Mapping suggests that site slopes would be suitable for conveyance however, due to the steepness of slope may require check dams to slow flows.

- The site is not located within a groundwater source protection zone.
- Residential developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

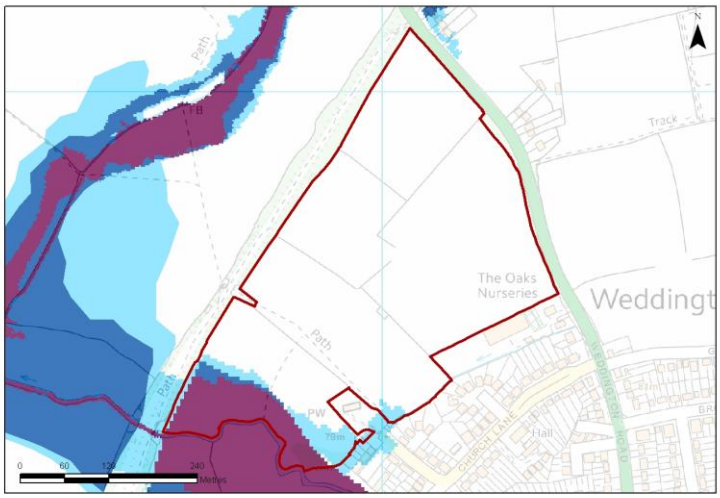
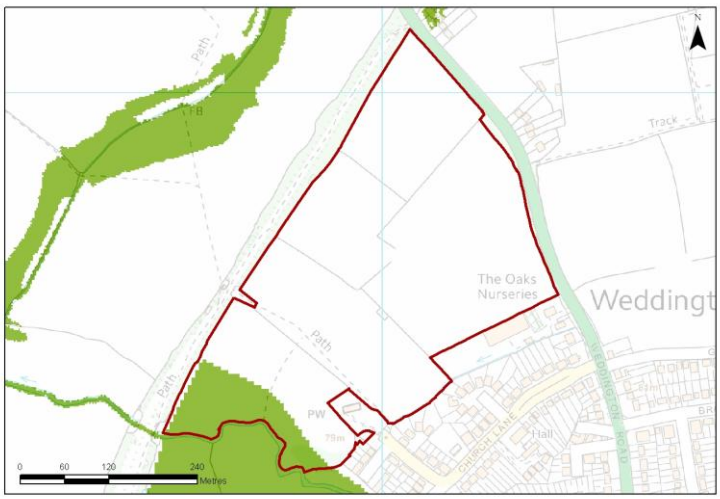
None.

Effects of Climate Change:

Increased water levels in the River Anker, unnamed drain and the Coventry Canal. Increased storm intensities.

Flood Risk Implications for Development:

- Only a small proportion of the development site is affected by flood levels, therefore all development should be located within Flood Zone 1, unless appropriate in accordance with NPPF Technical Guidance.
- Consideration of the peak flows on the River Anker, unnamed drains and the Coventry Canal as well as its durations required when considering drainage.
- Broad scale modelling shows this site to be at risk from the Coventry Canal should inundation occur. Developers should be aware that any site that is at or below canal bank level may be subject to canal flooding and this should be taken into account when building resilience into low level properties. Due to the potentially numerous locations for failure scenarios, the canal mapping is considered indicative only and will need to be reviewed and updated as part of any detailed site specific FRA.
- Developers should consider incorporating an eight metre buffer adjacent to the canal to allow access for maintenance and repair.
- A site specific flood risk assessment will be required for any development in Flood Zone 2 and 3.
- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.
- Consider using Flood Zone 2 as public open space

Table 7-5: PDA2b				
OS NGR: SP360 938	**Area:** 15.2 ha		**Brown/Greenfield:** Greenfield	
Flood Zone Coverage:	**FZ3a:** 1%	**FZ3b:** 7%	**FZ2:** 4%	**FZ1:** 88%
Exception Test required? Yes, for Essential infrastructure development in FZ3b, Essential infrastructure and More Vulnerable development in FZ3a and Highly Vulnerable development in FZ2. Highly Vulnerable infrastructure should not be permitted within FZ3a. Highly Vulnerable, More Vulnerable and Less Vulnerable infrastructure should not be permitted within FZ3b.				
Requirements for passing the Exception Test: • To pass Part 'b' of the Exception Test, a FRA should demonstrate that: the development will be safe, will avoid increasing flood risk elsewhere, and will reduce flood risk overall. • Preference should be given first to locating development outside the flooded areas, to the East of the site, away from the flood zone extending from the River Anker that flows along the southern site boundary and areas of surface water flooding in the North of the site. It should be possible to reduce flood risk by using sequential design to locate more vulnerable developments towards higher ground, through building design and by meeting drainage requirements. Some resilience measures may be required if buildings are situated in the flood risk area. • Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage				
Flood Zone Map: Local Authority Boundary Potential Development Area **Flood Zones** Flood Zone 3b Flood Zone 3a Flood Zone 2 Contains Ordnance Survey data © Crown copyright and database right 2012				
Climate Change: Local Authority Boundary Potential Development Area **Flood Zone 3 with Climate Change** Contains Ordnance Survey data © Crown copyright and database right 2012				

Surface Water Map:

Local Authority Boundary

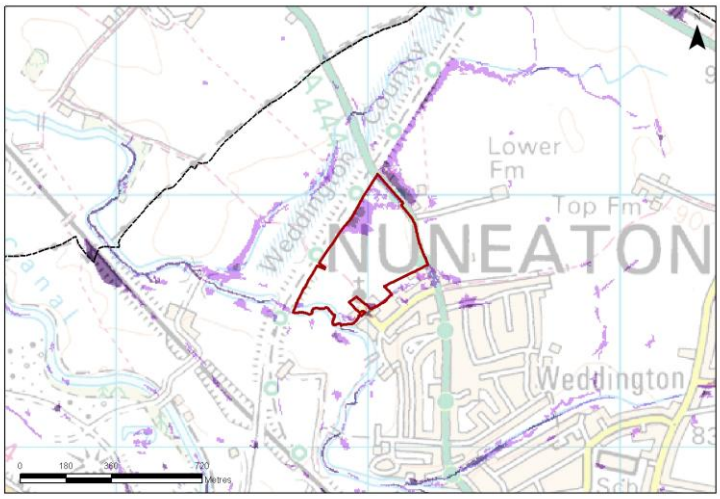
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

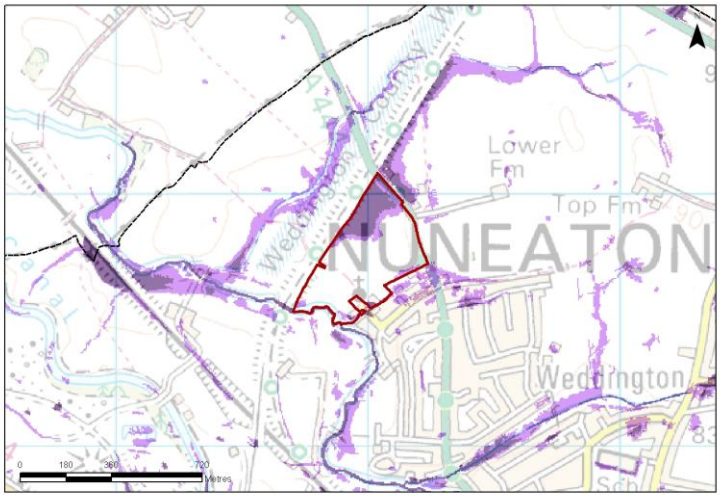
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Primary flood risk to the site is fluvial from the River Anker, resulting from overtopping of the watercourse channel. The River Anker flows in a North-westerly direction along the southern boundary of the development site.
- Additional flood risk is also posed by surface water flooding and overland flows.
- With further developments and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Colluvium, Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.78
	1 in 100 year (plus climate change)	31.0
Estimated Attenuation Storage Volume (m3)	3587.2-5396	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that the slopes are suitable for forms of detention to be used on site.
Filtration		All forms of filtration are likely to be suitable.
Conveyance		All forms of conveyance are likely to be suitable

- The site is not located within a groundwater source protection zone.
- Residential developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

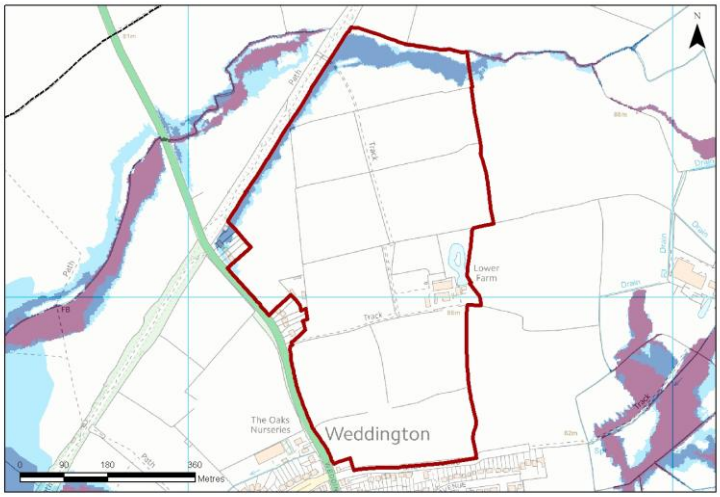
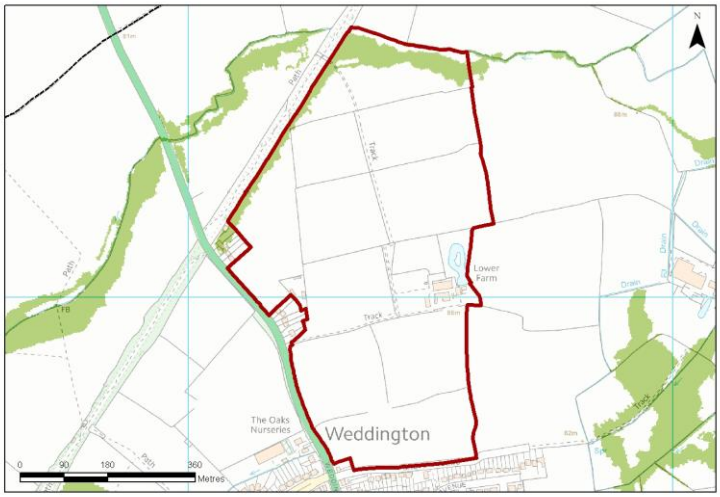
None

Effects of Climate Change:

Increased water levels in the River Anker. Increased storm intensities.

Flood Risk Implications for Development:

- Only a small proportion of the development site is affected by flood levels, therefore all development should be located within Flood Zone 1, unless appropriate in accordance with NPPF Technical Guidance. Consideration of the peak flows on the River Anker and its durations required when considering drainage.
- A site specific flood risk assessment will be required for any development in Flood Zone 2 and 3.
- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.
- Consider using Flood Zone 2 as public open space.

Table 7-6: PDA2c				
OS NGR: SP363942	**Area:** 24.4ha		**Brown/Greenfield:** Predominately Greenfield	
Flood Zone Coverage:	**FZ3a:** 6%	**FZ3b:** 1%	**FZ2:** 2%	**FZ1:** 91%
Exception Test required? Yes, for Essential infrastructure development in FZ3b, Essential infrastructure and More Vulnerable development in FZ3a and Highly Vulnerable development in FZ2. Highly Vulnerable infrastructure should not be permitted within FZ3a. Highly Vulnerable, More Vulnerable and Less Vulnerable infrastructure should not be permitted within FZ3b.				
Requirements for passing the Exception Test: • To pass Part 'b' of the Exception Test, a FRA should demonstrate that: the development will be safe, will avoid increasing flood risk elsewhere, and will reduce flood risk overall. • Preference should be given first to locating development outside the flooded areas, to the south west of the site, away from the flood zone extending from the unnamed drain that flows along the northern site boundary. It should be possible to reduce flood risk by using sequential design to locate more vulnerable developments towards higher ground, through building design and by meeting drainage requirements. Some resilience measures may be required if buildings are situated in the flood risk area. • Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage.				
Flood Zone Map: Local Authority Boundary Potential Development Area **Flood Zones** Flood Zone 3b Flood Zone 3a Flood Zone 2 Contains Ordnance Survey data © Crown copyright and database right 2012				
Climate Change: Local Authority Boundary Potential Development Area **Flood Zone 3 with Climate Change** Contains Ordnance Survey data © Crown copyright and database right 2012				

Surface Water Map:

Local Authority Boundary

Potential Development Area

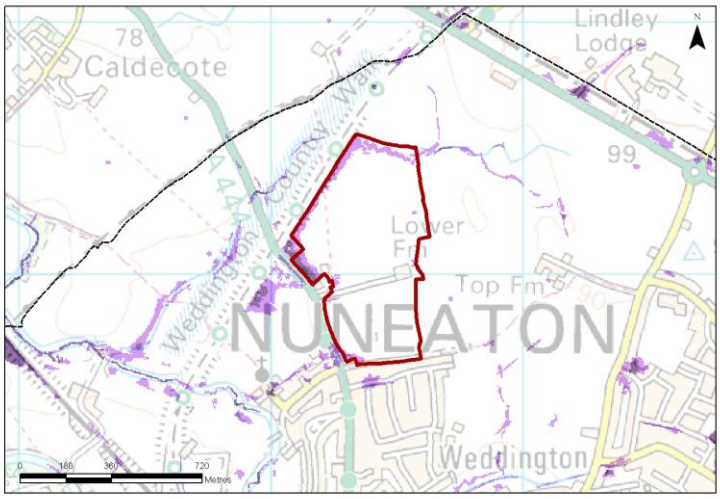
Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.

Contains Ordnance Survey data © Crown copyright and database right 2012



Surface Water Map:

Local Authority Boundary

Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.

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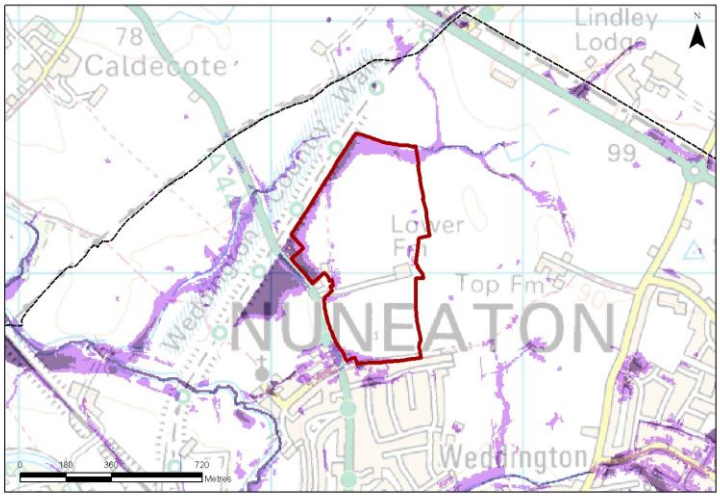


Sources of Flood Risk:

- Primary flood risk is fluvial, resulting from overtopping of an unnamed drain flowing west along the northern boundary of the development site. An embankment on the western site of the site appears to hinder water movement through this drain directing it along the edge of the site boundary in the western regions of the site.
- Additional flood risk is posed by surface water flooding and overland flows.
- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Colluvium, Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.7
	1 in 100 year (plus climate change)	31.0

Estimated Attenuation Storage Volume (m3)	5758.4-8662

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that the slopes are suitable for forms of detention to be used on site.
Filtration		All forms of filtration are likely to be suitable.
Conveyance		All forms of conveyance are likely to be suitable

- The site is not located within a groundwater source protection zone.
- Residential developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

None.

Effects of Climate Change:

Increased water levels in the unnamed drain. Increased storm intensities.

Flood Risk Implications for Development:

- Only a small proportion of the development site is affected by flood levels, therefore all development should be located within Flood Zone 1, unless appropriate in accordance with NPPF Technical Guidance. The proportion of the site that is affected relates to an unnamed drain and embankment that hinders flow out of the site. New infrastructure should be designed to not increase flood risk in these regions during large rainfall events.
- Consideration of the peak flows on the unnamed drain and its durations required when considering drainage.
- A site specific flood risk assessment will be required for any development in Flood Zone 2 and 3.
- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.
- Consider using Flood Zone 2 as public open space.

Table 7-7: PDA2d				
OS NGR: SP359945	**Area:** 6.6ha		**Brown/Greenfield:** Greenfield	
Flood Zone Coverage:	**FZ3a:** 2%	**FZ3b:** 1%	**FZ2:** 4%	**FZ1:** 93%

Exception Test required? Yes, for Essential infrastructure development in FZ3b, Essential infrastructure and More Vulnerable development in FZ3a and Highly Vulnerable development in FZ2.

Highly Vulnerable infrastructure should not be permitted within FZ3a. Highly Vulnerable, More Vulnerable and Less Vulnerable infrastructure should not be permitted within FZ3b.

Requirements for passing the Exception Test:

- To pass Part 'b' of the Exception Test, a FRA should demonstrate that: the development will be safe, will avoid increasing flood risk elsewhere and will reduce flood risk overall.
- Preference should be given to locating development outside the flooded areas, to the northern areas of the site due to an unnamed drain that flows along the southern boundary of the proposed development. It should be possible to reduce flood risk at this location by using sequential design to locate more vulnerable development towards higher ground, through building design and by meeting drainage requirements. Some resilience measures may be required if buildings are situated in the flood risk area.
- Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage.

Flood Zone Map:

Local Authority Boundary

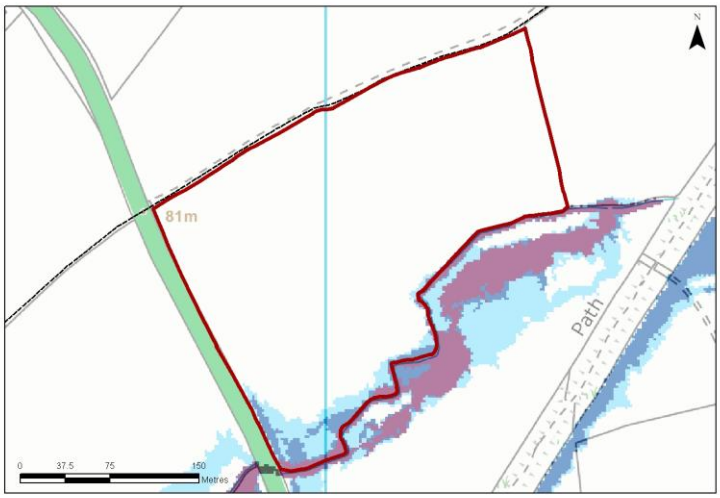
Potential Development Area

Flood Zones

Flood Zone 3b

Flood Zone 3a

Flood Zone 2

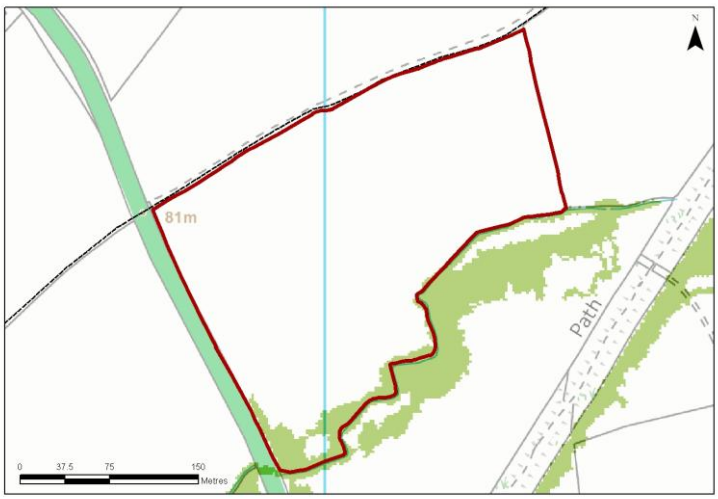


Climate Change:

Local Authority Boundary

Potential Development Area

Flood Zone 3 with Climate Change



Surface Water Map:

Local Authority Boundary

Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.

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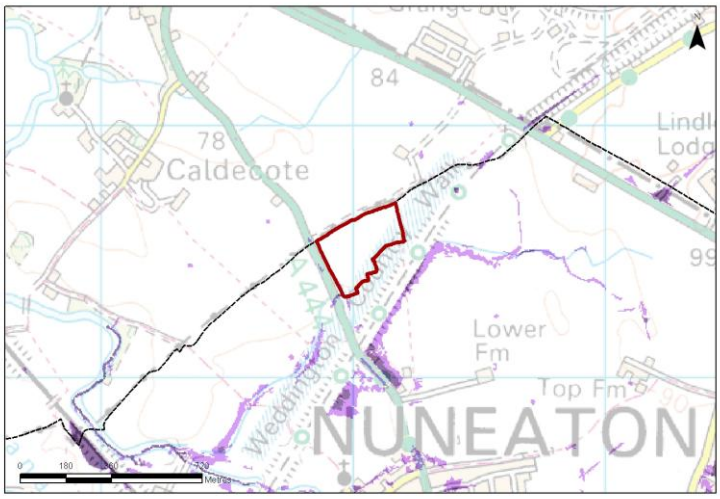


Surface Water Map:

Local Authority Boundary

Potential Development Area

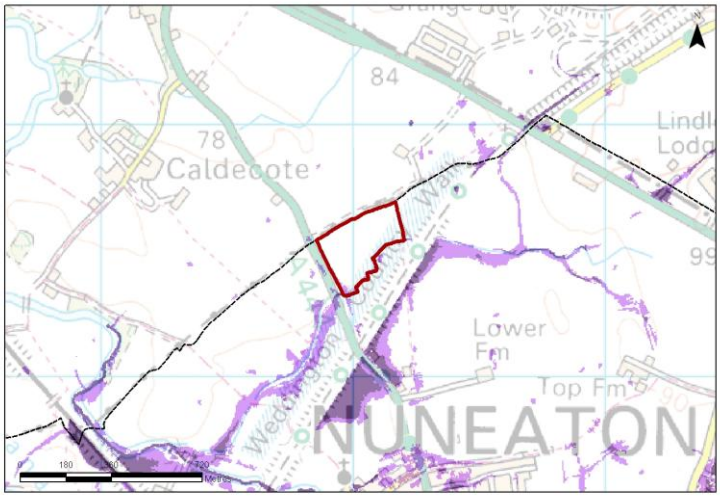
Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.

Contains Ordnance Survey data © Crown copyright and database right 2012



Sources of Flood Risk:

- Primary flood risk is from overtopping of an unnamed drain flowing west along the southern boundary of the development site.
- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Colluvium, Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.6
	1 in 100 year (plus climate change)	30.5
Estimated Attenuation Storage Volume (m3)	1570.8-2356.2	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that the slopes are suitable for forms of detention to be used on site.
Filtration		All forms of filtration are likely to be suitable.
Conveyance		All forms of conveyance are likely to be suitable

- The site is not located within a groundwater source protection zone.
- Residential developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

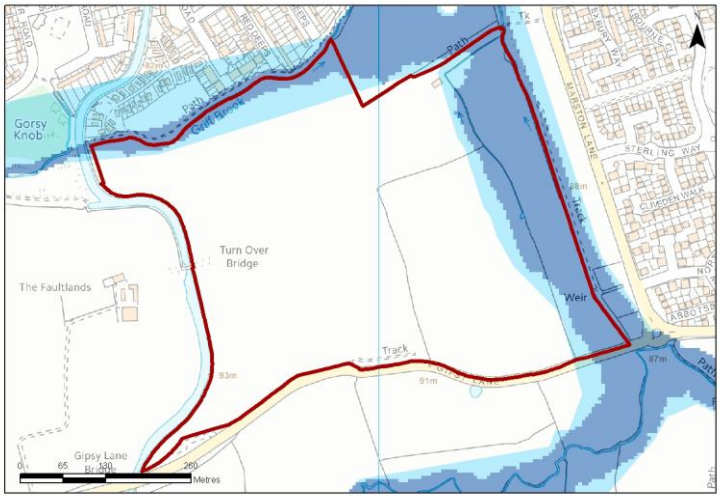
None.

Effects of Climate Change:

Increased water levels in the unnamed drain. Increased storm intensities.

Flood Risk Implications for Development:

- Only a small proportion of the development site is affected by flood levels, therefore all development should be located within Flood Zone 1, unless appropriate in accordance with NPPF Technical Guidance.
- Consideration of the peak flows on the unnamed drain and its durations required when considering drainage.
- A site specific flood risk assessment will be required for any development in Flood Zone 2 and 3.
- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.
- Consider using Flood Zone 2 as public open space.

Table 7-8: PDA3				
OS NGR: SP370895	**Area:** 28.0ha		**Brown/Greenfield:** Greenfield	
Flood Zone Coverage:	**FZ3a:** 17%	**FZ3b:** 0%	**FZ2:** 8%	**FZ1:** 75%
Exception Test required? Yes, for Essential Infrastructure and more vulnerable development in FZ3a and Highly Vulnerable development in FZ2. Highly Vulnerable infrastructure should not be permitted within FZ3a.				
Requirements for passing the Exception Test: • To pass Part 'b' of the Exception Test, a FRA should demonstrate that: the development will be safe, will avoid increasing flood risk elsewhere and will reduce flood risk overall. • Preference should be given to locating development in the south eastern parts of the site, outside of flooded areas. It should be possible to reduce flood risk at this development site by using sequential design to locate more vulnerable developments towards higher ground, through building design and by meeting drainage requirements. New developments being located outside of Flood Zone 2 and 3 needs to ensure that no increase in flood risk occurs. Some resilience measures may be required if buildings are situated in the flood risk area. • Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage				
Flood Zone Map: Local Authority Boundary Potential Development Area **Flood Zones** Flood Zone 3b Flood Zone 3a Flood Zone 2 Contains Ordnance Survey data © Crown copyright and database right 2012				
Climate Change: Local Authority Boundary Potential Development Area **Flood Zone 3 with Climate Change** Contains Ordnance Survey data © Crown copyright and database right 2012	No climate change mapping available			

Surface Water Map:

Local Authority Boundary

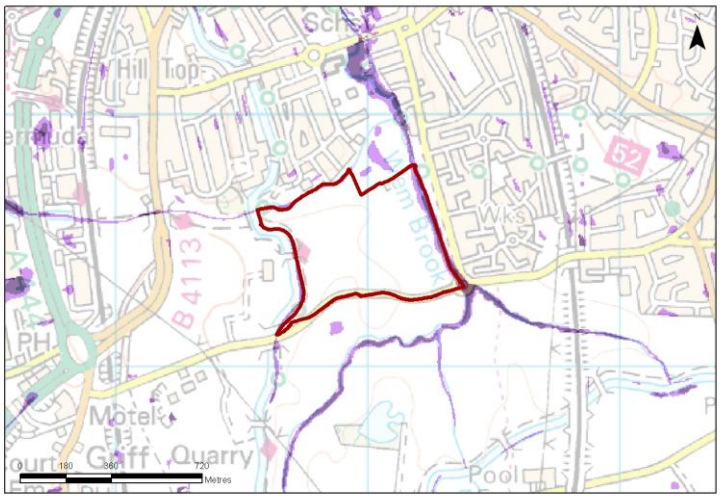
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

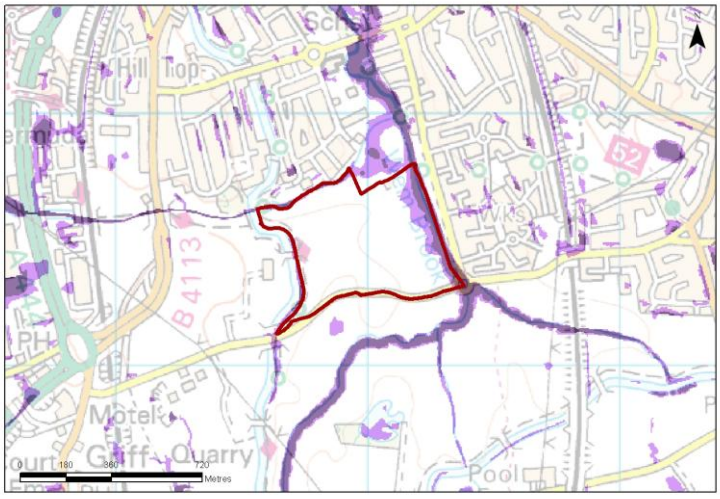
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Primary flood risk is fluvial, resulting from overtopping of the water course channels of the Wem Brook, Griff Brook and Coventry Canal that flow along the eastern, northern and western boundaries of the site.
- Additional flood risk is posed by overland flows from adjacent developments.
- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Colluvium, Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.0
	1 in 100 year (plus climate change)	26.8
Estimated Attenuation Storage Volume (m3)	6832-10388	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		All forms of filtration are likely to be suitable.
Conveyance		All forms of conveyance are likely to be suitable

- The site is not located within a groundwater source protection zone.
- Residential developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

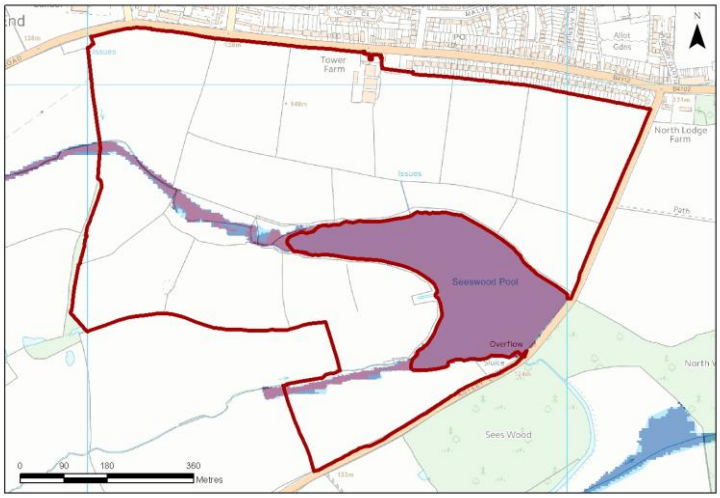
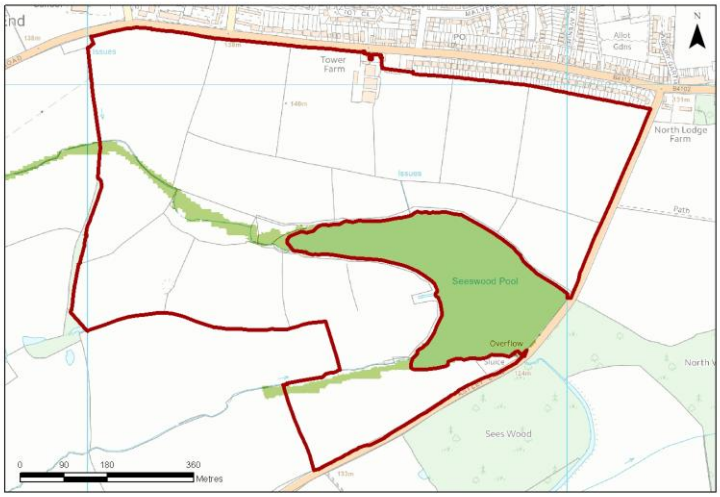
None.

Effects of Climate Change:

Increases in water levels for Coventry Canal, Wem Brook and Griff Brook. Increased storm intensities.

Flood Risk Implications for Development:

- Only a small proportion of the development site is affected by flood levels, therefore all development should be located within Flood Zone 1, unless appropriate in accordance with NPPF Technical Guidance.
- Consideration of the peak flows on the Coventry Canal, Wem Brook and Griff Brook and its durations required when considering drainage.
- Broad scale modelling shows this site to be at risk from the Coventry Canal should a breach occur. Developers should be aware that any site that is at or below canal bank level may be subject to canal flooding and this should be taken into account when building resilience into low level properties. Due to the potentially numerous locations for failure scenarios, the canal mapping is considered indicative only and will need to be reviewed and updated as part of any detailed site specific FRA.
- Developers should consider incorporating an eight metre buffer adjacent to the canal to allow access for maintenance and repair.
- A site specific flood risk assessment will be required for any development in Flood Zone 2 and 3.
- The affect of climate change will need to be assessed as part of a detailed site specific SFRA.
- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.
- Consider using Flood Zone 2 as public open space

Table 7-9: PDA4				
OS NGR: SP324 908	**Area:** 59.5ha		**Brown/Greenfield:** Greenfield	
Flood Zone Coverage:	**FZ3a:** 2%	**FZ3b:** 1%	**FZ2:** 1%	**FZ1:** 96%
Exception Test required? Yes, for Essential infrastructure development in FZ3b, Essential infrastructure and More Vulnerable development in FZ3a and Highly Vulnerable development in FZ2. Highly Vulnerable infrastructure should not be permitted within FZ3a. Highly Vulnerable, More Vulnerable and Less Vulnerable infrastructure should not be permitted within FZ3b.				
Requirements for passing the Exception Test: • To pass Part 'b' of the Exception Test, a FRA should demonstrate that the development will be safe, will avoid increasing flood risk elsewhere and will reduce flood risk overall. • First preference should be given to locating development outside of the flooded areas, to the northern areas of the development site. This sub-location is separated from the remainder of the site by an unnamed drain that flows through the centre of the development site in an easterly direction draining into Seeswood Pond. Second preference should be given to the areas in the southern region of the site that do not flood. It should be possible to reduce flood risk at this site by using sequential design to locate more vulnerable developments towards higher ground, through building design and by meeting drainage requirements. • Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage.				
Flood Zone Map: Local Authority Boundary Potential Development Area **Flood Zones** Flood Zone 3b Flood Zone 3a Flood Zone 2 Contains Ordnance Survey data © Crown copyright and database right 2012				
Climate Change: Local Authority Boundary Potential Development Area **Flood Zone 3 with Climate Change** Contains Ordnance Survey data © Crown copyright and database right 2012				

Surface Water Map:

Local Authority Boundary

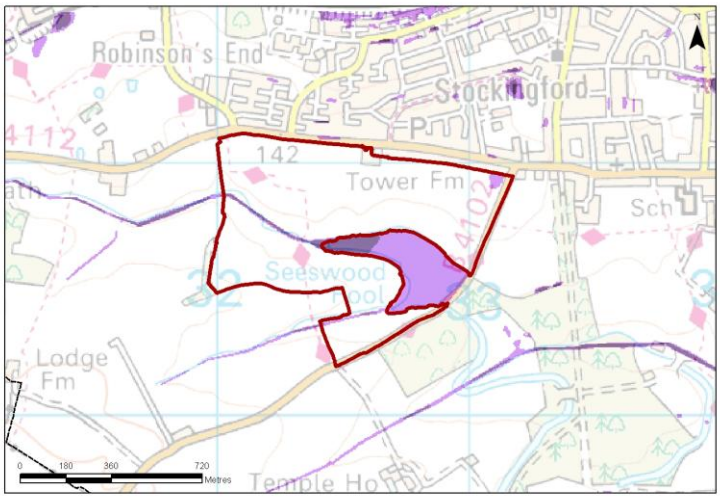
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

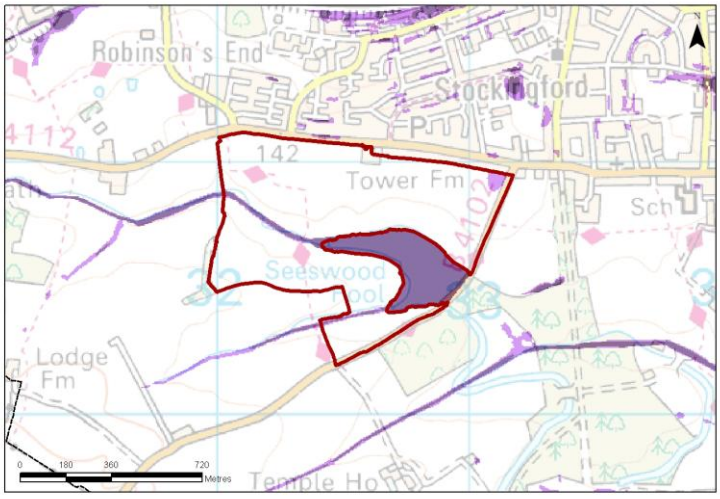
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Primary flood risk is from overtopping of two unnamed drains that flow in an easterly direction through the site. Both drains flow into Seeswood Pond which although located just outside of the development site boundary could pose another source of flooding. New developments within this area will need to ensure that pond and their overflow systems are adequately maintained.
- Also will further development and creation of impermeable ground surface, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Colluvium, Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.7
	1 in 100 year (plus climate change)	29.9

Estimated Attenuation Storage Volume (m3)	13923-21360.5

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		All forms of filtration are likely to be suitable.
Conveyance		Mapping suggests that site slopes would be suitable for conveyance however, due to the steepness of slope may require check dams to slow flows.

- The site is not located within a groundwater source protection zone.
- Residential developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

None.

Effects of Climate Change:

Increased water levels in the unnamed drains and Seeswood Pond. Increased storm intensities.

Flood Risk Implications for Development:

- Only a small proportion of the development site is affected by flood levels, therefore all development should be located within Flood Zone 1, unless appropriate in accordance with NPPF Technical Guidance.
- Consideration of the peak flows on the unnamed drains and Seeswood Pond as well as its durations required when considering drainage.
- A site specific flood risk assessment will be required for any development in Flood Zone 2 and 3.
- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.
- Consider using Flood Zone 2 as public open space.

Table 7-10: PDA5a		
OS NGR: SP342903	**Area:** 78.9ha	**Brown/Greenfield:** Greenfield
Exception Test required? No		

NPPF Guidance:

- For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA. The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off must be included.
- Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.

Surface Water Map:

Local Authority Boundary

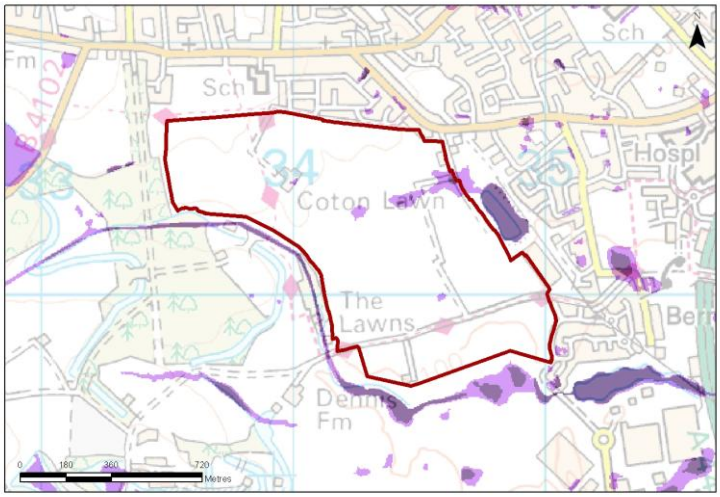
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

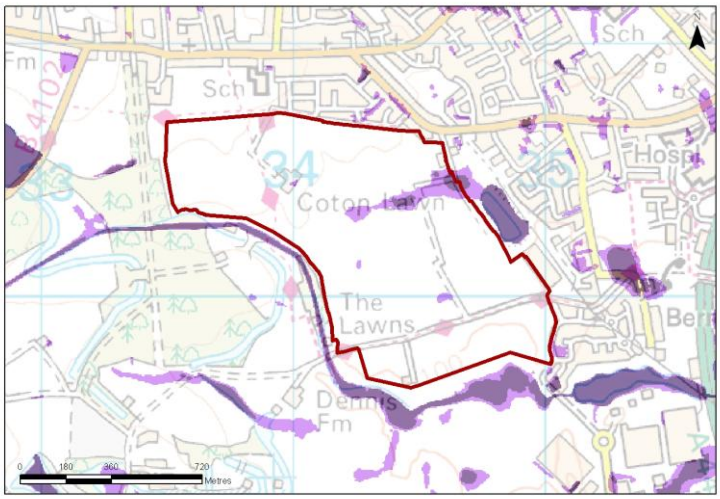
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Additionally flood risk is from surface water flooding and overland flows from adjacent developments.
- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be

developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Colluvium, Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.5
	1 in 100 year (plus climate change)	29.0
Estimated Attenuation Storage Volume (m3)	18699.3-28640.7	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		All forms of filtration are likely to be suitable.
Conveyance		All forms of conveyance are likely to be suitable

- The site is not located within a groundwater source protection zone.
- Residential developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

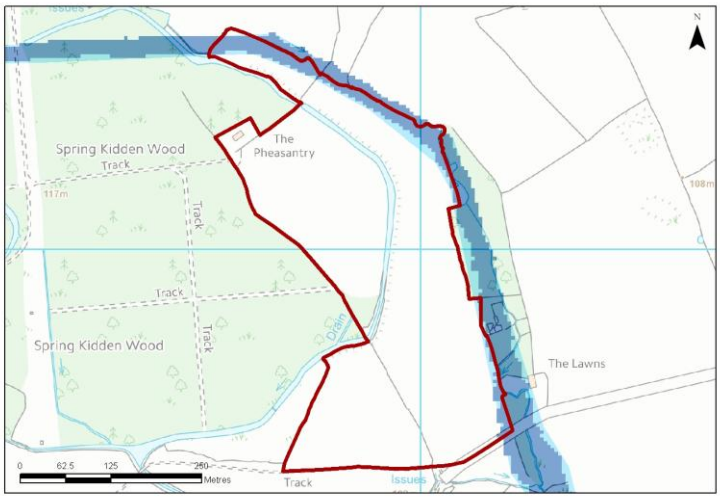
None.

Effects of Climate Change:

Increases in water levels in an unnamed drain. Increased storm intensities.

Flood Risk Implications for Development:

- Developers should consider reservoir flooding during the planning stage, using the EA's reservoir inundation mapping. Where possible, developers should consider using areas at possible risk as public open space.
- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.

Table 7-11: PDA5b				
OS NGR: SP339899	**Area:** 13.0ha		**Brown/Greenfield:** Greenfield	
Flood Zone Coverage:	**FZ3a:** 6%	**FZ3b:** 0%	**FZ2:** 2%	**FZ1:** 92%
Exception Test required? Yes, for Essential Infrastructure and more vulnerable development in FZ3a and Highly Vulnerable development in FZ2. Highly Vulnerable infrastructure should not be permitted within FZ3a.				
Requirements for passing the Exception Test: • To pass Part 'b' of the Exception Test, a FRA should demonstrate that the development will be safe, will avoid increasing flood risk elsewhere and will reduce flood risk overall. • First preference should be given to locating development outside of the flooded areas, away from the eastern site boundary. It should be possible to reduce flood risk at this site by using sequential design to locate more vulnerable developments towards higher ground, through building design and by meeting drainage requirements. Some resilience measures may be required if buildings are situated in the flood risk area • Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage.				
Flood Zone Map: Local Authority Boundary Potential Development Area **Flood Zones** Flood Zone 3b Flood Zone 3a Flood Zone 2 Contains Ordnance Survey data © Crown copyright and database right 2012				
Climate Change: Local Authority Boundary Potential Development Area **Flood Zone 3 with Climate Change** Contains Ordnance Survey data © Crown copyright and database right 2012	No climate change mapping available			

Surface Water Map:

Local Authority Boundary

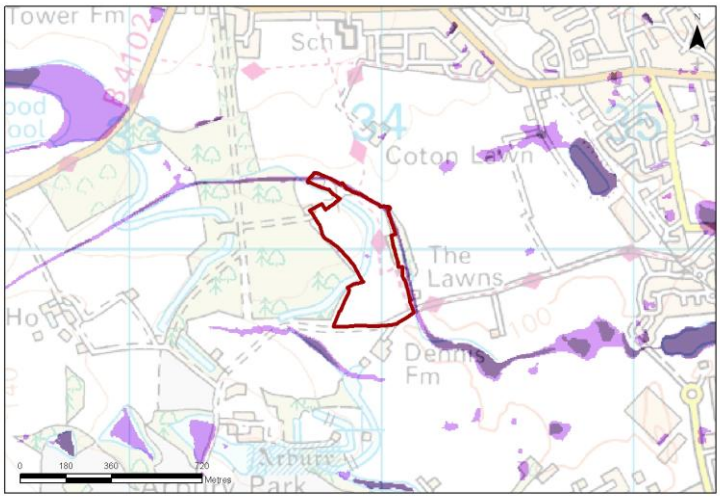
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

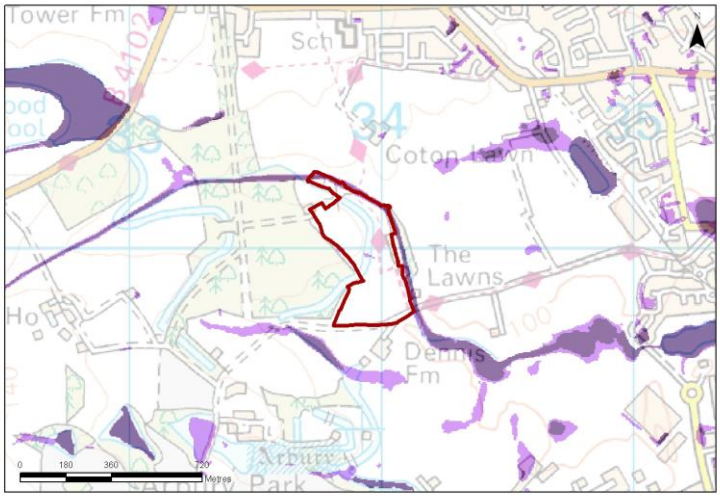
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Primary flood risk is from overtopping of two unnamed drains one of which flows through the centre of the proposed development site. The second unnamed drain follows along the eastern site boundary.
- Also will further development and creation of impermeable ground surface, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Colluvium, Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.7
	1 in 100 year (plus climate change)	29.9
Estimated Attenuation Storage Volume (m3)	3042-4667	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that site slopes are steep and detention storage therefore will not be suitable
Filtration		All forms of conveyance are likely to be suitable
Conveyance		Mapping suggests that site slopes would be suitable for conveyance however, due to the steepness of slope may require check dams to slow flows.

- The site is not located within a groundwater source protection zone.
- Residential developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

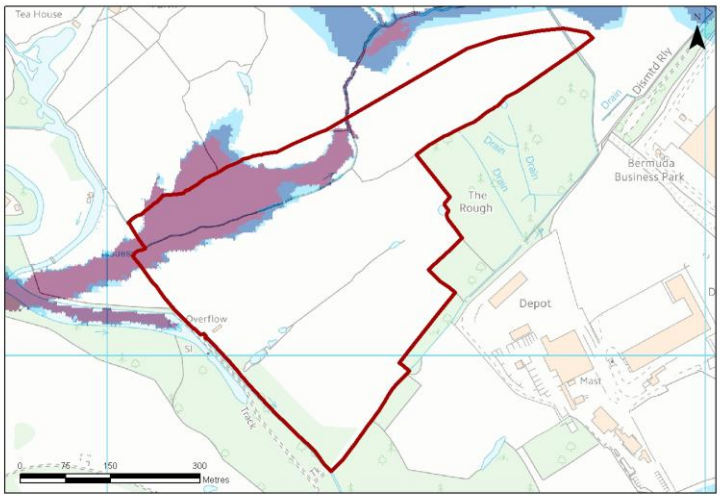
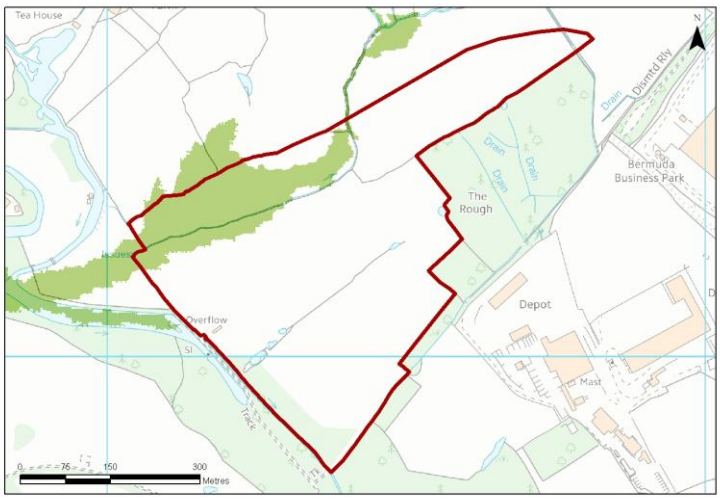
None.

Effects of Climate Change:

Increased water levels in unnamed drains. Increased storm intensities.

Flood Risk Implications for Development:

- Only a small proportion of the development site is affected by flood levels, therefore all development should be located within Flood Zone 1, unless appropriate in accordance with NPPF Technical Guidance.
- Consideration of the peak flows on the unnamed drain and its durations required when considering drainage.
- A site specific flood risk assessment will be required for any development in Flood Zone 2 and 3.
- The affect of climate change will need to be assessed as part of a detailed site specific SFRA.
- Developers should consider reservoir flooding during the planning stage, using the EA's reservoir inundation mapping. Where possible, developers should consider using areas at possible risk as public open space.
- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.
- Consider using Flood Zone 2 as public open space

Table 7-12: PDA5c				
OS NGR: SP343891	**Area:** 22.3ha		**Brown/Greenfield:** Greenfield	
Flood Zone Coverage:	**FZ3a:** 13%	**FZ3b:** 1%	**FZ2:** 1%	**FZ1:** 85%
Exception Test required? Yes, for Essential infrastructure development in FZ3b, Essential infrastructure and More Vulnerable development in FZ3a and Highly Vulnerable development in FZ2. Highly Vulnerable infrastructure should not be permitted within FZ3a. Highly Vulnerable, More Vulnerable and Less Vulnerable infrastructure should not be permitted within FZ3b.				
Requirements for passing the Exception Test: • To pass Part 'b' of the Exception Test, a FRA should demonstrate that: the development will be safe, will avoid increasing flood risk elsewhere and will reduce flood risk overall. • Preference should be given to locating development outside the flooded areas, to the southern and eastern areas of the site due to an unnamed drain that flows along the northern boundary of the proposed development. It should be possible to reduce flood risk at this location by using sequential design to locate more vulnerable development towards higher ground, through building design and by meeting drainage requirements. Some resilience measures may be required if buildings are situated in the flood risk area. • Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage				
Flood Zone Map: Local Authority Boundary Potential Development Area **Flood Zones** Flood Zone 3b Flood Zone 3a Flood Zone 2 Contains Ordnance Survey data © Crown copyright and database right 2012				
Climate Change: Local Authority Boundary Potential Development Area **Flood Zone 3 with Climate Change** Contains Ordnance Survey data © Crown copyright and database right 2012				

Surface Water Map:

Local Authority Boundary

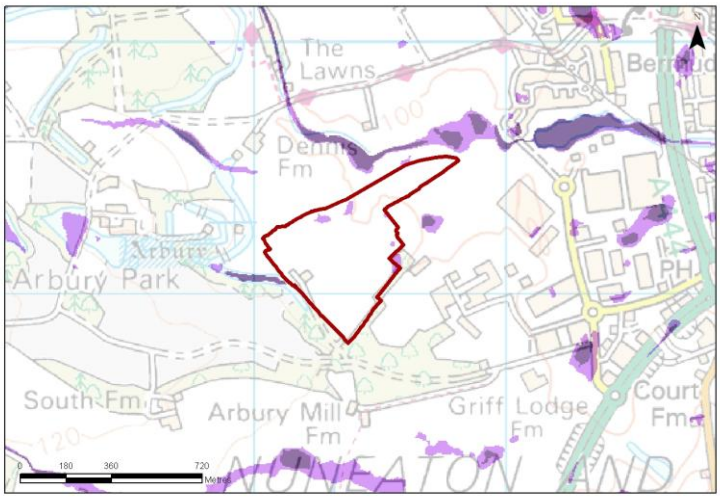
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

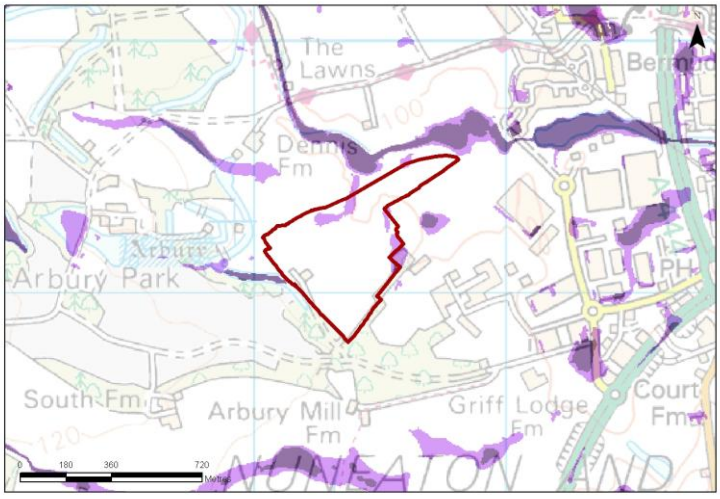
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Primary flood risk is from overtopping an unnamed drain. The drain flows in a north easterly direction the western region of the development site. There are also a further two unnamed drains that flow along the southern boundary of the development site.
- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Colluvium, Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	6.8
	1 in 100 year (plus climate change)	26.4
Estimated Attenuation Storage Volume (m3)	5463.5-8317.9	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		All forms of filtration are likely to be suitable.
Conveyance		All forms of conveyance are likely to be suitable

- The site is not located within a groundwater source protection zone.
- Residential developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

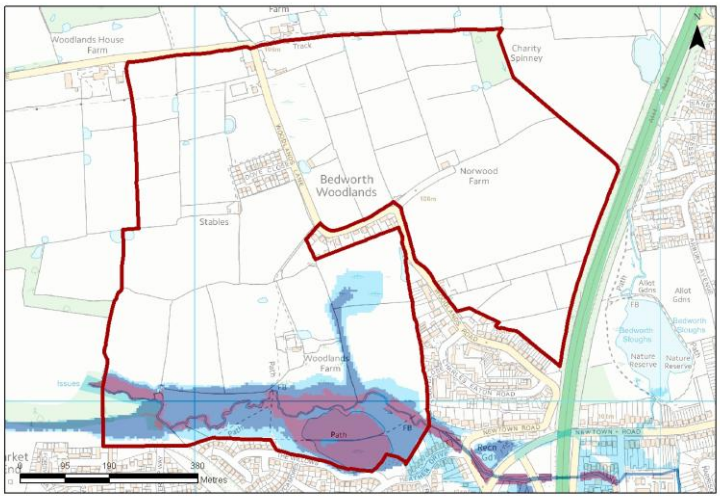
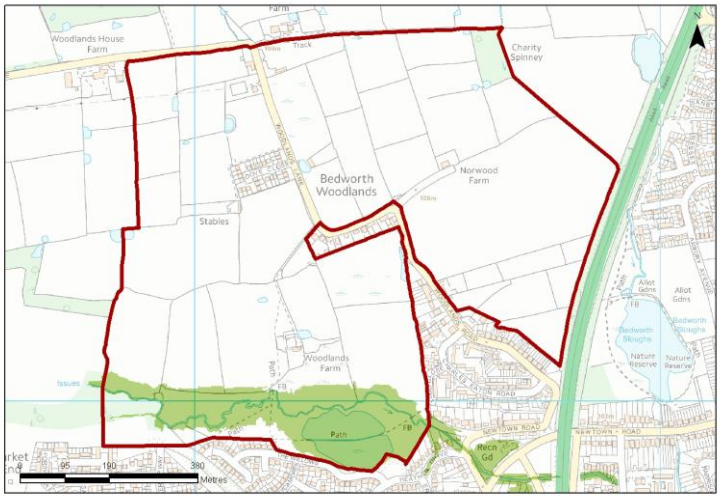
None.

Effects of Climate Change:

Increased water levels in the unnamed drains. Increased storm intensities.

Flood Risk Implications for Development:

- Only a small proportion of the development site is affected by flood levels, therefore all development should be located within Flood Zone 1, unless appropriate in accordance with NPPF Technical Guidance.
- Consideration of the peak flows on the unnamed drains is required when considering drainage.
- A site specific flood risk assessment will be required for any development in Flood Zone 2 and 3.
- Developers should consider reservoir flooding during the planning stage, using the EA's reservoir inundation mapping. Where possible, developers should consider using areas at possible risk as public open space.
- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.
- Consider using Flood Zone 2 as public open space.

Table 7-13: PDA6				
OS NGR: SP342875	**Area:** 74.8ha		**Brown/Greenfield:** Predominately Greenfield	
Flood Zone Coverage:	**FZ3a:** 10%	**FZ3b:** 1%	**FZ2:** 4%	**FZ1:** 85%
Exception Test required? Yes, for Essential infrastructure development in FZ3b, Essential infrastructure and More Vulnerable development in FZ3a and Highly Vulnerable development in FZ2. Highly Vulnerable infrastructure should not be permitted within FZ3a. Highly Vulnerable, More Vulnerable and Less Vulnerable infrastructure should not be permitted within FZ3b.				
Requirements for passing the Exception Test: • To pass Part 'b' of the Exception Test, a FRA should demonstrate that the development will be safe, will avoid increasing flood risk elsewhere and will reduce flood risk overall. • Preference should be given to locating development outside the flooded areas, to the north of the River Sowe, which flows through a southern section of the development site. It should be possible to reduce flood risk at this location by using sequential design to locate more vulnerable development towards higher ground, through building design and by meeting drainage requirements. Some resilience measures may be required if buildings are situated in the flood risk area. • Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage.				
Flood Zone Map: Local Authority Boundary Potential Development Area **Flood Zones** Flood Zone 3b Flood Zone 3a Flood Zone 2 Contains Ordnance Survey data © Crown copyright and database right 2012				
Climate Change: Local Authority Boundary Potential Development Area **Flood Zone 3 with Climate Change** Contains Ordnance Survey data © Crown copyright and database right 2012				

Surface Water Map:

Local Authority Boundary

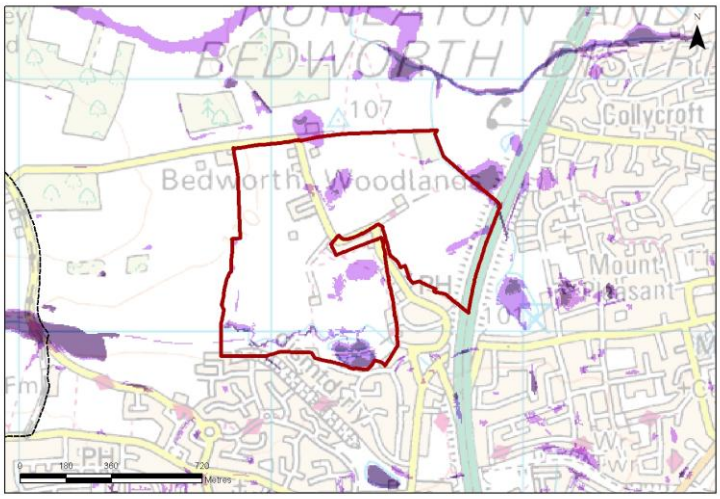
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

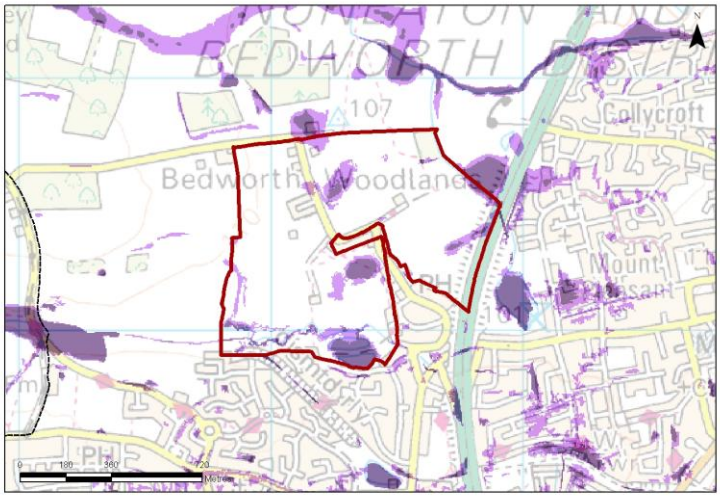
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Primary risk is from the River Sowe, resulting from overtopping of the watercourse channel. The River Sowe flows in easterly direction through the southern region of the development site. Bedworth Slough Brook flows along the northern site boundary following in a south eastern direction. Bedworth Slough Brook does not significantly enter the site boundary. As well as risk from overtopping of the channels there is flood risk from surface water flooding and overland flows.
- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.5

	1 in 100 year (plus climate change)	29.2
Estimated Attenuation Storage Volume (m3)	17952-26778.4	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		All forms of filtration are likely to be suitable
Conveyance		All forms of conveyance are likely to be suitable

- This site is located in a groundwater nitrate vulnerable zone. It is therefore recommended that a form of pre-treatment is provided before allowing infiltration.
- The site is not located within a groundwater source protection zone.
- Residential developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

None.

Effects of Climate Change:

Increased water levels in both the River Sowe and the Bedworth Slough Brook. Increased storm intensities.

Flood Risk Implications for Development:

- Only a small proportion of the development site is affected by flood levels, therefore all development should be located within Flood Zone 1, unless appropriate in accordance with NPPF Technical Guidance.
- Consideration of the peak flows on the River Sowe and the Bedworth Slough Brook as well as its durations required when considering drainage.
- A site specific flood risk assessment will be required for any development in Flood Zone 2 and 3.
- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.
- Consider using Flood Zone 2 as public open space

Table 7-14: PDA7		
OS NGR:SP333860	**Area:** 26.1ha	**Brown/Greenfield:** Predominately Greenfield
Exception Test required? No		

NPPF Guidance:

- For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA. The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off must be included.
- Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.

Surface Water Map:

Local Authority Boundary

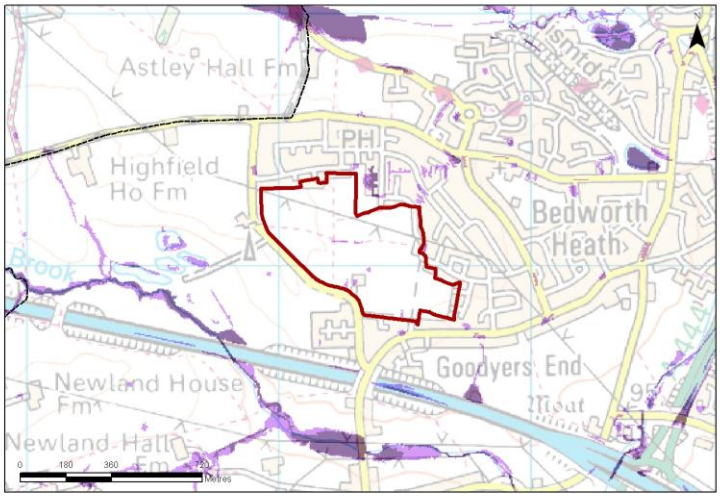
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

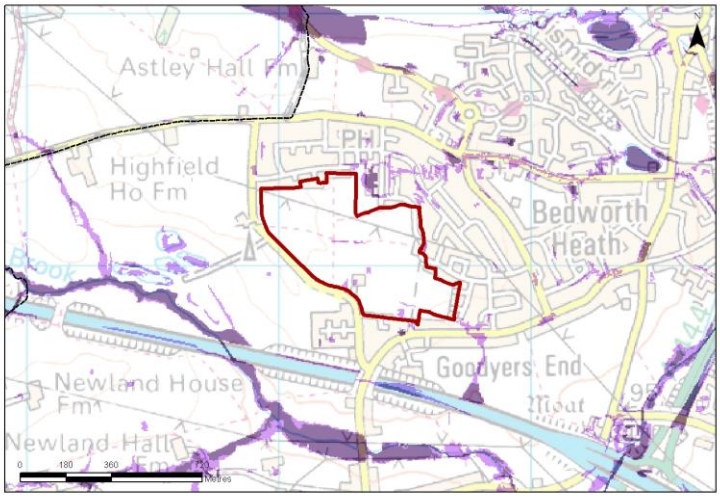
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Primary flood risk is from surface water flooding and overland flows.
- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be

developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Glaciolacustrine clays and silts	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.4
	1 in 100 year (plus climate change)	28.8
Estimated Attenuation Storage Volume (m3)	6290.1-9369.9	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		All forms of filtration are likely to be suitable.
Conveyance		All forms of conveyance are likely to be suitable

- This site is located in a groundwater nitrate vulnerable zone. It is therefore recommended that a form of pre-treatment is provided before allowing infiltration.
- The site is not located within a groundwater source protection zone.
- Commercial developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

None.

Effects of Climate Change:

Increased storm intensities.

Flood Risk Implications for Development:

- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.

Table 7-15: PDA8		
OS NGR: SP349850	**Area:** 12.6ha	**Brown/Greenfield:** Greenfield
Exception Test required? No		

NPPF Guidance:

- For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA. The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off must be included.
- Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.

Surface Water Map:

Local Authority Boundary

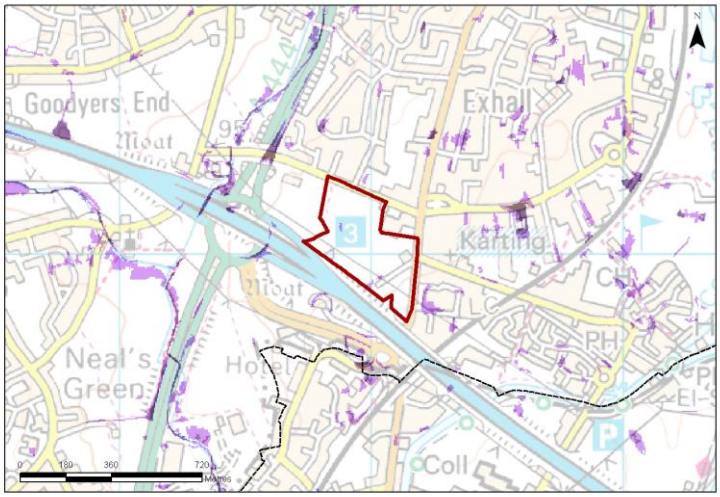
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

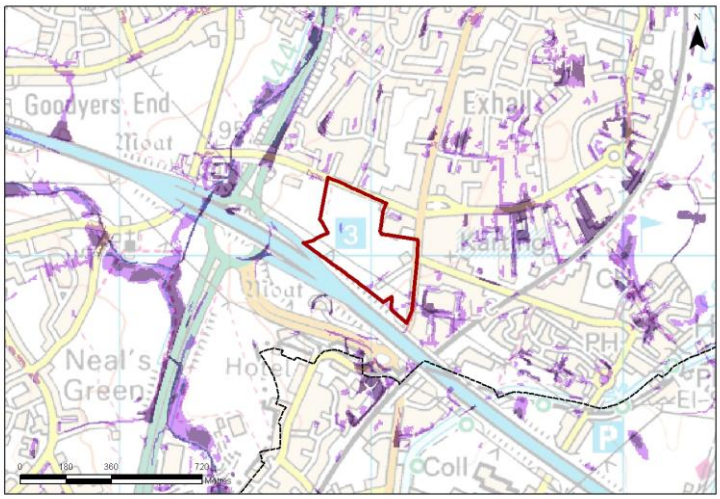
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Primary flood risk is from surface water flooding and overland flows.
- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to

represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Glaciolacustrine clays and silts	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.9
	1 in 100 year (plus climate change)	30.9
Estimated Attenuation Storage Volume (m3)	2948.4-4422.6	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		All forms of filtration are likely to be suitable.
Conveyance		All forms of conveyance are likely to be suitable

- The site is not located within a groundwater source protection zone.
- Commercial developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

None.

Effects of Climate Change:

Increased storm intensities.

Flood Risk Implications for Development:

- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.

Table 7-16: PDA9		
OS NGR: SP 36271 85272	**Area:** 32.95ha	**Brown/Greenfield:** Greenfield
Exception Test required? No		

NPPF Guidance:

- For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA. The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off must be included.
- Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques

Surface Water Map:

Local Authority Boundary

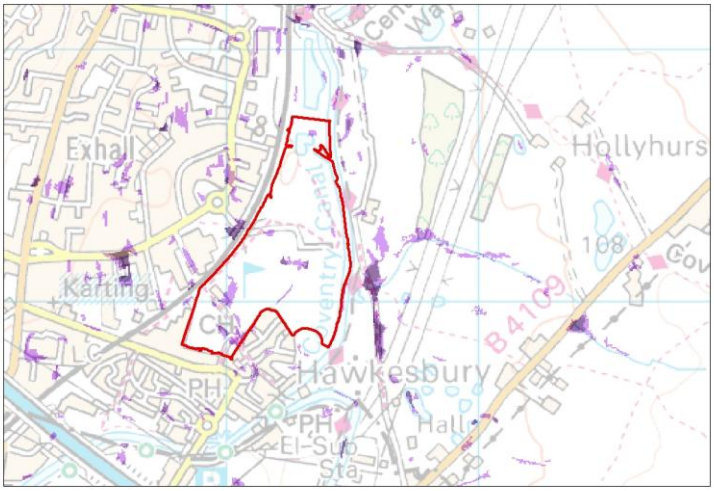
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

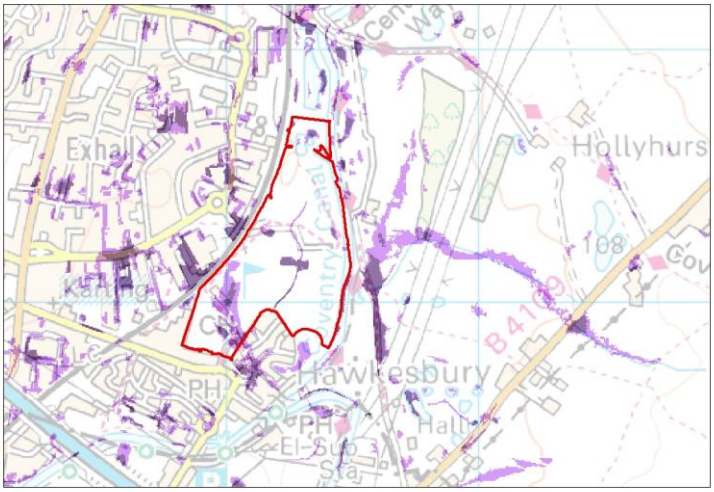
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Primary flood risk is from surface water flooding and overland flows.
- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to

represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Glaciolacustrine clays and silts	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.94
	1 in 100 year (plus climate change)	31
Estimated Attenuation Storage Volume (m3)	7710.3-11960.9	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		The majority of the forms of source control would be suitable except pervious pavements due to contamination risk from landfill deposits. Further investigation and consultation with the Environment Agency may be needed.
Infiltration		Mapping suggests underlining soil is likely to be permeable however; landfill deposits in the localised area make infiltration unsuitable without further detailed investigation and consultation with the Environment Agency.
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		Mapping suggests that filtrations would be suitable but require a form of liner to prevent contamination from localised landfill deposits.
Conveyance		All forms of conveyance are likely to be suitable

- The site is not located within a groundwater source protection zone.
- The site is bordered by several landfill areas. Investigation and consultation with the Environment Agency may be needed to assess the risk of contamination.
- Residential developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

None

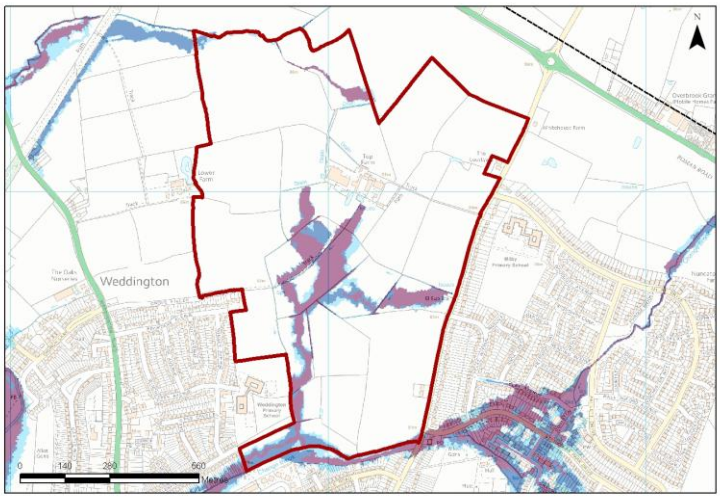
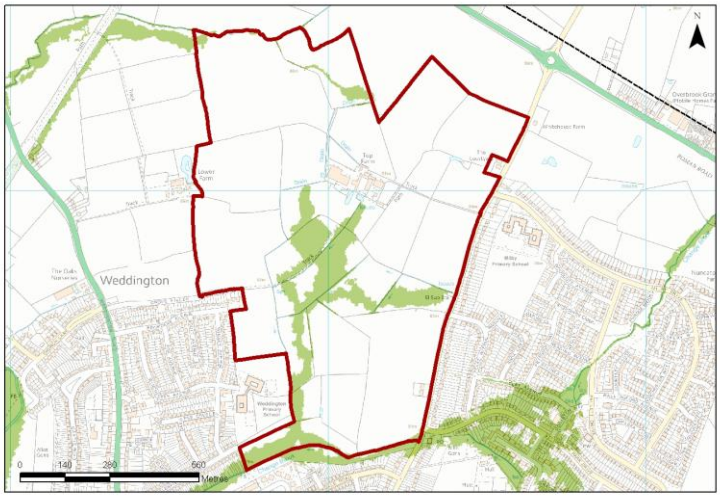
Effects of Climate Change:

Increased storm intensities.

Flood Risk Implications for Development:

- The Coventry Canal flows adjacent to the Eastern site boundary. In this particular case the development is rising away from the canal and the land at the opposite bank is lower. Therefore, in the event of canal inundation, water will flow away from the proposed development site. However, a detailed investigation may be required in a detailed FRA to assess the full flood risk of the Coventry Canal with any proposed development.
- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Developers should consider incorporating an eight metre buffer adjacent to the canal to allow access for maintenance and repair.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:

- Reducing volume and rate of runoff
- Relocating development to zones with lower flood risk
- Creating space for flooding.

Table 7-17: PDA10				
OS NGR: SP371939	**Area:** 94.1ha		**Brown/Greenfield:** Predominately Greenfield	
Flood Zone Coverage:	**FZ3a:** 9%	**FZ3b:** 1%	**FZ2:** 2%	**FZ1:** 88%
Exception Test required? Yes, for Essential infrastructure in FZ3b, Essential Infrastructure and more vulnerable development in FZ3a and Highly Vulnerable development in FZ2. Highly Vulnerable infrastructure should not be permitted within FZ3a. Highly Vulnerable, More Vulnerable and Less Vulnerable infrastructure should not be permitted within FZ3b.				
Requirements for passing the Exception Test: • To pass Part 'b' of the Exception Test, a FRA should demonstrate that: the development will be safe, will avoid increasing flood risk elsewhere and will reduce flood risk overall. • Preference should be given firstly to locating development outside of flooded areas which are predominately found in the central part of the development site. It should be possible to reduce flood risk at this development site by using sequential design to locate more vulnerable developments towards higher ground, through building design and by meeting drainage requirements. New developments being located outside of Flood Zone 2 and 3 needs to ensure that no increase in flood risk occurs. Some resilience measures may be required if buildings are situated in the flood risk area. • Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage.				
Flood Zone Map: Local Authority Boundary Potential Development Area **Flood Zones** Flood Zone 3b Flood Zone 3a Flood Zone 2 Contains Ordnance Survey data © Crown copyright and database right 2012				
Climate Change: Local Authority Boundary Potential Development Area **Flood Zone 3 with Climate Change** Contains Ordnance Survey data © Crown copyright and database right 2012				

Surface Water Map:

Local Authority Boundary

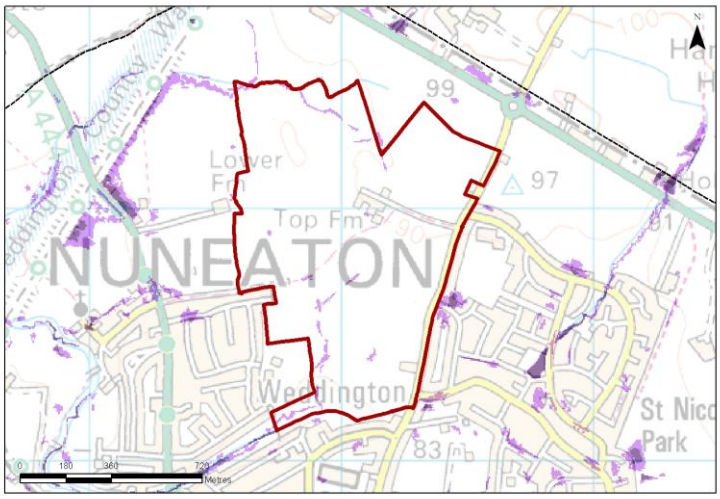
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

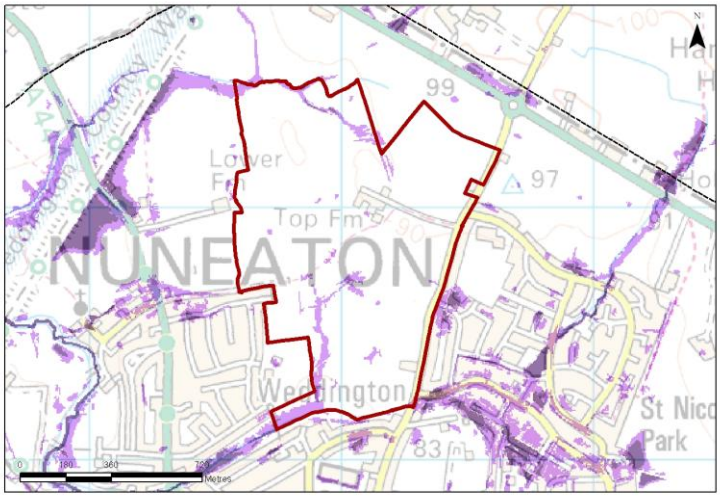
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Primary flood risk is from the Change Brook and unnamed drain, resulting from overtopping of the watercourses channel. The Change Brook has several small tributaries that originate in the development site and flow in a southerly direction out of the site boundary. An unnamed drain originates in the north of the development zone eventually flowing in a westerly direction around the northern boundary.
- Additional flood risk is posed from surface water flooding and overland flows.
- With further development and creation of impermeable ground surface, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Colluvium, Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	8.0

	1 in 100 year (plus climate change)	32.2
Estimated Attenuation Storage Volume (m3)	21831.2-32935	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		All forms of filtration are likely to be suitable.
Conveyance		All forms of conveyance are likely to be suitable

- The site is not located within a groundwater source protection zone.
- Residential developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

None.

Effects of Climate Change:

Increased water levels in the Change Brook and the unnamed drain. Increased storm intensities

Flood Risk Implications for Development:

- Redevelopment of the site is proposed to focus on residential uses.
- Only a small proportion of the development site is affected by flood levels, therefore all development should be located within Flood Zone 1, unless appropriate in accordance with NPPF Technical Guidance.
- Consideration of the peak flows on the Change Brook and unnamed drains is required when considering drainage.
- A site specific flood risk assessment will be required for any development in Flood Zone 2 and 3.
- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.
- Consider using Flood Zone 2 as public open space.

Table 7-18: AR/13/08h				
OS NGR: SP346888	**Area:** 6.6ha		**Brown/Greenfield:** Greenfield	
Flood Zone Coverage:	**FZ3a:** 0%	**FZ3b:** 0%	**FZ2:** 1%	**FZ1:** 99%
Exception Test required? Yes, for Highly Vulnerable development in FZ2.				

Requirements for passing the Exception Test:

- To pass Part 'b' of the Exception Test, a FRA should demonstrate that: the development will be safe, will avoid increasing flood risk elsewhere and will reduce the flood risk overall.
- Preference should be given first to locating development away from the southern part of the development site, outside the floodplain areas of the unnamed drain that runs through a small section of the site. It should be possible to reduce flood risk at this location by using sequential design to locate vulnerable developments towards higher ground, through building design and by meeting drainage requirements. Some resilience measures may be required if buildings are situated in the flood risk area.
- Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage.

Flood Zone Map:

Local Authority Boundary

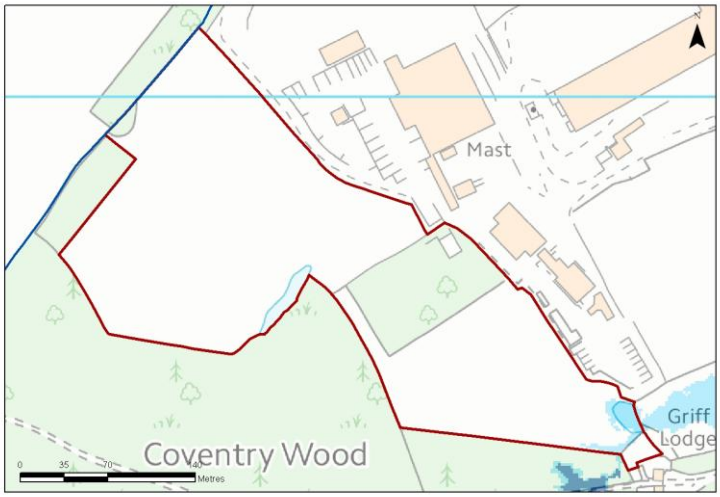
Potential Development Area

Flood Zones

Flood Zone 3b

Flood Zone 3a

Flood Zone 2

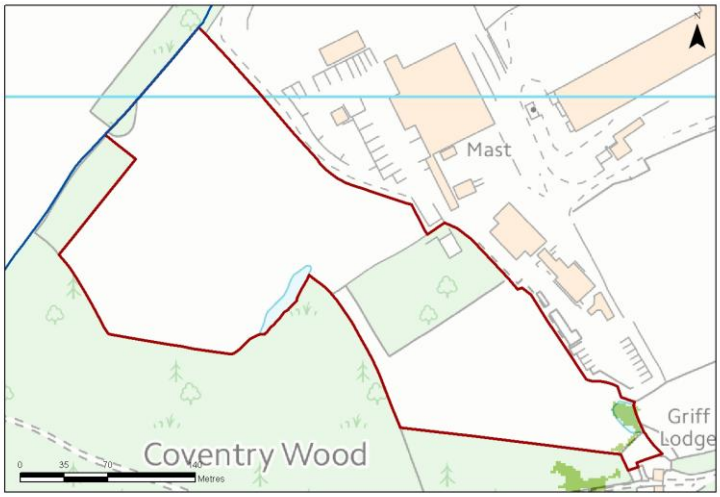


Climate Change:

Local Authority Boundary

Potential Development Area

Flood Zone 3 with Climate Change



Surface Water Map:

Local Authority Boundary

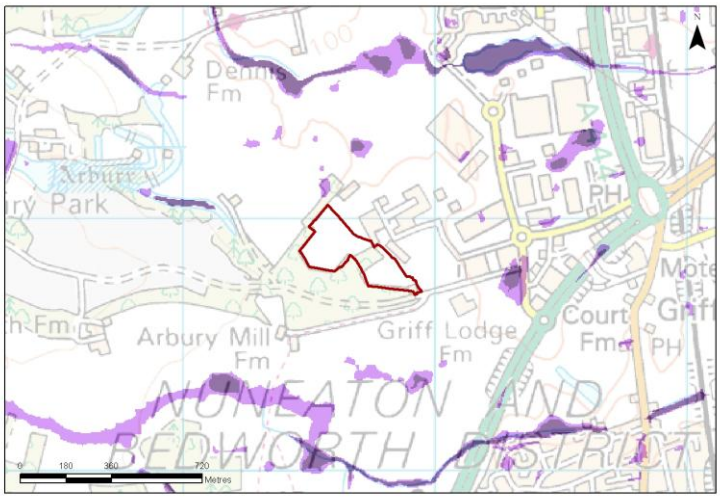
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

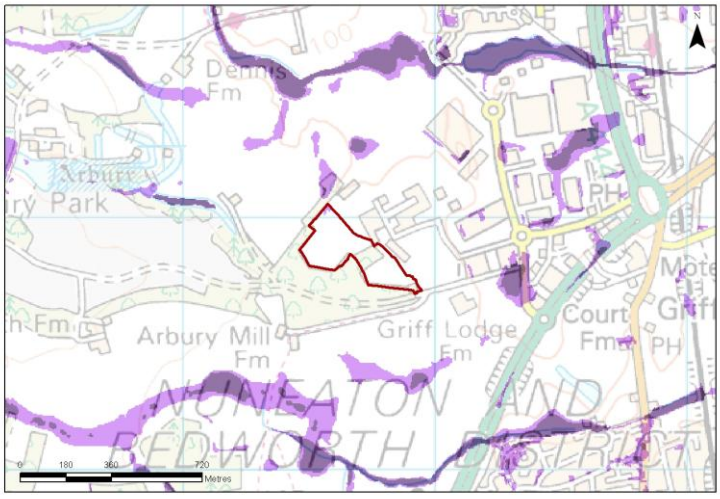
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- The primary flood risk is fluvial, resulting from overtopping of an unnamed drain that flows to the South and North West of the site, along the site boundaries. There is also risk from overland flows from adjacent developments.
- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Colluvium, Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.3
	1 in 100 year (plus climate change)	28.4
Estimated Attenuation Storage Volume (m3)	1577.4-2409	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		All forms of filtration are likely to be suitable.
Conveyance		All forms of conveyance are likely to be suitable

- The site is not located within a groundwater source protection zone.
- Commercial developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

None

Effects of Climate Change:

Increase water levels in the unnamed drain. Increased storm intensities.

Flood Risk Implications for Development:

- Only a small proportion of the development site is affected by flood levels, therefore all development should be located within Flood Zone 1, unless appropriate in accordance with NPPF Technical Guidance.
- A site specific flood risk assessment will be required for any development in Flood Zone 2.
- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.
- Consider using Flood Zone 2 as public open space.

Table 7-19: AR/13/08i				
OS NGR: SP350885	**Area:** 9.4ha		**Brown/Greenfield:** Greenfield	
Flood Zone Coverage:	**FZ3a:** 3%	**FZ3b:** 1%	**FZ2:** 7%	**FZ1:** 89%

Exception Test required? Yes, for Essential infrastructure in FZ3b, Essential Infrastructure and more vulnerable development in FZ3a and Highly Vulnerable development in FZ2.

Highly Vulnerable infrastructure should not be permitted within FZ3a. Highly Vulnerable, More Vulnerable and Less Vulnerable infrastructure should not be permitted within FZ3b.

Requirements for passing the Exception Test:

- To pass Part 'b' of the Exception Test, a FRA should demonstrate that: the development will be safe, will avoid increasing flood risk elsewhere and will reduce flood risk overall.
- Preference should be given firstly to locating development outside of flooded areas to the western part of the development site away from the unnamed drain flowing through the site. Secondary preference would be for area in the centre of the development that is shown not to flood. It should be possible to reduce flood risk at this development site by using sequential design to locate more vulnerable developments towards higher ground, through building design and by meeting drainage requirements. New developments being located outside of Flood Zone 2 and 3 needs to ensure that no increase in flood risk occurs. Some resilience measure may be required if buildings are situated in the flood risk area.
- Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage.

Flood Zone Map:

Local Authority Boundary

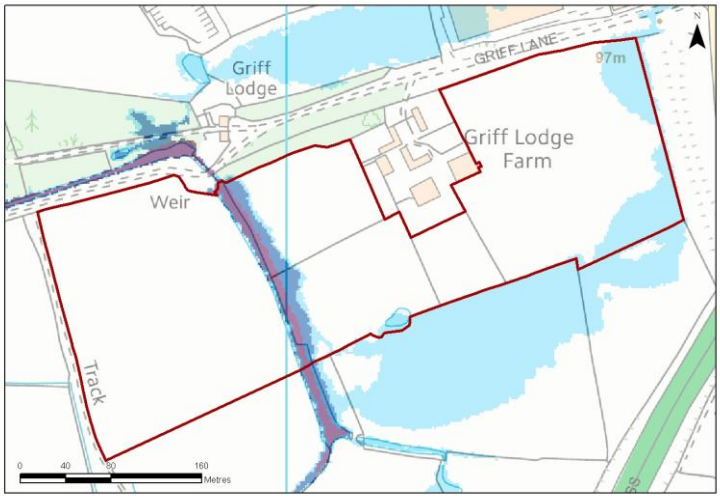
Potential Development Area

Flood Zones

Flood Zone 3b

Flood Zone 3a

Flood Zone 2

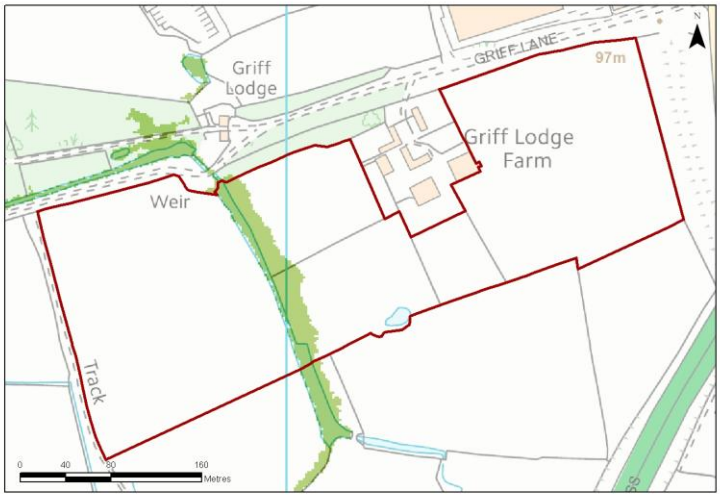


Climate Change:

Local Authority Boundary

Potential Development Area

Flood Zone 3 with Climate Change



Surface Water Map:

Local Authority Boundary

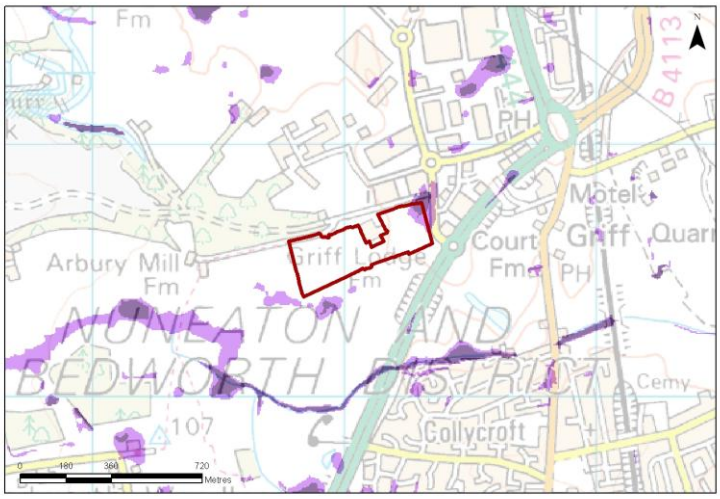
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

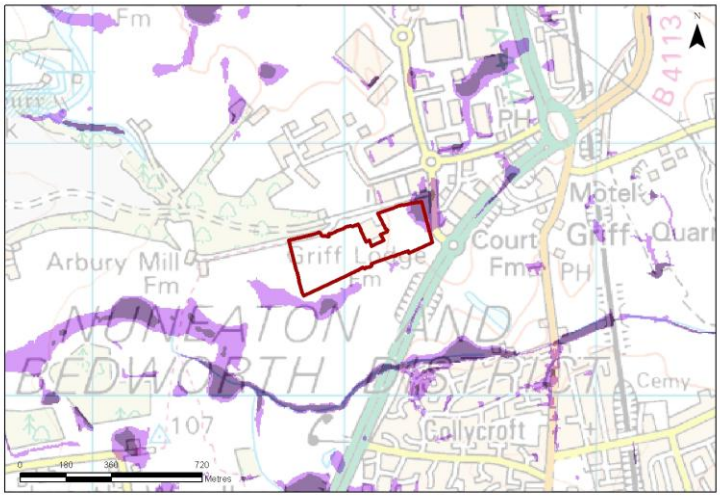
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Primary flood risk is fluvial resulting in overtopping of unnamed drains. The majority of the drains run along the boundaries of the site however, one drain flows north to south through the development site. In addition, overland surface water and overland flows may also pose a risk to the site.
- With further development and creation of impermeable ground surface, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Colluvium, Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	6.9
	1 in 100 year (plus climate change)	26.6
Estimated Attenuation Storage Volume (m3)	2303-3496.8	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		All forms of filtration are likely to be suitable.
Conveyance		All forms of conveyance are likely to be suitable

- The site is not located within a groundwater source protection zone.
- Commercial developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

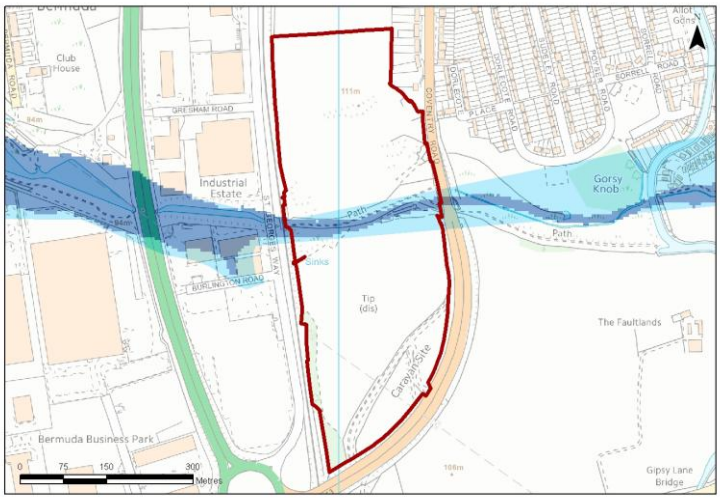
None.

Effects of Climate Change:

Increase water levels in the unnamed drain. Increased storm intensities.

Flood Risk Implications for Development:

- Only a small proportion of the development site is affected by flood levels, therefore all development should be located within Flood Zone 1, unless appropriate in accordance with NPPF Technical Guidance.
- A site specific flood risk assessment will be required for any development in Flood Zone 2 and 3.
- Consideration of the peak flows on the unnamed drain is required when considering drainage.
- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.
- Consider using Flood Zone 2 as public open space.

Table 7-20: AR/13/08J				
OS NGR: SP360895	Area: 16.8ha		**Brown/Greenfield:** Both	
Flood Zone Coverage:	**FZ3a:** 3%	**FZ3b:** 0%	**FZ2:** 6%	**FZ1:** 91%
Exception Test required? Yes, for Essential Infrastructure and more vulnerable development in FZ3a and Highly Vulnerable development in FZ2. Highly Vulnerable infrastructure should not be permitted within FZ3a.				
Requirements for passing the Exception Test: • To pass Part 'b' of the Exception Test, a FRA should demonstrate that: the development will be safe, will avoid increasing flood risk elsewhere and will reduce flood risk overall. • Preference should be given to locating development outside of flooded areas that run through the centre of the development site. It should be possible to reduce flood risk at this development site by using sequential design to locate more vulnerable developments towards higher ground, through building design and by meeting drainage requirements. New developments being located outside of Flood Zone 2 and 3 needs to ensure that no increase in flood risk occurs. Some resilience measures may be required if buildings are situated in the flood risk area. • Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage.				
Flood Zone Map: Local Authority Boundary Potential Development Area **Flood Zones** Flood Zone 3b Flood Zone 3a Flood Zone 2 Contains Ordnance Survey data © Crown copyright and database right 2012				
Climate Change: Local Authority Boundary Potential Development Area **Flood Zone 3 with Climate Change** Contains Ordnance Survey data © Crown copyright and database right 2012	No climate change mapping available			

Surface Water Map:

Local Authority Boundary

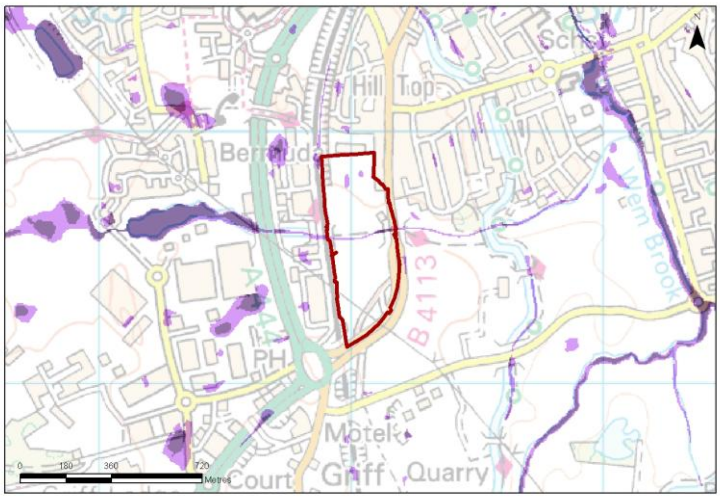
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

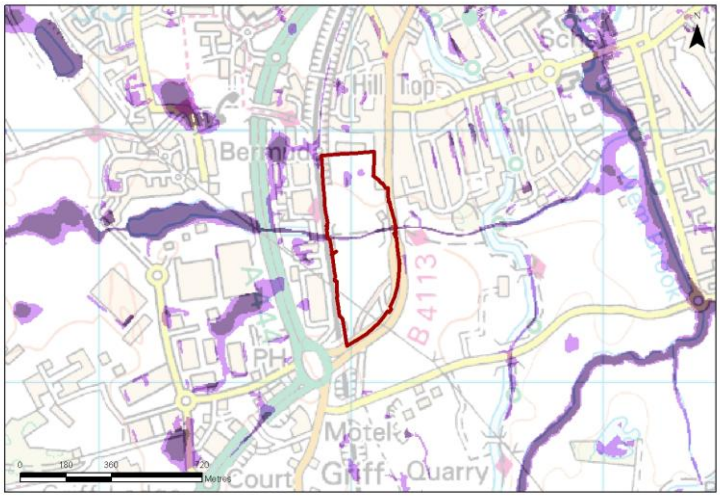
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Primary flood risk is fluvial, resulting from overtopping of an unnamed drain that runs directly through the site in an easterly direction. There is also risk from overland flows from adjacent developments.
- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Colluvium, Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.7
	1 in 100 year (plus climate change)	29.9
Estimated Attenuation Storage Volume (m3)	3931.2-6031.2	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		All forms of filtration are likely to be suitable.
Conveyance		Mapping suggests that site slopes would be suitable for conveyance however, due to the steepness of slope may require check dams to slow flows.

- The site is not located within a groundwater source protection zone.
- Commercial developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

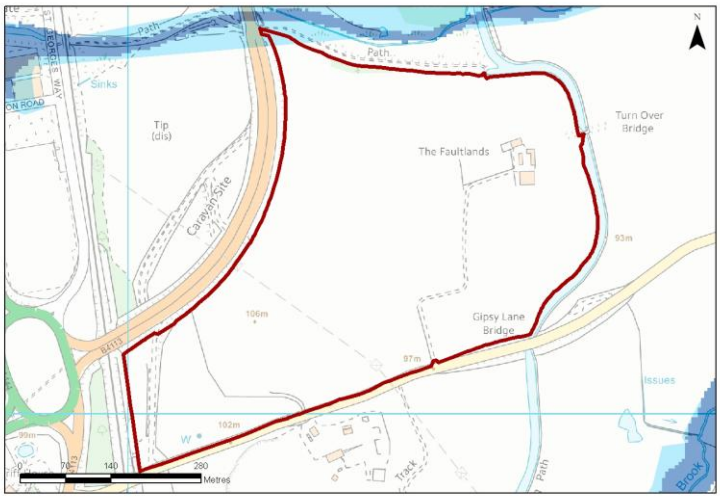
None.

Effects of Climate Change:

Increase water levels in the unnamed drain. Increased storm intensities.

Flood Risk Implications for Development:

- Only a small proportion of the development site is affected by flood levels, therefore all development should be located within Flood Zone 1, unless appropriate in accordance with NPPF Technical Guidance.
- Consideration of the peak flows on the unnamed drain and its durations required when considering drainage.
- A site specific flood risk assessment will be required for any development in Flood Zone 2.
- The affect of climate change will need to be assessed as part of a detailed site specific SFRA.
- Developers should consider reservoir flooding during the planning stage, using the EA's reservoir inundation mapping. Where possible, developers should consider using areas at possible risk as public open space.
- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.
- Consider using Flood Zone 2 as public open space

<table>
<tr><th colspan="5">Table 7-21: AR/13/08K</th></tr>
<tr><td>OS NGR: SP363892</td><td colspan="2">Area: 27.3ha</td><td colspan="2">Brown/Greenfield:
Predominately Greenfield</td></tr>
<tr><td>Flood Zone Coverage:</td><td>FZ3a: 0%</td><td>FZ3b: 0%</td><td>FZ2: 1%</td><td>FZ1: 99%</td></tr>
<tr><td colspan="5">Exception Test required? Yes, for Highly vulnerable development in FZ2.</td></tr>
<tr><td colspan="5">Requirements for passing the Exception Test:
To pass Part 'b' of the Exception Test, a FRA should demonstrate that: the development will be safe, will avoid increasing flood risk elsewhere and will reduce flood risk overall.
Preference should be given to locating development outside of flooded areas away from the northern site boundary. It should be possible to reduce flood risk at this development site by using sequential design to locate more vulnerable developments towards higher ground, through building design and by meeting drainage requirements. New developments being located outside of Flood Zone 2 and 3 needs to ensure that no increase in flood risk occurs. Some resilience measures may be required if buildings are situated in the flood risk area.
Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage.</td></tr>
<tr><td colspan="2">Flood Zone Map:
Local Authority Boundary
Potential Development Area
Flood Zones
Flood Zone 3b
Flood Zone 3a
Flood Zone 2
Contains Ordnance Survey data © Crown copyright and database right 2012</td><td colspan="3"> 
</td></tr>
<tr><td colspan="2">Climate Change:
Local Authority Boundary
Potential Development Area
Flood Zone 3 with Climate Change
Contains Ordnance Survey data © Crown copyright and database right 2012</td><td colspan="3">No climate change mapping available</td></tr>
</table>

Surface Water Map:

Local Authority Boundary

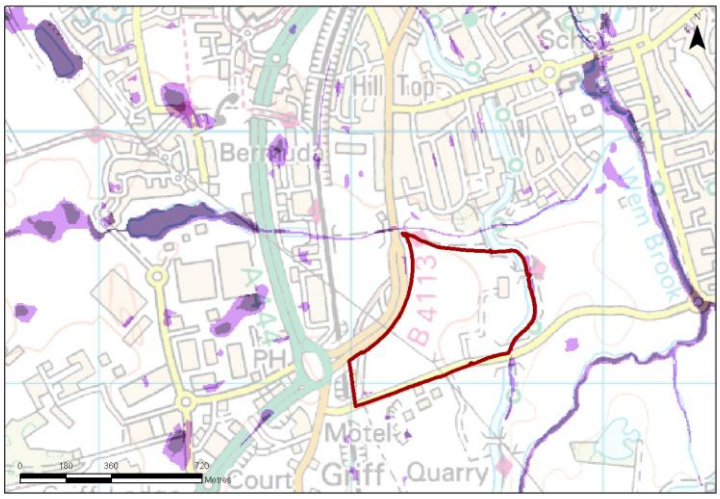
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

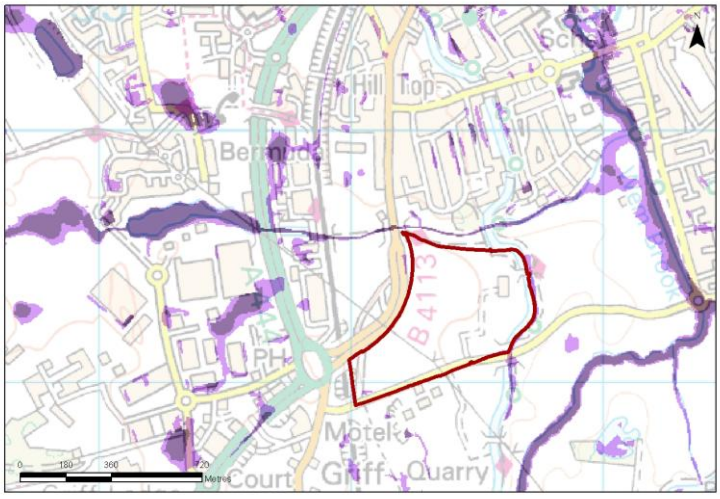
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Primary flood risk is fluvial, resulting in overtopping of unnamed drain that flows along the northern site boundary. Additionally flood risk is posed by Griff Brook, located close to the northern boundary and Coventry Canal which flows south along the eastern site boundary.
- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Colluvium, Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.6
	1 in 100 year (plus climate change)	29.4
Estimated Attenuation Storage Volume (m3)	6442.8-9855.3	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		All forms of filtration are likely to be suitable.
Conveyance		All forms of conveyance are likely to be suitable

- The site is not located within a groundwater source protection zone.
- Commercial developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

None.

Effects of Climate Change:

Increase water levels in Coventry Canal, Griff Brook and an unnamed drain. Increased storm intensities.

Flood Risk Implications for Development:

- Only a small proportion of the development site is affected by flood levels, therefore all development should be located within Flood Zone 1, unless appropriate in accordance with NPPF Technical Guidance.
- Consideration of the peak flows on the Griff Brook, an unnamed drain and the Coventry Canal and its durations required when considering drainage.
- A site specific flood risk assessment will be required for any development in Flood Zone 2.
- The affect of climate change will need to be assessed as part of a detailed site specific SFRA.
- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Developers should consider incorporating an eight metre buffer adjacent to the canal to allow access for maintenance and repair.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.
- Consider using Flood Zone 2 as public open space

Table 7-22: Ex/19/08		
OS NGR: SP327845	**Area:** 5.3ha	**Brown/Greenfield:** Greenfield
Exception Test required? No		

NPPF Guidance:

- For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA. The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off must be included.
- Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.

Surface Water Map:

Local Authority Boundary

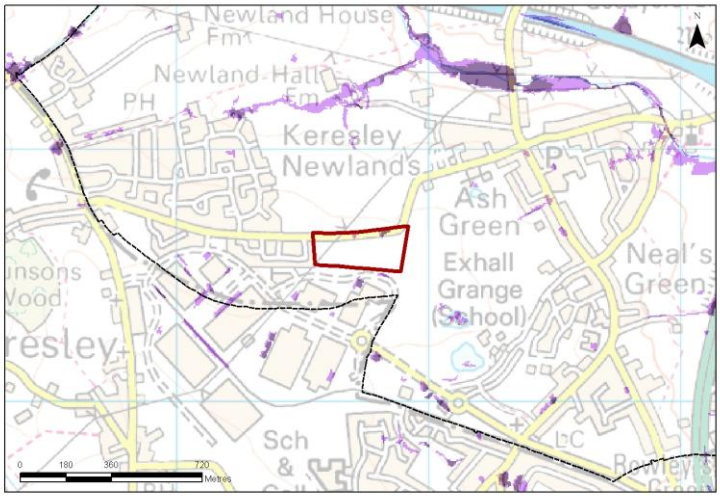
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

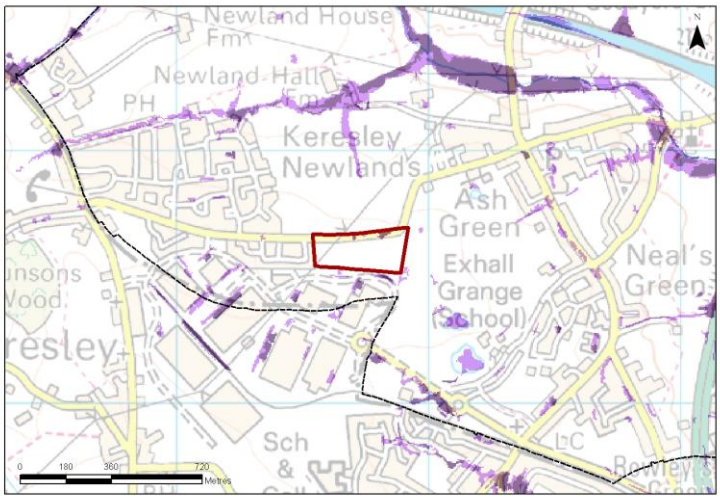
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Primary flood risk is from surface water flooding and overland flows.
- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to

represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Glaciolacustrine clays and silts	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.6
	1 in 100 year (plus climate change)	29.9
Estimated Attenuation Storage Volume (m3)	1256.1-1881.5	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		All forms of filtration are likely to be suitable.
Conveyance		All forms of conveyance are likely to be suitable

- The site is not located within a groundwater source protection zone.
- Commercial developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

None.

Effects of Climate Change:

Increased storm intensities.

Flood Risk Implications for Development:

- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.

Table 7-23: HE/01/08		
OS NGR: SP341855	**Area:** 20.9ha	**Brown/Greenfield:** Greenfield
Exception Test required? No		

NPPF Guidance:

- For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA. The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off must be included.
- Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.

Surface Water Map:

Local Authority Boundary

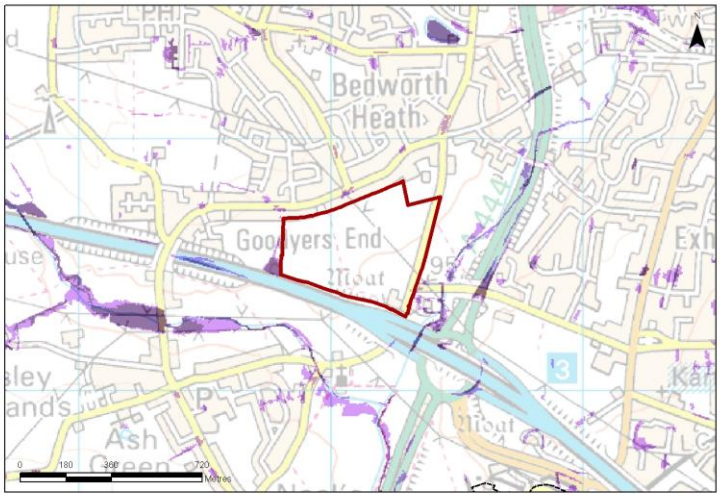
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

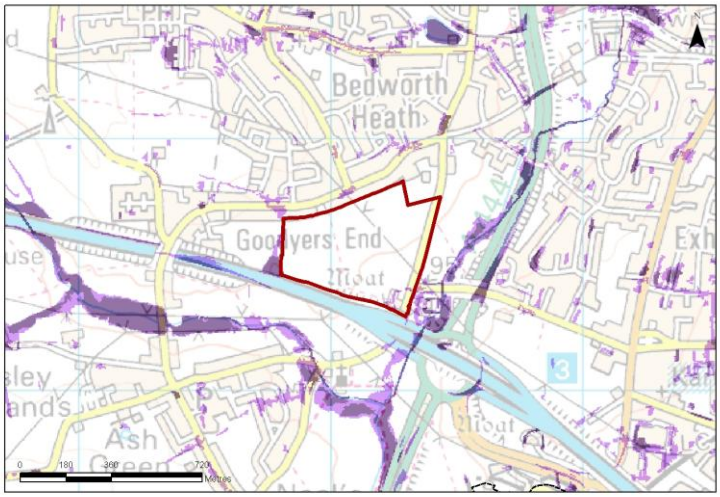
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Primary flood risk is from surface water flooding and overland flows. .
- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be

developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Glaciolacustrine clays and silts	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.7
	1 in 100 year (plus climate change)	30.1
Estimated Attenuation Storage Volume (m3)	4953.3-7398.6	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		All forms of filtration are likely to be suitable.
Conveyance		All forms of conveyance are likely to be suitable

- The site is not located within a groundwater source protection zone.
- Residential and commercial developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

None.

Effects of Climate Change:

Increased storm intensities.

Flood Risk Implications for Development:

- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.

Table 7-24: P11		
OS NGR:SP329842	**Area:** 3.5ha	**Brown/Greenfield:** Greenfield
Exception Test required? No		

NPPF Guidance:

- For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA. The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off must be included.
- Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.

Surface Water Map:

Local Authority Boundary

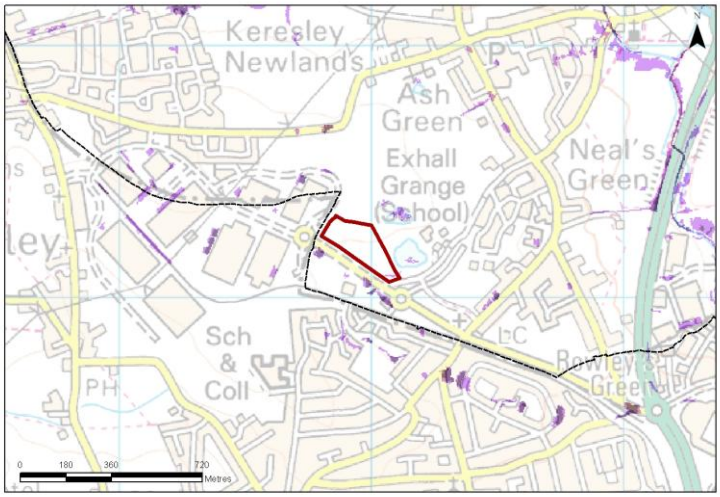
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

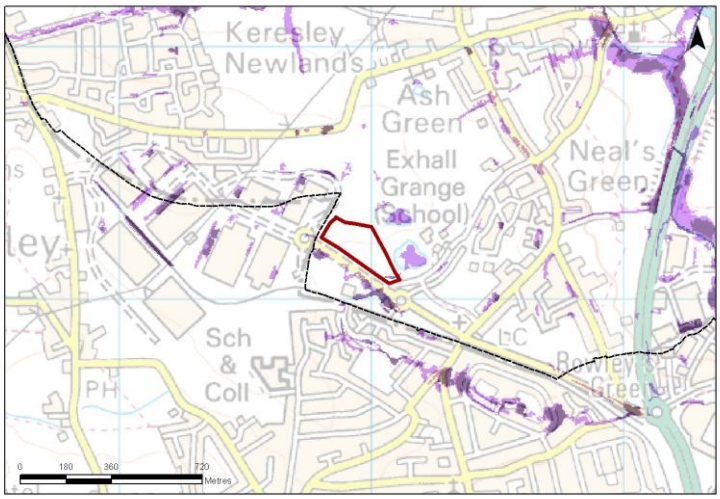
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Primary flood risk is from surface water flooding and overland flows.
- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to

represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Glaciolacustrine clays and silts	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.7
	1 in 100 year (plus climate change)	30.3
Estimated Attenuation Storage Volume (m3)	826-1235.5	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		All forms of filtration are likely to be suitable.
Conveyance		All forms of conveyance are likely to be suitable

- The site is not located within a groundwater source protection zone.
- Commercial developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

None.

Effects of Climate Change:

Increased storm intensities.

Flood Risk Implications for Development:

- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.

Table 7-25: P27		
OS NGR: SP357899	**Area:** 0.9ha	**Brown/Greenfield:** Greenfield
Exception Test required? No		

NPPF Guidance:

- For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA. The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off must be included.
- Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.

Surface Water Map:

Local Authority Boundary

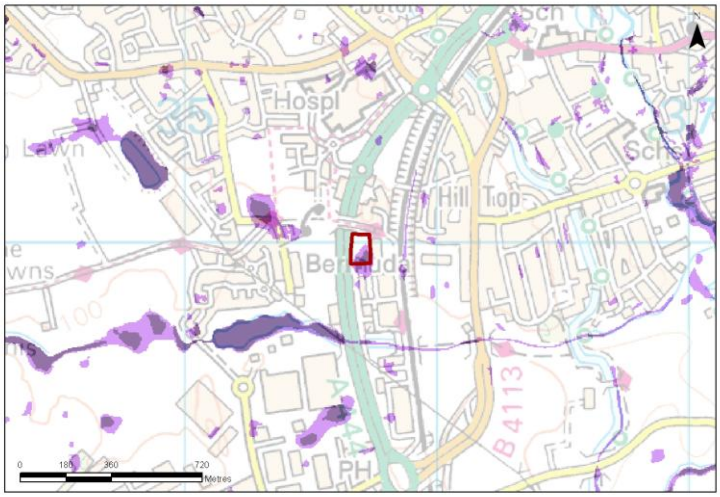
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

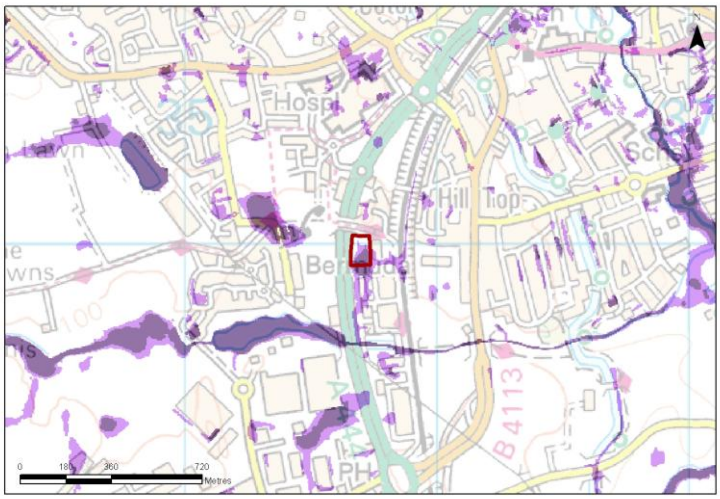
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Primary flood risk is from surface water flooding and overland flows.
- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to

represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Colluvium, Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.3
	1 in 100 year (plus climate change)	28.4
Estimated Attenuation Storage Volume (m3)	215.1-328.5	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		All forms of filtration are likely to be suitable.
Conveyance		All forms of conveyance are likely to be suitable

- The site is not located within a groundwater source protection zone.
- Commercial developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

None.

Effects of Climate Change:

Increased storm intensities.

Flood Risk Implications for Development:

- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.

Table 7-26: P28		
OS NGR: SP354903	**Area:** 0.5ha	**Brown/Greenfield:** Brownfield
Exception Test required? No		

NPPF Guidance:

- For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA. The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off must be included.
- Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.

Surface Water Map:

Local Authority Boundary

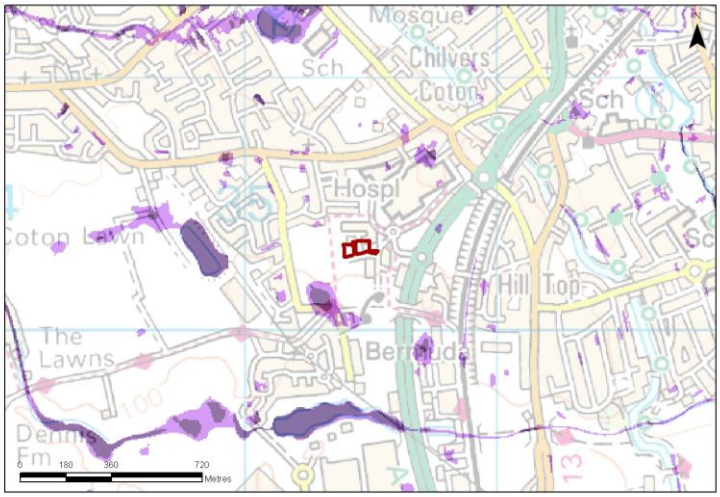
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

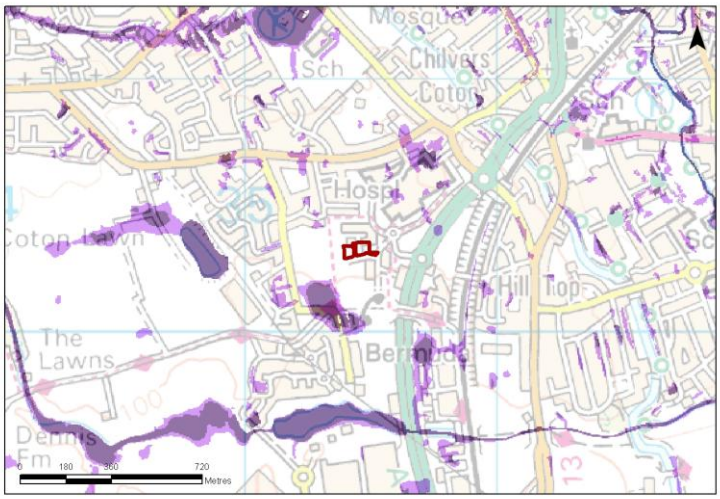
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Colluvium, Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.2
	1 in 100 year (plus climate change)	28.0
Estimated Attenuation Storage Volume (m3)	120-183.5	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		The majority of the forms of source control would be suitable except pervious pavements due to contamination risk from historical landfill deposits.
Infiltration		Mapping suggests underlining soil is likely to be permeable however; historic landfill deposits in the localised area make infiltration unsuitable without further detailed investigation and consultation with the Environment Agency.
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		Mapping suggests that filtrations would be suitable but require a form of liner to prevent contamination from localised historic landfill deposits.
Conveyance		All forms of conveyance are likely to be suitable

- The site is not located within a groundwater source protection zone.
- Commercial developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

None.

Effects of Climate Change:

Increased storm intensities.

Flood Risk Implications for Development:

- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.

Table 7-27: PO3		
OS NGR: SP354901	**Area:** 1.7ha	**Brown/Greenfield:** Brownfield
Exception Test required? No		

NPPF Guidance:

- For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA. The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off must be included.
- Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.

Surface Water Map:

Local Authority Boundary

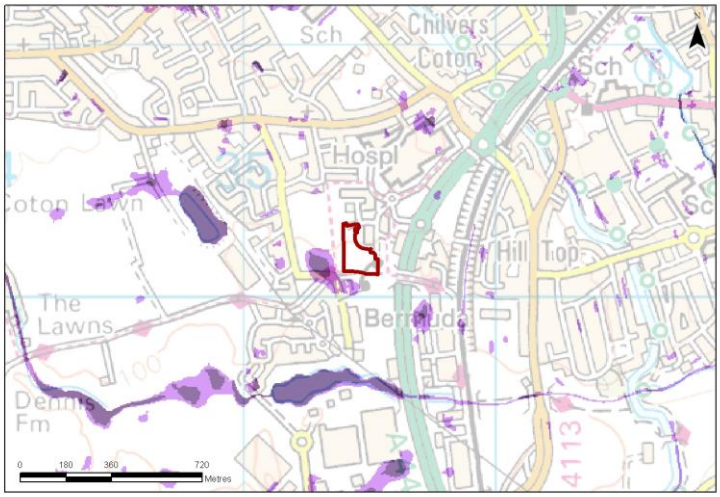
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

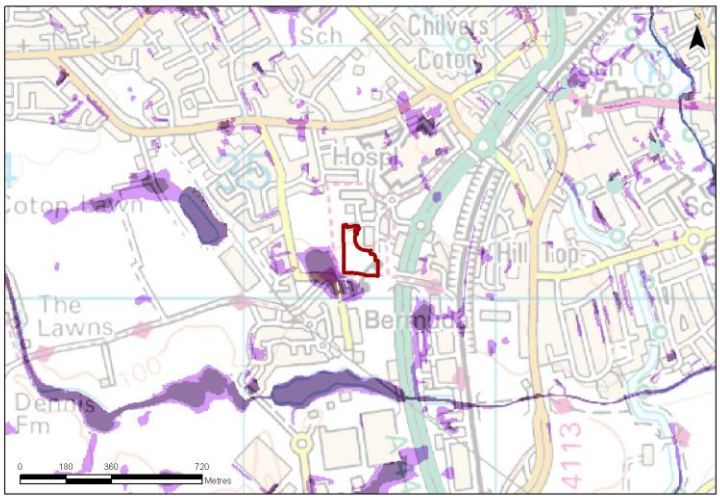
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Colluvium, Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.5
	1 in 100 year (plus climate change)	29.3
Estimated Attenuation Storage Volume (m3)	401.2-613.7	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		The majority of the forms of source control would be suitable except pervious pavements due to contamination risk from historical landfill deposits.
Infiltration		Mapping suggests underlining soil is likely to be permeable however; historic landfill deposits in the localised area make infiltration unsuitable without further detailed investigation and consultation with the Environment Agency.
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		Mapping suggests that filtrations would be suitable but require a form of liner to prevent contamination from localised historic landfill deposits.
Conveyance		All forms of conveyance are likely to be suitable

- The site is not located within a groundwater source protection zone.
- Commercial developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

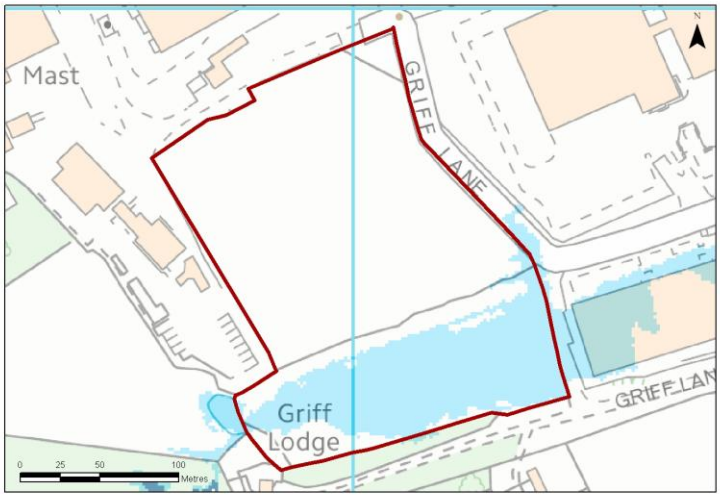
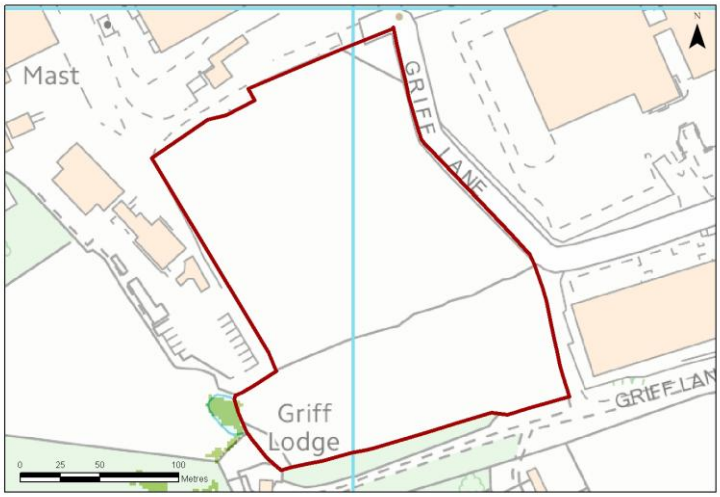
None.

Effects of Climate Change:

Increased storm intensities.

Flood Risk Implications for Development:

- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.

Table 7-28: PO4				
OS NGR: SP	**Area:** 4.2ha		**Brown/Greenfield:** Greenfield	
Flood Zone Coverage:	**FZ3a:** 0%	**FZ3b:** 0%	**FZ2:** 25%	**FZ1:** 75%
Exception Test required? Yes, for Highly Vulnerable development in FZ2.				
Requirements for passing the Exception Test: • To pass Part 'b' of the Exception Test, a FRA should demonstrate that: the development will be safe, will avoid increasing flood risk elsewhere and will reduce flood risk overall. • Preference should be given first to locating development outside the flooded areas, to the northern regions of the site. It should be possible to reduce flood risk at this development site by using sequential design to locate more vulnerable developments towards higher ground, through building design, and by meeting drainage requirements. Some resilience measure may be required if buildings are situated in the flood risk area. • Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage.				
Flood Zone Map: Local Authority Boundary Potential Development Area **Flood Zones** Flood Zone 3b Flood Zone 3a Flood Zone 2 Contains Ordnance Survey data © Crown copyright and database right 2012				
Climate Change: Local Authority Boundary Potential Development Area **Flood Zone 3 with Climate Change** Contains Ordnance Survey data © Crown copyright and database right 2012				

Surface Water Map:

Local Authority Boundary

Potential Development Area

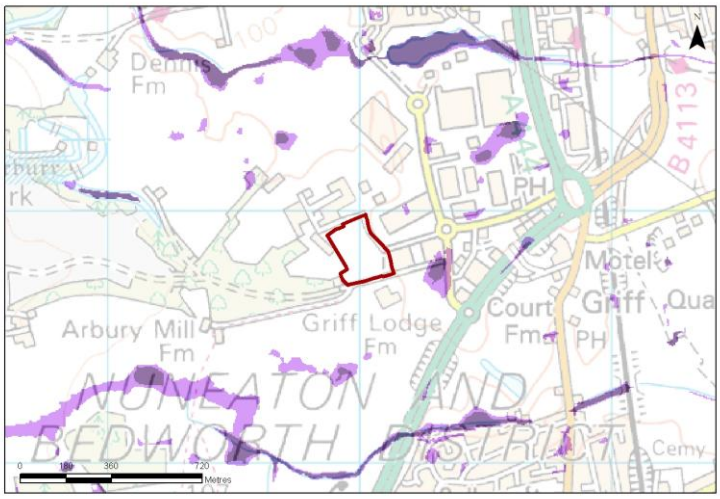
Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.

Contains Ordnance Survey data © Crown copyright and database right 2012



Surface Water Map:

Local Authority Boundary

Potential Development Area

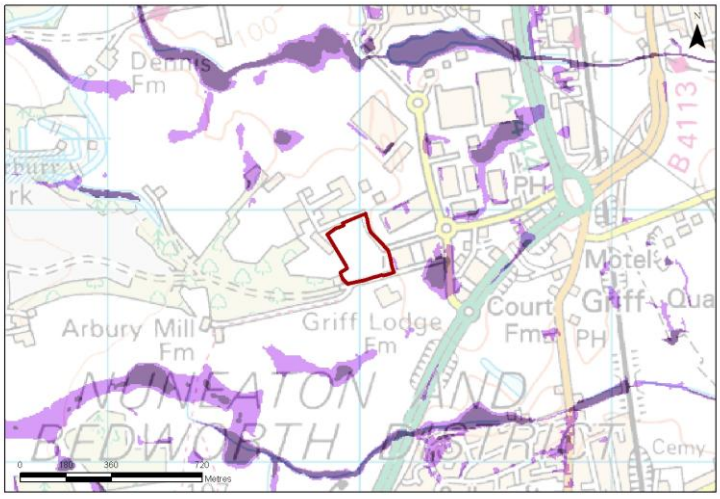
Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.

Contains Ordnance Survey data © Crown copyright and database right 2012



Sources of Flood Risk:

- Fluvial flood risk from an un-named drain.
- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Colluvium, Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.6
	1 in 100 year (plus climate change)	29.7
Estimated Attenuation Storage Volume (m3)	987-1512	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		All forms of filtration are likely to be suitable.
Conveyance		Mapping suggests that site slopes would be suitable for conveyance however, due to the steepness of slope may require check dams to slow flows.

- The site is not located within a groundwater source protection zone.
- Commercial developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

None.

Effects of Climate Change:

Increased storm intensities.

Flood Risk Implications for Development:

- All development should be located within Flood Zone 1, unless appropriate in accordance with NPPF Technical Guidance. Also with a larger region in the south of the development site is located in Flood Zone 2 new infrastructure should be designed to not increase flood risk in these regions during large rainfall events.
- A site specific flood risk assessment will be required for any development in Flood Zone 2.
- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.
- Consider using Flood Zone 2 as public open space.

Table 7-29: WB/01/08		
OS NGR: SP359899	**Area**: 2.0ha	**Brown/Greenfield:** Both
Exception Test required? No		

NPPF Guidance:

- For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA. The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off must be included.
- Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.

Surface Water Map:

Local Authority Boundary

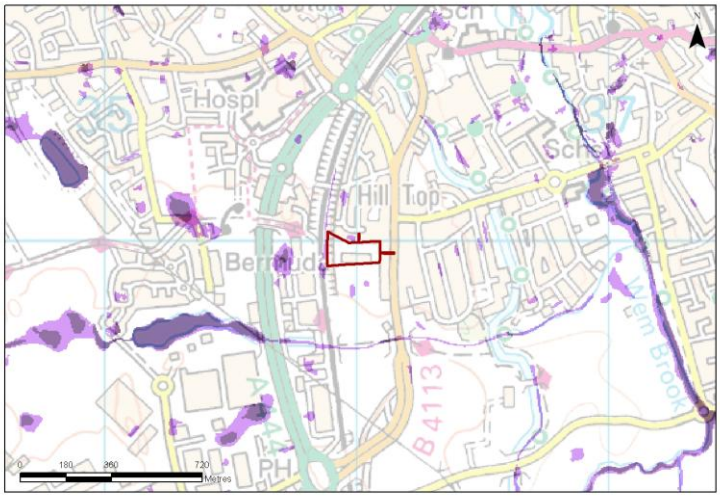
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

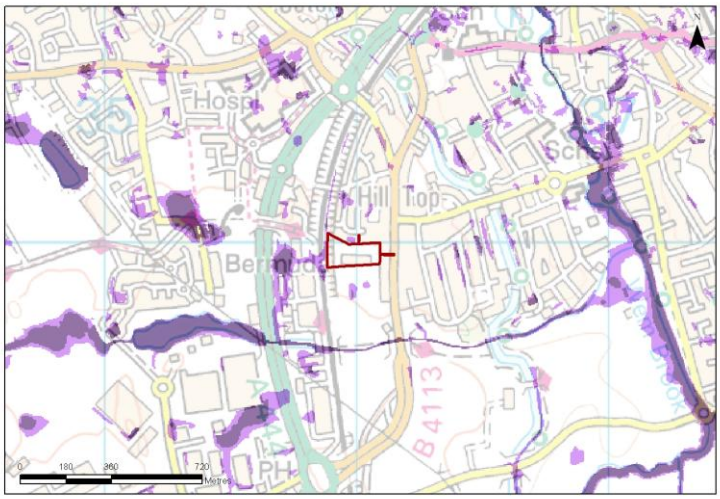
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

As an indication of requirements to manage surface water runoff at the development site an assessment of the soil types, greenfield runoff rate and attenuation storage volume is included below. Storage volumes displayed are calculated with an assumption that 75% of the site will be developed impermeable ground. A 25% increase in rainfall depths has been included to represent predicted future climate change effects.

PLEASE NOTE: This assessment has been carried out using broad-scale datasets and aims to provide an indication of the likely opportunities and constraints for this development site. A detailed drainage assessment based on site-specific conditions should be carried out by a suitably qualified professional and submitted with any planning application. The values below should not be used for design purposes.

Soil Type	Predominately Gravel with underlining Colluvium, Glaciolacustrine clays and silts.	
Greenfield Runoff Rate (l/s/ha)	1 in 2 year	7.5
	1 in 100 year (plus climate change)	29.0
Estimated Attenuation Storage Volume (m3)	474-726	

SUDS and the development site:

SUDS Type	Potential Suitability	Comments
Source Control		All forms of source control are likely to be suitable
Infiltration		Mapping suggests high permeability at this site, site investigations should be carried out to assess potential for drainage by infiltration
Detention		Mapping suggests that site slopes may be steep so larger features 'above ground' may not be viable
Filtration		All forms of filtration are likely to be suitable.
Conveyance		All forms of conveyance are likely to be suitable

- The site is not located within a groundwater source protection zone.
- Commercial developments should provide at least two independent SUDS features in series to provide a suitable level of water quality treatment.

Flood Defences:

None.

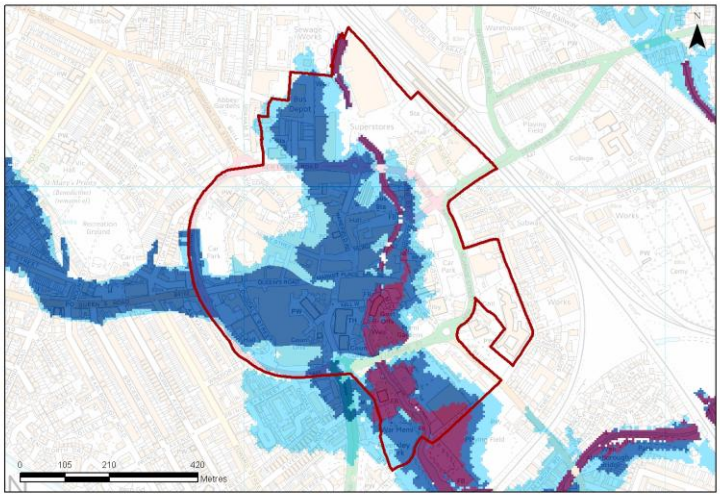
Effects of Climate Change:

Increased storm intensities.

Flood Risk Implications for Development:

- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.

7.3.1 Nuneaton Town Centre

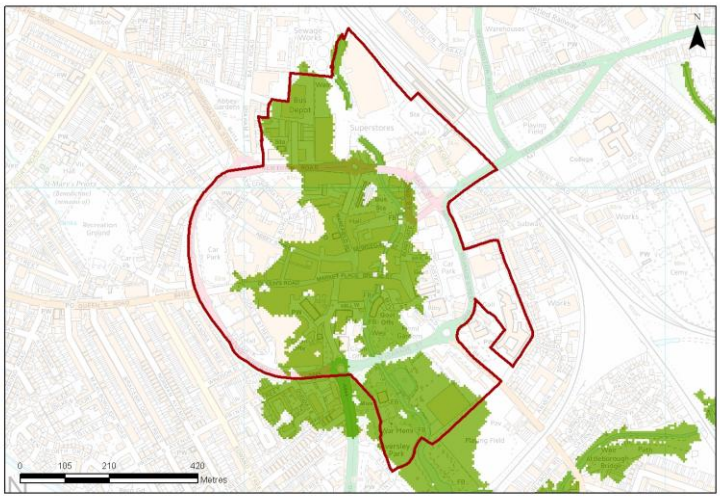
Table 7-30: Nuneaton Town Centre				
OS NGR: SP362 918	**Area:** 46.7ha		**Brown/Greenfield:** Brownfield	
Flood Zone Coverage:	**FZ3a:**	**FZ3b:**	**FZ2:**	**FZ1:**
Exception Test required? Yes, for Essential infrastructure development in FZ3b, Essential infrastructure and More Vulnerable development in FZ3a and Highly Vulnerable development in FZ2. Highly Vulnerable infrastructure should not be permitted within FZ3a. Highly Vulnerable, More Vulnerable and Less Vulnerable infrastructure should not be permitted within FZ3b.				
Requirements for passing the Exception Test: • To pass Part 'b' of the Exception Test, a FRA should demonstrate that: the development will be safe, will avoid increasing flood risk elsewhere and will reduce flood risk overall. • Preference should be given to locating development outside of flooded areas that run through the centre of the development site. It should be possible to reduce flood risk at this development site by using sequential design to locate more vulnerable developments towards higher ground, through building design and by meeting drainage requirements. New developments being located outside of Flood Zone 2 and 3 needs to ensure that no increase in flood risk occurs. Some resilience measures may be required if buildings are situated in the flood risk area. • Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage.				
Flood Zone Map: Local Authority Boundary Potential Development Area **Flood Zones** Flood Zone 3b Flood Zone 3a Flood Zone 2 Contains Ordnance Survey data © Crown copyright and database right 2012				

Climate Change:

Local Authority Boundary

Potential Development Area

Flood Zone 3 with Climate Change



Surface Water Map:

Local Authority Boundary

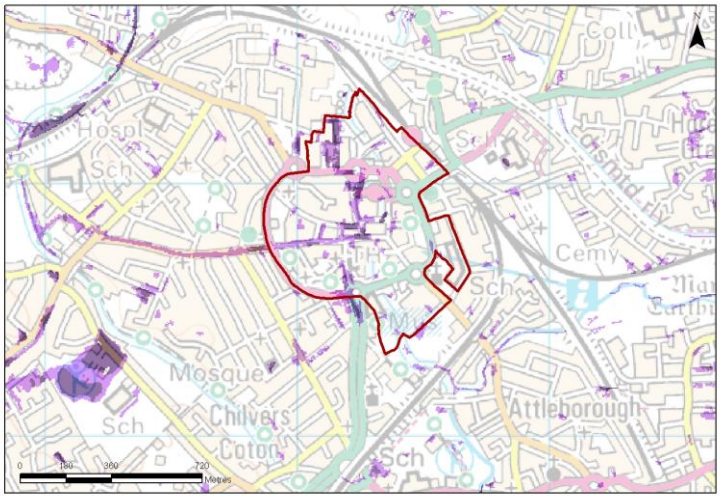
Potential Development Area

Flood Map for Surface Water (30 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Surface Water Map:

Local Authority Boundary

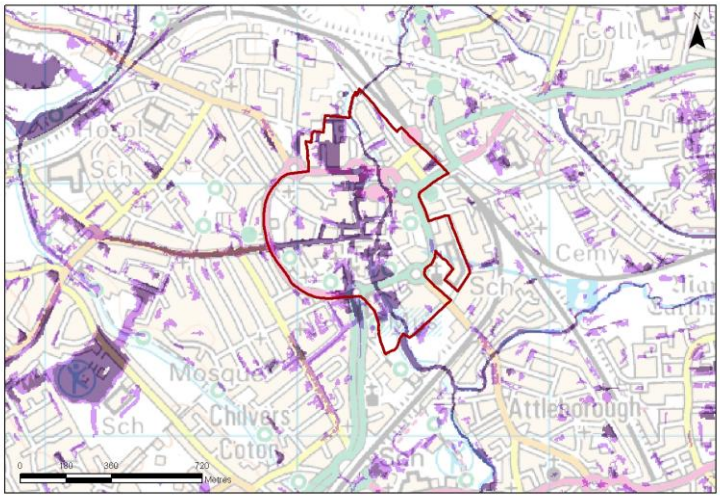
Potential Development Area

Flood Map for Surface Water (200 yr)

> 0.3m

> 0.1m

This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale due to the method used.



Sources of Flood Risk:

- Primary fluvial flood risk is from the River Anker, resulting from overtopping of the watercourse channel. The River Anker flows in a northerly direction through the central section of the development site.
- With further development and creation of impermeable ground surfaces, surface water flooding may become a problem.

Surface Water Drainage:

New developments and redevelopments within the town centre should seek opportunities to reduce the rate and volume of surface water runoff by incorporating SUDS into their proposals or retrofitting SUDS systems. In addition to reducing flood risks downstream, the use of SUDS can improve water quality in receiving watercourses and create more desirable urban spaces. Spatial constraints are likely to make 'traditional' SUDS techniques such as ponds and swales prohibitive, but most forms of source controls and bioretention systems will be suitable at all locations. Further guidance on retrofitting of SUDS systems can be found in CIRIA Report C713: Retrofitting to Manage Surface Water.

Flood Defences:

River Anker flood relief channel and associated structures

Effects of Climate Change:

Increased water levels in the River Anker. Increased storm intensities

Flood Risk Implications for Development:

- A large proportion of the development site is affected by flood levels, therefore all new development should be located within Flood Zone 1, unless appropriate in accordance with NPPF Technical Guidance.
- Consideration of the peak flows on the River Anker is required when considering drainage.
- A site specific flood risk assessment will be required for any development in Flood Zone 2 and 3.
- Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development.
- Assessment for runoff should include allowance for climate change effects.
- New or re-development should adopt exemplar source control SUDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
- Onsite attenuation schemes would need to be tested against the hydrograph of the receiving watercourse to ensure flows are not exacerbated downstream within the catchment.
- Demonstration that development at this location can be made safe.
- New development must seek opportunities to reduce overall level of flood risk at the site for example by:
    - Reducing volume and rate of runoff
    - Relocating development to zones with lower flood risk
    - Creating space for flooding.
- Consider using Flood Zone 2 and 3 as public open space.

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8 Flood Risk from Canals

8.1 Introduction

Two canals, the Coventry Canal and the Ashby-de-la-Zouch Canal are located in the Nuneaton and Bedworth Borough. Primary flood risk from canal breaches for the proposed development sites in this SFRA is from the Coventry Canal. The Coventry Canal flows from the Coventry Basin to Atherstone Locks in one continuous pound (a stretch of canal between two locks) before continuing on towards Tamworth. The canal flows north through Nuneaton and is adjacent to a number of the proposed development sites. Along the course of the Coventry Canal there are numerous sections where watercourses run either adjacent or underneath the canal. Therefore understanding the interactions of the canal and main rivers are integral to understanding of flood risk in the area.

As part of assessing flood risk from the canals, worst case canal inundation assessments have been identified based on areas of raised embankments in close proximity to proposed development sites. These assessments do not take the structural integrity of the embankment into account or quantify a risk of failure. Flooding may occur at any location along the canal system where there is a raised embankment. Canal inundation analysis is therefore indicative and digital plans only have been submitted as part of this SFRA. At locations that could be affected by inundation from canal breach more detailed assessments should be included in the site FRAs. This should be based on a more detailed appreciation of the hazard and the implications during a flood emergency.

8.2 Flood Risk from Canals

Canals do not generally pose a direct flood risk as they are a regulated water body. The residual risk from canals tends to be associated with lower probability events such as overtopping and embankment failure.

The residual risk associated with canals is more difficult to determine as it depends on a number of factors including, for example, the source and magnitude of surface water runoff into the canal, the size of the canal, construction materials and level of maintenance. The probability of a breach is managed by continued maintenance.

No attempt is made in this SFRA to assess the probability of failure other than noting that such events are very rare. However, in accordance with NPPF, all sources of flooding need to be considered. If a breach event were to occur then the consequences, to people and property, could be high. In order to understand the possible impacts, a series of inundation models have been generated for this SFRA. It should be noted that the canal breach locations have been identified based on areas of the canal that includes raised embankments. The mapping is intended to provide an indication of the likely impact of selected failure scenarios. It is not intended that inundation mapping provides a comprehensive analysis of all failure scenarios and further site specific analysis will need to be considered at all sites located within the vicinity of a canal system. Developers should be aware that any site that is at or below canal bank level may be subject to canal flooding and this should be taken into account when building resilience into low level properties

According to the Warwickshire PFRA there are no known records of flooding events that relate to the Coventry Canal and the Ashby-de-la-Zouch Canal within the Nuneaton and Bedworth Borough.

A "Canal Hazard Zone" has been created for proposed development sites, where applicable, to show areas that could potentially be affected by flooding in the event of breach of selected raised canal embankments. These are based on broad scale modelling techniques and should only be taken as an indication of the extent of flooding at potential risk. The methodologies used to derive the risk from canal inundation are outlined in the next section.

8.3 Canal Inundation Methodology

Canal breaches can be caused by overtopping and erosion of canal embankments. In general, failure is more commonly caused by degradation of the canal lining and erosion within the embankment slope until failure occurs.

Flooding from a breach of a canal embankment is largely dictated by canal and ground levels, canal embankment construction, breach characteristics and the volume of water within the canal that can discharge into the lower lying areas behind the embankment. For this study, the potential maximum flood extent is limited by the maximum volume of water within a pound length. However, during a joint probability flood event or if there is an interaction between a canal and watercourse then the volume and extent of flooding may increase.

The potential breach outflow volume is either dictated by the upstream canal pound length or, for long pound lengths, how quickly the operating authorities can react to prevent further water loss. A pound length was calculated for the Coventry Canal and possible breach locations at the proposed development sites were identified. Areas lower than the estimated minimum canal water levels were assumed to be at potential risk from a canal breach. Canal water levels and surrounding ground levels were determined using LIDAR data.

There are a number of uncertainties associated with the simulation of flooding from canals in either overtopping or breach conditions. A number of assumptions have been used in the simulation of flooding for Nuneaton and Bedworth Borough for this SFRA:

- Generally the Coventry Canal is 10-12 metres wide.
- The minimum depth of approximately 1.2metres
- The canal is typically shallow but variability in depth along the course has not been taken into account.
- A impound length of water was calculated from the Coventry Basin to the next nearest locks located in Atherstone.
- That British Waterways would be notified of the break immediately and have engineers on site within one hour.

These assumptions should be considered when using and reviewing the mapping produced from the modelling.

A breach hydrograph was developed using a 1-D HECRAS model to represent the three stage mechanism with the starting water level as bank full. The respective pound lengths were applied to the model. The breach hydrographs obtained from HECRAS were fed into a two dimensional JFLOW model to assess potential flood inundation extents along the length of the canal. Inflows were applied to the JFLOW model along the canal at potential breach locations.

8.4 Flooding from Coventry Canal in Nuneaton & Bedworth

Canal flooding is an unlikely occurrence and so should be considered to be a residual risk. The locations at the proposed development sites where canal inundation was assessed are detailed below:

- On the right bank of the Coventry Canal (SP3529 9303) at the junction of the canal and an overflow channel. Land situated in the development site PDA2a is significantly lower than the canal channel therefore would be at risk should canal inundation occur.
- On the right bank of the Coventry Canal (SP 3655 8962). The Griff Brook flows perpendicular to the canal at this location. Although two proposed development sites (PDA3 & AR/13/08K) border the canal downstream of this location, site AR/13/08K is shown to be on higher ground and therefore not at significant risk. Ground levels for development site PDA3 are significantly lower, therefore increasing the flood risk should canal inundation occur.
- Although there are no previous records of flooding along the canal the primary flood risk appears to be from overtopping.

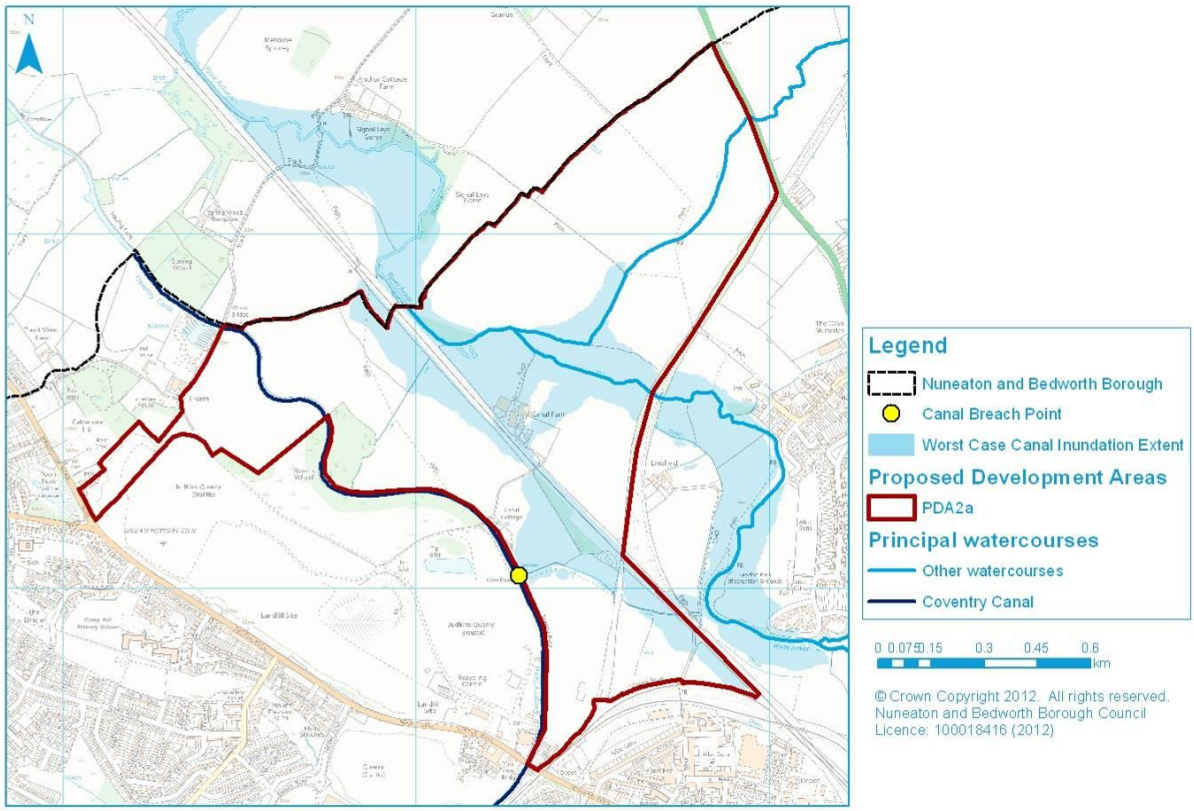
8.5 Data Availability

A series of worst case canal inundation appraisals have been undertaken at selected locations along the canal system in Nuneaton and Bedworth. Due to the potentially numerous locations for failure scenarios, the canal mapping is considered indicative only and will need to be reviewed and updated as part of any detailed site specific FRA. The location of inundation scenarios were based on the location of elevated canal systems and vulnerable infrastructure. The actual probability of failure, at any location, has not been assessed in this SFRA.

8.6 Inundation Results

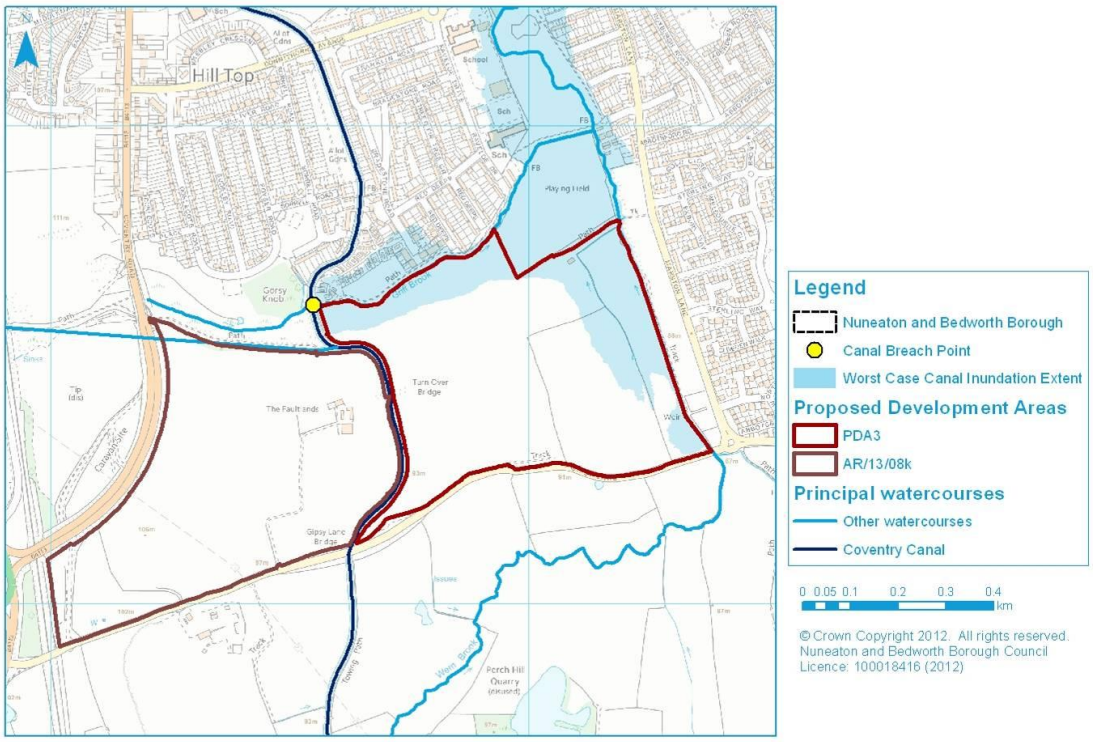
Simulated inundation from the Coventry Canal was conducted at the locations described in section 8.4. This section provides a summary of the canal inundation from these breach points. Figure 8-1 shows the inundation from a canal breach on the Coventry Canal adjacent to development site PDA2a. Flooding extends directly into the development site due to the sloping topography. Flood water is shown to be restricted by a former railway embankment that runs directly through the site. However, this embankment is overtopped at two low points located in the centre and south of the site (SP3527 9341 & SP3575 9292). From these locations flooding follows the topography, entering the River Anker's floodplain and extending along the watercourse.

Figure 8-1: Canal Inundation at site PDA2a



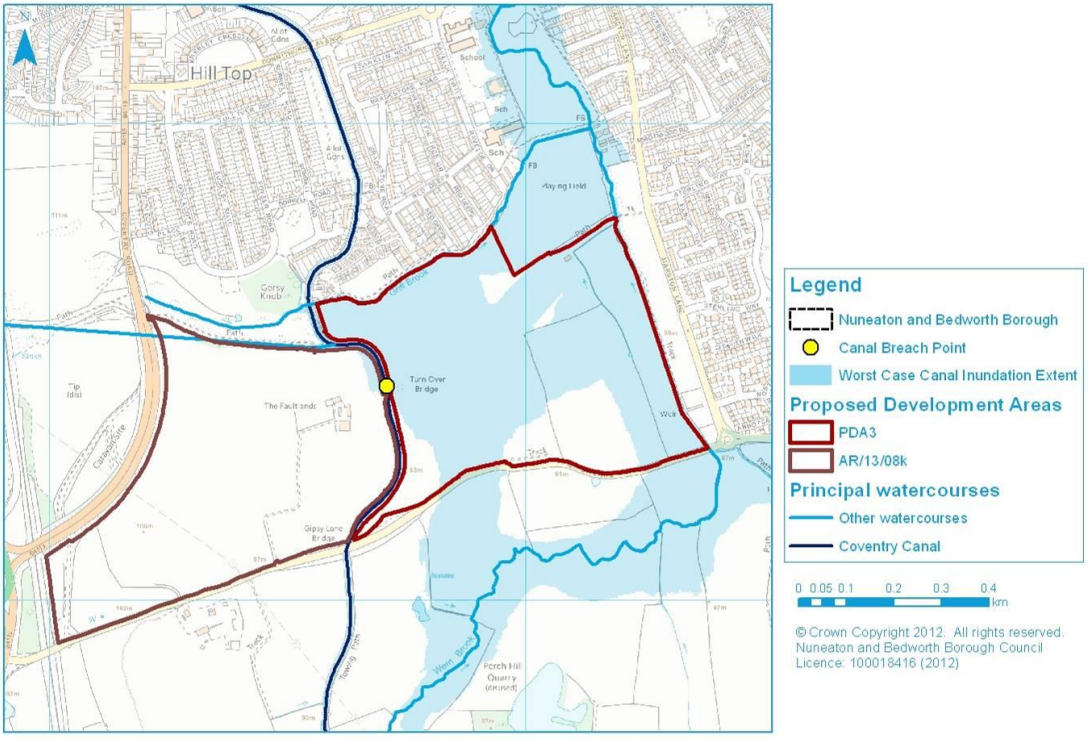
In order to best represent canal inundation at PDA3, two scenarios were run for the breach of the Coventry Canal at this development site. The first scenario was a canal breach at the location of Griff Brook flowing underneath the canal. The extent of flooding from this breach is shown in Figure 8-2. Flood water affects the northern and eastern boundary of the development site, with water following low points in the topography. Flood water predominately flows north away from the site, following the course of Wem Brook.

Figure 8-2: Canal inundation at Site PDA3 (Scenario One)



The second scenario was a canal breach located between development sites PDA3 and AR/13/08K where a bridge crosses the canal. The extent of flooding is shown in Figure 8-3. From this breach site, flooding is more widely spread than the previous scenario, covering the majority of the site with only a small portion in the south remaining unaffected. This extent of flooding can be attributed to the location of the canal breach, breaching onto higher ground than the rest of the site. Flood water therefore flows into lower land rather than be restricted by higher land, as shown in Scenario 1. Like Scenario 1, flooding extends along the course of the Wem Brook in both a northern and southern direction.

Figure 8-3: Canal inundation at Site PDA3 (Scenario Two)



8.6.1 Implications

The modelled scenarios show a worst case situation should canal inundation occur but does not assess the probability of failure. The mapping shows the residual risk as the canal should be well maintained.

However, development at sites adjacent to the canal will need to consider this residual risk as part of a detailed FRA. Any development should be set back eight metres from the canal, providing a buffer strip to 'make space for water' and to allow access for maintenance or repair should it be required.

8.7 Seeswood Pool

Consultation with the Environment Agency has identified one reservoir held on the EA's reservoir register: Seeswood Pool (SP32800 90500). Environment Agency records show the undertaker of Seeswood Pool to be Warwickshire County Council. Undertakers are the operators, users or owners of the reservoir and have ultimate responsibility for the safety of the reservoir.

The EA are the enforcement authority for the Reservoirs Act 1975 in England and Wales. The EA ensure reservoirs are regularly inspected and essential safety work carried out if required.

According to the Level 1 SFRA, there is no history of any recorded breach or overtopping of this reservoir.

The extent of flooding from Seeswood Pool is shown in the EA's Interactive Maps on their website (http://www.environment-agency.gov.uk/homeandleisure/37793.aspx). These maps show the largest area that might be flooded if a reservoir were to fail and release the water it holds. As with the canal inundation maps, the maps on the EA website show a worst case scenario and do not give any information about the likelihood of flooding to an area.

The map of flooding from Seeswood Pool shows inundation follows the path of the un-named watercourse downstream of the reservoir. The extent of the reservoir inundation is slightly greater than Flood Zone Two upstream of the A444. Downstream of the A444 the extent is very similar to that of Flood Zone Two.

In the unlikely event of failure of Seeswood Pool, small areas of the following proposed development sites would be at risk.

- PDA5a – the south-west area of the site, adjacent to the un-named tributary would be at risk from flooding
- PDA5b – a small area in the east of the site, adjacent to the un-named tributary would be at risk from flooding
- PDA5c – the section of land in the north east would be at risk from flooding
- AR/13/08j – a small area through the centre of the site would be at risk (the flood extent is the same are that for Flood Zone 2)

Developers should consider reservoir flooding during the planning stage. Given the relatively small proportion of the sites that would be affected should there be a failure at Seeswood Pool, developers should consider using these areas of the sites as public open space and green infrastructure.

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9 Flood defences and critical structures

9.1 Flood defences

9.1.1 Residual Risk

The Nuneaton and Bedworth Level 2 SFRA presents the risk of flooding from watercourses across the borough. It focuses on those areas at greatest risk, where strategic development sites have been proposed by the council. The river modelling that has been developed for the SFRA is of a strategic nature. Detailed studies should seek to refine the understanding of flood risk from all sources where a specific site risk assessment is required.

Consideration of residual risk behind flood defences has been undertaken as part of this study. The residual risk of flooding in an extreme flood event or from failure of defences should always be carefully considered.

The condition of existing flood defences and whether they will continue to be maintained and/or improved in the future is an issue that needs to be considered as part of the risk based sequential approach and in the light of this, whether proposed land allocations are appropriate and sustainable. In addition, detailed Flood Risk Assessments (FRAs) will need to explore the condition of defences thoroughly, especially where these defences are informal and contain a wide variation of condition grades. It is important that all of these assets are maintained in a good condition.

A review of key defences across the borough and their condition has been included in Section 3.4.

The following scenarios have been assessed as part of this SFRA

- **Scenario One:** An extreme (1000-year event) causing overtopping of the cut-off embankments on the River Anker
- **Scenario Two:** Removal of the cut-off embankments on the River Anker in a 1 in 20 year event
- **Scenario Three:** Removal of the cut-off embankments on the River Anker in a 1 in 100 year event.

The results of these scenarios are shown in Figure 9-2 to Figure 9-3.

Figure 9-1 shows the residual risk should an extreme event cause overtopping of the cut-off embankments on the River Anker. The extent of flooding in Nuneaton town centre is increased, notably to the left of the A444. Additionally the flood relief channel is overwhelmed during an extreme event, with water overtopping on both banks.

Figure 9-2 and Figure 9-3 show the flood extent in Nuneaton town centre if the cut-off embankments were removed (i.e. an undefended scenario). The effect during a 1 in 20 year flood event is negligible, with flood water being stored in the area at Attleborough Fields. A similar result is shown during a 1 in 100 year flood event, with negligible increases in flood extent through the town centre.

The similarity of the results from the 1 in 100 year defended against the 1 in 100 year undefended outline (shown in Figure 9-3) suggest the standard of protection provided by the cut-off embankments may be less than 1 in 100 years SoP. If the SoP were 100-years then it would be expected that the outlines would be significantly different.

Developers should consider the standard of protection provided by defences and residual risk as part of a detailed flood risk assessment.

Figure 9-1: Overtopping of cut-off embankments in an extreme event (1 in 1000 year)

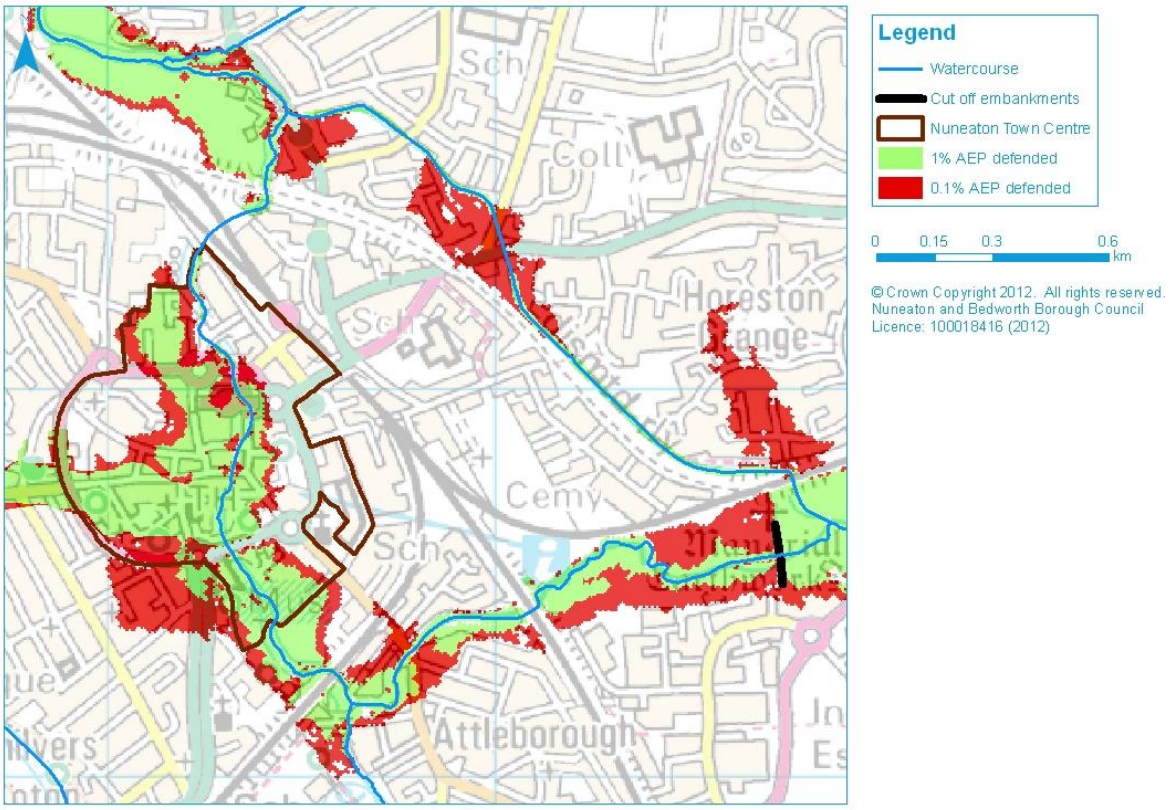


Figure 9-2: Removal of cut-off embankments in a 1 in 20 year event

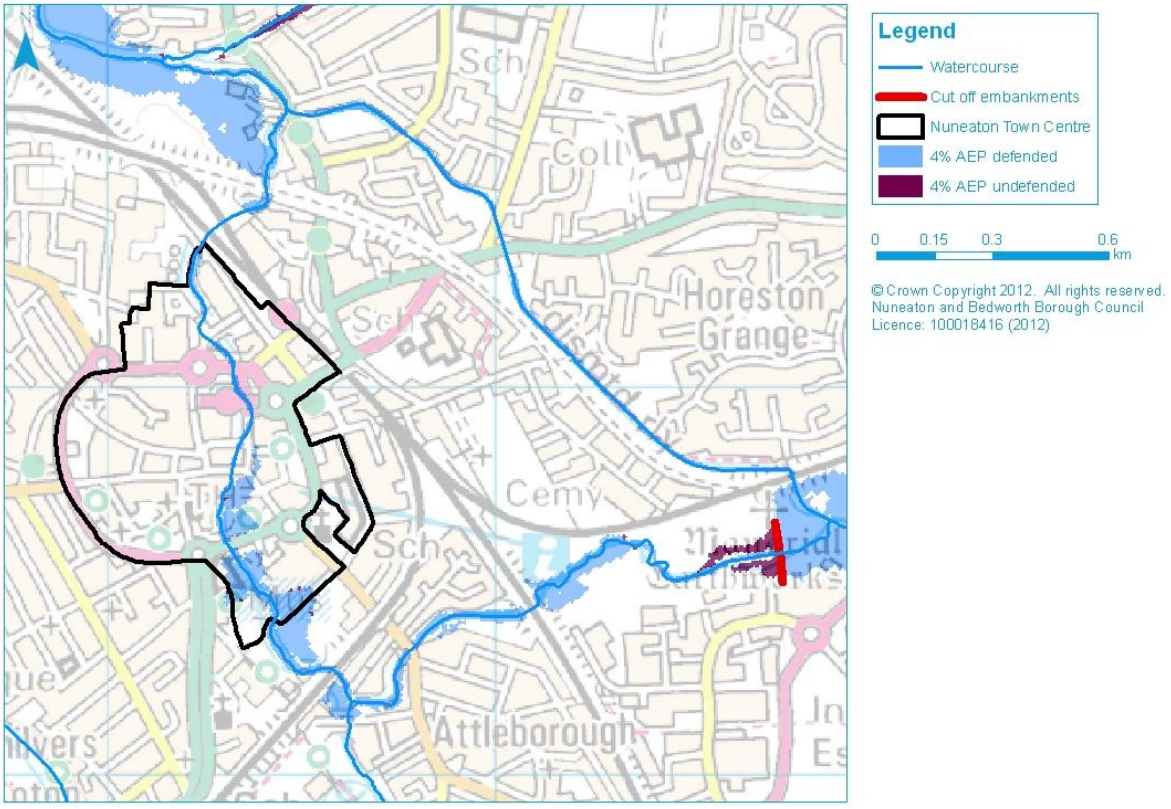
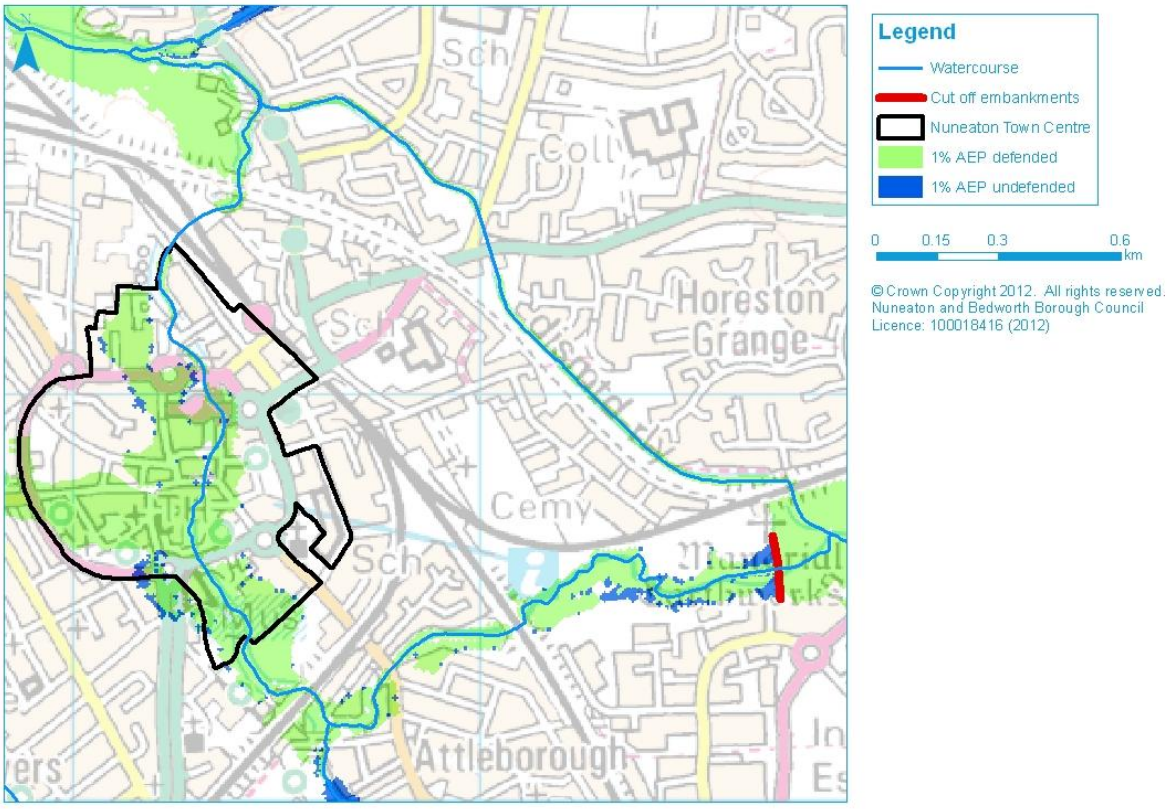


Figure 9-3: Removal of cut-off embankments in a 1 in 100 year event



9.1.2 Future Risk

Section 3.4 describes how a Policy 4 was applied to policy unit containing the Nuneaton and Bedworth Area in the Trent CFMP. This policy requires the current level of flood risk to be sustained in the future. The River Anker detailed model was run with defences for the 1 in 100 year (1% AEP) event and the 1% AEP plus climate change event, to assess the possible protection of the River Anker flood defences in the future, assuming the defences are maintained to the current level. A comparison of the flood extents produced is shown in Figure 9-4.

The modelling results indicate that if the current level of defence is sustained into the future the extent of flooding from the River Anker in Nuneaton town centre from a 1 in 100 year flood will increase. In addition the increase in water levels as a result of climate change will cause overtopping of the flood relief channel.

The modelling suggests that maintaining the current level of defence into the future will increase the level of risk from the current situation. Further defence measures may be required to maintain the current level of risk into the future.

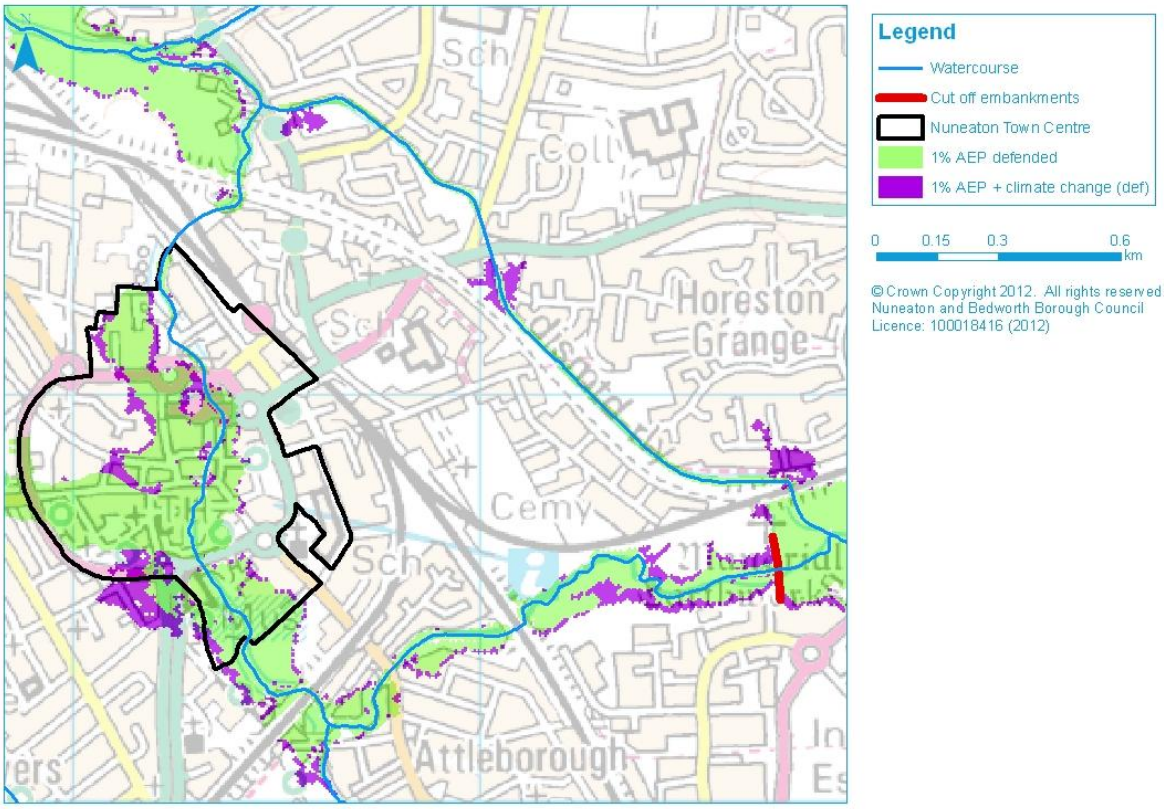
For example,

- Flood risk to Nuneaton Town Centre may be reduced through attenuation of flows on the Wem Brook or Bar Pool Brook using flood storage or wetland areas

Creation of wetland and storage areas would not only provide space to store water and attenuate flows. It would also provide Green Infrastructure within the Nuneaton and Bedworth Borough, improving accessibility to waterways and improving water quality, supporting regeneration and improving opportunity for leisure, economic activity and biodiversity. The ability to implement any flood defence measures will be affected by land availability and funding.

These measures should be investigated and incorporated into the Local Flood Risk Management Strategy being prepared by the LLFA (Warwickshire County Council). Consideration should be given to the timing and funding of the measures, as well as the communities that will benefit from the implementation, which could include new development proposed in the plan.

Figure 9-4: Assessment of future flood risk on the River Anker if current defence level is maintained.



9.2 "Critical Structures"

In addition to the Environment Agency's formal flood defence assets, there are other flood risk management (FRM) measures in place in the borough. These include:

- Council owned assets
- Environment Agency Flood Warning Areas (FWAs)
- Critical structures such as bridges, weirs, culverts and trash screens which may affect local hydraulics and flood risk.

9.2.1 Designation of features/structures

Under the FWMA 2010 EA, LLFAs, district councils, the EA and internal drainage boards have legal powers to "designate" structures and features that affect flood or coastal erosion risk (whether or not it was originally intended to do so) and are not directly maintained by these organisations.

A designation is a legally binding notice served by the designating authority on the owner of the feature and will automatically apply to anyone dealing with the land and to successive owners or occupiers of a particular property of parcel of land.[13]

Four conditions must be satisfied to enable a structure or feature to be designated. These are outlined in Table 9-1. If any of the four conditions cannot be met than designation is not possible.

Should a feature/structure be designated the owner should be able to continue to use the structure/feature. They may also alter, remove or replace the structure of feature providing they have the prior consent of the designating authority.

[13] Information Note: Designation of structures and features for flood and coastal erosion risk management purposes (Defra, July 2012).

Table 9-1: Designation conditions

Condition	
1	The designating authority thinks the existence of the structure or feature affects a flood or coastal erosion (or both) risk.
2	The designating authority has flood or coastal erosion risk management functions in respect of the risk being affected.
3	The structure or feature is not already designated by another designating authority.
4	The owner of the structure or feature is not a designating authority.

The following factors should also be considered[13].

- An assessment of flood or coastal risk associated with the structure/feature in terms of the consequences of its alteration, removal or replacement.
- Consider the general circumstances of the owner of the structure/feature. (A designating authority may reach an agreement with a third party, with respect to flood risk management, without recourse to a designation.)
    - If the designating authority is confident that the owner is aware of the flood or coastal erosion risk management function that their structure/feature serves then designation may not be relevant
    - If the designating authority is confident that the management, use or treatment of the structure/feature does not give rise to adverse risks then designation may not be relevant.
- Assess the vulnerability of the structure/feature to change or damage
- Assess any need for emergency repairs by the owner or intervention by the designating authority.

Further information on the designating of structures and features can be found in the Defra Information Note: Designation of structures and features for flood and coastal erosion risk management purposes (July 2012).

9.2.2 Critical structures within Nuneaton and Bedworth Borough

As part of the Level 2 SFRA, we have prepared an outline assessment of critical structures which may affect flood risk.

Critical structures identified in the Level 2 SFRA include:

- Change Brook: A5 culvert. Surcharging of this culvert may cause backing up of Change Brook to the north of the A5, increasing risk to Overbrook Grange
- Change Brook: Coniston Way culvert: surcharging or failure of this culvert, in an extreme event, may cause backing up of Change Brook increasing risk to properties in the area.
- Railway embankments at Attleborough
- Railway embankments at Bedworth Heath

It is recommended that the ownership of these structures is identified to determine whether they are owned by a designating authority. Designation is not possible on any structures owned by a designating authority.

For any of the structures/features not owned by a designating authority it is recommended the factors outlined in Section 9.2.1 above should be considered and a more detailed assessment be prepared, if required. The resolution of the assessment possible for the Level 2 SFRA is probably less than required to identify all appropriate features.

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10 Critical Drainage Areas and Green Infrastructure

10.1 Critical Drainage Areas

10.1.1 Introduction

The Town and Country Planning Order 2006 defines Critical Drainage Areas (CDAs) as "an area within Flood Zone 1 which has critical drainage problems and which has been notified...[to]...the local planning authority by the Environment Agency". However, the Environment Agency Standing Advice also recognises the part that SFRAs play in identifying areas with drainage problems and in doing so highlighting areas that need a FRA to consider drainage in detail.

Certain locations are particularly sensitive to an increase in the rate of surface water runoff and or/volume from a new development. There are generally known local flooding problems associated with these areas. These areas have been defined as CDAs in the SFRA. Specific drainage requirements are required in these areas to help reduce local flood risk. These are areas with complex surface water flooding problems that would benefit from a Surface Water Management Plan and subsequent drainage strategy.

The SFRA has developed Critical Drainage Areas where:

1. There is a high risk of localised flooding from ordinary watercourses including culverts surcharging and overland surface water flows, including the potential for flooding from the sewer network due to failure/blockage or exceedance events when the storm return period is greater than the sewer was designed for, or
2. Where there are areas of significant redevelopment planned that could have a significant impact on surface water runoff to local watercourses and the sewer network.

Screening for CDAs within the Nuneaton and Bedworth area was undertaken using data from the following sources:

- Past flooding information from the Warwickshire PFRA
- The Flood Map for Surface Water (FMfSW)
- An assessment of properties at risk based on the FMfSW
- Severn Trent Water DG5 register

The historical flood records from Severn Trent Water (STW), the Environment Agency and Warwickshire County Council were analysed to help identify any CDAs throughout the borough. It was assumed that where a historical record exceeded an eight metre distance from a watercourse, the event was presumed to be from surface water runoff or by exceeding sewer capacities.

Severn Trent Water provided historical flooding records from this SFRA. Details of the sewer network were not made available for use in the assessment. The sewer network can have a significant impact on the location of surface water and sewer flooding for more frequent events. It can also affect the distribution of water throughout urban catchments during flood events, passing excess flows from the combined network into watercourses through combined sewer overflows.

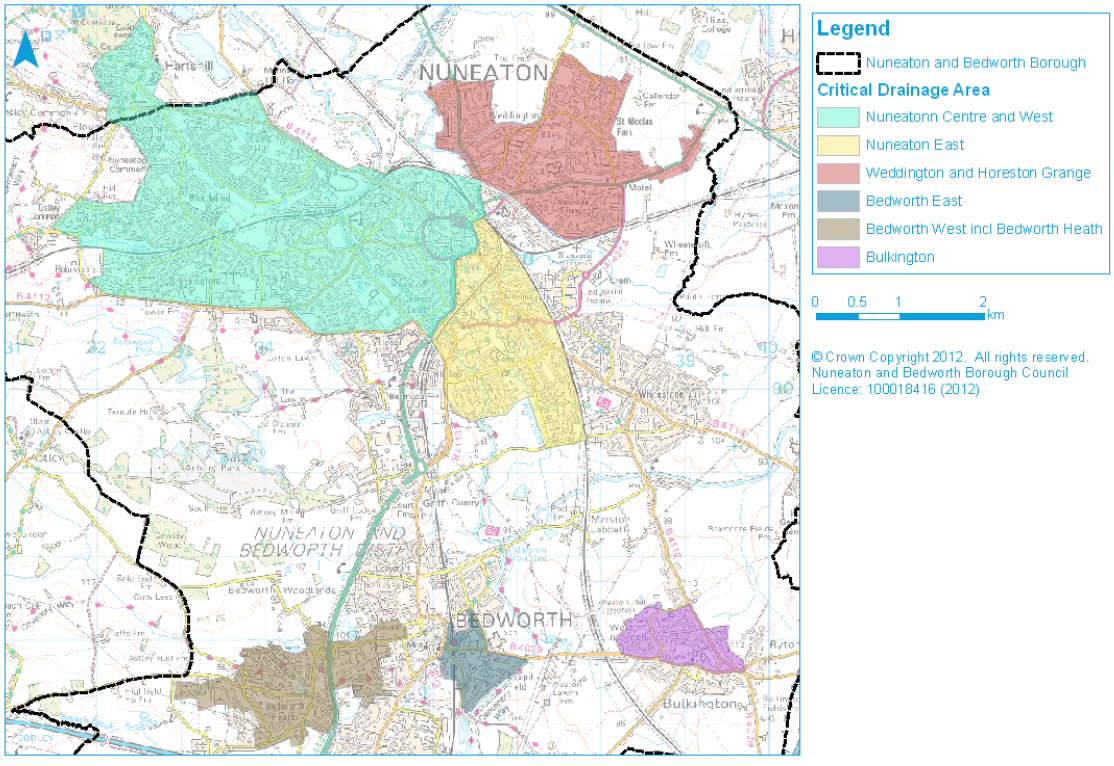
Using the available data, CDAs have been provided as part of the SFRA and are detailed in Table 10-2 and Figure 10-1.

Table 10-1: Critical Drainage Areas

Critical Drainage Area	Reason
Nuneaton Centre and West	• Reported sewer and surface water flooding incidences • SFRA analysis shows significant surface water flooding hotspot • Properties shown as affected in the DG5 register

Critical Drainage Area	Reason
Nuneaton East	• Reported sewer and surface water flooding incidences • SFRA analysis shows significant surface water flooding hotspot • Properties shown as affected in the DG5 register
Weddington and Horeston Grange	• SFRA analysis shows significant surface water flooding hotspot • Properties shown as affected in the DG5 register
Bedworth East	• Reported sewer and surface water flooding incidences • Properties shown as affected in the DG5 register
Bedworth West including Bedworth Heath	• Reported sewer and surface water flooding incidences • SFRA analysis shows significant surface water flooding hotspot • Properties shown as affected in the DG5 register
Bulkington	• Reported sewer and surface water flooding incidences • SFRA analysis shows significant surface water flooding hotspot • Properties shown as affected in the DG5 register

Figure 10-1: Critical Drainage Areas



The CDAs are shown in Figure 10-1 and it can be seen that without risk based information for the sewer network the CDAs cover an extensive area. Sewer network details such as sewer capacities and drainage direction would help refine CDAs. The CDAs provided in the SFRA

should be refined over time as more detailed information on flood risk and local flood management assets, including Severn Trent Drainage Areas and sewered catchments, becomes available. In addition it should be noted that the delineation of SFRAs utilised existing historic flooding data including the DG5 register. These data sets only include reported and known flooding events. There may have been other flood events within the borough that are not included in these datasets and therefore were unavailable for this analysis. The CDAs identified here should therefore only be taken as a starting point in the identification of areas for which a SWMP would be beneficial.

10.1.2 Recommendations for Surface Water Management

Under the FWMA county councils and unitary authorities are responsible for a leadership role in local flood risk management, of which the production of a SWMP may be required. However, unitary and county local authorities can delegate the production of a SWMP to a lower tier. A SWMP is undertaken in consultation with key local partners who are responsible for surface water management and drainage in their area.

Warwickshire County Council, as the lead for local flood risk management, should co-ordinate any future surface water management work. The Defra Surface Water Management Plan Guidance (2010) supports the use of SFRAs in providing the evidence base for where SWMPs are required.

Nuneaton and Bedworth Borough Council, the Environment Agency, Severn Trent Water and Warwickshire County Council should work closely together, using the outputs from the SFRA as a starting point, to identify any requirement for, potential locations of, and priorities for SWMPs . They should identify particular hotspots where surface water solutions can be identified or more detailed modelling is needed.

Surface water management needs to take a holistic approach, taking into account all the sources of local flood risk, including from sewers, overland flow, culverted and open watercourses and groundwater. A suite of options are available for surface water management including source control, such as the implementation of SUDs, increasing the capacity of sewers or watercourses, storing excess water and managing exceedance flows through urban design and "Green Infrastructure". SWMPs should provide the opportunity to undertake detailed sewer modelling and pool together the knowledge and understanding from different organisations to help assess options to reduce surface water flood risk to new and existing development.

Options to reduce flood risk in one location should not increase risk upstream or downstream. SWMP areas may cross one or more local authority area and different local authorities, the Environment Agency and Severn Trent Water can be brought together in a SWMP partnership to develop sustainable options to manage surface water flood risk. Where there are possible interactions with canals the Canal and Rivers Trust should also be involved.

There is the potential for groups of development sites coming forward to share a central and integrated solution for managing surface water runoff. This is best investigated further through a Drainage Strategy during the detailed FRA stage. Such solutions can provide great benefits besides water management, including providing recreational facilities, improving biodiversity and making communities a better place to live. Where there are several sites that would share a communal facility, such sites may be funded through developer Section 106 or Community Infrastructure Levy payments. Drainage Strategies can be particularly useful for considering, recommending the implementation of, and long term management arrangements for, SUDS and setting appropriate runoff rates from new development.

10.2 Green Infrastructure

Green Infrastructure is a planned and managed network of natural environmental components and green spaces that intersperse and connect the urban centres, suburbs and rural fringe and consist of:

- Open spaces – parks, woodland, nature reserves, lakes
- Linkages – River corridors and canals, and pathways, cycle routes and greenways
- Networks of “urban green” – private gardens, street trees, verges and green roofs.

The identification and planning of Green Infrastructure is critical to sustainable growth. It merits forward planning and investment as much as other socio-economic priorities such as health, transport, education and economic development. GI is also central to climate change action and is a recurring theme in planning policy.

With regards to flood risk, green spaces can be used to manage storm flows and free up water storage capacity in existing infrastructure to reduce risk of damage to urban property, particularly in city centres and vulnerable urban regeneration areas. Green infrastructure can also improve accessibility to waterways and improve water quality, supporting regeneration and improving opportunity for leisure, economic activity and biodiversity.

The evidence base provided in the Level 2 SFRA should be used to enhance the Nuneaton and Bedworth Green Infrastructure Plan[14]. River corridors identified as functional floodplains are an excellent linkage of GI and can provide storage during a flood event. Areas identified within the urban environment or upstream of a critical surface water flood area should be incorporated into council GI strategies. Opening up land to create flow paths or flood storage areas can help protect current and future property.

In certain circumstances runoff green space can cause flooding in developed areas. This should be considered through further detailed work in a Surface Water Management Plan.

GI Zones identified in the 2009 Green Infrastructure Plan relevant to flood risk are outlined in Table 10-2.

Table 10-2: GI Zones

GI Zone	Project	Description	Flood risk implications
2 Post industrial discovery zone	2d. Midland Quarry water body	Enhance link with the adjacent canal. Future development such as a marina and diving centre	Increased provision of water storage through attenuation and balancing scheme for the canal and associated hydrology
3 Urban Waterways and wetlands zone	3a. Wetland enhancement and improved management presence/access enhancement to valley at Camp Hill	Widening and diversifying wetlands and riparian habitats	Linking of existing wetland habitats and expansion/buffering of riparian habitat corridors providing space for water
	3b. Floodplain Parklands	Linked network (along Anker, Ashby Canal and Wem Brook) of wetland spaces – flood meadow parklands and lakes	Increased space for water storage
	3c. Urban river corridor	A greenway along the River Anker from Hartshill railway bus station to town centre north, providing a north-south link.	Increased space for water storage
	3d. Restoration and enhancement of the river edges within George Eliot and Riversley Parks	Enhanced wetland character along the watercourse, expanding and linking wetland habitat.	Flood attenuation. Vegetated banks will help aid future flood risk management
	3e. Anker Valley east	Restoration, enhancement and expansion of the wetland landscape character around Nuneaton East.	Wetland habitat creation and enhancement will help reduce flood risk through increased flood storage potential
	3f. Keresley Wetland Park	Creation of an enhanced and better linked series of wetland habitats	Expanded and more flexible wetland habitat with greater resilience to flood risk.

[14] Nuneaton and Bedworth Green Infrastructure Plan: Final Report (Nuneaton and Bedworth Borough Council, 2009)

11 FRA requirements

11.1 Over-arching principles

The Nuneaton and Bedworth SFRA focuses on delivering a strategic assessment of flood risk within the area. Prior to development, site-specific assessments will need to be undertaken to ensure all forms of flood risk at a site are fully addressed. In addition, following the Sequential Test, some sites may be put forward for the Exception Test. These will require further work in a detailed FRA. Any site that does not pass the Exception Test should not be allocated for development. It is normally the responsibility of the developer to provide a FRA with an application. However, a LPA can decide to commission a detailed, site-specific FRA to help them decide upon allocations in the high risk zone. The Level 2 SFRA cannot provide this level of site-specific information.

It should be acknowledged that a detailed FRA may show that a site is not appropriate for development of a particular vulnerability, or at all. Where the FRA shows that a site is not appropriate for a particular usage, a lower vulnerability classification may be appropriate.

11.2 Requirements for flood risk assessments

The aim of a FRA is to demonstrate that the development is protected to the 1% annual probability event and is safe during the design flood event, including an allowance for climate change and any historic or extreme events. This includes assessment of mitigation measures required to safely manage flood risk. Development proposals requiring FRAs should:

- Apply the Sequential, and when necessary Exception, Tests
- Not increase flood risk, either upstream or downstream, of the site, taking into account the impacts of climate change
- Not increase surface water volumes or peak flow rates, which would result in increased flood risk to the receiving catchments
- Use opportunities provided by new development to, where practicable, reduce flood risk within the site and elsewhere
- Ensure that where development is necessary in areas of flood risk (after application of Sequential and Exception Tests) , it is made safe from flooding for the lifetime of the development, taking into account the impact of climate change
- All sources of flood risk, including fluvial, surface water and drainage need to be considered.

FRAs for proposed developments in the Nuneaton and Bedworth Borough area should follow the approach recommended by the NPPF and associated guidance, and guidance provided by the Environment Agency.

11.3 Mitigation Measures

Mitigation measures should be seen as a last resort to address flood risk issues. Consideration should first be given to minimising risk by planning sequentially across a site. Once risk has been minimised, only then should mitigation measures be considered.

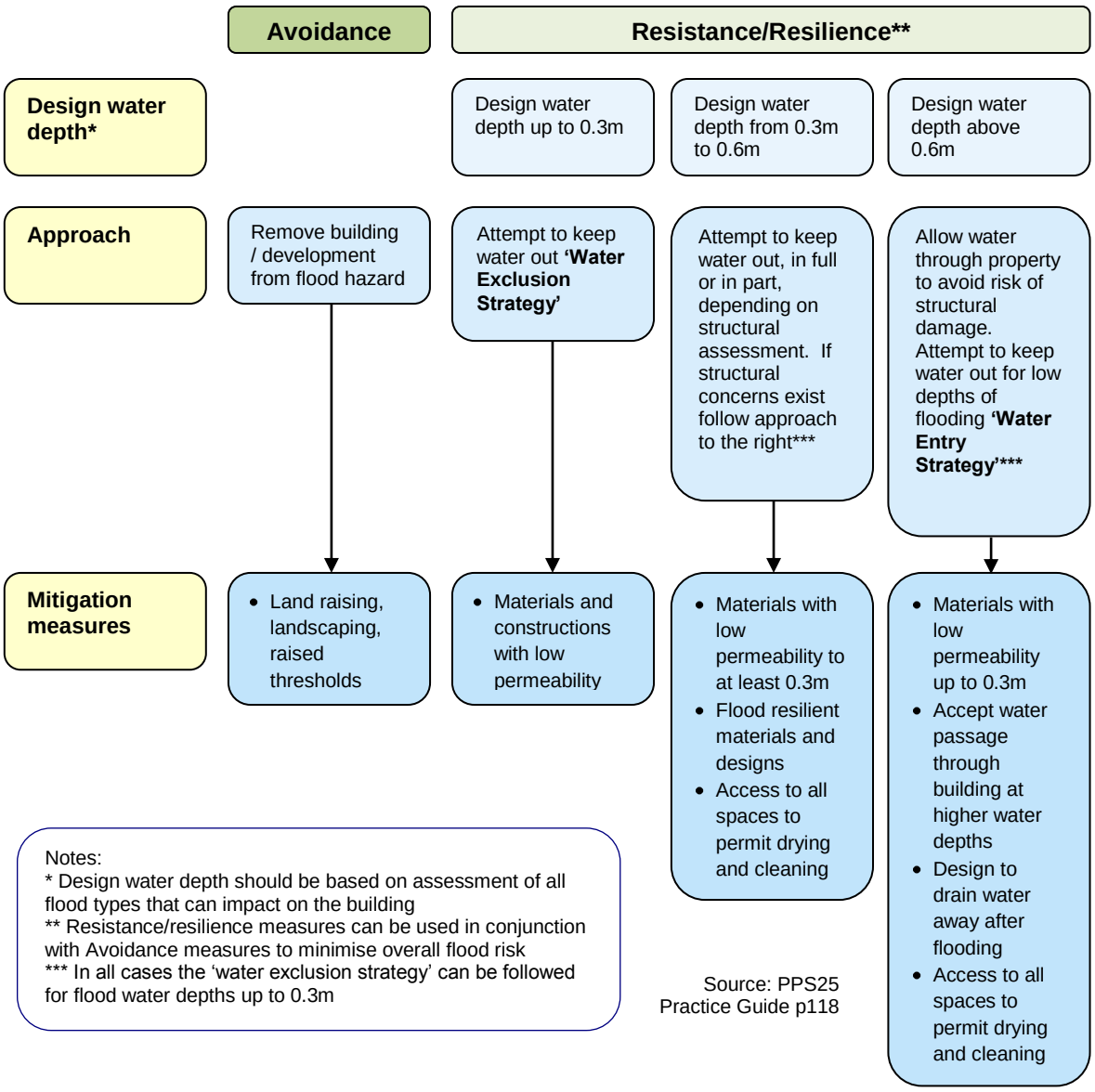
The fact that mitigation measures are discussed in this SFRA should not be taken as a presumption that the Sequential Test has been bypassed. It is included to give a fuller picture of the implications of allocating a site, and for use in a subsequent SA. Normally, suitable mitigation measures for a proposed development will be determined through assessment of flood depths via hydrological and hydraulic modelling (or use of existing models) carried out as part of a FRA.

Often the determining factor in deciding whether a particular development can or cannot proceed is the practical feasibility and financial viability of flood risk mitigation rather than technical limitations. Detailed technical assessments are required in the FRA to assess the practical feasibility, together with a commercial review by the developer of the cost of the mitigation works.

At the SFRA stage, broad assumptions are therefore required regarding the feasibility of flood risk mitigation to ensure that only sites with realistic development potential are put forward.

Some mitigation measures were outlined in the previous guidance (PPS25) and are presented in Figure 11-1. It is assumed that floor level raising will continue to be the traditional mitigation measure. It should be noted that the Environment Agency see actual land raising as a last option. Thought will also be required to ensure safe access and egress is available for flood events including climate change. The Emergency Services should be consulted on the evacuation and rescue capabilities and any advice or requirements included.

Figure 11-1: Rationale for flood resilient and/or resistant design strategies[4]



There should be no interruption to flood flows or loss of flood storage as a result of any proposed development. Flood storage compensation may be appropriate for sites on the edge of the existing floodplain. Modification of ground levels/compensation works may re-configure the floodplain but should not be used to increase land available for development.

Whilst flooding mitigation measures can be implemented in most sites, it is worth noting that in some instances the findings of individual FRAs may determine that the risk of flooding to a proposed development is too great and mitigation measures are not feasible. In these instances, the development will be subject to an objection by the Environment Agency.

11.4 Sustainable Urban Drainage Systems

Sustainable Urban Drainage Systems (SUDS) are management practices which enable surface water to be drained in a way which mimics, as closely as possible, the run-off prior to site development. The choice of flow management facilities within a single site is heavily influenced by constraints including (but not limited to):

- Topography
- Geology (soil permeability)
- Available area
- Former site use
- Proposed site use
- Groundwater conditions
- Future adoption and maintenance possibilities

The design, construction and ongoing maintenance regime of such a scheme must be carefully defined, and a clear and comprehensive understanding of the existing catchment hydrological processes and existing drainage arrangements is essential.

For infiltration SUDS techniques it is imperative that the water table is low enough and a site-specific infiltration test is undertaken. Where sites lie within or close to groundwater protection zones or aquifers further restrictions may be applicable, and guidance should be sought from the Environment Agency.

There are many different SUDS techniques which can be implemented. The suitability of the techniques will be dictated in part by the development proposal and site conditions. Advice on best practice is available from the Environment Agency and the Construction Industry Research and Information Association (CIRIA).

The inclusion of SUDS within developments should be seen as an opportunity to enhance ecological and amenity value, incorporating above ground facilities into the development landscape strategy. SUDS must be considered at the outset, during preparation of the initial site conceptual layout to ensure that enough land is given to design spaces that will be an asset to the development rather than an after-thought.

Under the Flood and Water Management Act, the SUDS Approval Body will be responsible for approving, adopting and maintaining drainage plans and SUDS schemes that meet the National Standards for sustainable drainage.

All new developments will require planning approval from both the SAB and the local planning authority. The Environment Agency will be a statutory consultee when delivering SUDS for any proposed discharge of surface water into a watercourse.

Local planning bodies should:

- Promote the use of SUDS for the management of run off
- Ensure their policies and decisions on applications support and compliment the building regulations on sustainable rainwater drainage, giving priority to infiltration over first watercourses, then sewers
- Incorporate favourable policies within development plans
- Adopt policies for incorporating SUDS requirements into Local Development Documents
- Encourage developers to utilise SUDS wherever practicable, if necessary, through the use of appropriate planning conditions
- Develop joint strategies with sewerage undertakers and the Environment Agency to further encourage the use of SUDS

Table 11-1: Example SUDS Techniques

SUDS Technique	Flood Reduction	Water Quality Treatment & Enhancement	Landscape and Wildlife Benefit
Living roofs	✓	✓	✓
Basins and ponds	✓	✓	✓
Constructed wetlands	✓	✓	✓
Balancing ponds	✓	✓	✓
Detention basins	✓	✓	✓
Retention ponds	✓	✓	✓
Filter strips and swales	✓	✓	✓
Infiltration devices	✓	✓	✓
Soakaways	✓	✓	✓
Infiltration trenches and basins	✓	✓	✓
Permeable surfaces and filter drains	✓	✓	
Gravelled areas	✓	✓	
Solid paving blocks	✓	✓	
Porous pavements	✓	✓	
Tanked systems	✓		
Over-sized pipes/tanks	✓		
Storm cells	✓		

11.5 Reducing Flood Risk

The minimum acceptable standard of protection against flooding for new property within flood risk areas is 1% annual probability for fluvial flooding and a breach during a 0.5% annual probability tidal event, with allowance for climate change over the lifetime of the development. The measures chosen will depend on the nature of the flood risk. Some of the more common measures include:

11.5.1 Reducing Flood Risk through Site Layout and Design

Flood risk should be considered at an early stage in deciding the layout and design of a site to provide an opportunity to reduce flood risk within the development. A number of the Nuneaton and Bedworth allocations cover all three Flood Zones.

The NPPF states that a sequential, risk-based approach should be applied to try to locate more vulnerable land use to higher ground, while more flood-compatible development (e.g. vehicular parking, recreational space) can be located in higher risk areas. However vehicular parking in floodplains should be based on nature of parking, flood depths and hazard including evacuation procedures and flood warning.

Waterside areas, or areas along known flow routes, can be used for recreation, amenity and environmental purposes, allowing the preservation of flow routes and flood storage, and at the same time providing valuable social and environmental benefits contributing to other sustainability objectives. Landscaping should ensure safe access to higher ground from these areas, and avoid the creation of isolated islands as water levels rise.

11.5.2 Modification of Ground Levels

Modifying ground levels to raise the land above the required flood level is a very effective way of reducing flood risk to the site in question, particularly where the risk is entirely from tidal flooding and the land does not act as conveyance for flood waters.

However, in most areas of fluvial flood risk, conveyance or flood storage would be reduced by raising land above the floodplain, adversely impacting on flood risk downstream. Compensatory

flood storage must be provided, and should be on a level for level, volume for volume basis on land that does not currently flood but is adjacent to the floodplain (in order for it to fill and drain). It should be in the vicinity of the site and within the red line of the planning application boundary (unless the site is strategically allocated). Ground raising in the floodplain should not be undertaken to increase the developable land on a site but merely to configure it for a more convenient use. Raising ground levels can also deflect flood flows, so analyses should be performed to demonstrate that there are no adverse effects on third party land.

Where the site is entirely within the floodplain it is not possible to provide compensatory storage at the maximum flood level and this will not be a viable mitigation option. Compensation schemes must be environmentally sound.

Raising levels can also create areas where surface water might pond during significant rainfall events. Any proposals to raise ground levels should be tested to ensure that it would not cause increased ponding or build up of surface runoff on third party land.

11.5.3 Raised Defences

Construction of raised floodwalls or embankments to protect new development is not a preferred option, as a residual risk of flooding will remain. Compensatory storage must be provided where raised defences remove storage from the floodplain.

Temporary or demountable defences are not acceptable flood protection for a new development unless flood risk is residual only.

11.5.4 Developer Contributions

In some cases and following the application of the sequential test, it may be necessary for the developer to make a contribution to the improvement of flood defence provision that would benefit both the development in question and the local community. Developer contributions can also be made to maintenance and provision of flood risk management assets, flood warning and the reduction of surface water flooding (i.e. SUDS).

Defra's Flood Defence Grant in Aid (FDGiA)[15] goes to flood risk management authorities to pay for a range of activities including flood defence schemes that help reduce the risk of flooding and coastal erosion. Some schemes are only partly funded by FDGiA and therefore any shortfall in funds will need to be found from elsewhere using Partnership Funding, for example local levy funding, local businesses or other parties benefitting from the scheme.

If a developer relies on a project to improve an existing defence, the developer will be expected to make a contribution which should be in proportion to the benefits received by the development. For new development in locations without existing defences, or where development is the only beneficiary, the full costs of appropriate risk management measures for the life of the assets proposed must be funded by the developer.

However, just because the developer is willing to fund the cost of the necessary protection from flooding or coastal erosion, does not mean the development can be made appropriate; other policy aims also need to be met. Funding from developers should be explored prior to the granting of planning permission and in partnership with the local planning authority.

The Environment Agency is committed to working in partnership with Developers to reduce flood risk. Where assets are in need of improvement or a scheme can be implemented to reduce flood risk, the EA request that Developers contact them to discuss potential solutions. The Partnerships and Strategic Overview Team who manage these partnerships can be contacted by calling **03708 506 506 (Mon-Fri, 8am - 6pm).**

11.5.5 Building Design

Internal areas of new development should be designed to be dry during the 1 in 1000-year flood event.

The raising of floor levels within a development avoids damage occurring to the interior, furnishings and electrics in times of flood. If it has been agreed with the Environment Agency that, in a particular instance, the raising of floor levels is acceptable, they should be raised to

[15] Principles for implementing flood and coastal resilience funding partnerships (Environment Agency, 2012)

600mm above the maximum water level caused by a 1 in 100-year (1% AEP) event plus climate change. This additional height that the floor level is raised to is referred to as the "freeboard".

Allocating the ground floor of a building for less vulnerable use is an effective way of raising living space above flood levels.

Putting a building on stilts is not considered an acceptable means of flood mitigation for new development. However it may be allowed in special circumstances if it replaces an existing solid building, as it can improve flood flow routes. In these cases attention should always be paid to safe access and egress and a legal agreement should be entered into to ensure the ground floor use is not changed.

11.5.6 Resistance and Resilience

There may be instances where flood risk remains to a development. For example, where the use is water compatible, where an existing building is being changed, where residual risk remains behind defences, or where floor levels have been raised but there is still a risk at the 0.1% annual probability. In these cases (and for existing development in the floodplain), additional measures can be put in place to reduce damage in a flood and increase the speed of recovery. These measures should not be relied on as the only mitigation method.

Temporary Barriers

Temporary barriers consist of moveable flood defences which can be fitted into doorways and/or windows. The permanent fixings required to install these temporary defences should be discrete and keep architectural impact to a minimum. On a smaller scale temporary snap on covers for airbricks and air vents can also be fitted to prevent the entrance of flood water.

Permanent barriers

Permanent barriers can include built up doorsteps, rendered brick walls and toughened glass barriers.

Wet-proofing

Interior design to reduce damage caused by flooding, for example:

- Electrical circuitry installed at a higher level with power cables being carried down from the ceiling rather than up from the floor level.
- Water-resistant materials for floors, walls and fixtures.

If redeveloping existing basements, new electrical circuitry installed at a higher level with power cables being carried down from the ceiling rather than up from the floor level to minimise damage if the development floods.

Resilience measures will be specific to the nature of flood risk, and as such will be informed and determined by the FRA.

11.6 Managing Flood Risk from other Sources

11.6.1 Surface water and sewer flooding

Where new development is in an area where the public sewerage network does not currently have sufficient spare capacity to accept additional development flows it is recommended that the developer discusses such issues with Severn Trent Water at the earliest possible stage. The development should improve the drainage infrastructure to reduce flood risk on site. It is important however that a drainage impact assessment shows that this will not increase flood risk elsewhere, and the drainage requirements regarding runoff rates and SUDS for new development are met.

If residual surface water flood risk remains, the likely flow routes and depths across the site should be modelled. The site should be designed so that these flow routes are preserved and building design should provide resilience against this residual risk.

When redeveloping existing buildings, the installation of some permanent or temporary flood-proofing and resilience measures could prevent against both surface water and sewer flooding. Non-return valves prevent water entering the property from drains and sewers. Non-return valves can be installed within gravity sewers or drains, within the property's private sewer

upstream of the public sewerage system. These need to be carefully installed and must be regularly maintained. Additionally, manhole covers within the property's grounds could be sealed to prevent surcharging.

11.6.2 Groundwater

Groundwater flooding has a very different flood mechanism to any other and for this reason many conventional flood defence and mitigation methods are not suitable. The only way to fully reduce flood risk would be through building design, ensuring floor levels are raised above the water levels caused by a 1% annual probability fluvial / 0.5% annual probability tidal plus climate change event. Site design would also need to preserve any flow routes followed by the groundwater overland to ensure flood risk is not increased downstream.

When redeveloping existing buildings it may be acceptable to install pumps in basements as a resilience measure. However for new development this is unlikely to be considered an acceptable solution.

11.7 Making Development Sites Safe

11.7.1 Safe Access and Egress

The developer must ensure that safe access and egress is provided to an appropriate level for the type of development. This may involve raising access routes to a suitable level. More vulnerable development such as residential development should have safe access and egress with routes remaining 'operational' during flooding.

As part of the FRA, the developer should review the acceptability of the proposed access in consultation with the Environment Agency.

11.7.2 Flood Warning and Evacuation

Emergency/evacuation and rescue plans should be in place for all highly vulnerable and major development within the 1 in 1,000 year floodplain. Those developments which house vulnerable people (i.e. care homes and schools) will require more detailed plans. Other major development may also consider this as it is beneficial from a public safety perspective as well as a socio-economic point of view. The responsibility for approving these plans lies with the emergency planners and emergency services. Advice should be sought from WCC's Emergency Planning team when producing an emergency/evacuation plan for developments as part of an FRA. Detailed emergency/evacuation plans for developments should undertake consultation not only with WCC's emergency planning team but also the emergency services so they know what is expected of them in the event of an emergency. Table 6-1 can assist those responsible for ensuring whether or not the emergency services can undertake evacuation and rescue.

Areas where no flood warning exists may find it difficult to demonstrate that their development is safe i.e. a car park in Flood Zone 3.

Flood warnings supplied by the Environment Agency's Floodline Warnings Direct service can be provided to homes and businesses within Flood Zones 2 and 3, although the service is not available everywhere. Developers should encourage those owning or occupying developments, where flood warnings can be provided, to sign up to receive them. This applies even if the development is defended to a high standard.

11.8 Making Space for Water

The NPPF sets out a clear policy aim in Flood Zone 3 to create space for flooding by restoring functional floodplain. As part of this Level 2 SFRA, GI Zones identified in the 2009 Green Infrastructure Plan relevant to flood risk have been identified.

The Trent CFMP has allocated a Policy 4 to the policy unit containing Nuneaton and Bedworth. This requires further action to sustain the current level of flood risk into the future. Identification of open spaces and potential storage facilities can be used by the local authorities to set future land use and flood management policies to protect those areas in wide, open spaces in Flood Zone 3a where development should be avoided to reduce overall flood risk. An assessment of Green Infrastructure areas is provided in Section 10.2.

11.8.1 Opportunities for River Restoration and Enhancement

All new development close to rivers should consider the opportunity presented to improve and enhance the river environment. Developments should look at opportunities for river restoration and enhancement as part of the development. Options include backwater creation, de-silting, in-channel habitat enhancement and removal of structures. When designed properly, such measures can have benefits such as reducing the costs of maintaining hard engineering structures, reducing flood risk, improving water quality and increasing biodiversity. Social benefits are also gained by increasing green space and access to the river.

11.8.2 Buffer Strips

As a minimum, developers should set back development eight metres from the landward toe of fluvial defences or top of bank where defences do not exist. This provides a buffer strip to 'make space for water', allow additional capacity to accommodate climate change and ensure access to defences is maintained for maintenance purposes.

For watercourses classed as 'Main River' a minimum eight metre easement from the top of bank is recommended for maintenance purposes to avoid disturbing riverbanks, benefiting ecology and having to construct engineered riverbank protection. Building adjacent to riverbanks can also cause problems to the structural integrity of the riverbanks and the building, making future maintenance of the river much more difficult.

11.8.3 Drainage Capacity

The capacity of internal drainage infrastructure is often limited and is at or near capacity under existing conditions. Development that leads to increased peak runoff within the drainage catchments may lead to infrastructure capacity being exceeded, with the potential for increased flood risk. Development locations should be assessed to ensure capacity exists within both the on and off site network.

12 Summary and recommendations

12.1 Summary

- The Level 2 SFRA has considered fluvial, surface water and canal flood risk in the Nuneaton and Bedworth Borough
- Flood risk has been assessed in detail on all proposed sites, including residual risk.
- The latest flood zone maps have been provided, with and without climate change, to provide advice on the fluvial flood risk.
- The Flood Map for Surface Water is provided, indicating the likelihood of surface water flooding in the Nuneaton and Bedworth Borough.
- Surface water flooding is a risk in many of the areas. Advice has been provided regarding suitable SUDS options.
- Critical Drainage Areas have been identified and recommendations made for Surface Water Management Plans. Green Infrastructure within the Borough has also been assessed.
- Guidance for the requirements for a site specific Flood Risk Assessment for the sites where a detailed assessment of risk was undertaken is provided (Section 7.3), as well as general guidance on flood risk assessment for any development proposals within the Nuneaton and Bedworth Borough (Section 11).

It is important to recognise that the SFRA has been developed using the best available information at the time of writing. This relates both to the current risk of flooding from rivers, and the potential impacts of future climate change. The Environment Agency regularly reviews their flood risk mapping, and it is important that they are approached to determine whether updated (more accurate) information is available prior to commencing a detailed Flood Risk Assessment.

12.2 Recommendations

- It is recommended that the mapping produced for the Level 2 SFRA is used in preference to the Level 1 SFRA when identifying flood risk within the Nuneaton and Bedworth Borough.
- It is recommended that developers refer to the FRA recommendations provided in the proposed development site summary tables in Section 7.3 as well as the general guidance on flood risk assessment in Section 11.

  The key requirements for future development are summarised below:

  - All sites within Zones 2 and 3 will require a detailed Flood Risk Assessment in accordance with NPPF, making reference to Sections 7.3 and 11, and associated maps of this report. Consultation with the Environment Agency is strongly recommended at an early stage in the FRA process.
  - The layout of buildings and access routes should adopt a sequential approach, steering buildings (and hence people) towards areas of lowest risk within the boundaries of the site. This will also ensure that the risk of flooding is not worsened by, for example, blocked flood flow routes.
  - The FRA requirements defined in Section 11 of this Level 2 SFRA must be considered for all future development brought forward.
- Investigation of further flood defence measures within the Borough is recommended as part of the Local Flood Risk Management Strategy. Suggested measures for investigation include storage or wetland areas upstream on the Wem or Bar Pool Brooks.
- Any development adjacent to the canals should take account of residual risk from breach or failure and it is recommended the development incorporates a buffer zone next to the canal to allow access for maintenance and repair, should it be required.
- Any development downstream of Seeswood Pool, shown to be at risk on the EA's reservoir flood map, should take account of this residual risk and consider using the areas of the sites potentially affected by reservoir failure as public open space.

- Where critical structures/features have been identified it is recommended the council investigate ownership of these structures/features, and undertake further assessment where required, to determine whether designation of the structure/feature is needed.
- Nuneaton and Bedworth Borough Council, the Environment Agency, Severn Trent Water and Warwickshire County Council should work closely together, using the Critical Drainage Area outputs from the SFRA as a starting point, to identify any requirement for, potential locations of, and priorities for SWMPs . They should identify particular hotspots where surface water solutions can be identified or more detailed modelling is needed.
- The evidence base provided in the Level 2 SFRA should be used to enhance the Nuneaton and Bedworth Green Infrastructure Plan[16]. River corridors identified as functional floodplains are an excellent linkage of GI and can provide storage during a flood event. Areas identified within the urban environment or upstream of a critical surface water flood area should be incorporated into council GI strategies. Opening up land to create flow paths or flood storage areas can help protect current and future property.
- The Level SFRA is a living document and should be periodically updated when new information on flood risk, flood warning or new planning guidance or legislation becomes available.

12.3 Use of SFRA Data

Whilst all data used in the preparation of this SFRA has been supplied to the LPA (including reports, mapping, GIS and modelled data) there is a need to maintain controls over the data and how it is applied and modified. It is anticipated that the SFRA and associated maps will be published on the Council's website as PDFs. As the central source of SFRA data, these maps will be available to download.

The LPA will be able to use the modelled output (depths, hazards and outlines) for internal use. The use of this information must consider the context within which it was produced. The use of this data will fall under the license agreement between the LPA and the Environment Agency as it has been produced using Environment Agency data. It should be remembered that the modelling undertaken for the SFRA is of a strategic nature and more detailed FRAs should seek to refine the understanding of flood risk from all sources to any particular site.

SFRA data should not be passed on to third parties outside of the LPA. Any third party wishing to use existing Environment Agency flood risk datasets should contact External Relations in the Environment Agency Midlands Region.

[16] Nuneaton and Bedworth Green Infrastructure Plan: Final Report (Nuneaton and Bedworth Borough Council, 2009)

Appendices

A Level 1 SFRA Supplement

A.1 Introduction

This supplement advises where new information in the Level 2 SFRA should be used in preference to the information contained in the published Level 1 SFRA. This aims to avoid any potential ambiguity of information presented during consultations and inquiries and used by those parties seeking to implement allocated development during the plan period. The following sections summarise the chapters of the Level 1 SFRA where information in the Level 2 SFRA should take preference.

A.2 Planning Context

- Planning Policy Statements (PPS) and Planning Policy Guidance (PPG) have been replaced by the National Planning Policy Framework and accompanying Technical Guidance.
- Regional Spatial Strategies will be abolished under the Localism Act.

A.3 Flood Risk in the Study Area

Historic Flooding

- In addition to the historic flood information in the Level 1 SFRA, an additional event in 2008 has since been recorded.

A.4 Strategic Flood Risk Mapping

The flood maps provided for the Level 2 SFRA should take preference over the maps used for the Level 1 SFRA. The Level 2 SFRA maps have been created using the current, best available, data, including additional modelling undertaken as part of the SFRA.

A.5 Flood Warning Systems and Flood Risk Management Measures

- Asset condition and residual risk have been assessed as part of the Level 2 SFRA.
- Additional “critical structures” have been identified as part of the SFRA.
- Details of the Environment Agency’s Flood Warning service in the Level 2 SFRA should be used in preference to those in the Level 1. In November 2010, the EA made changes to their Flood Warning service aimed to make the service easier to understand and help the public respond to a flood. This included changes to their flood warning codes and updating the warning messages. Flood Alert replaced the Flood Watch.

A.6 Flood Risk Management Policy Considerations

- Many of the policies outlined in this section of the Level 1 SFRA are still applicable, although reference to Planning Policy Statement 25 (PPS25) should be replaced with National Planning Policy Framework.

A.7 Guidance on Application of the Sequential Test

- The Level 2 SFRA sets out a comprehensive overview of the Sequential and Exception Tests and how they should be applied based on the National Planning Policy Framework. It sets out what development is appropriate and where. The Level 1 SFRA guidance was based on PPS25 and therefore preference should be given to the Level 2 SFRA which incorporates changes to the Exception Test outlined in the NPPF.

A.8 Guidance for Developers

- Full and comprehensive guidance for developers is provided in the Level 2 SFRA and should be used in preference to the Level 1 SFRA. The Level 2 also provides site specific recommendations for developers for the allocation sites proposed for the Borough Plan.

A.9 Guidance for the Application of Sustainable Urban Drainage Systems

- Guidance for the application of SUDS is provided in the Level 2 SFRA and should be used in preference to the Level 1 SFRA. The Level 2 also provides broad scale assessments and site specific recommendations for the allocation sites proposed for the Borough Plan.

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B Flood Zone Mapping

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C Climate Change Mapping

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D Depth, Velocity and Hazard Mapping

Depth, velocity and hazard mapping is only available at the following proposed development sites:

- AR/13/08h, AR/13/08i, PO4, PDA5c
- PDA1, PDA10
- PDA2a, PDA2b, PDA2c, PDA2d
- PDA4
- PDA6

The remaining proposed development sites either are at no risk of flooding, or the flood zones for these sites were based upon Environment Agency Flood Zone Maps for which no depth, velocity or hazard mapping was available.

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E Canal Inundation Mapping

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F Surface Water Mapping

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