Forest Heath District Council

Strategic Flood Risk Assessment

Level 2

Final Report

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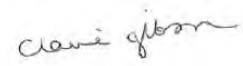
Author	Claire Gibson	
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Report No **5003-BM01397-BMR-05**

Date **October 2011**

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Appendices

SUMMARY

This report forms the Level 2 Strategic Flood Risk Assessment (SFRA) for the Forest Heath District Council area. It seeks to address the eight key elements of an SFRA as required by PPS25. Furthermore, the Level 2 SFRA underlines the subsequent implications for land development. The purpose of this document is to provide a robust evidence base when considering flood risk for the emerging Local Development Framework (LDF).

The Sequential Test was carried out for development data supplied by Forest Heath District Council in September 2010 which provided a total 9,062 dwellings. The results concluded all proposed dwelling sites could accommodate residential development either because they are sites wholly within Flood Zone 1, or where the sequential layout of sites partially within Flood Zone 2 would result in development in Flood Zone 1. Only one non residential site is wholly within Flood Zone 3. The Exception Test is not required for any sites within the Forest Heath District.

The main watercourses within the Forest Heath district are the River Lark, River Kennet, Cut off Channel, River Snail and Newmarket Drain. No flood hazard mapping has been undertaken as part of this study. A current Environment Agency study is updating the Flood Zone mapping across the district. When published, this will represent an improved understanding of flood risk. It is thus recommended that the conclusions included within this report are reviewed in 2012/13 to ensure that inappropriate development is avoided.

Additional model runs have been undertaken on the Newmarket Drain to assess the impacts of a blockage of the culvert under Willie Snaith Road in Newmarket. For a 75% blockage (maximum proportion modelled), the impact on water levels extend approximately 360m upstream and increases peak water levels by 0.7m. However, predicted flood levels are not above bank level for any modelled scenario.

The National Flood and Coastal Defence Database (NFCDD) indicate that there are raised defences on the River Lark upstream of Mildenhall and downstream of West Row and on the Little Ouse north of Lakenheath. In addition to the raised defences there are 41 flood defence structures (as defined by the NFCDD) located in the Forest Heath district of which 22 are in the control of the Environment Agency comprising a range of weirs, sluices and outfalls. The SFRA recommends that maintainers of any flood defence assets in private ownership should be made aware of the flood defence role and the importance of maintaining the asset in good condition.

Guidance on future flood risk management has been taken from the Catchment Flood Management Plan (CFMP). In the Newmarket policy area, further action is proposed to sustain the current level of flood risk into the future (responding to the potential increases in risk from urban development, land use change and climate change). In the Eastern Rivers unit, the policy is to reduce existing flood risk management actions (accepting that flood risk will increase with time).

Detailed sewer model outputs were not available as part of this SFRA. Further information on the sewerage infrastructure is incorporated into the WCS in the form of knowledge of the systems performance and the perceived impact of additional properties being promoted in these areas.

The risk of surface water flooding was assessed based on currently available data from the Environment Agency. Key settlements at risk are Newmarket, Mildenhall, Brandon, Lakenheath, Dalham, Exning and Eriswell. A surface water flooding susceptibility scoring exercise was carried using the Areas Susceptible to Surface Water Flooding (AStSWF) maps produced by the Environment Agency highlighted that Newmarket had the highest susceptibility to surface

water flooding. This SFRA recommends that a Surface Water Management Plan (SWMP) is produced for Newmarket.

Groundwater flooding was highlighted as a risk in the Level 1 SFRA. The new Areas Susceptible to Groundwater Flooding (AStGWF) maps produced by the Environment Agency illustrate a band of 1km grid squares with a higher susceptibility to groundwater emergence running the north west to south west across the district. Main settlements within this band are Brandon, Lakenheath, Beck Row, and West Row. Newmarket also contains areas of higher susceptibility. Historic groundwater flooding has been recorded in three locations in Newmarket. Site specific Flood Risk Assessments must therefore undertake specific investigations into groundwater flooding.

A SuDS map has been created for the Forest Heath district to identify broad areas where particular sustainable drainage techniques may be suitable. Full details of this are contained in the Stage 2 Water Cycle Strategy.

The SFRA recommends that development within Forest Heath District must incorporate SuDS to control surface water runoff from new development in line with industry guidance and in tandem with any green infrastructure proposals.

This SFRA sets out a range of recommendations for flood risk management and planning policy as well as detailed requirements for any site specific flood risk assessments. The reader should refer to sections 12 and 13 for this information.

1 Introduction

Hyder Consulting (UK) Limited (HCL) was appointed by Forest Heath District Council (FHDC) in March 2010 to undertake a Level 2 Strategic Flood Risk Assessment (SFRA) for their administrative area.

This report builds upon the work carried out by Hyder Consulting[1] carried out as part of the Level 1 Water Cycle Study and Strategic Flood Risk Assessment in August 2009 henceforth referred to as the 'Level 1 SFRA'.

1.1 Context

The Planning and Compulsory Purchase Act 2004 (PCPA) required Local Planning Authorities (LPAs) to produce Local Development Frameworks (LDFs) to replace the system of Local, Structure and Unitary Development Plans. LDFs are a portfolio of Local Development Documents (LDDs) that collectively deliver the spatial planning strategy for the Local Authority area. The PCPA requires LDDs to undergo a Sustainability Appraisal (SA), which assists Local Planning Authorities (LPAs) in ensuring their policies fulfil the principles of sustainability.

Planning Policy Statement 25 Development and Flood Risk (PPS25)[2] sets out a framework for managing flood risk through the spatial planning process. The overarching aim of PPS25 is to ensure that flood risk is taken into account at all stages of the planning process in order to avoid inappropriate development in areas at risk of flooding. It is a requirement of PPS25 that LPAs prepare appropriately detailed SFRAs, to be used as the evidence base for strategic land use planning decisions as part of the LDF.

1.2 Overview of the SFRA Process

The SFRA process comprises two stages, Level 1 and Level 2; a Level 1 SFRA will identify whether a Level 2 SFRA is required. The Level 2 SFRA provides the additional sufficient detail for a robust evidence base on flood risk to determine where Part C of the Exception Test (see section 7 for further details) can be passed.

A Level 1 SFRA (scoping) was undertaken by Hyder Consulting in 2009[1] covering the Forest Heath administrative area. The report identified seven recommendations for the Level 2 SFRA, relevant to Forest Heath District Council:

- The identification of the Functional Floodplain (Flood Zone 3b) and climate change assessment on Flood Zone 3a focusing on Newmarket.
- A high level assessment of SuDS viability to assist developer selection of sites.
- Undertake the Sequential Test for all sites for proposed growth using Level 1 SFRA results, recommendations and in accordance with the LDF documents for Forest Heath to ensure only Flood Zone 1 areas will be allocated for new development.
- Following this, if the sites that are partially within Flood Zones 2 and 3 are still to be sequentially tested by the Council, then only the areas within Flood Zone 1 should be considered for development and the remaining areas within Flood Zones 2 and 3 should be kept free for green open space, surface water management and any flood risk management enhancements to reduce the flood risk locally or strategically.
- Identify strategic opportunities for reduced flood risk for urban areas.
- Produce developer checklist to assist development control process.

- Assess potential additional flood risk due to increased flows from wastewater treatment works and combined sewer overflows to account for Stage 2 WCS requirements.

These latter two elements are addressed within the Stage 2 WCS.

1.3 Aims and Objectives

The principal purpose of a Level 2 SFRA is to facilitate the application of the Sequential and Exception Tests (see section 7 for further information). Table 1-1 lists the outputs required from a Level 2 SFRA, as set out in PPS252, and highlights how these will, or have been met.

Required Output	Discussed in
O1 An appraisal of the current condition of flood defence infrastructure and of likely future flood management policy with regard to its maintenance and upgrade	This report, section 5
O2 An appraisal of the probability and consequences of overtopping or failure of flood risk management infrastructure, including an appropriate allowance for climate change	Predominantly removed from scope through Environment Agency discussions. See blockage modelling in section 10
O3 Definition and mapping of the Flood Zone 3b in locations where this is required	N/A[a]
O4 Maps showing the distribution of flood risk across all flood zones from all sources of flooding taking climate change into account	Removed from scope through Environment Agency discussions
O5 Guidance on appropriate policies for sites which satisfy parts a) and b) of the Exception Test, and requirements to consider at the planning application stage to pass part c) of the Exception Test	This report, section 11
O6 Guidance on the preparation of Flood Risk Assessments (FRA) for sites of varying risk across the Flood Zones, including information about the use of SuDS techniques	This report, section 11
O7 Identification of the location of areas at risk of surface water flooding and identification of the need for Surface Water Management Plans	This report, section 8
O8 Meaningful recommendations to inform policy, development control and technical issues	This report, section 11

Table 1-1 Level 2 SFRA Outputs

[a] Scope of works removed due to ongoing Environment Agency project to improve flood risk mapping in this area using combined 1D-2D models.

2 Guidance and Legislation

2.1 National Planning Context

National policy on development and flood risk in England is set out in PPS25[2] and aims to "ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding". A sequential approach to the location of development is a key foundation for PPS25 and is based on flood avoidance, with new development directed to areas where the probability of flooding is low.

Development should be kept out of medium and high flood risk areas, wherever possible. As part of the sequential approach, the vulnerability of land uses should also be considered when determining development suitability.

To assist in the application of the sequential approach in allocating and permitting development, two decision-making tools are incorporated into PPS25, the Sequential and the Exception Tests.

2.1.1 The Sequential Test

The Sequential Test assesses whether a new development can be located in an area of lowest risk of flooding, i.e. within Flood Zone 1. If this is not achievable, the test then moves through Flood Zone 2 and finally Flood Zone 3 to locate reasonably available sites. In each case, the flood risk vulnerability of the development is taken into account. Flooding from all sources should be considered.

2.1.2 The Exception Test

In some situations, development in Flood Zones 2 or 3 may be required to address social or economic needs of a community. In such cases, the Exception Test should be applied to demonstrate:

a The development provides wider sustainability benefits to the community that outweigh flood risk

b It is on brownfield land or, if it is not, there are no reasonable alternative brownfield sites

c It will be safe, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall

2.2 Regional Planning Context

2.2.1 Regional Spatial Strategy

The Planning and Compulsory Purchase Act of 2004 introduced Regional Spatial Strategies (RSS) to provide consistent regional frameworks for guiding the preparation of Local Development Documents (LDD). The East of England Plan[3] is the RSS covering Forest Heath District Council and was adopted in May 2008.

On 14th December 2010, the Department for Communities and Local Government published the Decentralisation and Localism Bill (DLB) leading to the national revoking of the RSS. The DLB empowers local authorities to determine local housing strategy numbers and thus allowing local authorities to opt out of the RSS housing targets. At the time of writing, no decision had

been made as to targets and as such, in agreement with Forest Heath District Council members, the SFRA will retain the existing RSS targets for the purposes of this work.

Newmarket lies within the Cambridge sub-region where the aspiration is to continue to develop as a centre of excellence and expansion of the 'knowledge based economy' spreading out from Cambridge City, along with other settlements within Forest Heath District Council's administrative area.

Within the RSS, Forest Heath (together with St Edmundsbury and Mid Suffolk) are also tasked with supporting a growth in jobs of 18,000. The RSS sets out policies informing the management of flood risk; policy WAT4 (Flood Risk Management) prioritises the defence of existing properties from flooding and the location of new development where there is little or no risk of flooding. The Local Authority (FHDC) should also address the adoption of SuDS systems by relevant bodies and consider long term liability issues associated with their use. Following on from this, new legislation concerning SuDS Approving Bodies (SAB) (see section 12) is in development which will place more responsibility on the local authority in terms of SuDS management.

2.3 Local Planning Context

2.3.1 Core Strategy

The Core Strategy Development Plan Document (DPD) for Forest Heath was adopted on 12th May 2010 and forms part of the Local Development Framework (LDF) for the district. The LDF is a set of key strategic documents, establishing a vision and certain principles that are core to the way that the areas develop in the longer term.

The Core Strategy contains Policy CS7, which sets a broad distribution of development to meet the RSS growth targets and comply with Planning Policy Statement 3 Housing (PPS3)[4]. In addition to these dwellings, FHDC are expecting the completion of a number of committed sites (those with planning permission as of April 2009). This includes an additional 682 dwellings to be completed as an extension to the east of the existing Red Lodge development, as per extant planning permission. The total development trajectory for the district is therefore as shown in Table 2-1.

The Regional Spatial Strategy (RSS) housing requirement for Forest Heath for 2001-2021 is 6,400 homes. The Local Development Framework will also have to make continued provision for housing beyond 2021 in accordance with national guidance (PPS3: 'Housing') which requires the delivery of housing for at least 15 years from the date of adoption (2010). The requirement for the period 2021 to 2031 totals 3,700 homes – giving a total requirement for the District to be 10,100 dwellings from 2001 through to 2031.

The 2009 Annual Monitoring Report states that 1,935 new dwellings had been constructed from April 2001 to March 2009 bringing the total dwellings required planned to 2031 to be 8,165. Between 2009 and 2010, a further 368 were constructed.

In summary, with the completion of 2,303 dwellings in the period 2001 to 2010, a further 7,797 dwellings are now required up to 2031 to satisfy the provisions with the Core Strategy.

Location	2010-2015	2015-2020	2020-2025	2025-2031	Total
Brandon*	437 *(537)*	177 *(377)*	150 *(300)*	150 *(200)*	914 *(1,414)*
Lakenheath	103	233	200	200	736
Mildenhall	412	392	350	380	1,534
Newmarket	540	579	400	400	1,919
Red Lodge	341	341	690	510	1,882
Beck Row	260	167	0	0	427
Exning	196	7	0	0	203
Kentford	142	46	0	0	188
West Row	189	25	0	0	214
Total	2,620 *(2,720)*	1,967 *(2,167)*	1,790 *(1,940)*	1,640 *(1,690)*	8,017 *(8,517)*

Table 2-1 Projected development trajectory for FHDC (taken from Stage 2 WCS Table 4-4)

** Brandon allocation in brackets includes 500 additional dwellings dependant on provision of a deliverable relief road*

The Core Strategy commits to achieving the RSS housing targets as a minimum and sets out a broad spatial and temporal allocation of sites in the district with more detail to be provided in the Sites Allocation Development Plan Document (DPD). However, following the election of the coalition government in May 2010 and the consequent proposed abolition of RSS (see 2.2.1), FHDC postponed consultation on their Sites Allocation DPD.

Development numbers are locations are discussed further in section 7 'Application of the Sequential Test'.

2.3.2 Strategic Housing Land Availability Assessment

A joint Strategic Housing Land Availability Assessment (SHLAA) study was undertaken for Forest Heath together with St Edmundsbury Borough, Babergh District and Mid Suffolk District councils. Information used to inform the SHLAA and consequently to develop the preferred sites lists has been taken forward to the Sequential Test stage as it is deemed that this information represents the most appropriate picture of future development in the area. Section 7 discusses this further.

2.3.3 Water Cycle Study

Water Cycle Studies (WCS) are developed to help ensure that development is progressed sustainably and is not constrained by inadequate infrastructure. The WCS for Forest Heath and St Edmundsbury is currently in progress; Stage 1 was completed in August 2009 and Stage 2 (FHDC only) is due for completion in Autumn 2011. Stage 1 concluded that:

- Historic flood risk issues exist in most of the major settlements. This topic warrants further investigation, in light of the potential increase resulting from new development.
- Discharge rates resulting from new development should not be increased without an appropriate assessment of the potential downstream flood risk. Developments should not proceed when there is insufficient capacity at WwTW or within the sewerage network.

- It is recommended that on a precautionary basis, significant development areas such as Mildenhall, Newmarket and Red Lodge should not be approved until suitable sewerage assessments are in place, requiring input from AWS and perhaps developers.
- There are opportunities for the whole range of SuDS to be used across the study area, including infiltration and attenuation options; however caution is required so that inappropriate surface water management is not permitted due to the prevalence of a number of source protection zones and the major aquifer across most of the study area. The planning system and development control process presents significant opportunities to control development and deliver PPS25 compliance.

2.4 Environment Agency

2.4.1 Flood Map

The Environment Agency published the first national map of flooding in 2000; this was subsequently updated in 2004 to provide an improved overview of flood risk in England and Wales. The flood map highlights areas potentially at risk of flooding from rivers or sea, the locations of flood defences and the areas benefiting from flood defences. The map is available to local authorities and emergency services to assist with emergency planning, LPAs to inform development planning decisions as well as for general public viewing. This therefore acts as a starting point for the assessment of flood risk in Forest Heath upon which this SFRA will build.

2.4.2 Statutory Consultee Role

On 1 October 2006, the Town and Country Planning Order 2006[5] made the Environment Agency a statutory consultee for planning applications involving the development of land within Flood Zones 2 and 3 (except minor development, and for any development of land of 1 ha or more or in respect to residential development where the number of dwellings is 10 or more or greater than 0.5ha irrespective of Flood Zone).

If an LPA is minded to approve an application for major development in an area at risk of flooding, contrary to the advice of the Environment Agency, the LPA must inform the Secretary of State of the proposal. The Secretary of State will then check the general compliance of the planning application with PPS25 and decide whether it should be called in for determination. This SFRA is therefore an important tool for assisting the LPA to make appropriate decisions on approving developments.

2.4.3 Catchment Flood Management Plan

Background

Catchment Flood Management Plans (CFMP) are high level strategic plans prepared by the Environment Agency in order to set out future policies for sustainable flood risk management. A CFMP will:

- Carry out high level assessments of current and future flood risk from all sources
- Identify opportunities and constraints for reducing flood risk through strategic changes
- Identify opportunities to maintain, restore or improve resources
- Develop policies to guide flood risk management decisions
- Set priorities for strategic studies, actions or projects to manage flood risk

A number of CFMP policies are chosen which can then be applied to different parts of the CFMP area. The policy choices are discussed in the sections below.

Current Scale of Flood Risk

A CFMP makes an assessment of the current scale of flood risk to each policy unit. Forest Heath is covered by the Great Ouse CFMP[6] and is located across two Policy Units:

- 18 - Eastern Rivers
- 21 - Newmarket

Within the Great Ouse catchment, Newmarket/Exning are listed as having 50-100 properties at risk during a 1% AEP (1 in 100 chance of occurring in any given year) event. Groundwater flood risk is highlighted for Newmarket.

Future Flood Risks

Sensitivity testing was carried out to assess the impacts of climate change and urbanisation on river flows. This was then used to develop the future scenario against which the current risks could be compared. Urbanisation was increased by 2% and peak river flows by 20% for the Great Ouse CFMP. The future flood risk was increased most significantly in larger urban areas outside the Forest Heath area.

Policy Selection

The following policies are applicable across the council area:

Policy 2
Areas of low to moderate flood risk where we can generally reduce existing flood risk management actions. This policy will tend to be applied where the overall level of risk to people and property is low to moderate. It may no longer be value for money to focus on continuing current levels of maintenance of existing defences if we can use resources to reduce risk where there are more people at higher risk. We would therefore review the flood risk management actions being taken so that they are proportionate to the level of risk.
Policy 3
Areas of low to moderate flood risk where we are generally managing existing flood risk effectively. This policy will tend to be applied where the risks are currently appropriately managed and where the risk of flooding is not expected to increase significantly in the future. However, we keep our approach under review, looking for improvements and responding to new challenges or information as they emerge. We may review our approach to managing flood defences and other flood risk management actions, to ensure that we are managing efficiently and taking the best approach to managing flood risk in the longer term.
Policy 4
Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change
This policy will tend to be applied where the risks are currently deemed to be appropriately managed, but where the risk of flooding is expected to significantly rise in the future. In this case we would need to do more in the future to contain what would otherwise be increasing risk. Taking further action to reduce risk will require further appraisal to assess whether there are socially and environmentally sustainable, technically viable and economically justified options.
Policy 5
Areas of moderate to high flood risk where we can generally take further action to reduce flood risk. This policy will tend to be applied to those areas where the case for further action to reduce flood risk is most compelling, for example where there are many people at high

risk, or where changes in the environment have already increased risk. Taking further action to reduce risk will require additional appraisal to assess whether there are socially and environmentally sustainable, technically viable and economically justified options.
Policy 6
Areas of low to moderate flood risk where we will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits. This policy will tend to be applied where there may be opportunities in some locations to reduce flood risk locally or more widely in a catchment by storing water or managing run-off. The policy has been applied to an area (where the potential to apply the policy exists), but would only be implemented in specific locations within the area, after more detailed appraisal and consultation.

Within the study area, the following policies have been selected:

CFMP	Policy Unit	Policy
Great Ouse	1 Bedford Ouse Rural and Eastern Rivers	2
Great Ouse	5 Newmarket	4

Table 2-2 Policy Selection

This report has summarised the key proposals from the CFMP; for additional detail on CFMP plans and proposals, the original document should be consulted.

2.5 Internal Drainage Boards

The IDBs have a rolling programme of maintenance for many of the watercourses under their control as well as undertaking capital improvement works to reduce the risk of flooding. They play an important role in the planning process and bring detailed knowledge of their catchments, regularly giving drainage advice on impacts of proposed development.

There are four main IDBs located within on the western edge of the Forest Heath area; Lakenheath, Mildenhall, Middle Fen and Burnt Fen all of which are part of the Ely Group of Drainage Boards. Further detailed information is contained within the Level 1 SFRA.

3 Study Area Characteristics

3.1 General

The Forest Heath District is one of the smallest rural districts in the UK, just under 38,000 ha. The district is predominantly rural, with the market towns of Brandon, Mildenhall and Newmarket and key service areas of Lakenheath and Red Lodge making up the most of the district's urban areas (Figure A-1 in Appendix A). Relatively high proportions of the district are low-lying fen land with the River Kennett at Moulton and the watercourses through Newmarket being at the greatest risk of flood.

3.2 Flood Risk

PPS25 requires that all sources of flood risk are considered including rivers, sea, land, groundwater, sewers and artificial sources. The key potential causes of flooding across the Local Authority area are:

- Overflow from watercourses
- Breaching or mechanical, operational or structural failure of flood defences, hydraulic structures (pumps, etc) and water retention facilities
- Localised pluvial flooding – piped sewerage & highway drainage systems, surface runoff and/or overland flow
- Groundwater flooding

Fluvial

A full description of the watercourses and the catchments is given in the Level 1 SFRA[1].

Land and Surface Water

Conclusions from the Level 1 SFRA indicate that flooding from rural runoff is a significant risk in a number of locations within the study area and currently many suffer repetitive problems. However, the majority of these locations are agricultural locations, Class B roads and minor roads. This is discussed further in section 8.

Groundwater

The study area is geologically susceptible to groundwater flooding, due to the low lying nature of the land, and the underlying major aquifers. Several locations to the north of the study area suffer repetitive flooding from seasonal rising groundwater. More detail is given in the Level 1 SFRA and Section 8 of this report.

Sewers

Sewer flooding incidents have been reported across the study area as described in the Level 1 SFRA. Additional detail on sewer flooding is included within the Stage 2 WCS.

Artificial Sources

Artificial sources of flood risk incorporate reservoirs, canals and lakes where water is retained above the natural ground level, as well as flood risk management infrastructure. There have been no reports of flooding from reservoirs, canals or artificial sources within the study area. A full description of the assets within the study area is given in the Level 1 SFRA.

3.3 Historical Flooding

A search of the British Hydrological Society archives[7] and the internet was carried out to form a general picture of historical flooding. The findings are summarised in Table 3-1.

Date	Source of Flood	Settlement	Description
12th February 1616	Fluvial	Newmarket	
18th March 1947	Fluvial		Widespread flooding
1968	Fluvial	Moulton	Damaging floods

Table 3-1 Significant historical floods

3.4 Geology

The study area is almost wholly underlain by chalk with small strips of Upper Greensand and Gault and Kimmeridge Clays along the north western edge of the Forest Heath boundary. The chalk is predominantly overlain with Till with Glacial Sand and Gravel and River Terrace deposits distributed through the river valleys.

3.5 Nature Conservation Designations

Table 3-2 lists the existing nature conservation designations in the study area. Designated areas provide an additional driver in the pursuit of sustainable management of surface water given the need to ensure an enhanced level of protection. Likewise the use of SuDS can provide conservation benefits in the development of areas of green space which can be used by wildlife as small scale reserves and corridors linking existing designated areas. These opportunities are discussed further in section 8.

Designation	Number of Sites
SSSI (Site of Special Scientific Interest	92
SPA (Special Protection Area)	19
SAC (Special Area of Conservation)	17
LNR (Local Nature Reserve)	9
NNR (National Nature Reserve)	2
CWS (County Wildlife Site)	10

Table 3-2 Conservation Sites (source Natural England)

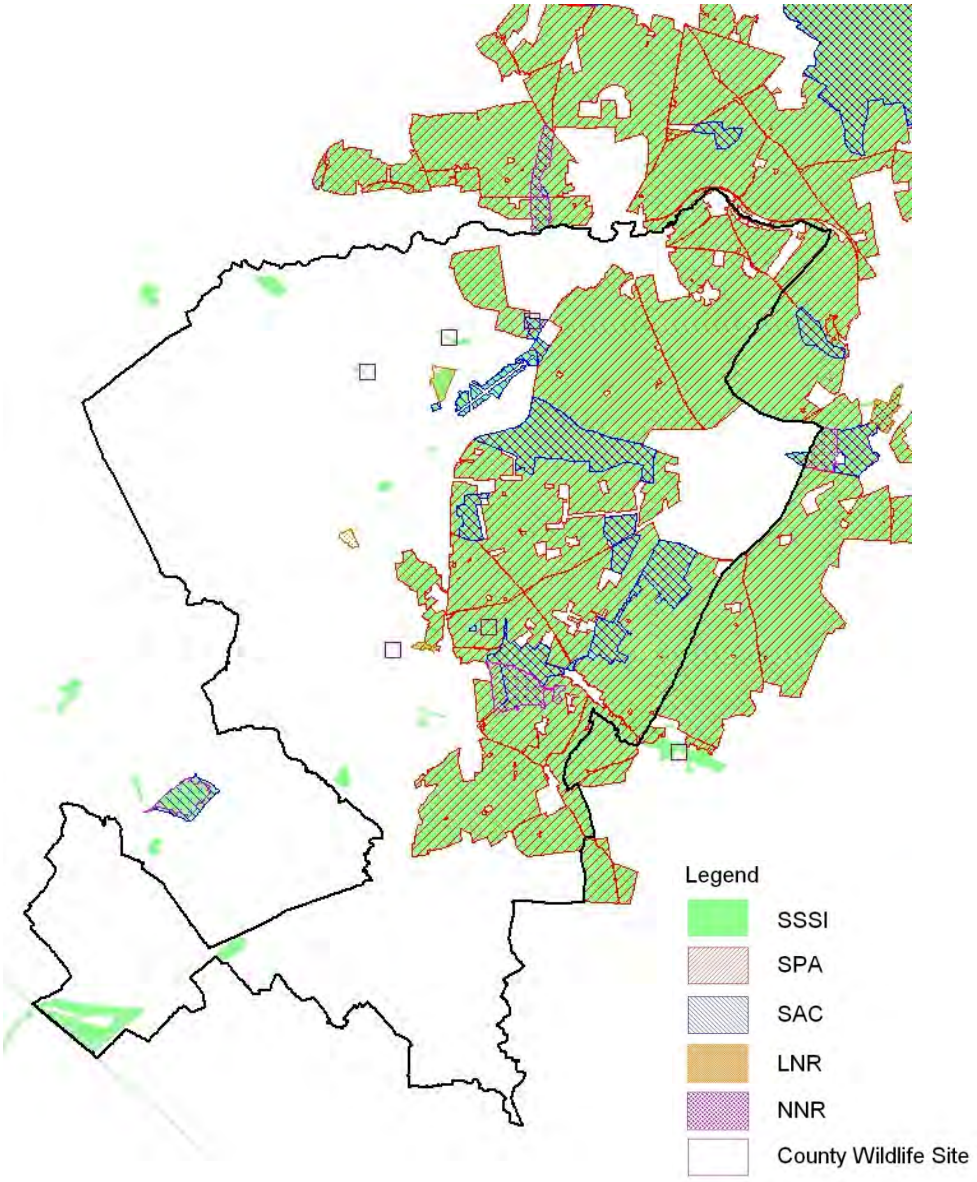

Figure 3-1 Conservation Designations

3.6 Landscape

Forest Heath district is predominantly rural with settlements scattered throughout. Newmarket and Mildenhall are the main urban areas existing throughout the district. A Landscape Character Assessment[8] (LCA) is an approach enabling the understanding and therefore appropriate management and decision making within an area. Forest Heath is overlapped by four defined areas; Breckland, South Suffolk and North Essex Clayland, The Fens and East Anglian Chalk.

Key features which are relevant to the assessment of flood risk are summarised in Table 3-3.

Area	Feature	Potential Impact on Flood Risk
Breckland	Long history of settlement but now very sparsely populated, with nucleated villages in river valleys	Development favoured in river valleys where flood risk is likely to be greater
	The area is crossed by a number of rivers, notably the Little Ouse, Lark, Black Bourne, Thet and Wissey, of which some are unusually fast-flowing chalk streams. The lushness of their shallow valleys contrasts strongly with the dry uplands and the availability of water had a significant influence on the pattern of settlement. This is reflected in parish boundaries, which are often 'stretched' to reach a mere or stream	Development favoured in river valleys where flood risk is likely to be greater
	Rivers within the shallow valleys have been historically canalised in some places for navigation or more recently engineered. Some floodplain meadows have been lost. Where diversity is reduced and streamside vegetation lost, landscape variety and contrast will also decrease	Loss of floodplain meadows likely to increase flood risk
South Suffolk and North Essex Clayland	Broadly flat, chalky, boulder clay plateau dissected by undulating river valley topography, particularly marked in upper valley reaches, which are much smaller in scale.	Significant influence on patterns of run off
The Fens	A hierarchy of rivers, drains and ditches provide a strong influence throughout the area. Embanked rivers and roddons create local enclosure and elevation.	Flood risk associated with increased number of drains and ditches
East Anglian Chalk	Long straight roads, open grass tracks, isolated 19th century white or yellow brick farmhouses and distinctive nucleated villages, generally within valleys.	Development favoured in river valleys where flood risk is likely to be greater

Table 3-3 Landscape Character Assessment

3.7 Population

There are 55,500 people living in the Forest Heath area giving an average density of 148 people per square kilometre. Relative to the rest of England this figure is fairly low (London 4,726 people/km², North West 484 people/km²).

3.8 Transport Network

Roads

Newmarket is linked to London via the A11 and is also situated on the A14 Midlands to East Coast road. The remainder of the study area is served by a network of more minor roads. Flood risk to the main road infrastructure is considered further within this report in section 10.7.

Rail

Newmarket is served by a local train service to Cambridge and Ipswich. The railway line between Newmarket and Bury St Edmunds crosses the River Kennet, River Lark Kentford Stream and Cavendish Stream. The flood risk to this infrastructure is considered within this SFRA, in section 10.7.

3.9 Impacts of Climate Change

Work carried out as part of the UK Climate Impacts Programme (UKCIP)[9] predicts that the earth's climate will undergo a number of changes into the future. Using this research as a basis, the Suffolk Climate Action Plan[10] was created. In general, by the 2080s, the East of England is likely to experience:

- An average temperature rise of 3.6°C
- 20% increase in winter rainfall leading to increased flooding
- Sea level rise

The strategy highlights that:

- Increased flood events will lead to increased damage to property and disruption to economic activity;
- Higher incidence of damage to transportation, utilities and communications caused by an increase in extreme weather events;

It is therefore concluded that climate change will have a significant impact on flooding in the area and consideration of the potential impacts is essential in preparing this SFRA.

4 Methodology

4.1 PPS25 Vulnerability Classification

PPS25 introduces the concept of flood risk vulnerability and compatibility whereby development types are assigned a vulnerability rating which is used to determine the suitability with respect to flood zones2. The vulnerability of the proposed development types that are the subject of this SFRA is summarised in Table 4-1.

Development Type	Vulnerability	Flood Zone Compatibility	Exception Test
Dwelling Houses	More vulnerable	Flood Zone 1, 2	Required for Flood Zone 3a
Drinking Establishments			
Non Residential Educational Establishments			
Shops	Less Vulnerable	Flood Zone 1, 2 and 3a	N/A
Restaurants and Cafes			
Offices			
General Industrial			
Amenity open space	Water Compatible	Flood Zone 1, 2, 3a and 3b	N/A
Outdoor sports and recreation			

Table 4-1 Flood Risk Vulnerability

4.2 Consultation

Throughout the project consultation has been carried out with:

- Anglian Water Services
- Forest Heath District Council
- Environment Agency Development Control, Asset Systems Management, Flood Risk and Mapping

4.3 Data Collection

An extensive data set was collated as part of the SFRA; full details are included in Appendix B (incoming data register).

4.4 Fluvial Flood Risk Mapping

The Level 1 SFRA details the existing hydraulic modelling studies carried out in the area and makes recommendations for additional modelling.

However, the Environment Agency has recently commissioned a further modelling project to assess flood risk from the Eastern Rivers as part of the Strategic Flood Risk Mapping framework. This project is due for completion in March 2012. Figure 4-1 illustrates the extent of the Eastern Rivers modelling project. Given the improved nature of this combined river and

floodplain modelling, no updates have been made to the Flood Zones within the Forest Heath district as part of this SFRA, however it is recommended that this work is reviewed subsequent to the delivery of the updated modelling so as to capture any amendments to the flood risk information in a timely fashion for developments into the future.

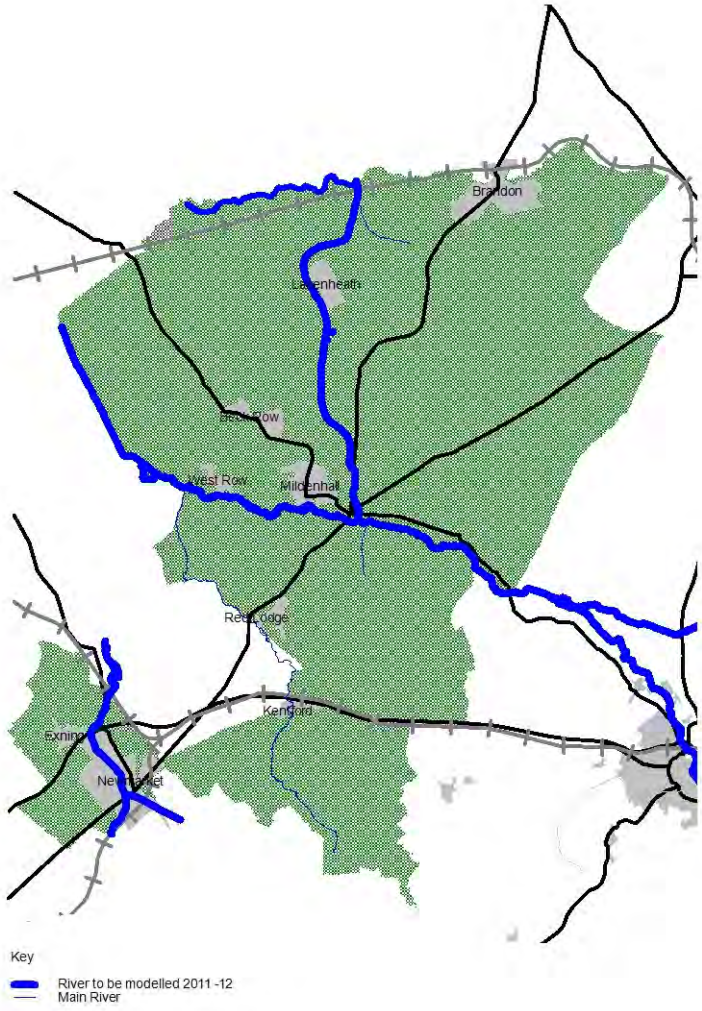

Figure 4-1 Extent of modelled rivers planned for 2011/12 project within FHDC area

4.5 Surface Water Flooding

No specific surface water flood risk modelling was carried out for this Level 2 SFRA as agreed with the Environment Agency. Instead, broad scale pluvial mapping, the 'Areas Susceptible to Surface Water Flooding Maps' (AStSWF) and 'Flood Map for Surface Water (FMfSW) produced as part of the national surface water flood risk mapping project was used to inform decisions.

4.5.1 Sewer Flooding

Detailed sewer model outputs were not available as part of this SFRA. Further information on the sewerage infrastructure is incorporated into the WCS in the form of knowledge of the systems performance and the perceived impact of additional properties being promoted in these areas. Therefore any conclusions regarding sewer flooding were taken from the WCS.

4.6 SFRA Outputs

The outputs of a Level 2 SFRA as required by the PPS25 practice guide[11] are:

- An appraisal of the current condition of flood defence infrastructure and of likely future policy with respect to its maintenance and upgrade;
- An appraisal of the probability and consequences of overtopping or failure of flood risk management, including appropriate allowance for climate change;
- Maps showing the distribution of flood risk across flood zones;
- Guidance on appropriate policies for sites that satisfy parts a and b of the exception test, and requirements for passing part c;
- Guidance on the preparation of FRAs for sites of varying risk across the flood zone; and
- Guidance to developers on management of surface water and the potential for using SuDS.

The following chapters address these key outputs; in each case the relevant output is reiterated within the blue quote box at the beginning of each chapter.

5 Existing Flood Risk Management

PPS25 O1: An appraisal of the current condition of flood defence infrastructure and of likely future policy with respect to its maintenance and upgrade;

A range of measures are in place in the Forest Heath district with the aim of reducing flood risks and hazards to people; these are discussed in the following sections.

5.1 Flood Defence Assets

The Forest Heath district is protected from a range of flooding events by a range of measures including natural and man-made defences. Traditional defences such as raised banks and walls are built to help reduce the occurrence, and therefore frequency of flooding. Some other structures provide flood defence benefits, however they may also be built to manage low flows or are part of the infrastructure network.

These assets are owned, operated and maintained by the Environment Agency, Local Authorities, Internal Drainage Boards, private business and/or local residents.

5.1.1 Location

Data held within the National Flood and Coastal Defence Database (NFCDD) indicates that there are raised defences on the River Lark upstream of Mildenhall and downstream of West Row and on the Little Ouse north of Lakenheath. The NFCDD records that the defences at Mildenhall are designed to the 10% AEP (1 in 10 chance of occurring in any given year) level and those at West Row and Lakenheath are designed to the 1% AEP (1 in 100 chance of occurring in any given year) level.

In addition to the raised defences there are 41 flood defence structures (as defined by the NFCDD) located in the Forest Heath district of which 22 are in the control of the Environment Agency comprising a range of weirs, sluices and outfalls.

Maintainers of assets in private ownership should be made aware of the flood defence role and the importance of maintaining the asset in good condition.

5.1.2 Maintenance and Upgrade Policy

The Environment Agency has prepared Catchment Flood Management Plans (CFMP) across the river basins of England and Wales to provide a high-level strategic planning tool, setting out the long term investment plans for sustainable flood risk management over the next 50 – 100 years. The Forest Heath district is covered by two Policy Units:

- 18 - Eastern Rivers
- 21 - Newmarket

The CFMP highlights the details of current and future flood risks and the preferred flood risk policy for each of these unit areas as described below:

Policy Unit 18 – Eastern Rivers

The policy approach across the Eastern Rivers unit is Policy 2. This is to reduce existing flood risk management actions (accepting that flood risk will increase with time).

For smaller watercourses, where flood risk management actions permit, the policy is also to reduce existing flood risk management actions (accepting that flood risk will increase with time).

The CFMP has proposed a number of actions upon the major stakeholders to deliver further studies/information over given timescales. The proposed actions for the Easter Rivers unit in which the District lies are presented below in Table 5-1 below:

Action Proposed	Lead Partner	Timescale	Priority
Develop System Asset Management Plans (SAMPs) to consider where we can reduce flood risk maintenance activities	• Environment Agency Asset System Management Team	2010 – 2011	Low
Investigate opportunities to restore natural processes to help reduce current levels of flood risk management on most of the **main rivers**. Investigating opportunities to enhance the riparian corridor and improving the water environment	• Environment Agency	Ongoing	Low
Investigate opportunities to restore natural processes to help reduce current levels of flood risk management on **ordinary watercourses**. Investigating opportunities to enhance the riparian corridor and improving the water environment	• Suffolk CC • FHDC	Ongoing	Low
Develop a Flood Incident Management Plan to implement Extended Direct Warnings for the River Kennett (Ouseden to Freckenham). Implementing an opt-out Flood Warning system for those areas affected through Dalham, Moulton, Kentford and Freckenham	• Environment Agency	Ongoing	Medium
Develop a Flood Incident Management Plan to create a community based flood warning system for the River Kennett (Ouseden to Freckenham). Implementing an opt-out Flood Warning system for those areas affected through Dalham, Moulton, Kentford and Freckenham	• Environment Agency	2012 – 2013	Medium
Investigate and deliver opportunities are taken within County and Unitary Authority Minerals and Waste Development Plans to utilise mineral extraction sites to store water and reduce flood risk downstream, whilst creating a mosaic of environmental habitats	• Suffolk CC • FHDC	2010 – 2020	Medium

Table 5-1 Proposed Actions from the Great Ouse CFMP for the Eastern Rivers Policy Unit area

Policy Unit 21 – Newmarket

The policy approach for Newmarket is Policy 4. This is to take further action to sustain the current level of flood risk into the future (responding to the potential increases in risk from urban development, land use change and climate change). For smaller watercourses, where flood risk management actions permit, the policy is to reduce existing flood risk management actions (accepting that flood risk will increase with time).

The CFMP has proposed a number of actions upon the major stakeholders to deliver further studies/information over given timescales. The proposed actions for the Newmarket unit in which the District lies are presented in Table 5-2 below.

Action Proposed	Lead Partner	Timescale	Priority
Develop a flood risk study for Newmarket to investigate options to manage future flood risk	• Suffolk CCC • FHDC	2015 – 2020	Medium
Continue with the current levels of flood risk management on all ordinary watercourses in this policy unit. Through regulation and persuasion watercourses should be kept clear of obstructions and free flowing	• Suffolk CC • FHDC • Anglian Water	Ongoing	Medium
Ensure any policies within the Local Development Framework are in line with CFMP policy. In particular new development in Newmarket not to increase risk to existing development	• Suffolk CC • FHDC • Environment Agency	Ongoing	Medium
Develop an Emergency Response Plan for the Electricity Sub-Station and road at risk of flooding	• Private Owners • Anglian Water • Highways Agency • Suffolk CC • FHDC	2015 – 2020	Medium
Develop a Flood Incident Management Plan to investigate the potential to create a groundwater flood warning service for Newmarket	• Environment Agency	2011 - 2012	Medium
Investigate a resistance and resilience project for the Listed buildings at risk of flooding in Newmarket to identify the extent/impact of flooding and whether local protection/resilience measures are needed.	• English Heritage • Environment Agency	2010 – 2100	Medium

Table 5-2 Proposed Actions from the Great Ouse CFMP for the Newmarket Policy Unit area

5.2 Maintenance Regime

The watercourses in the Forest Heath district are predominantly classed as 'maintained channels'. Maintained channels are non-flood defence structures and are owned by the Environment Agency (61%), Local Authority (17%) or are in private (riparian) ownership (22%).

5.2.1 Recommendation

It is advised that FHDC, the Ely Group of Drainage Boards, the Environment Agency and Suffolk County Council (as the Lead Local Flood Authority) sets up a formal arrangement to monitor and keep up to date with flood defence maintenance and management, taking into account any policies or strategies evolving from the CFMP. It is recommended that this takes place on a quarterly basis so as to communicate the risks across the district and respond to emerging needs in a timely fashion.

5.3 Flood Warning

The Environment Agency operate a full flood warning system covering designated areas in England and Wales which is described in detail in the Level 1 SFRA. The Forest Heath district is covered by three defined flood warning areas:

- River Thet & Little Ouse from Thetford to Brandon
- River Lark from Fornham St, Martin to Isleham
- River Kennett from Ousden to Freckenham

Residents and businesses covered by the flood warning system are able to register to receive information on potential flooding.

5.4 Emergency Planning

In recognition of the flood risks around the Forest Heath district and the limited planned development, it is advised that FHDC reviews and updates its emergency planning for all sources of flooding, taking into full account the recent publication of the FMfSW.

Forest Heath is part of the Suffolk Joint Emergency Planning Unit (JEPU). A multi agency flood plan for Suffolk has been produced which outlines the risks, roles and responsibilities. The plan contains arrangements for flood warnings and a multi-agency response on matters such as health and safety, response priorities, identification of vulnerable people, evacuation routes, transport, damage limitation and information during a major flooding event.

The Emergency Management service obtains information from the Meteorological Office and Environment Agency on weather patterns. This is to ensure that the service can predict the potential for major weather-related incidents and plan their response accordingly. The current Multi-Agency Flood Warning and Response Plan was last updated in September 2010, and is regularly reviewed.

6 Assessment of Flood Risk and Hazard

PPS25 O2: An appraisal of the probability and consequences of overtopping or failure of flood risk management, including appropriate allowance for climate change;
Maps showing the distribution of flood risk across flood zones;

6.1 Flood Risk

6.1.1 Scenario Parameters

Baseline

Flood outlines for the 1% AEP (1 in 100 chance of occurring in any given year) were available for the Newmarket Drains to enable the assessment of the potential development sites across Newmarket. This assessment identified two sites lying adjacent to the line of the watercourse, and within the indicative flood zones.

Breach

It was agreed with the Environment Agency that an assessment of defence breach was not required as part of this Level 2 SFRA.

Blockage

Section 10.5 outlines the modelled blockage scenarios on the Newmarket Drains culvert under Willie Snaith Road.

6.1.2 Results

Baseline

The Environment Agency are currently updating the flood mapping for a number of rivers in the district using combined one and two dimensional models. This will therefore result in improved baseline flood risk maps for the district. Consequently, no changes were made to baseline flood maps as part of this SFRA.

Blockage

A range of blockages (25%, 50% and 75%) were applied to the Willie Snaith Road culvert in a 1% AEP (1 in 100 chance of occurring in any given year) event with and without an allowance for climate change. The water levels from the blockage runs were compared to the baseline events to assess the impact of the blockage. Even with a 75% blockage in place the water levels did not rise out of bank in this area. The model results are outlined in section 10.5.

Implications for Development

The implications of the flood extents for potential development sites are discussed in section 7.

6.2 Flood Hazard

As agreed with the Environment Agency, flood hazard mapping was not carried out as part of this Level 2 SFRA.

7 Application of the Sequential and Exception Tests

As discussed in section 2.1.1, a key aim of the SFRA is to enable the application of the Sequential Test. The flood risk mapping has been used to inform this process

7.1 Development Data

The development data used was provided by Forest Heath District Council in September 2010. Table 7-1 summarises the development data taken through the Sequential Test; a full list of sites is contained within Appendix D.

Development Category	Proposed Dwellings
Total preferred sites	9,062
Of which Housing Only	5,275
Of which Mixed Use	3,787

Table 7-1 Development Data Summary

A total of 9,062 dwellings can be accommodated within the preferred sites.

7.2 Flood Zone Classification

The hydraulic modelling discussed in section 6 was used to define the extents of Flood Zones 1, 2 and 3 where:

- Flood Zone 1 has a probability of flooding less than 0.1% AEP (1 in 1000 chance of occurring in any given year);
- Flood Zone 2 has a probability of flooding of between the 1% AEP (1 in 100 chance of occurring in any given year) event and the 0.1% AEP (1 in 1000 chance of occurring in any given year) event; and
- Flood Zone 3 has a probability of flooding greater than the 1% AEP (1 in 100 chance of occurring in any given year) event.

7.3 Sites Dwellings Assessment

7.3.1 Sites Wholly in Flood Zone 1

Assuming that all sites in Flood Zone 1 are developed, an estimated total of 7,080 dwellings can be provided within Flood Zone 1. This figure is below the 7,797 dwellings required from 2010 to 2031. There may also be reasons for which a site cannot be developed all together or at the density estimated thus further reducing the potential number of dwellings in Flood Zone 1. Table D1 in Appendix D contains a full list of the Flood Zone 1 sites together with details of the proposed allocation, suggested use and planning status.

Therefore the Sequential Approach requires that potential sites in Flood Zone 2 are explored.

7.3.2 Sites Wholly or Partially in Flood Zone 2

Assuming that all potential sites in Flood Zone 2 were developed, a further 1,972 dwellings could be accommodated. This brings the total number of potential dwellings in Flood Zone 1 and 2 to 9,052. This exceeds the requirement of 7,797 (2010 to 2031) from the adopted Core Strategy.

Table 7-2 lists the dwellings sites within Flood Zone 2 and the percentage of the site within the Flood Zone. For details of the proposed allocation, suggested use and planning status, please refer to Table D-2 in Appendix D. The distribution of Flood Zone 2 across each site is shown in Appendix E. Flood Zone 3 is also shown in darker blue (see 7.3.3).

Site Reference	Site Name	% in Flood Zone 2
170 (M/19)	Land West of Mildenhall, South of West Row Road	0.7
172 (N/18)	George Lambton Playing Fields	0.3
175 (L12)	Land North of Burrow Drive and Briscoe Way	3.35
198 (L/26)	Land West of Eriswell Road	0.12
203 (RL/08)	Land to rear 4 to 14b Turnpike Lane	2.14
169 (B/17)	Land to West of Brandon	0.75

Table 7-2 Dwellings Sites in Flood Zone 2

7.3.3 Sites Wholly or Partially in Flood Zone 3

Four preferred sites are partially within Flood Zone 3 as detailed in Table 7-3 (Table D-3 in Appendix D).

Site Reference	Site Name	% in Flood Zone 3
169 (B/17)	Land to West of Brandon	0.31
172 (N/18)	George Lambton Playing Fields	4.89
175 (L12)	Land North of Burrow Drive and Briscoe Way	1.33
198 (L/26)	Land West of Eriswell Road	2.29

Table 7-3 Dwellings Sites Partially in Flood Zone 3

7.4 Non Residential Sites

In addition to the sites proposed for housing, there are a further twelve sites which are proposed for non residential uses only. Although these cannot be specifically linked to RSS and Core Strategy targets, the site suitability should still be considered as part of the Sequential Test.

7.4.1 Non Residential Sites Wholly in Flood Zone 1

There are eight non residential sites wholly or predominantly in Flood Zone 1; a full list of sites is included in Appendix D.

7.4.2 Non Residential Sites Wholly or Partially in Flood Zone 2

There are three non residential sites wholly or partially in Flood Zone 2; these are summarised in Table 7-4 together with the percentage flood zone coverage. Appendix E illustrates the spatial distribution of Flood Zones across these sites.

Site Reference	Site Name	% in Flood Zone 2
223 (N/17)	Land South Willie Snaith Road & North Craven Way	3.3
237 (N/30)	Sam Alper Court	0.89
241 (N/25)	Land South of High Street - Home of Horseracing	4.57

Table 7-4 Non Residential Sites within Flood Zone 2

7.4.3 Non Residential Sites Wholly or Partially in Flood Zone 3

There are four non residential sites wholly or partially in Flood Zone 3; these are summarised in Table 7-5 together with the percentage flood zone coverage. Appendix E illustrates the spatial distribution across the sites.

Site Reference	Site Name	% in Flood Zone 3
240 (N/27)	Market Square, Newmarket	100
223 (N/17)	Land South of Willie Snaith Road & North Craven Way	45.75
237 (N/30)	Sam Alper Court	3.78
241 (N/25)	Land South of High Street - Home of Horseracing	0.21

Table 7-5 Non Residential Sites containing Flood Zone 3

7.5 Requirement for the Exception Test

Residential dwellings are classified as ‘more vulnerable’ by PPS25 and therefore the Exception Test is required only where residential development is proposed within Flood Zone 3a. Given that there are no proposals for ‘more vulnerable development’ within Flood Zone 3, the Exception Test is not required.

7.6 Site Layout

Where a potential development site contains a combination of Flood Zones 1, 2 and 3 a sequential approach to the layout of the site should be taken in order to appropriately locate any different uses within the boundary of the site. Appendix E should be used to inform these decisions.

7.7 Summary

Based on the September 2010 list of preferred sites, it is concluded that it is likely that FHDC will be able to meet their targets for dwelling numbers from sites within Flood Zone 1 and 2. However, given the uncertainties associated with final development densities, it is recommended that sites with areas lying in Flood Zone 2 should be progressed and the site layout designed to avoid areas of flood risk

8 Surface Water Management

PPS25 O7: Identification of the location of areas at risk of surface water flooding and identification of the need for Surface Water Management Plans

8.1 Introduction

Section 6.2.6 of the Level 1 SFRA sets out general surface water management advice for the district. Since the publication of the Level 1 SFRA and the issue of the draft Level 2 SFRA, a number of developments have occurred concerning the assessment of surface water flood risk in England. The assessment of surface water flood risk included in the draft Level 2 SFRA (see section 8.3) has not be re-done however, any new or updated information is included in the sections below.

Technical guidance published by DEFRA[12] classifies surface water flooding as:

- Surface water runoff; 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 flooding (known as pluvial flooding);
- Flooding from groundwater where groundwater is defined as all water which is below the surface of the ground and in direct contact with the ground or subsoil.
- Sewer flooding; flooding which occurs when the capacity of underground systems is exceeded due to heavy rainfall, resulting in flooding inside and outside of buildings. Note that the normal discharge of sewers and drains through outfalls may be impeded by high water levels in receiving waters as a result of wet weather or tidal conditions;
- Flooding from open-channel and culverted watercourses which receive most of their flow from inside the urban area and perform an urban drainage function;
- Overland flows from the urban/rural fringe entering the built-up area; and
- Overland flows resulting from groundwater sources.

8.2 Evidence Base

8.2.1 Level 1 SFRA

The Level 1 SFRA identified recorded incidents of surface water flooding, however no detailed modelling and mapping was undertaken.

This Level 2 SFRA has built upon the work undertaken within the Level 1 SFRA to produce a series of surface water risk maps for Forest Heath to help inform the development of a sustainable surface water policy for the district and county, and help identify areas where a more detailed assessment of surface water flood risk may be required.

8.2.2 Areas Susceptible to Surface Water Flooding

Following the summer 2007 floods, one of the key recommendations of the Pitt Review[13] was that the Environment Agency, supported by Local Authorities and water companies, should identify areas that are at highest risk from surface water flooding. One objective of these maps was to provide Local Resilience Forums (LRFs) with an initial indication of areas that may be

susceptible to surface water flooding with the purpose that they may be used in combination with local knowledge to plan their emergency response to surface water flooding.

JBA on behalf of the Environment Agency undertook simple surface water flood modelling at a national scale starting in 2008. The modelling did not take into account underground sewerage and drainage systems or smaller over ground drainage systems. No buildings were included and a single rainfall event was applied.

The 'Areas Susceptible to Surface Water Flooding' map shows flooded areas in a rainfall event with in a 0.5% AEP (1 in 200 chance of occurring in any year). The maps use three bandings indicating areas which are 'less', 'intermediate' and 'more' susceptible to surface water flooding. The map is not suitable for identifying individual properties at risk of surface water flooding.

The maps have therefore been used in conjunction with the information contained within the Level 1 FRA, as a tool to help assist in the identification of areas that may be susceptible to surface water flooding across Forest Heath.

The ASTSWF map defines three bands of susceptibility: less, intermediate, and more. The 'more' band has been used as part of this SFRA as it identifies those areas that have 'a natural vulnerability to: flood first; flood deepest; and/or, flood for relatively frequent, less extreme events (when compared to the other bands). Figure A-2 in Appendix A illustrates the distribution of AStSWF across the district.

8.2.3 Flood Map for Surface Water

The Environment Agency Flood Map for Surface Water (FMfSW) was issued to Local Authorities in November 2010. This mapping is a refinement of the mapping produced for the 2008 AStSWF. It considers the 3.3% AEP (1 in 30 chance of occurring in any given year) and 0.5% AEP (1 in 200 chance of occurring in any given year) and in each case the results are classified as either 'deep' or 'shallow' where shallow is between 0.1m and 0.3m and deep is above 0.3m. The model topography is based on Environment Agency 2010 composite LiDAR. The main changes in the FMfSW are:

- Lower (1.1 hour) storm duration
- Rainfall reduced to 39% in rural areas and 70% in urban areas to account for infiltration
- Continuing loss rate of 12mm/hour applied in urban areas to represent sewer flow
- Varying Manning's n to 0.1 for rural areas and 0.03 for urban areas
- Buildings raised by 5m based on OS MasterMap data

It should also be noted that flooded areas less than 200m² have been removed from the FMfSW. Figure A-4 in Appendix A illustrates the FMfSW for the Forest Heath district.

It is noted that in agreement with FHDC; it was decided to undertake the surface water analysis once using the original AStSWF data. This was agreed as the AStSWF approach was likely to present a more cautious approach to highlighting settlement susceptibility, due to the additional assumptions (including reducing net rainfall to account for infiltration and urban drainage networks) associated with the FMfSW.

8.2.4 DEFRA National Rank Order of Settlements Susceptible to Surface Water Flooding

In August 2009, DEFRA allocated funding to 77 Local Authorities considered to be at greatest risk from surface water flooding, taking into account the anticipated properties at risk associated

with the broad scale surface water modelling (ASTSWF) out to inform this assessment which was combined with anecdotal evidence to determine the top 77[14].

Suffolk County Council was allocated funding to address surface water flooding in Ipswich; no towns in Forest Heath were identified within the top 77. Table 8-1 summarises the results of the process for towns in Forest Heath.

Town	Ranking	Properties at Risk
Newmarket	119	2800
Mildenhall	642	400
Brandon	750	310
Lakenheath	1404	100

Table 8-1 DEFRA SWMP Funding Assessment Results (Source DEFRA)

It is noted that Newmarket currently has only 1000 less properties at risk than Rochdale which was ranked 77th and therefore received funding.

8.2.5 Preliminary Flood Risk Assessment

The Flood Risk Regulations (2009) transpose the European Floods Directive into UK law. A six year risk management cycle is set out of which a Preliminary Flood Risk Assessment (PFRA) report is the first stage of this cycle[15].

Under the Flood and Water Management Act, Suffolk County Council as the Tier 1 Local Authority for the Forest Heath District is the 'Lead Local Flood Authority' (LLFA) and has responsibility for local flood risk. Therefore, the PFRA has been undertaken by Suffolk County Council.

The Environment Agency identified 1km grid squares (termed 'blue squares) throughout England that could be considered as at potentially significant risk of flooding. This was based on the 0.5% AEP rainfall event where predicted flooding would affect:

- More than 200 people (based on a 2.34 occupancy figure); or
- More than 20 non residential properties; or
- More than one item of critical infrastructure

Within the Forest Heath district, the PFRA identified blue squares in the following settlements:

- Dalham
- Exning
- Mildenhall
- Eriswell
- Brandon
- Newmarket

This highlights that there is a risk of surface water flooding in these locations.

Recording Flood Events

From December 2011, LLFA's are required to record the following information as a minimum on occurrence of a flood event:

- Start date and duration in days
- Probability
- Main source
- Main mechanism
- Main characteristics
- Significant consequences of flooding.

The PFRA states that Suffolk County Council will establish a county-wide reporting procedure using a standard template. Data from each flooding incident will be recorded and passed, on an annual basis, to a central record system administered by Suffolk County Council.

8.3 Identification of Locations at Risk of Surface Water Flooding

The assessment described below is based on the mapping available at the time to support the study programme, namely the Environment Agency dataset AStSWF. The FMfSW was made available towards the end of December 2010, however due to the programme restrictions at the time; this data was not used to update this assessment.

8.3.1 Limitations

The approach taken in using the AStSWF is conservative in the assumption that all rain would form runoff rather than entering the drainage system or infiltrating, therefore results should be viewed as a starting point with this assumption in mind.

These risk maps should be used to assist the strategic consideration of the impacts of surface water flooding but also the sequential approach, the production of Surface Water Management Plans (SWMPs), and detailed FRAs for specific development proposals

Historical data for calibration of predicted surface water flooding is extremely limited; this fact combined with the broad scale approach taken to the modelling has not resulted in a detailed calibration exercise being undertaken at this stage.

8.3.2 Methodology

Mapping has been carried out across the county to identify locations at risk from surface water flooding. Existing GIS information has been used to map settlements within the district that may be susceptible to surface water flooding. The following information has been used:

- Environment Agency AStSWF maps
- Anecdotal evidence obtained during the Level 1 SFRA from Suffolk County Council Highways Department
- Anglian Rivers CFMP

An initial assessment was undertaken of the key settlements across Forest Heath. These settlements include sub-regional centres, large market towns, market towns and key centres and local centres. Figure A3 in Appendix A shows the key settlements assessed.

For each settlement the percentage area within an AStSWF was calculated and a classification as to the level of risk was made according to the percentage of affected area.

When using the AStSWF maps, the 'More' band is useful to help identify areas which have a natural vulnerability to flood first, flood deepest and / or flood for more frequent, less severe events (when compared to other bands).

For this assessment, the 'More' and 'Intermediate' bandings have been utilised to determine which areas may be at greatest risk of surface water flooding. The settlements were categorised into 'High', 'medium' or 'low' susceptibility based on the percentage area of the AStSWF within the settlement. Table 8-2 outlines the bandings adopted.

Susceptibility to SW flooding	Criteria
High	> 20 % coverage & reported incidents
Medium	>20% coverage & no reported incidents or 10 -20% & reported incidents
Low	< 10% coverage

Table 8-2 Susceptibility bandings for Surface Water flood risk

8.3.3 Results

Existing Settlements

Figure 8-1 shows the settlements that may be susceptible to surface water flooding, based on the overall assessment. The settlement identified with the highest susceptibility to surface water flooding is Newmarket.

Kentford, Brandon, Mildenhall, Beck Row, West Row, Red Lodge and Exning have a medium susceptibility to surface water flooding. Whilst the risk in this area is not considered as high as for the settlements outlined above, surface water flooding is predicted to be a potential issue. Whilst this area should be considered in preference to those classified at high susceptibility, further assessment as to the potential surface water flooding issues should be considered prior to development.

Lakenheath is classified has having a low susceptibility to surface water flooding. Based on the assessment undertaken, the perceived susceptibility to surface water flooding is lower than for the settlements outlined above and development of this area should not be constrained significantly by surface water flooding.

It should be noted that the assessment undertaken has focused primarily on the available broad-scale mapping; areas identified as being at low susceptibility are still at risk of surface water flooding. Consequently, when proposed sites are identified, further assessment should be undertaken to assess the risk of surface water flooding. Site specific FRAs should be undertaken as part of the planning application process to determine the overall risk to the site.

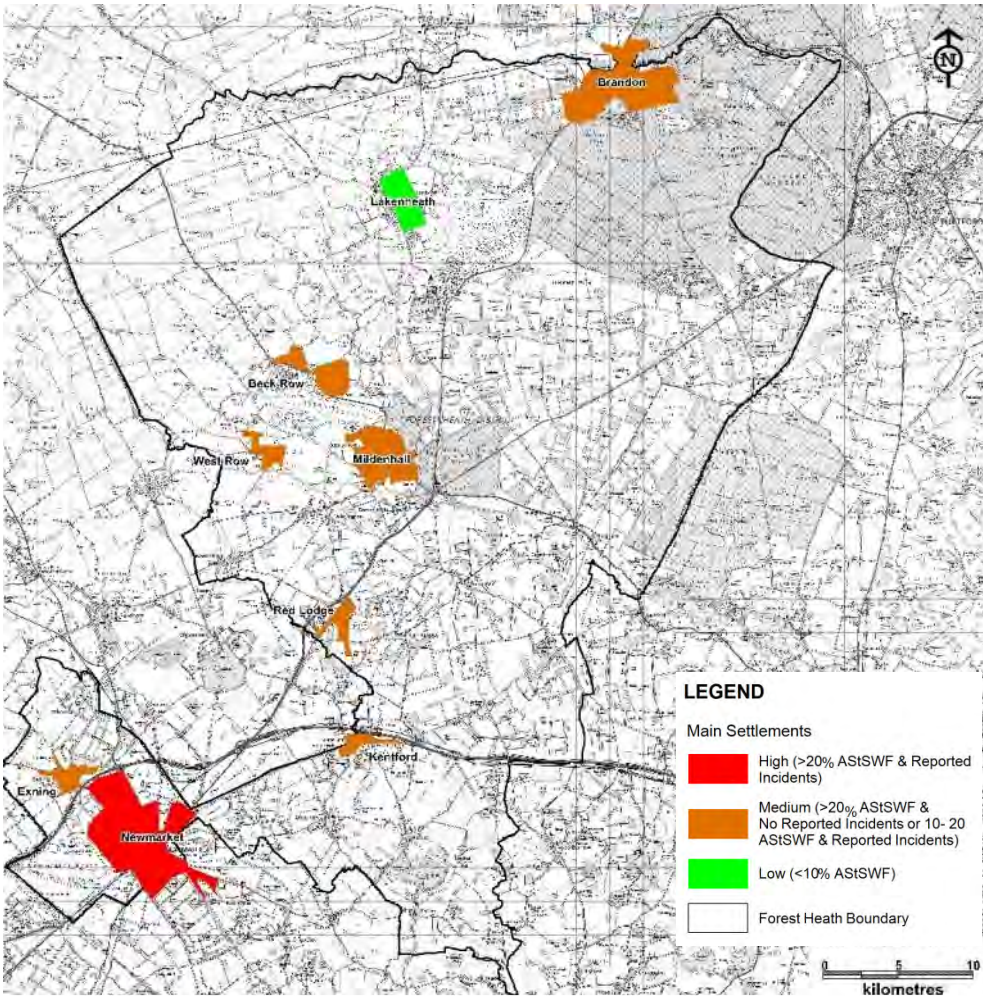

Figure 8-1 Settlements Susceptible to Surface Water Flood Risk (A larger version Figure A-3 is available in Appendix A)

Proposed Development Locations

A total of 18 of the 98 preferred sites contain areas classified as 'more susceptible' to surface water flooding and a further 52 sites contain areas of intermediate susceptibility and 13 contain only areas classed as 'less susceptible'.

Only 27 sites are classified as located outside of areas susceptible to surface water flooding. Table C1 in Appendix C lists all the sites and their surface water susceptibility.

These locations should be seen as indicative only; surface water flood risk to individual properties should not be assessed using this mapping.

8.3.4 Requirement for a SWMP

A SWMP is 'a framework through which key local partners with responsibility for surface water and drainage work together to understand the causes of surface water flooding and agree the most cost effective way of managing surface water flood risk'[12]. At present, the responsibility for managing and responding to surface water flooding lies with the upper tier local authorities; Suffolk County Council in this case.

Chapter 1 of the SWMP Technical Guidance (March 2010), provides guidance on identifying whether a SWMP is required:

- SWMP studies should be prioritised in areas considered to be at greatest risk of surface water flooding or where partnership working is considered essential to both understand and address surface water flooding concerns
- In areas of future urbanisation/redevelopment new building presents a challenge to existing drainage systems but can also become an opportunity to address long-standing problems.
- Areas where there is evidence of surface water flooding history. This is one of the most reliable indicators of high risk for future flooding. Information on previous flooding is often collated in an SFRA or CFMP, but is also available from the LPA, water companies, the Environment Agency and the community.
- In areas where the operation of local drainage system is known to be complicated by interactions between systems, solutions have to involve a partnering approach.

Considering the conditions highlighted above and that a large population are identified as being susceptible to surface water flooding, ***it is recommended that a Surface Water Management Plan is developed for Newmarket***. This recommendation should be put forward to Suffolk County Council as the LLFA for the Forest Heath district.

A SWMP has been undertaken in Ipswich using DEFRA funding and lessons learnt will be used to inform a Suffolk wide strategy; Suffolk County Council has confirmed that they will lead on this. It is noted that there are currently no plans for a SWMP in other locations within Suffolk.

8.3.5 Identification of Critical Drainage Areas

The Town and Country Planning (General Development Procedure) (Amendment) (No. 2) (England) Order 2006 introduces the concept of 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". Once an area has been defined as a CDA, this has a planning implication; LPAs are required to consult the Environment Agency on all applications for development in flood risk areas (except minor development), including those in areas located within a CDA. Flood Risk Assessments (FRAs) are therefore required, which consider the flood risk implications of surface water drainage, for all planning applications in CDAs.

It is therefore recommended that further, more detailed work is carried out to determine the locations of any CDA's, particularly in areas where high levels of new development are proposed. This work may be completed as part of a SWMP.

8.3.6 Site Specific FRAs

The risk of surface water flooding should be addressed in site specific FRAs. As stated above, CDA's should be identified which will inform the requirement for site specific FRAs for development in Flood Zone 1.

It is suggested that more detailed surface water modelling should be undertaken to inform these FRA's. It is also recommended that future work is carried out to collect anecdotal data concerning surface water flooding.

In accordance with Annex F of PPS25, the surface water drainage arrangements for any area should be such that the volumes and peak flow rates of surface water are no greater than the rates prior to the proposed development, unless specific off-site arrangements are made and result in the same net effect. Due to the particular issues experienced in Newmarket a site specific FRA may be required for the area (regardless of the size of the development).

A site specific FRA will be reviewed either by FHDC or the Environment Agency depending on the scale and nature of the proposed development. The FRA should demonstrate that post-development surface water attenuation rates should be as close as practicable to surface water flows arising from the area prior to proposed development.

Contact should be made with Anglian Water at an early stage in the planning process for these areas in order to discuss and investigate improvement requirements or options for the local drainage network.

8.4 Sewer Flooding

A review of sewer flooding was undertaken as part of the Level 1 SFRA; no further information has been provided subsequently to this. It is recommended that for all issues related to the sewerage network and sewer flooding, the Level 2 WCS and Anglian Water are consulted for the most up to date and comprehensive information.

8.5 Groundwater

Groundwater flooding was highlighted as a risk in the Level 1 SFRA. In terms of the preferred development sites for Forest Heath, historic groundwater flooding has been recorded occurring in Newmarket.

Subsequent to the publication of the Level 1 SFRA, the Environment Agency has published the Areas Susceptible to Groundwater Flooding (AStGWF) map. This is a strategic scale map which shows groundwater flood areas on a 1km square grid and is based on the top two susceptibility bands of the British Geological Society (BGS) 1:50,000 Groundwater Flood Susceptibility Map.

It shows the proportion of each 1km grid square where geological and hydrogeological conditions indicate a susceptibility to groundwater emergence. It does not show the likelihood of groundwater flooding occurring. Figure 8-2 shows the AStGWF map for the Forest Heath district.

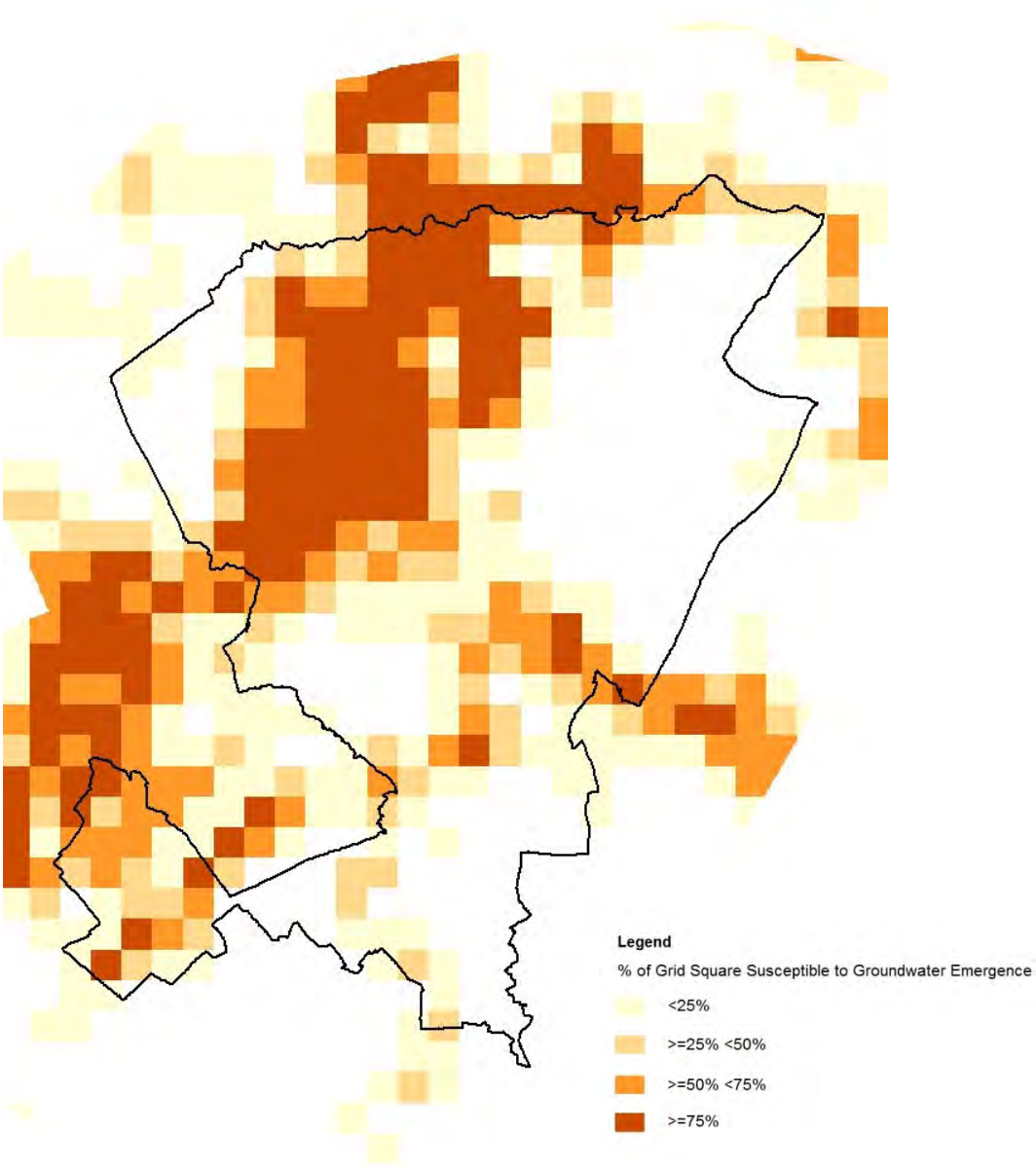

Figure 8-2 Areas Susceptible to Groundwater Flooding (source Environment Agency)

There is a band of higher susceptibility running the north west to south west across the district. Main settlements within this band are Brandon, Lakenheath, Beck Row, and West Row. Newmarket also contains areas of higher susceptibility. This mapping should therefore inform site specific FRAs in terms of their investigations into groundwater flooding.

A study into the collation, monitoring and risk assessment for chalk aquifers produced as part of the DEFRA Strategy for Flood and Coastal Erosion Risk Management study[16] sets out a number of recommendations for effective monitoring and collation of groundwater flooding information in chalk catchments. Of note, it recommended that a national database collating records of flooding from all sources (including groundwater) be developed and that this should be updated with future records of groundwater flooding supplied by the Environment Agency, other organisations and the public. This makes a link with duties of an LLFA (Suffolk CC) and also for FHDC to contribute to this process given their knowledge of the area.

9 Surface Water Drainage and SuDS

Areas of undeveloped land are predominantly reliant on the natural processes of conveyance and infiltration to drain surface water. The effect of development is to generally reduce the site permeability thus changing the way in which it responds to rainfall in terms of the quantity of surface water flowing through and off the site as well as the quality of this water. PPS25 stresses the importance of managing surface water arising from a developed site in a sustainable manner which reduces flood risk to the site and surrounding area.

Sustainable Drainage Systems (SuDS) form an approach to the management of surface water focussed on source control to provide both qualitative and quantitative benefits. SuDS encompass a range of techniques which aim to mimic the natural processes of runoff and infiltration as closely as possible. SuDS schemes should be based on a hierarchy of methods termed the 'SuDS treatment train' as illustrated in Figure 9-1.

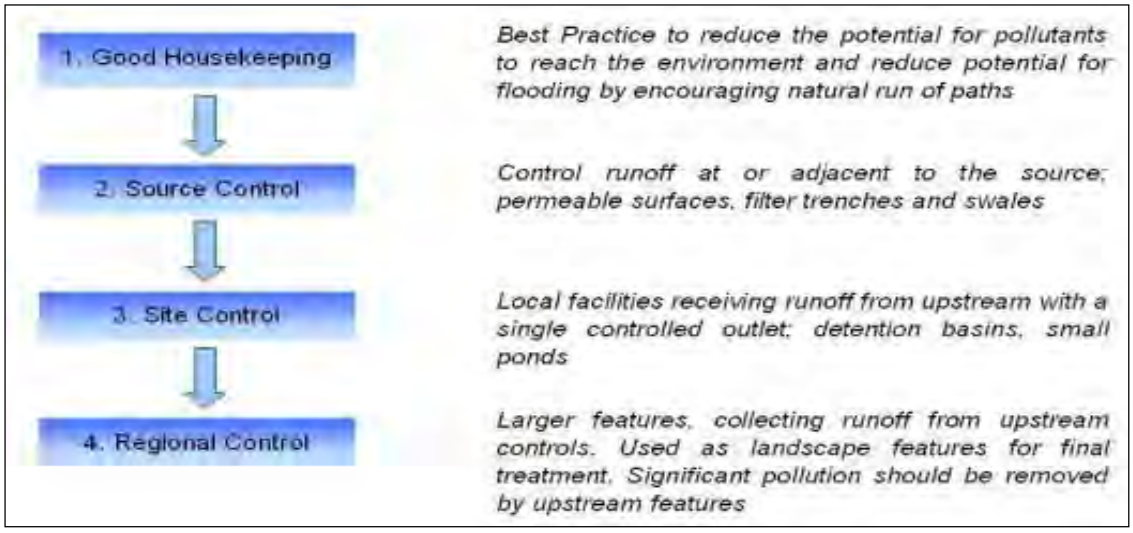

Figure 9-1 SuDS Treatment Train

The infiltration potential across the study area is generally good due to the presence of chalk overlain by gravels. However infiltration potential should not be used as a stand along indicator of SuDS suitability, or solely to define appropriate techniques for an area. Information obtained from the Environment Agency as part of this report highlights the presence of a major aquifer (high vulnerability) beneath the majority of the study area.

The Environment Agency defines Source Protection Zones for groundwater sources used for public drinking water supply which show the risk of contamination from pollution. The study area is covered by three of the four zones;

- Zone 1 (Inner protection zone)
- Zone 2 (Outer protection zone)
- Zone 3 (Total Catchment supporting removal of water from the borehole)

These findings are incorporated into the recommendations regarding SuDS in section 12.

9.1.1 Green Infrastructure Strategy

Green infrastructure has an important role in the management of surface water by reducing the level of impermeable surfaces in an area and maintaining areas for conveyance of surface

water and overland flow. Policy CS2 in the Forest Heath Core Strategy seeks to promote green infrastructure.

9.1.2 SuDS Map

A SuDS map has been created for the Forest Heath district to identify broad areas where particular sustainable drainage techniques may be suitable. The SuDS map is included in Appendix G of the Stage 2 Water Cycle Strategy and the methodology used to create the map is defined within Section 11.4 of the WCS report.

10 Management of Residual Risk

10.1 Nature of Residual Risks

Residual risks are those remaining after the application of the sequential approach and the implementation of any flood mitigation measures. The requirement to manage residual risks is highlighted within PPS25.

The residual risks for the study area are:

- Failure of the existing flood defences
- Blockage of culverts in Newmarket
- Overtopping of existing flood defences by an extreme event in excess of the design standard
- Intense storms overwhelming surface water drainage systems

10.2 Maintenance of Raised Defences

None of the proposed development sites for Forest Heath are located within a defined 'Area Benefitting from Defences' (ABD) however development sites at Mildenhall, Lakenheath and Icklingham are adjacent to these areas. The Environment Agency ABD mapping does not take into account privately owned defences. Consequently, maintainers of assets in private ownership should be made aware of the flood defence role and the importance of maintaining the asset in good condition. It is recommended that FHDC in conjunction with SCC (as LLFA) seek to identify these assets and inform owners of their duties as far as is practicable.

The predicted future impacts of climate change (changing rainfall intensities and distributions) are likely to reduce the standard of protection of existing defences. Private owners should be informed of this scenario and discussion undertaken with all relevant stakeholders to determine the way forward.

10.3 De facto Defences

In addition to the protection afforded by formal defences, defacto defences can also play an important role in protecting areas from flooding. The following defacto defences have been identified as having the potential to influence flood risk:

- A14 and railway between Kentford and Risby
- Railway east of Brandon

It is therefore important that all relevant stakeholders are aware of the roles of these embankments in their responsibility to ensure that the integrity is not de-graded and that development and change is controlled appropriately.

10.4 Failure of Flood Defences

As agreed with the Environment Agency, an assessment of the failure of flood defences was not carried out as part of this SFRA.

10.5 Culvert Blockage

10.5.1 Location

The Environment Agency requested that an assessment of the impacts of a blockage of the culvert under Willie Snaith Road in Newmarket. Figure 10-1 shows the location of the culvert along with the Newmarket Drains ISIS model nodes.

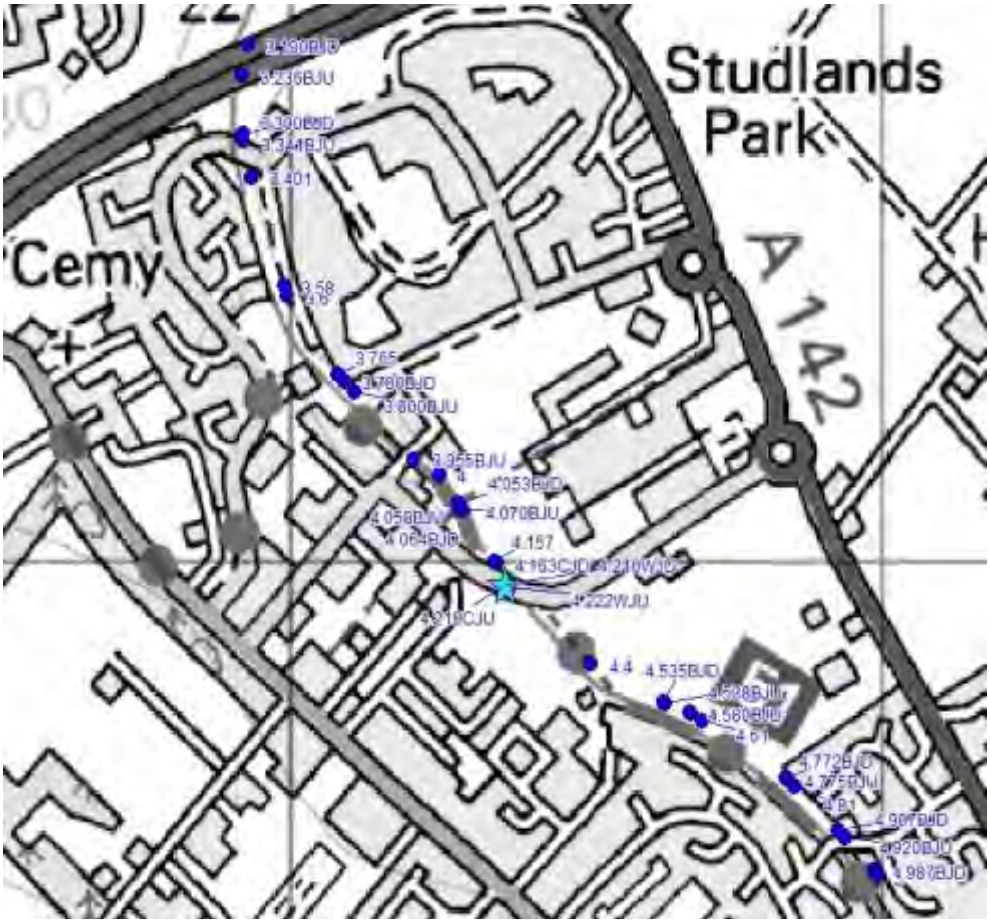

Figure 10-1 Culvert Location

10.5.2 ISIS Model

An ISIS model of the Newmarket Drains and River Snail had been previously constructed (2004) as part of the pre-feasibility study investigating the extent of flood risk, standards of protection and any potential mitigation options to address flood risk in Newmarket.

The original model was constructed using ISIS version 2.1; an error in the reservoir data in the *.dat file supplied by the Environment Agency for this SFRA had to be corrected in order to re-run the model in ISIS version 3.3. Table 10-1 shows the changes made.

Original Model		Revised Model	
Elevation	Area	Elevation	Area
32.5	0.7	32.5	0.7
33	358	33	358
33.5	1977	33.5	1977
34	5048	34	5048
35.5	8306	34.5	8306
35	11626	35	11626
35.5	15433	35.5	15433
36	19869	36	19869

Table 10-1 Corrections to Reservoir Data

A baseline model run was undertaken using ISIS version 3.3 and the results compared to those supplied with the original model. A maximum difference of 0.073m was found therefore confirming that correcting the reservoir data and using a new version of the software did not have a significant impact on results.

There are a series of warnings concerning the Bernoulli loss units within the model, poor model convergence and water levels rising above the level of the section data (glass walling). These warnings are inherent in the model supplied. No changes have been made to address these as part of the blockage modelling. Re-modelling of the Newmarket drains is being undertaken as part of the current Environment Agency project. It is expected that this will significantly improve the flood risk mapping in this area.

10.5.3 Blockage Scenarios

The 1% AEP event (1 in 100 chance of occurrence in any given year) with and without a climate change allowance was run and a blockage unit added to the culvert to assess the impacts of a 25%, 50% and 75% blockage. Figure 10-2 shows how the ISIS blockage unit was inserted into the culvert.

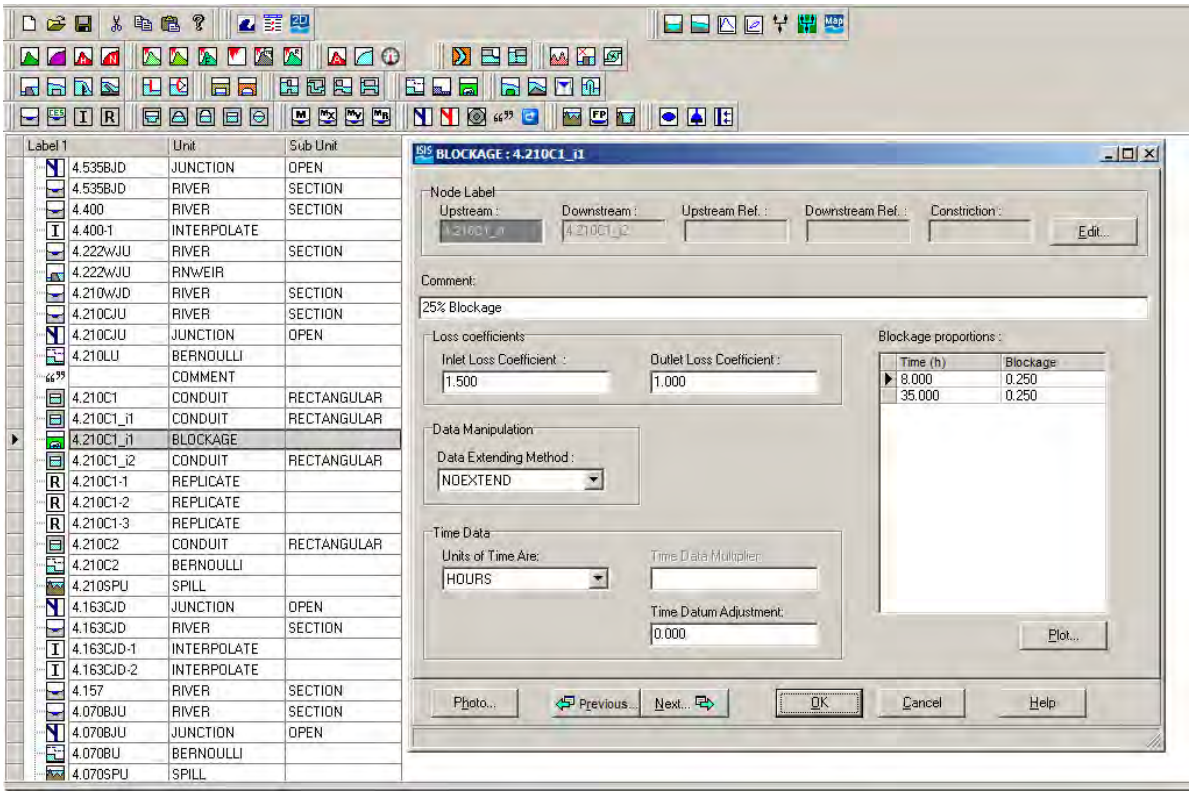

Figure 10-2 ISIS Blockage Unit

Tables 10-2 and 10-3 demonstrate the impacts of the blockage scenarios on water levels upstream.

ISIS Node	Increase on Baseline Water Levels (m)		
	25% Blockage	50% Blockage	75% Blockage
4.61	0.0	0.0	0.02
4.582BJU	0.0	0.0	0.03
4.582BU	0.0	0.0	0.03
4.582SPU	0.0	0.0	0.03
4.580BD	0.0	0.0	0.03
4.580SPD	0.0	0.0	0.03
4.580BJD	0.0	0.0	0.03
4.538BJU	0.0	0.0	0.05
4.538BU	0.0	0.0	0.05
4.538SPU	0.0	0.0	0.05
4.535BD	0.0	0.0	0.05
4.535SPD	0.0	0.0	0.05
4.535BJD	0.0	0.0	0.05
4.4	0.0	0.02	0.2
4.400-1	0.0	0.1	0.3
4.222WJU	0.0	0.1	0.4
4.210WJD	0.1	0.2	0.6
4.210CJU	0.1	0.3	0.7
4.210LU	0.1	0.3	0.7
4.210SPU	0.1	0.3	0.7
4.210C1	0.1	0.3	0.7

Table 10-2 Impact of Blockage on Water Levels 1% AEP

ISIS Node	Increase on Baseline Water Levels (m)		
	25% Blockage	50% Blockage	75% Blockage
4.61	0.0	0.0	0.03
4.582BJU	0.0	0.0	0.04
4.582BU	0.0	0.0	0.04
4.582SPU	0.0	0.0	0.04
4.580BD	0.0	0.0	0.04
4.580SPD	0.0	0.0	0.04
4.580BJD	0.0	0.0	0.04
4.538BJU	0.0	0.01	0.06
4.538BU	0.0	0.01	0.06
4.538SPU	0.0	0.01	0.06
4.535BD	0.0	0.01	0.06
4.535SPD	0.0	0.01	0.06
4.535BJD	0.0	0.01	0.06
4.4	0.0	0.03	0.2
4.400-1	0.01	0.1	0.3
4.222WJU	0.01	0.1	0.5
4.210WJD	0.1	0.3	0.7
4.210CJU	0.1	0.3	0.7
4.210LU	0.1	0.3	0.7
4.210SPU	0.1	0.3	0.7
4.210C1	0.1	0.3	0.8

Table 10-3 Impact of Blockage on Water Levels 1% AEP plus 20% for climate change

For a 75% blockage, the impacts on water levels extend approximately 360m upstream, behind Lester Piggott Way. A review of model cross sections has been undertaken to determine any out of bank flows. Figures 10-3 and 10-4 illustrate the predicted water levels and bank levels, demonstrating that water levels do not exceed bank levels for any modelled scenario.

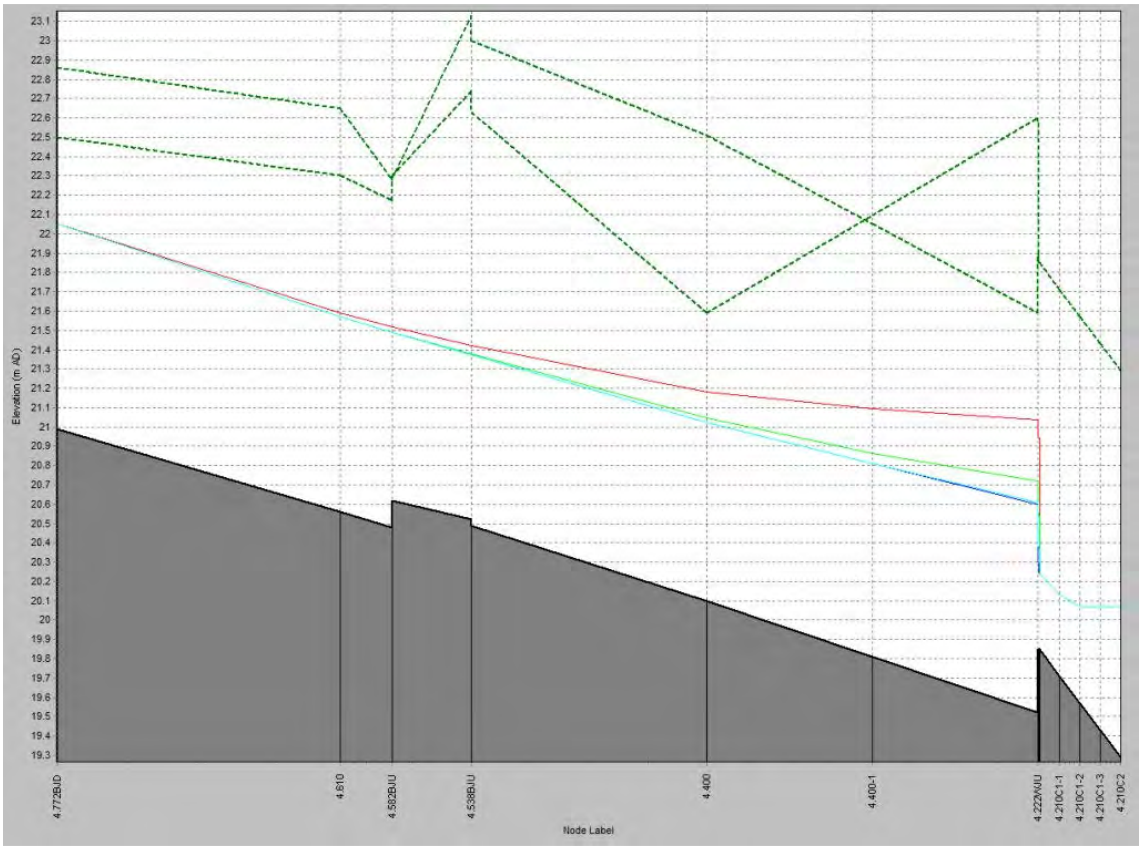

Figure 10-3 Long Section Blockage Sensitivity 1% AEP

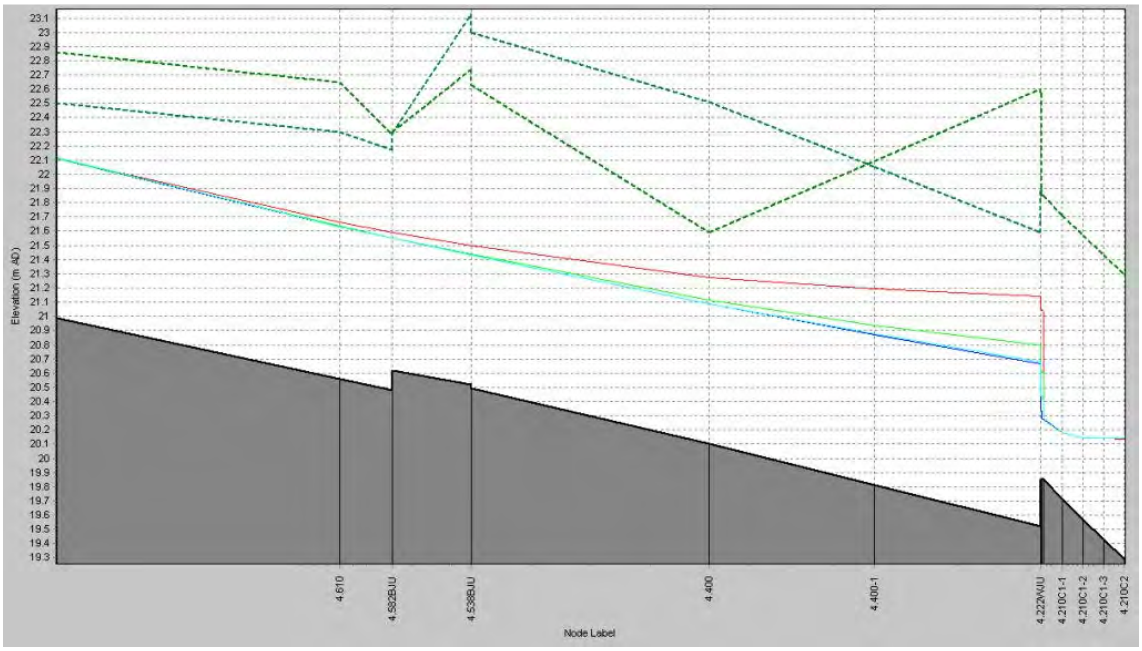

Figure 10-4 Long Section Blockage Sensitivity 1% AEP plus 20% for climate change

- Baseline
- 25% Blockage
- 50% Blockage
- 75% Blockage
- Bank Levels

10.6 Extreme Event

Flood Zone 2 is defined as areas which have between and 1% AEP and 0.1% AEP of fluvial flooding. Therefore by assessing the impacts of Flood Zone 2 on the potential development sites, it is considered that the risks from an extreme flood have been taken into account as part of this SFRA.

10.7 Emergency Planning

The flood risk maps produced as part of this SFRA should be used to inform emergency and evacuation plans; these plans should consider the impacts of flood risk on the transport networks, critical infrastructure and identify priority areas for evacuation.

During the 0.1% AEP (1 in 1000 chance of occurrence in any given year) event, the following transport links are at risk:

- Railway line running east west to Thetford, north west of Lakenheath
- A11 at Mildenhall
- A14 at Kennet and Kentford

The proposed Northern Distributer Road is not predicted to be at risk of flooding.

10.8 Flood Warning and Evacuation Plans

The Environment Agency operates a flood warning system enabling residents and business to receive alerts of flooding and thus prepare accordingly. There are five flood warning areas in the study area. It is recommended that existing and new residents sign up to this flood warning system. In addition, new developments should be encouraged to adopt flood resilience and resistance measures in their construction and layout.

10.9 Surface Water

New developments should plan for storm events of magnitudes in excess of the surface water drainage design capacity. Reference should be made to the CIRIA guidance on 'Designing for Exceedance[17]' which encourages development layouts to accommodate excess surface water and convey this safely off site.

11 Conclusions

General

- This report comprises the Level 2 SFRA for Forest Heath District Council
- The Core Strategy, adopted in May 2010 commits FHDC to providing 10,100 dwellings in the district between 2001 and 2031.
- The River Kennett, River Lark, Cut Off Channel and the River Little Ouse as key sources of fluvial flood risk in the Forest Heath district.
- Areas to the west of the district are susceptible to groundwater emergence
- The main areas of deep surface water flooding are located in the catchments to the east of the district.

Sequential Test

- The Sequential Test was carried out for the development sites provided (September 2010). The GIS layer included potential for 9,062 dwellings.
- If sites in Flood Zone 1 were developed, an estimated total of 7,080 dwellings would be provided compared to the required 7,797.
- A review of development sites in Flood Zone 2 was undertaken to account for the possibility of lower development densities in Flood Zone 1 sites
- A further 1,972 dwellings could be accommodated if all Flood Zone 2 sites were developed.
- The total number of potential dwellings in Flood Zone 1 and 2 is therefore 9,062, compared to the required 7,797.
- No proposed residential sites are wholly within Flood Zone 2 or 3 therefore development on these sites can be progressed by ensuring the site layout avoids areas of flood risk
- There are eight non residential sites wholly or predominantly in Flood Zone 1
- There are three non residential sites wholly or partially in Flood Zone 2 all of which can accommodate development though configuration of their site layout
- There are four non residential sites wholly or partially in Flood Zone 3 of which one (Market Square, Newmarket) is wholly within Flood Zone 3.

Exception Test

- Given that no inappropriate development is proposed in Flood Zone 3, the Exception Test is not required.

SFRA Objectives

These conclusions relate to the key findings in respect of the SFRA objectives set out at the start of the study.

An appraisal of the current condition of flood defence infrastructure and of likely future flood management policy with regard to its maintenance and upgrade

- There are raised defences on:
  - River Lark upstream of Mildenhall (10% AEP (1 in 10 chance of occurring in any given year) standard of protection)

- River Lark downstream of West Row (1% AEP (1 in 100 chance of occurring in any given year) standard of protection)
- Little Ouse north of Lakenheath (1% AEP (1 in 100 chance of occurring in any given year) standard of protection).

- The Environment Agency own and operate 22 flood defence structures; a further 19 flood defence structures are located in the district and are not owned by the Environment Agency.
- The Forest Heath district is covered by two CFMP policy units:
  - In the Eastern Rivers unit the policy is to maintain existing flood risk management actions, accepting that flood risk will increase with time
  - In the Newmarket unit the policy is to take further action to sustain the current level of flood risk into the future (responding to the potential increases in risk from urban development, land use change and climate change)
- The Forest Heath district is covered by three defined flood warning areas
- A multi agency flood plan for Suffolk has been produced which contains arrangements for flood warnings and responses for health and safety, response prioritisation, identification of vulnerable people, evacuation routes, transport, damage limitation and communication

An appraisal of the probability and consequences of overtopping or failure of flood risk management infrastructure, including an appropriate allowance for climate change

- An assessment of the impacts of a blockage of the culvert under Willie Snaith Road in Newmarket was undertaken
- The 1% AEP event (1 in 100 chance of occurrence in any given year) with and without climate was run and a blockage unit added to the culvert to assess the impacts of a 25%, 50% and 75% blockage
- For a 75% blockage, the impacts on water levels extend approximately 360m upstream, behind Lester Piggott Way. Predicted water levels do not exceed bank levels for any modelled scenario.

Guidance on appropriate policies for sites which satisfy parts a) and b) of the Exception Test, and requirements to consider at the planning application stage to pass part c) of the Exception Test

- Detailed recommendations are contained in Section 12 and are not therefore reproduced within these conclusions

Guidance on the preparation of Flood Risk Assessments (FRA) for sites of varying risk across the Flood Zones, including information about the use of SuDS techniques

- Detailed recommendations are contained in Section 12 and are not therefore reproduced within these conclusions

Identification of the location of areas at risk of surface water flooding and identification of the need for Surface Water Management Plans

- Newmarket, Mildenhall, Brandon, and Lakenheath were listed as 119th, 642nd, 750th and 1404th respectively in the DEFRA rank order of settlements susceptible to surface water flooding.
- The Suffolk PFRA identified that there was a risk of surface water flooding (blue squares) in Dalham, Exning, Mildenhall, Eriswell, Brandon and Newmarket.

- A surface water flooding susceptibility scoring exercise was carried out as part of the SFRA using the AStSWF maps. This highlighted that Newmarket had the highest susceptibility to surface water flooding.
- Kentford, Brandon, Mildenhall, Beck Row, West Row, Red Lodge and Exning have a medium susceptibility to surface water flooding.
- Lakenheath is classified has having a low susceptibility to surface water flooding.
- The same assessment process was undertaken for the proposed development sites and concluded:
  - 18 sites contain areas classified as 'more susceptible' to surface water flooding
  - 52 sites contain areas of intermediate susceptibility
  - 13 contain only areas classed as 'less susceptible'.
  - 27 sites are classified as located outside of areas susceptible to surface water flooding.
- Newmarket should be the focus of a Surface Water Management Plan and should seek to identify and notify any Critical Drainage Areas
- A review of sewer flooding was undertaken as part of the Level 1 SFRA; no further information has been provided.
- There is a band of 1km grid squares with a higher susceptibility to groundwater emergence running the north west to south west across the district. Main settlements within this band are Brandon, Lakenheath, Beck Row, and West Row. Newmarket also contains areas of higher susceptibility.
- A SuDS map has been created for the Forest Heath district to identify broad areas where particular sustainable drainage techniques may be suitable. Detail is included in the Stage 2 WCS.

Meaningful recommendations to inform policy, development control and technical issues

- Detailed recommendations are contained in Section 12 and are not therefore reproduced within these conclusions

12 Future Guidance and Policy Development

PPS25 O6: Guidance on the preparation of FRAs for sites of varying risk across the flood zone;
PPS25 O6: Guidance to developers on management of surface water and the potential for using Sustainable Drainage Systems (SuDS);
PPS25 O8: Meaningful recommendations to inform policy, development control and technical issues

12.1 Flood Risk Management Policy

12.1.1 Maintenance and Inspection Regimes

Raised Defences

- Raised defences should be regularly inspected and any necessary remedial works undertaken in a timely fashion.

Watercourses

- Clear guidance should be provided by FHDC on riparian ownership to define where the responsibilities lie. Reference should be made to the Environment Agency guidance 'Living on the Edge'[18].
- It is recommended that FHDC put in place a review process to keep riparian owners (new and existing) informed and to confirm that riparian duties are being met.

Culverts and Bridges

- Culverts and bridges should be regularly inspected and kept free of debris

12.1.2 Emergency Planning

- This SFRA should be issued to the emergency planning department at Forest Heath District Council
- Owners and operators of critical infrastructure within the Forest Heath district (such as Anglian Water, energy and utilities companies) should be identified by FHDC and made aware of the flood risk maps and how to interpret them

12.2 Surface Water Management

12.2.1 Existing Policies

Findings from this SFRA should make recommendations in order to influence policies set out in the Core Strategy and Supplementary Planning Documents. A review of the Core Strategy highlights the following policies of relevance:

- ENV2 To guide changes in our built and natural environment in a way which reduces and takes proper account of climate change and the risk of flooding
- CS2 Promotion of green infrastructure enhancement and/or provision on all new developments

- CS4 The council will support the development proposals that avoid areas of current and future flood risk and which do not increase flooding elsewhere
- CS4 Land will not be allocated in Flood Zones 2 and 3 with the exception of allocations for water compatible use. Where no reasonable site within Flood Zone 1 is available, allocations in Flood Zone 2 and 3 will be considered in accordance with PPS25
- CS4 The council will seek the implementation of SuDS into all new developments where technically feasible

This report supports these policies and makes the following specific recommendations with regard to surface water:

- The management of surface water should be integral to all new developments;
- Surface water runoff rates/volumes from new developments must be controlled;
- All new developments should incorporate appropriate SuDS techniques to manage surface water; SuDS guidance produced by AWS and DEFRA should be used where relevant;
- Soakaways should not be constructed in areas where river gravels overlay the chalk aquifer (this applies to the majority of the study area);
- SuDS schemes should be appropriately located within the development and should follow the principles of the SuDS hierarchy and should focus on both water quality and quantity;
- Where appropriate, all SuDS proposals should take into account and align with the FHDC green infrastructure aspirations;
- Maintenance schedules must be developed for all new SuDS schemes in order to prevent increased flood risk through dilapidation, siltation and general disrepair;
- Urban creep must be managed to prevent the laying of impermeable surfaces in gardens and curtilages;
- A holistic overview of all SuDS schemes proposed in any given area must be taken both to determine cumulative impacts and to provide the most efficient management of surface water. This may result in higher allowable runoff rates on an individual development site as a result of its strategic position higher up a SuDS train coupled with known additional storage potential sites on development sites further down the train.

12.2.2 Proposed Policy Units

Six flood risk management policy units have been defined for the study area in order to inform development. These units together with their policies are presented in detail the Stage 2 WCS and in summary in Table 12-1. Appendix C lists all the sites and their respective policy unit.

Description	Flood Risk Management Policy
IDB Districts with 1km buffer zone	Consultation must be carried out with the relevant IDB with regard to any surface water discharge On site SuDS should be used (see next section)
River Kennet catchment; Red Lodge and Kentford	Surface water flows should be attenuated at or below existing Greenfield rates prior to discharge to the River Kennet On site SuDS should be used (see next section)
Newmarket and Exning	Surface water flows from new developments should demonstrate a betterment compared to existing situation On site SuDS should be used (see next section)
River Lark catchment: Mildenhall	Surface water flows should be attenuated at or below existing Greenfield rates prior to discharge to the River Lark On site SuDS should be used (see next section)
River Ouse catchment: Brandon	Surface water flows should be attenuated at or below existing Greenfield rates prior to discharge to the River Ouse On site SuDS should be used (see next section)

Table 12-1 Proposed policy units

12.2.3 Guidance on the Use of SuDS

A full guidance assessment on the use of SuDS is outlined in the Forest Heath Stage 2 WCS, including details of the data, methodology and limitations. All development sites within the Forest Heath district are located in areas of major groundwater vulnerability. In addition, a significant number of sites are also within Source Protection Zones (SPZ). Sites outside SPZs are located predominantly within Lakenheath, Brandon and Red Lodge.

All SuDS schemes should ensure that their design, construction and maintenance incorporate appropriate measures for the protection of groundwater. It is generally recommended that sites in SPZ1 (inner) should not use SuDS due to the high risk of pollution of drinking water sources. Where infiltration based SuDS are to be used, the construction should be as shallow as possible, and above the soil zone to minimise the risks to underlying groundwater. However, localised infiltration tests and ground investigations will be required to confirm any constraints.

12.2.4 SuDS Approval Body

Background

The Flood and Water Management Act (2010) introduces the concept of a SuDS Approval Body (SAB), to be constituted by unitary authorities or county councils. For FHDC this will be Suffolk County Council.

The role of a local SAB will be to approve local SuDS applications where construction work will have implications for the drainage system. They will apply strict standards that will achieve benefits for water quality as well as flood management. The SAB also has a duty to adopt SuDS providing they are constructed in accordance with the approved proposals and the system functions accordingly.

As part of the approval process, the SAB can require a non-performance bond to be paid which would be refunded in full once the work was completed to the satisfaction of the approving

body. The Act also enables SABs to devolve the responsibility of SuDS adoption to other organisations such as land owners and IDBs on the condition that all partners are in agreement.

Defra are developing national standards for the design, operation and maintenance of SuDS which will set out the criteria on which the type of drainage appropriate to any given site or development can be determined. These national standards will however make allowance for local conditions and take into account the costs and benefits of SuDS. It is anticipated that SuDS provisions will commence in 2012 and it is the intended aim that the National SuDS Standards and Regulations are published in advance of this commencement.

Approval Process for Developers

Developers will apply for drainage and SuDS approval through two routes:

- At the same time as the planning application (joint application)
- A freestanding application where planning is not required or where the developer chooses not to make a joint application

A joint application will facilitate the effective design of drainage thus optimising resources, functionality and sustainability. An application should be made through the planning portal in the same way as planning applications. At the time of application, the SAB may ask for a non-performance bond. This should be returned to the developer if the system is designed and constructed to meet the national SuDS standards. It is important to note that for any development to commence, approval will be needed from both the SAB and the planning authority.

12.3 Planning Policy

12.3.1 Spatial Planning

- Development in Flood Zones 3a and 2 must be subject to a PPS25 compliant FRA;
- Development in areas highlighted by the surface water maps to be in areas more susceptible to surface water flooding should undertake an FRA in consultation with FHDC and the Environment Agency;
- Any future surface water modelling carried out in the district should seek to identify Critical Drainage Areas and these should be further used to inform the need for site specific FRAs;
- Where sites contain areas of Flood Zone 1, 2 and 3, the site layout should be configured such that the most vulnerable development is within the areas of lowest flood risk. As much development as possible should be located in Flood Zone 1 in all cases.

12.3.2 Development Control

- Impermeable creep should be managed to control increases in impermeable area and consequently increased surface water runoff; and
- No reduction in flood plain storage should take place unless a full assessment of the implications has been carried out in consultation with the Environment Agency.

12.3.3 Development Control Policy

- Where new development lies within the undefended 1% AEP (1 in 100 chance of occurrence in any given year) inclusive of climate change or greater flood risk areas, any

loss of storage volume must be compensated for on a 'level for level' and 'volume for volume' basis.

12.3.4 Windfall Sites

A windfall site is defined as:

> "A site not specifically allocated for development in a development plan, but which unexpectedly becomes available for development during the lifetime of a plan. Most "windfalls" are referred to in a housing context. They tend to be very small sites for one or a small number of homes". (Source www.planningportal.gov.uk)

Given that such sites are not derived from a sequentially tested allocation, they will need to be subject to the Sequential, and where required, the Exception Tests at the planning application stage. In order to assist in the application of the Exception Test to windfall sites, the PPS25 Practice Guide recommends that a checklist of local sustainability targets is developed based on the Local Authority Sustainability Appraisal where available. A sustainability appraisal for the Core Strategy has been prepared[19] and the objectives are summarised in Table 12-4.

Environmental	Social	Economic
To mitigate the noise pollution impact of American military aircraft	To meet housing requirements of the whole community	To offer everybody the opportunity for rewarding and satisfying employment
To maintain low levels of all other pollution which are present in Forest Heath	To reduce anti-social activities	To achieve sustainable levels of prosperity and economic development throughout the plan area
To protect the districts vast biodiversity natural capital	To maintain and improve levels of education and skills in the population overall	To reduce poverty and social exclusion
To mitigate the impact climate change will have on Forest Heath	To maintain the health of the population overall	To increase the ability for shorter commuting times and more sustainable forms of transport
To improve the availability and access to sustainable modes of transport	To ensure the unique character and population of the district are addressed	To revitalise town centres
To ensure a sustainable and good quality supply of water	To improve access to key services for all sectors of the population	To improve the range of tourist attractions in the District
To maintain a high quality rural environment	To prevent further loss of publicly accessible open space	
Maximise the redevelopment of 'brownfield sites' and avoid the development of environmentally sensitive 'greenfield sites'		
To encourage environmentally friendly energy uses		
Increase the rate of improvement to the energy efficiency of buildings in the District		
To safeguard Forest Heath's heritage for future generations		
To reduce waste		

Table 12-4 Sustainability Objectives Forest Heath District Council

12.4 Site Specific Flood Risk Assessments

12.4.1 General

This Level 2 SFRA report should be used as a general baseline framework for producing site specific FRAs. The subsequent sections contain recommendations for development sites in each of Flood Zones 1, 2 and 3. These sections are of particular relevance to Development Control Offices and Developers.

Paragraph E2 of PPS25 states that: 'Any organisation or person proposing a development must consider whether that development will not add to and should where practicable reduce flood risk. The future users of the development must not be placed in danger from flood hazards and should remain safe throughout the lifetime of the plan or proposed development and land use'.

Site specific FRAs are required for all development in Flood Zone 2 and Flood Zone 3 and for sites greater than 1 ha in Flood Zone 1, in accordance with Table D1 of PPS25. These will be reviewed either by the Local Planning Authority or the Environment Agency depending upon the scale and nature of the proposed development.

12.4.2 Flood Zone 1

- Any proposed development greater than 1ha (or greater than 0.5ha for residential) must be accompanied by a site specific FRA;
- A review of flooding from surface water, sewers and groundwater should be undertaken;
- Where a site is identified as being more susceptible to surface water flooding (as highlighted by the surface water maps) guidance from the Environment Agency should be sought regarding the requirements for appropriate FRAs;
- If in future Critical Drainage Areas are defined, these should be used to inform the need and requirement for FRAs;
- A drainage strategy for the development sites should also be prepared and demonstrate that the proposed drainage scheme and site layout design will prevent any properties from flooding in a 1% (1 in 100 chance of occurrence in any given year) rainfall event, allowing for climate change impacts;
- SuDS should be utilised wherever practicable, to manage surface water runoff. Local ground conditions (e.g. soil permeability, groundwater vulnerability) must be taken into account in the selection of appropriate SuDS techniques; and
- Under the terms of the Water Resources Act 1991 and the Land Drainage Byelaws, the prior written consent of the Environment Agency is required for any proposed works or structures in, under, over or within nine metres of the top of the bank of a main river. Exceptions to this must be agreed by the Environment Agency via a Flood Defence Consent. A similar distance is recommended for ordinary watercourses.

12.4.3 Flood Zone 2

- The Sequential Test must be applied before sites are allocated for development within this zone;
- Any development proposed in Flood Zone 2 must be the subject of a PPS25 compliant FRA;
- A review of flooding from fluvial sources, surface water, sewers and groundwater should be undertaken;
- If in future Critical Drainage Areas are defined, these should be used to inform requirements for FRAs;
- A drainage strategy for the site should also be prepared and demonstrate that the proposed drainage scheme and site layout design will prevent any properties from flooding in a 1% (1 in 100 chance of occurrence in any given year) event, allowing for climate change impacts;

- SuDS should be utilised wherever practicable, to manage surface water runoff. Local ground conditions (e.g. soil permeability, groundwater vulnerability) must be taken into account in the selection of appropriate SuDS techniques;
- Under the terms of the Water Resources Act 1991 and the Land Drainage Byelaws, the prior written consent of the Environment Agency is required for any proposed works or structures in, under, over or within nine metres of the top of the bank of a main river. Exceptions to this must be agreed by the Environment Agency via a Flood Defence Consent. A similar distance is recommended for ordinary watercourses.
- For highly vulnerable development uses, the hazard mapping should be used in order to determine whether the site passes part (c) of the Exception test to include:
  - The site layout should be configured such that the most vulnerable uses are located in areas of lowest hazard;
  - Safe access and egress routes should be included and located in areas of lowest flood hazard as stated in Table 4-2 of this document and in accordance with the DEFRA guidance[20];
  - Proposed floor levels should be a minimum 600mm above the flood depth arising from a 1% AEP (1 in 100 chance of occurrence in any given year) inclusive of climate change allowance;
  - Basements should be avoided unless i) they are of water resistant construction; ii) access to them is above the 1 in 100 year breach flood level (plus an allowance for modelling uncertainties and climate change); iii) they are used for storage and waterproof utilities only (i.e. non-residential uses); iv) access to them, including via lifts, is closed during flood events;
  - Site occupants should be made aware of the potential frequency and duration of flood events;
  - Flood warning and evacuation plans should be developed;
  - Any proposed ground raising required to lift development from the floodplain must be fully compensated on a level for level, volume for volume basis.
- Where a development site is located adjacent to, or near to a culverted watercourse (main river or ordinary), an assessment of the impacts on flood risk of a blockage in the culvert should be carried out in consultation with the Environment Agency as necessary.
- Mitigation measures should be incorporated into development design, to manage the risk of flooding to the development, including any residual risks:
  - Floor levels must be sited above the 1% AEP (1 in 100 chance of occurrence in any given year) flood level (plus an allowance for modelling uncertainties and climate change);
  - Flood resilient construction techniques should be used to ensure that the development is safe over its lifetime, allowing for the effects of climate change

12.4.4 Flood Zone 3

- The Sequential Test must be applied before sites are allocated for development within this Flood Zone;
- Highly vulnerable site uses should not be developed in this Flood Zone;
- A review of flooding from all sources should be undertaken;
- If in future Critical Drainage Areas are defined, these should be used to inform requirements for FRAs;

- A drainage strategy for the site should also be prepared and demonstrate that the proposed drainage scheme and site layout design will prevent any properties from flooding in a 1% (1 in 100 chance of occurrence in any given year) rainfall event, allowing for climate change impacts;
- SuDS should be utilised wherever practicable, to manage surface water runoff. Local ground conditions (e.g. soil permeability, groundwater vulnerability) must be taken into account in the selection of appropriate SuDS techniques;
- Under the terms of the Water Resources Act 1991 and the Land Drainage Byelaws, the prior written consent of the Environment Agency is required for any proposed works or structures in, under, over or within nine metres of the top of the bank of a main river. Exceptions to this must be agreed by the Environment Agency via a Flood Defence Consent. A similar distance is recommended for ordinary watercourses.
- All types of new development behind flood defences should be avoided if possible due to the residual risks associated with breaching or overtopping of the defences;
- Vulnerable and highly vulnerable development proposed in Flood Zone 3 must be the subject of a PPS25 compliant FRA which must show that the development will be safe, and will not increase flood risk elsewhere:
  - Demonstrate that the flood defences provide an acceptable standard of safety, taking climate change into account
  - Safe access and egress routes should be included and located in areas of lowest flood hazard and in accordance with the DEFRA guidance.
  - Flood resilience for developments must be incorporated within the design[21] including the use of flood entry strategies such as resistant building materials where appropriate.
  - Assessment of the residual risks must be assessed
  - Design of the site layout should avoid locating buildings within areas of high hazard as illustrated by any hazard mapping previously undertaken by the Environment Agency or as part of the site FRA
- For more vulnerable development uses, any available hazard mapping should be used in order to determine whether the site passes part (c) of the Exception test to include:
  - The site layout should be configured such that the most vulnerable uses are located in areas of lowest hazard
  - Access and egress routes should be provided and located in areas of lowest flood hazard
  - Proposed floor levels should be a minimum 600mm above the flood depth arising from a 1% AEP (1 in 100 chance of occurrence in any given year) inclusive of climate change allowance;
  - Basements should be avoided unless i) they are of water resistant construction; ii) access to them is above the 1 in 100 year breach flood level (plus an allowance for modelling uncertainties and climate change); iii) they are used for storage and waterproof utilities only (i.e. non-residential uses); iv) access to them, including via lifts, is closed during flood events;
  - Site occupants should be made aware of the potential frequency and duration of flood events
  - Flood warning and evacuation plans should be developed
  - Any proposed ground raising required to lift development from the floodplain must be fully compensated on a level for level and 'volume for volume' basis

- Where a development site is located adjacent to, or near to a culverted watercourse (main river or ordinary), an assessment of the impacts on flood risk of a blockage in the culvert should be carried out in consultation with the Environment Agency as necessary.
- The impact of the development (including any mitigation measures) on the residual risks must also be assessed;
- Mitigation measures should be incorporated into development design, to manage the risk of flooding to the development, including any residual risks:
  - Floor levels must be sited a minimum 600mm above the 1% AEP (1 in 100 chance of occurrence in any given year) flood level (plus an allowance for modelling uncertainties and climate change)
  - Flood resilient construction techniques should be used to ensure that the development is safe over its lifetime, allowing for the effects of climate change
  - Flood Warning details should be included within the proposals to include details of evacuation plans, which should be written into the property deeds so that subsequent owners are aware and can prepare for the risks associated with flooding.
- Bungalows and other single-storey buildings should be avoided; and
- Where development in undefended areas results in a loss of storage volume, compensatory floodplain storage must be compensated on a level for level, volume for volume basis.

12.5 General

- Education of those developing and building as well as those living in the study area should be promoted to facilitate a responsible approach to flooding and enable individuals to take ownership to an extent where they believe that their actions can influence flood risk

13 Recommendations

Detailed recommendations in respect of Flood Risk Management policies, planning policies, SuDS and the production of site specific FRAs are set out in section 12 of this report. Additional recommendations identified throughout this SFRA and which are not covered in section 12 are set out below.

Planning Policy

- To assist delivery of a holistic approach to flood risk management and enable flooding to be taken into account at all stages of the planning process, the findings of this report should be incorporated into the emerging LDF documents for FHDC and read in conjunction with the Level 1 SFRA. It is recommended that, a specific policy on flood risk management should be included either in future revisions of the FHDC Core Strategy or in a specific Supplementary Planning Document (SPD) to ensure that:
  - Development is located in the lowest flood risk areas,
  - New development is flood-proofed to a satisfactory degree and does not increase flood risk elsewhere,
  - Surface water is managed effectively on site.

Surface Water Management

- PPS25 states that a Level 2 SFRA should identify any requirements for SWMPs. It is recommended to undertake an SWMP for Newmarket due to the history of surface water flooding, predicted future flooding issues and the future planned growth.
- FHDC should work with Suffolk County Council and the Suffolk Flood Risk Partnership to collate and analyse anecdotal data concerning surface water flooding. This will aid calibration of surface water models and improve understanding of flood risk.
- New developments should plan for storm events of magnitudes in excess of the surface water drainage design capacity making reference to the CIRIA guidance on 'Designing for Exceedance[17],
- The PFRA states that Suffolk County Council will establish a county-wide reporting procedure using a standard template. Data from each flooding incident will be recorded and passed, on an annual basis, to a central record system administered by Suffolk County Council. This SFRA supports this approach.
- It is therefore recommended that further, more detailed work is carried out to determine the locations of any CDA's, particularly in areas where high levels of new development are proposed. This work may be completed as part of a SWMP.

Flood Risk Management

- Maintainers of assets in private ownership should be made aware of the flood defence role and the importance of maintaining the asset in good condition.
- The predicted future impacts of climate change (changing rainfall intensities and distributions) are likely to reduce the standard of protection of existing defences. Private owners should be informed of this scenario and discussion undertaken with all relevant stakeholders to determine the way forward.
- It is advised that FHDC, the Ely Group of Drainage Boards and the Environment Agency sets up a formal arrangement to monitor and keep up to date with flood defence maintenance and management, taking into account any policies or strategies evolving from the CFMP. It is recommended that this takes place on a quarterly basis so as to

communicate the risks across the District and respond to emerging needs in a timely fashion as well as agree a protocol for identification of assets at risk.

- Owners of de facto defences should be made aware of their potential impacts on flood risk and any works involving such defences carefully monitored
- The 0.1% AEP (1 in 1000 chance of occurrence in any given year) event flood extents should be used as an indicator to inform and set out emergency procedures to be carried out during an extreme event
- Existing and new residents should sign up to the Environment Agency flood warning system
- New developments should be encouraged to adopt flood resilience and resistance measures in their construction and layout
- The flood risk maps should be used to inform emergency and evacuation plans; these plans should consider the impacts of flood risk on the transport networks, critical infrastructure and identify priority areas for evacuation. The maps, currently in preparation for the Eastern Rivers works, should be made available at the earliest possible opportunity to the Civil Contingencies Unit, to allow a review of the plans and procedures for flood events to be altered in light of the most up-to-date information.

Sewer Flooding

- It is recommended that for all issues related to the sewerage network and sewer flooding, the Level 2 WCS and Anglian Water are consulted for the most up to date and comprehensive information.

References

[1] Hyder Consulting (2009) Level 1Strategic Flood Risk Assessment

[2] Communities and Local Government (2009) Planning Policy Statement 25 Development and Flood Risk

[3] Government Office for the East of England (2008) East of England Plan: The Revision to the Spatial Strategy for the East of England

[4] Communities and Local Government Planning Policy Statement 3: Housing (PPS3)

[5] Town and Country Planning Act 1990 http://www.opsi.gov.uk/acts/acts1990/UKpga_19900008_en_1.htm

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[7] British Hydrological Society website http://www.hydrology.org.uk/

[8] Swanwick C and Land Use Consultants on behalf of The Countryside Agency and Scottish Natural Heritage (2002) Land Character Assessment: Guidance for England and Scotland

[9] UK Climate Impacts Programme (UKCIP) Climate Change Scenarios www.ukcip.org.uk

[10] Green Suffolk Suffolk Climate Action Plan

[11] Communities and Local Government (2009) Planning Policy Statement 25 (PPS25) Practice Guide

[12] Defra (2010) Surface Water Management Plan Technical Guidance

[13] Sir Michael Pitt (2007) Learning Lessons from the 2007 Floods

[14] Defra (2009) National Rank Order of Settlements Susceptible to Surface Water Flooding

[15] Suffolk County Council / AECOM (2011) Suffolk Preliminary Flood Risk Assessment (PFRA)

[16] Environment Agency / Jacobs (2006) Groundwater flooding records collation, monitoring and risk (reference HA5) Extended Report (Chalk Aquifers) available from http://archive.defra.gov.uk/environment/flooding/documents/risk/chalkextendreport.pdf

[17] CIRIA (2006) Designing for Exceedance in Urban Drainage (C635)

[18] Environment Agency (2007) Living on the Edge

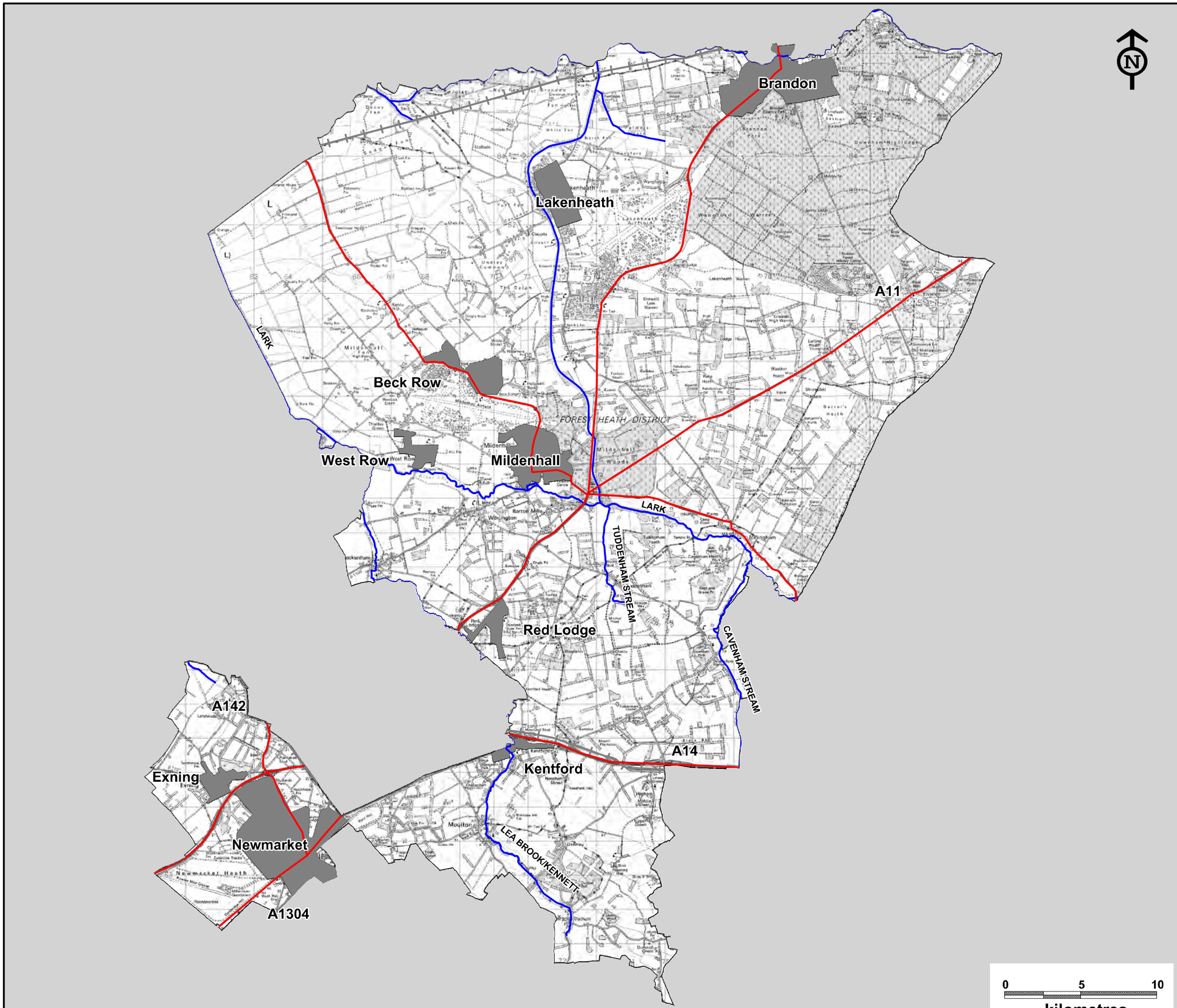
[19] Forest Heath District Council (2010) Final Sustainability Appraisal of the Core Strategy DPD for the Forest Heath District Council Local Development Framework

[20] Defra and Environment Agency (2006) Flood Risks to People Phase 2, FD2321 Technical Report 1 and Defra and Environment Agency (2005) Flood Risk Assessment Guidance for New Development, FD2320 Technical Report 2

[21] CIRIA (with CLG, Defra and the Environment Agency) (2007) Improving the Flood Performance of New Buildings: Flood Resilient Construction http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf

Appendix A

Figures



LEGEND

- Main Road
- Railway
- Main Settlement
- Forest Heath Boundary
- Main River

Rev	Drw	Chk	Apd		Date
A	AMM	LAF	LAF		MAY 2011

Forest Heath District Council

Environment Agency

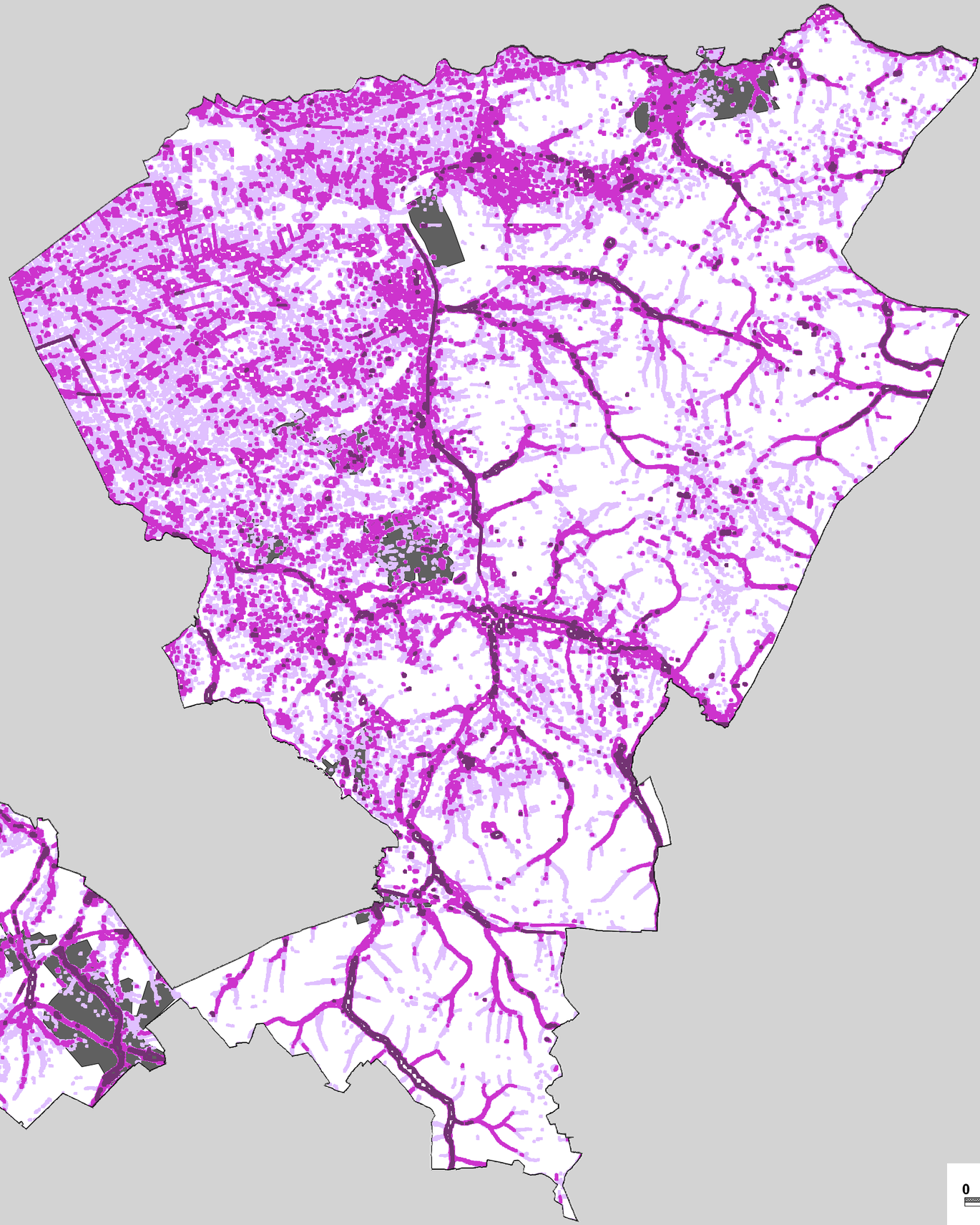
FOREST HEATH STRATEGIC FLOOD RISK ASSESSMENT

FOREST HEATH DISTRICT COUNCIL

STUDY AREA OVERVIEW

Hyder Consulting

Drawing	Figure	Scale	Rev
0201-BM01397-BMD-01	A-1	NTS	A



LEGEND

Areas Susceptible to Surface Water Flooding

- More (>1.0m)
- Intermediate (0.3m - 1.0m)
- Less (0.1m - 0.3m)
- Main Settlements
- Forest Heath Boundary

The map shows areas that are susceptible to surface water flooding. It has been produced using a simplified method that excludes:

Underground sewerage and drainage systems;
Smaller over ground drainage systems;
Buildings.

This map shows the Environment Agency Areas Susceptible to Surface Water Flooding (2008) which have been provided to Forest Heath District Council under Special License. This data and map is strictly for internal use only.

A	AMM	LAF	LAF		MAY 2011
Rev	Drw	Chk	Apd		Date

Forest Heath District Council

Environment Agency

FOREST HEATH STRATEGIC FLOOD RISK ASSESSMENT

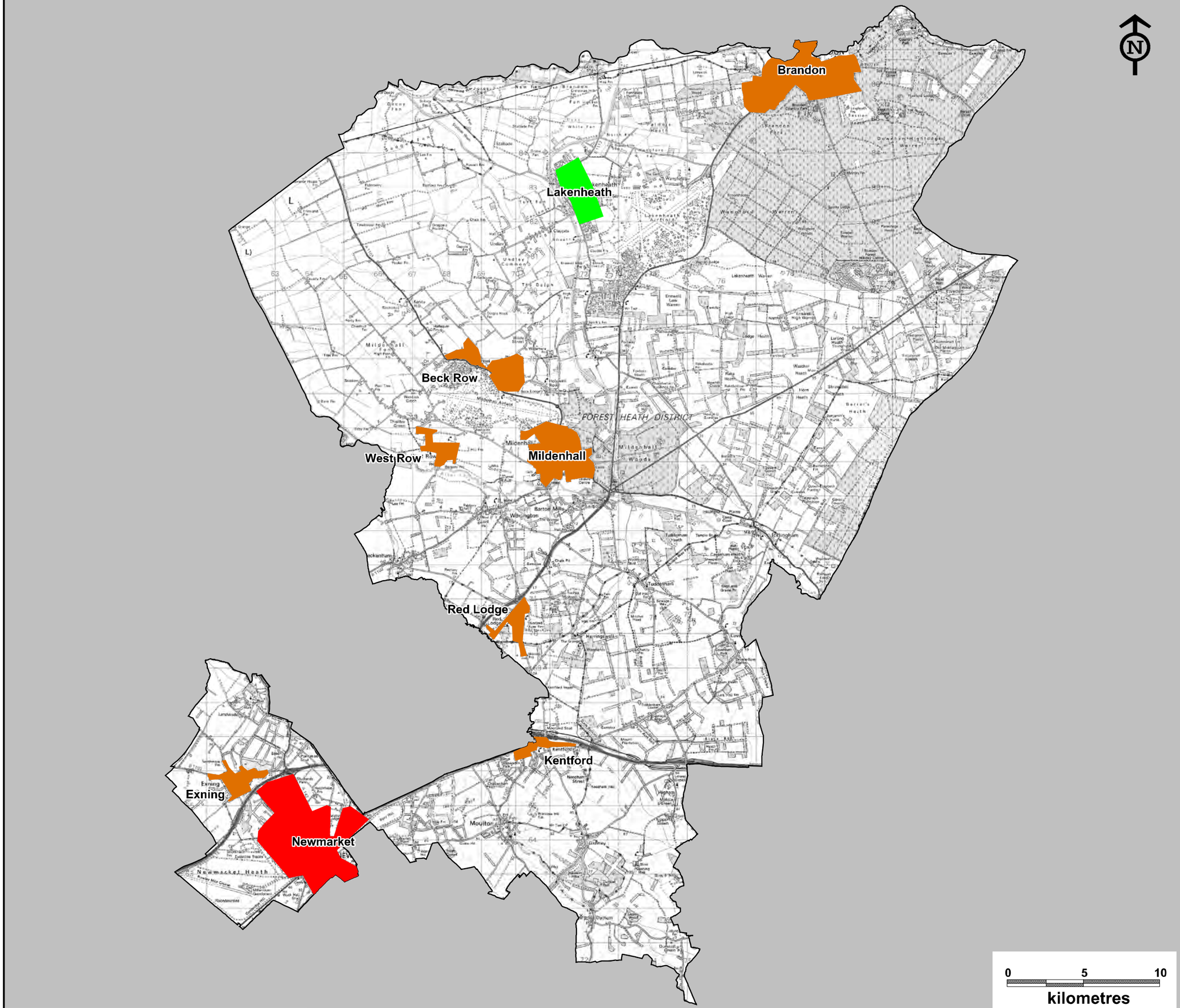
FOREST HEATH DISTRICT COUNCIL

SURFACE WATER SUCEPTIBILITY

Hyder Consulting

Drawing	Figure	Scale	Rev
0202-BM01397-BMD-01	A-2	NTS	A

0 5 10
kilometres



LEGEND

Main Settlements

- High (>20% AStSWF & Reported Incidents)
- Medium (>20% AStSWF & No Reported Incidents or 10- 20 AStSWF & Reported Incidents)
- Low (<10% AStSWF)
- Forest Heath Boundary

Rev	Drw	Chk	Apd		Date
A	AMM	LAF	LAF		MAY 2011

Forest Heath District Council

Environment Agency

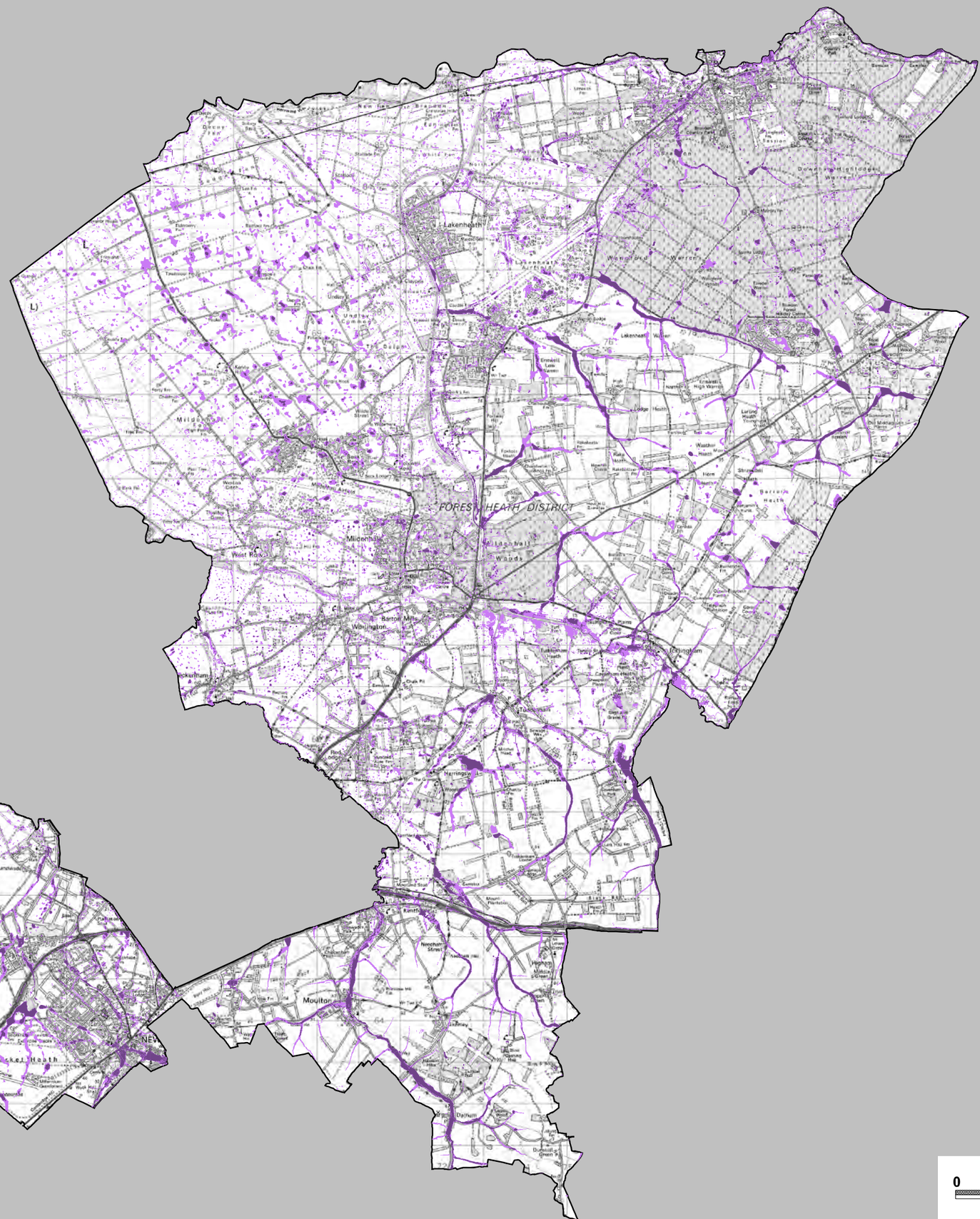
FOREST HEATH STRATEGIC FLOOD RISK ASSESSMENT

FOREST HEATH DISTRICT COUNCIL

SETTLEMENTS AT RISK OF SURFACE WATER FLOODING

Hyder Consulting

Drawing	Figure	Scale	Rev
0203-BM01397-BMD-01	A-3	NTS	A



0 5 10
kilometres

LEGEND

DEEP (>0.3M)

SHALLOW (>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.

Rev	Drw	Chk	Apd		Date
A	CLG	LAF	LAF		OCT 2011

Forest Heath District Council

Environment Agency

FOREST HEATH STRATEGIC FLOOD RISK ASSESSMENT

FOREST HEATH DISTRICT COUNCIL

FLOOD MAP FOR SURFACE WATER 0.5% AEP (1 IN 200 CHANCE OF OCCURRENCE IN ANY GIVEN YEAR)

Hyder Consulting

Drawing	Figure	Scale	Rev
0204-BM01397-BMD-01	A-4	NTS	A

Appendix B

Data Register

INCOMING DOCUMENT REGISTER

Project Title	Project Code
Forest Heath SFRA & WCS	BM01397 / UA000034

Hyder Doc Ref	Incoming Date	Originator	Originator's Doc. Ref	Originator's Organisation	Document Title/ Description	Format of incoming info	Project Aspect
IN001	15-May-08	Website		FHDC	IN001 - Core Strategy Extracts I&O	Word	A) Develop Scenarios
IN002	15-May-08	Website		FHDC	IN002 - Site Allocation DPD Issues and Options	Word	A) Develop Scenarios
IN003	15-May-08	Website		FHDC	IN003 - AmendedLDStimetableMarch2006	PDF	A) Develop Scenarios
IN004	15-May-08	Website		FHDC	IN004 - Doc3KEYFACTS	PDF	A) Develop Scenarios
IN005	15-May-08	Website		FHDC	IN005 - StatementoffiveyearsupplyofHousingLandFHwebsitedoc	PDF	A) Develop Scenarios
IN006	15-May-08	Website		FHDC	IN006 - NewmarketEmploymentSites2	PDF	A) Develop Scenarios
IN007	15-May-08	Website		FHDC	IN007 - MildenhallEmploymentSites	PDF	A) Develop Scenarios
IN008	15-May-08	Website		FHDC	IN008 - BrandonEmploymentSites2	PDF	A) Develop Scenarios
IN009	15-May-08	Website		FHDC	IN009 - LakenheathEmploymentSites2	PDF	A) Develop Scenarios
IN010	15-May-08	Website		FHDC	IN010 - RedLodgeEmploymentSites	PDF	A) Develop Scenarios
IN011	15-May-08	Website		FHDC	IN011 - Map Extracts	Word	A) Develop Scenarios
IN025	26-Jun-08	Adam Ireland		EA	IN025 - Great Ouse CFMP	PDF	E) SW & Flood Risk
IN026	26-Jun-08	Adam Ireland		EA	IN026 - Cam and Ely Ouse CAMs	PDF	B) Water Resource & Supply
IN027	26-Jun-08	Website		ECDC	IN027 - SFRA	PDF	E) SW & Flood Risk
IN028	26-Jun-08	Website		EA	IN028 - anglian RBMP	PDF	C) Water Quality
IN029	8-Jul-08	Website		FHDC	IN29 -LDF Core strategy Policy: Housing	PDF	A) Develop Scenarios
IN030	8-Jul-08	Website		FHDC	IN030 - Briefing Statement Overall Housing Provision	PDF	A) Develop Scenarios
IN031	8-Jul-08	Website		FHDC	IN031 - HousingStrategy 2007-2010	PDF	A) Develop Scenarios
IN032	8-Jul-08	Website		FHDC	IN032 - Approved LDS	PDF	A) Develop Scenarios
IN033	8-Jul-08	Website		FHDC	IN033 - RedLodgeMasterPlanmap	PDF	A) Develop Scenarios
IN034	8-Jul-08	Website		FHDC	IN034 - Suffolk Structural Plan - Economy	PDF	A) Develop Scenarios
IN035	8-Jul-08	Website		FHDC	IN035 - Suffolk Structural Plan - County Strategy	PDF	A) Develop Scenarios
IN036	8-Jul-08	Website		FHDC	IN036 - East of England Plan - Core Strategy	PDF	A) Develop Scenarios
IN037	8-Jul-08	Website		FHDC	IN037 - East of England Plan - Economic	PDF	A) Develop Scenarios
IN038	8-Jul-08	Website		FHDC	IN038 - East of England Plan - Housing	PDF	A) Develop Scenarios
IN039	8-Jul-08	Website		FHDC	IN039 - Local Plan Issues	PDF	A) Develop Scenarios
IN040	8-Jul-08	Website		FHDC	IN040 - Green Infrastructures Map	PDF	A) Develop Scenarios
IN041	8-Jul-08	Cambridge Horizons			IN041 - Planning for Housing Delivery, info on FHDC and SEBC	PDF	A) Develop Scenarios
IN042	8-Jul-08	Cambridge Horizons			IN042 - Economic Context and Forcasting for IN041	PDF	A) Develop Scenarios
IN043	10-Jul-08	MS		FHDC	IN043 - Core Strategic Development Map	Picture	A) Develop Scenarios
IN044	10-Jul-08	MS		FHDC	IN044 - LDF Site Specific Policies & Allocations - Issues & Options (includes A3 plans)		A) Develop Scenarios
IN045	10-Jul-08	MS		FHDC	IN045 - Folder containing current planning applications for all parish sites	Word	A) Develop Scenarios
IN046	10-Jul-08	RM		AWS	IN046 - Map of STW (A1)	Picture	D) FW Sewerage & Treatment
IN048	10-Jul-08	MS		FHDC	IN048 - LocalPlan1996 contains density and allocation till 2006	PDF	A) Develop Scenarios
IN049	10-Jul-08	MS		FHDC	IN049 - Implementation of RedLodge 98	PDF	A) Develop Scenarios
IN050	10-Jul-08	MS		FHDC	IN050 - RedLodgeMasterPlan 98	PDF	A) Develop Scenarios
IN051	10-Jul-08	MS		FHDC	IN051 - Annual Report 06/07	PDF	A) Develop Scenarios
IN052	10-Jul-08	MS		FHDC	IN052 - Key Paragrahs from Core Strategy extracted from web documents	Word	A) Develop Scenarios
IN053	14-Jul-08	Adam Ireland		EA	River Lark - Flood Extent Maps (1 to 2,5,10,25,100)		E) SW & Flood Risk
IN054	14-Jul-08	Adam Ireland		EA	River Lark - IDB_Pump_Stations		E) SW & Flood Risk

INCOMING DOCUMENT REGISTER

Project Title	Project Code
Forest Heath SFRA & WCS	BM01397 / UA000034

Hyder Doc Ref	Incoming Date	Originator	Originator's Doc. Ref	Originator's Organisation	Document Title/ Description	Format of incoming info	Project Aspect
IN055	14-Jul-08	Adam Ireland		EA	River Lark - Model_Cross_Section_Locations		E) SW & Flood Risk
IN056	14-Jul-08	Adam Ireland		EA	River Lark - stat_main_river_sw		E) SW & Flood Risk
IN057	14-Jul-08	Adam Ireland		EA	River Lark - Telemetry_Stations		E) SW & Flood Risk
IN058	14-Jul-08	Adam Ireland		EA	Parkenham - 100yr_final		E) SW & Flood Risk
IN059	14-Jul-08	Adam Ireland		EA	Parkenham - 1000yr_final		E) SW & Flood Risk
IN060	14-Jul-08	Adam Ireland		EA	Newmarket - flood10_nm_clean		E) SW & Flood Risk
IN061	14-Jul-08	Adam Ireland		EA	Newmarket - flood50_nm_clean		E) SW & Flood Risk
IN062	14-Jul-08	Adam Ireland		EA	Newmarket - nm_point_final_wl&xsect		E) SW & Flood Risk
IN063	14-Jul-08	Adam Ireland		EA	Newmarket - outline-option1_clean		E) SW & Flood Risk
IN064	14-Jul-08	Adam Ireland		EA	Ixworth - 100yr_final		E) SW & Flood Risk
IN065	14-Jul-08	Adam Ireland		EA	Ixworth - 1000yr_final		E) SW & Flood Risk
IN066	14-Jul-08	Adam Ireland		EA	General - AreaBenefiting_region_Clip		E) SW & Flood Risk
IN067	14-Jul-08	Adam Ireland		EA	General - FEO_region_Clip (EA0521951,EA052194703,EA052196809,EA052197805,EA052199804)		E) SW & Flood Risk
IN068	14-Jul-08	Adam Ireland		EA	General - flood zone2&3		E) SW & Flood Risk
IN069	14-Jul-08	Adam Ireland		EA	General - fm defence		E) SW & Flood Risk
IN070	14-Jul-08	Adam Ireland		EA	General - MFO_region_Clip (EA05213,EA05214,EA05236,EA05238,EA05247,EA05259,EA05260,EA05261,EA05264,EA05265,EA05267,EA052102,EA052134,EA052224,EA052225,EA0522290)		E) SW & Flood Risk
IN071	14-Jul-08	Adam Ireland		EA	General - ModelledFloodGroup_polyline		E) SW & Flood Risk
IN072	14-Jul-08	Adam Ireland		EA	General - nodes_new		E) SW & Flood Risk
IN073	14-Jul-08	Adam Ireland		EA	General - rivers_clip_Clip		E) SW & Flood Risk
IN074	14-Jul-08	Adam Ireland		EA	General - study_area		E) SW & Flood Risk
IN076	16-Jul-08	Adam Ireland		EA	Anglian Region CFMP - Wash Catchments - Selected FRM Policies V2	PDF	E) SW & Flood Risk
IN077	16-Jul-08	Adam Ireland		EA	Anglian Region CFMP - Wash Catchments - Policy Unit Justifications	Excel	E) SW & Flood Risk
IN078	18-Jul-08	Adam Ireland		EA	Culford Stream SOP, Hydraulic Models & Landline tiles		E) SW & Flood Risk
IN079	30-Jul-08	Adam Ireland		EA	Monitoring Station Locations for SFRA	Word	E) SW & Flood Risk
IN081	11-Aug-08	Adam Ireland		EA	Central Region - NFCDD Database GIS tables	GIS Files	E) SW & Flood Risk
IN082	12-Aug-08			FHDC	FHDC LDF - Core Strategy 'Final Policy Option'		Z) General
IN083	12-Aug-08	Adam Ireland		EA	Discharge Data and compliance data (in excel format)		Z) General
IN085	19-Aug-08	RM		AWS	FH & SE STW Data 18-08-08	Excel	D) FW Sewerage & Treatment
IN086	19-Aug-08	RM		AWS	7 files showing Braintree boundary (all shp files on sharepoint)	GIS Files	Z) General
IN087	19-Aug-08	RM		AWS	Braintree Buffer Area	PDF	Z) General
IN088	20-Aug-08	Breckland DC		Breckland DC	Thetford WCS Stage 1 Report	PDF	Z) General
IN089	26-Aug-08	Adam Ireland		EA	4 x CAMS Technical Documents (Cam & Ely Ouse, Combined Essex, Broadland Rivers & East Suffolk)	Paper	Z) General
IN090	26-Aug-08	RM		AWS	Zip folder of shape files for sewer flooding, blocks, collapses etc	GIS Files	E) SW & Flood Risk
IN091	6-Aug-08	RM		AWS	4 Zip folders with OS tiles and clean and dirty network shape files + pdf map of STW locations plus DWRMP	Various	Z) General
IN092	22-Aug-08	Adam Ireland		EA	5 zip files: flood warning, GQA data and sample points, GWV, Pollution Incidents and source protection zones	GIS Files	Z) General
IN093	22-Aug-08	Adam Ireland		EA	LIDAR Licence	PDF	Z) General
IN095	28-Aug-08	RM		AWS	Shape files for STW locations	GIS Files	D) FW Sewerage & Treatment
IN096	28-Aug-08	Tom Parker		FHDC	OS data for FHDC - 10k and 50k (Tile TL68) Raster & Mapinfo Tabs	GIS Files	Z) General

INCOMING DOCUMENT REGISTER

Project Title	Project Code
Forest Heath SFRA & WCS	BM01397 / UA000034

Hyder Doc Ref	Incoming Date	Originator	Originator's Doc. Ref	Originator's Organisation	Document Title/ Description	Format of incoming info	Project Aspect
IN097	28-Aug-08	Tom Parker		FHDC	District Boundaries (SEBC & FHDC) Mapinfo Tabs	GIS Files	Z) General
IN098	28-Aug-08	Tom Parker		FHDC	Local Plan Mapinfo Tabs	GIS Files	A) Develop Scenarios
IN099	28-Aug-08	Tom Parker		FHDC	LDF Options 2006 Mapinfo Tabs	GIS Files	A) Develop Scenarios
IN100	28-Aug-08	Tom Parker		FHDC	Employment Land Review - Report & Mapinfo Tabs	GIS Files	A) Develop Scenarios
IN101	28-Aug-08	Ross Chilvers		Ely Gp - IDB	Employment Land Review - Report & Mapinfo Tabs	GIS Files	E) SW & Flood Risk
IN102	29-Aug-08	Adam Ireland		EA	Bumstead Brook - Model Files (10,25,50,75,100,100CC,1000)	Model Files	E) SW & Flood Risk
IN103	29-Aug-08	Adam Ireland		EA	Chad Brook - Model Files (10,25,50,75,100,100CC,1000)	Model Files	E) SW & Flood Risk
IN104	29-Aug-08	Adam Ireland		EA	Chilton Stream - Model Files (10,25,50,75,100,100CC,200,1000)	Model Files	E) SW & Flood Risk
IN105	29-Aug-08	Adam Ireland		EA	Shape Files - Historic Flood Outlines	GIS Files	E) SW & Flood Risk
IN106	29-Aug-08	Adam Ireland		EA	Historic Flooding Table Plus Shapefiles of 1968 & 2001 events	GIS Files	E) SW & Flood Risk
IN107	29-Aug-08	Adam Ireland		EA	Flood Outlines - Stour ABD,75,100,100CC,1000	GIS Files	E) SW & Flood Risk
IN108	29-Aug-08	Adam Ireland		EA	Lower Stour & Brett - Model Files (10,25,50,75,100,100CC,1000,ABD)	GIS Files	E) SW & Flood Risk
IN109	29-Aug-08	Adam Ireland		EA	Middle Stour - Model Files (10,25,50,75,100,100CC,1000)	GIS Files	E) SW & Flood Risk
IN110	29-Aug-08	Adam Ireland		EA	Stour Brook - Model Files (10,25,50,75,100,200,100CC,1000)	GIS Files	E) SW & Flood Risk
IN111	29-Aug-08	Adam Ireland		EA	Upper Stour - Model Files (10,25,50,75,100,200,100CC,1000)	GIS Files	E) SW & Flood Risk
IN112	29-Aug-08	Adam Ireland		EA	Stour Flood Risk Study Vol 1 Main Report (Jan 08)	PDF	E) SW & Flood Risk
IN113	29-Aug-08	Adam Ireland		EA	Flood Warning Shape Files (Stour)	GIS Files	E) SW & Flood Risk
IN114	29-Aug-08	Adam Ireland		EA	Eastern Region - NFCDD Database GIS tables	GIS Files	E) SW & Flood Risk
IN115	29-Aug-08	Adam Ireland		EA	Stour - Low Flow Model Files	Model Files	B) Water Resource & Supply
IN116	29-Aug-08	Russell Smith		Entec	Braintree Stage 1 WCS	PDF	Z) General
IN117	1-Sep-08	Adam Ireland		EA	LiDAR Data	GIS Files	Z) General
IN118	2-Sep-08	Lakenheath Internal Drainage Board		Ely Gp - IDB	Water Level Management Plan - Pashford Poors Fen	Paper	E) SW & Flood Risk
IN119	2-Sep-08	Lakenheath Internal Drainage Board		Ely Gp - IDB	Water Level Management Plan - Lakenheath Poors Fen	Paper	E) SW & Flood Risk
IN120	2-Sep-08	Hannah, Reed and Associates Limited		Ely Gp - IDB	Alder Fen Strategic Catchment Review - C203116	PDF	E) SW & Flood Risk
IN121	3-Sep-08	Lakenheath Internal Drainage Board		Ely Gp - IDB	Restorations of Lakenheath Poors SSSI - pdf document and 12 figures	PDF	F) Conservation & Env
IN122	4-Sep-08	Adam Ireland		EA	Essex River Authority - Haverhill Flood Relief Scheme Part II - Meldham Washland - Engineer's Report (~1970)	Paper	E) SW & Flood Risk

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IN123	4-Sep-08	Adam Ireland		EA	Essex River Authority - Haverhill Flood Relief Scheme Part II - Meldham Washland - Engineer's Report (~1970) - Appendices & Graphs (A3)	Paper	E) SW & Flood Risk
IN124	4-Sep-08	Adam Ireland		EA	Dwg - 70/2855/8-9g Haverhill FRS Part II - Meldham Washland - General Site Plan & Earthworks Layout (1970)	Paper	E) SW & Flood Risk
IN125	4-Sep-08	Adam Ireland		EA	Essex River Authority - Report on the Ely Ouse - Essex Scheme (Water Transfer) - Binnie & Partners	Paper	E) SW & Flood Risk
IN126	25-Sep-08	Adam Ireland		EA	Pre-feasibility study - Flood Protection - Newmarket	PDF	E) SW & Flood Risk
IN127	25-Sep-08	Adam Ireland		EA	River Linnet SoP, Hydrology and Modelling Reports	PDF	E) SW & Flood Risk
IN127-1	10-Oct-08	Adam Ireland		EA	Comments on September Issue Stage 1 Report	Word	Z) General
IN130	26-Nov-08	Robin Poole		EA	12 Disks - CD & DVDs of hydraulic models and GIS files	Various	E) SW & Flood Risk
IN131	26-Nov-08			Suffolk Wildlife	3 jpgs showing County Wildlife Sites	Picture	F) Conservation & Env
IN132	28-Nov-08	Steve Hopper		EA	Additional monitoring point data	Word	C) Water Quality
IN133	4-Dec-08	MS		FHDC	SHLAA Outputs - Excel Spreadsheet of potential sites	Excel	A) Develop Scenarios
IN136	9-Dec-08	RM		AWS	Water Supply Strategy for the Bury Area	Word	B) Water Resource & Supply
IN137	12-Dec-08	Tom Parker		FHDC	SHLAA Outputs - Jpg Images and GIS files of Potential SHLAA sites	Various	A) Develop Scenarios
IN138	19/12/2008	Steve Hopper		EA	WwTW - Future Likely consents (from EA calculations)	Excel	C) Water Quality
IN139-1	22/12/2009			EA	Draft River Basin Management Plans Published for USE IN STUDY	Pdf	Z) General
IN139	14-Jan-09	Rob Morris		AWS	WwTW - Discharge Consent Sheets for 33 works within the LA	PDF	D) FW Sewerage & Treatment
IN140	14-Jan-09	Rob Morris		AWS	Tuddenham STW Stage 2 Report	PDF	D) FW Sewerage & Treatment
IN141	14-Jan-09	Rob Morris		AWS	Sewerage Stage 2 reports - Fornham All Saints, Haverhill and Tuddenham	Word	D) FW Sewerage & Treatment
IN142	14-Jan-09	Rob Morris		AWS	Ely Water Asset Plan	Word	B) Water Resource & Supply
IN143	14-Jan-09	Rob Morris		AWS	AWS - Strategic Water Supply Schematic	Pdf	B) Water Resource & Supply
IN144	14-Jan-09	Rob Morris		AWS	STW Data - 14/01/09 (update)	Excel	D) FW Sewerage & Treatment
IN145	26-Jan-09	Shyama Trivedy		NLP	New Strategic Plans.zip	Various	A) Develop Scenarios
IN146	26-Jan-09	Shyama Trivedy		NLP	Settlement Opportunity Mapping.zip	Various	A) Develop Scenarios
IN147	26-Jan-09	Richard Leishman		NE	Comments on September Issue Stage 1 Report	Word	Z) General
IN148	28-Jan-09	Adam Ireland		EA	Comments on December 2009 Stage 1 Draft Report	Word	Z) General
IN151	9-Jun-09	Adam Ireland		EA	Comments on May 2009 Stage 1 Draft Report Issue	Word	Z) General
IN152	21-Jul-09	Rob Morris		AWS	Comments on May 2009 Stage 1 Draft Report Issue	Word	Z) General

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Hyder Doc Ref	Incoming Date	Originator	Originator's Doc. Ref	Originator's Organisation	Document Title/ Description	Format of incoming info	Project Aspect
IN155	14-Aug-09	Magnus Magnusson		FHDC	Link to Core Strategy Submission Documentation - Consultation link - Submission released March 2009	Various	A) Develop Scenarios
IN157	19-Aug-09	James Meyer		FHDC	Specific Sites Allocation GIS Files	Various	A) Develop Scenarios
IN158	21-Aug-09	Magnus Magnusson		FHDC	Red Lodge dwelling umbers - email received 12/08/09 14:51 - Latest numbers	Various	A) Develop Scenarios
IN159	26-Aug-09	Magnus Magnusson		FHDC	Provisional' sites - latest list - not 100% but best there is !	Various	A) Develop Scenarios
IN160	7-Sep-09	Robin Poole		EA	Guidance on modelling needs for SFRA modelling updates (4 files)	Various	E) SW & Flood Risk
IN161	14-Sep-09	James Meyer		FHDC	Latest SSA Sites- Mapinfo Tabs.	GIS Files	A) Develop Scenarios
IN162	16-Oct-09	James Meyer		FHDC	Updates SAA sites spreadsheet	Excel	A) Develop Scenarios
IN163	16-Oct-09	James Meyer		FHDC	Indication of site phasing	Word	A) Develop Scenarios
IN164	16-Oct-09	James Meyer		FHDC	Details of sites under construction	Word	A) Develop Scenarios
IN165	16-Oct-09	James Meyer		FHDC	Updates GIS of sites following request	GIS Files	A) Develop Scenarios
IN166	16-Oct-09	James Meyer		FHDC	Missing background map file	GIS Files	A) Develop Scenarios
IN167	16-Oct-09	Robin Poole		EA	Draft report on Flood zone outline improvements to River Lark & Linnet through Bury St Edmunds.	Word	E) SW & Flood Risk
IN168	21-Oct-09	Website		AWS	AWS response to dWRMP consultation	PDF	B) Water Resource & Supply
IN169	21-Oct-09	Website		AWS	AWS supplementary response to dWRMP consultation	PDF	B) Water Resource & Supply
IN170	22-Oct-09	James Meyer		FHDC	Employment types and confirmation of dwelling numbers	Word	A) Develop Scenarios
IN171	22-Oct-09	James Meyer		FHDC	Revised GIS data for Brandon and Red Lodge	GIS Files	A) Develop Scenarios
IN172	22-Oct-09	James Meyer		FHDC	Revised Site spreadsheet to take accoutn of above GIS	GIS Files	A) Develop Scenarios
IN173	26-Oct-09	Rob Morris		AWS	JR09 WwTW stats	Excel	D) FW Sewerage & Treatment
IN174	26-Oct-09	Rob Morris		AWS	Revised AWS GIS data for CSO locations	GIS Files	D) FW Sewerage & Treatment
IN175	27-Oct-09	Magnus Magnusson		FHDC	Details on mixed use sites	Word	A) Develop Scenarios
IN176	29-Oct-09	Adam Ireland		EA	Report - how to use SW susceptibility maps and present the information	Pdf	E) SW & Flood Risk
IN178	2-Nov-09	Tom Parker		FHDC	SW susceptibility outlines - More, less & Intermediate	GIS Files	E) SW & Flood Risk
IN179	4-Nov-09	Magnus Magnusson		FHDC	EIP Topic Paper - Housing. Detailing current status of CS	Word	A) Develop Scenarios
IN180	25-Nov-09	Adam Ireland		EA	Comments on several options for WwTW Options in FHDC area - Updated on 26/11 and re-submitted - Both versions on file	Word	D) FW Sewerage & Treatment
IN181	22-Dec-09	Steve Hopper		EA	Revised Indicative Consents for Detalied FHDC WCS - based on options presented	Excel	D) FW Sewerage & Treatment
IN182	23-Dec-09	Ross Chilvers		Ely Gp - IDB	Lakenheath catchment map and discussion on options relating to Discharge from Lakenheath WCS		D) FW Sewerage & Treatment
IN183	23-Dec-09	Adam Ireland		EA	North Essex CFMP Summary Report - December 2009	pdf	E) SW & Flood Risk
IN184	23-Dec-09	Adam Ireland		EA	Final outlines of Rougham Hill Flood Zone changes - Word report and GIS File outlines	Various	E) SW & Flood Risk
IN185	5-May-10	Magnus Magnusson		FHDC	Housing Topic Paper 1 v3	PDF	A) Develop Scenarios

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Hyder Doc Ref	Incoming Date	Originator	Originator's Doc. Ref	Originator's Organisation	Document Title/ Description	Format of incoming info	Project Aspect
IN186	5-May-10	Magnus Magnusson		FHDC	C7 Insp Draft - Housing Allocation policy	PDF	A) Develop Scenarios
IN187	5-May-10	Magnus Magnusson		FHDC	Primary Village Site Allocations	Word	A) Develop Scenarios
IN188	5-May-10	Magnus Magnusson		FHDC	Red Lodge Build Out plans	PDF	A) Develop Scenarios
IN189	11-May-10	Rob Morris		AWS	JR10 WwTW figures (draft)	Excel	D) FW Sewerage & Treatment
IN190	11-May-10	Rob Morris		AWS	FHDC Preferred sites GIS originally from MM	GIS Files	A) Develop Scenarios
IN191	14-May-10	Magnus Magnusson		FHDC	FHDC Preferred sites spreadsheet	Excel	A) Develop Scenarios
IN192	21-May-10	Magnus Magnusson		FHDC	Revised Lakenheath Allocation	Excel	A) Develop Scenarios
IN193	26-May-10	Adam Ireland		EA	Updated EA Options Brief	Word	C) Water Quality
IN194	26-May-10	Adam Ireland		EA	Signed SoGC	Word	C) Water Quality
IN195	26-May-10	Adam Ireland		EA	Answer to LF queries via email	Word	C) Water Quality
IN196	27-May-10	Adam Ireland		EA	Tuddenham Stream Abstraction Points	Excel	B) Water Resource & Supply
IN197	21-Jun-10			AWS	Final WRMP	PDF	B) Water Resource & Supply
IN198	22-Jun-10	Trisha Harewood		EA	SFRA information	Various	E) SW & Flood Risk
IN199	25-Jun-10	Trisha Harewood		EA	SFRA information - further answer to questions on Hyder.1644.B..doc	Various	E) SW & Flood Risk
IN200	23-Jun-10	Trisha Harewood		EA	SFRA information - CD with Newmarket PFS (2004 & 2007 Addendum) plus models and shapefiles and River Lark SoP report	Various	E) SW & Flood Risk
IN201	23-Jul-10	Magnus Magnusson		FHDC	Consultation responses to Core Strategy from EA and AWS	Various	A) Develop Scenarios
IN202	16-Sep-10	Tom Parker		FHDC	Updated Core Strategy GIS files and tables	GIS Files	A) Develop Scenarios
IN203	8-Nov-10	Magnus Magnusson		FHDC	Updated Sites spreadsheet with phasing	Excel	A) Develop Scenarios
IN204	23-Nov-11	Rob Morris		AWS	Updated JR10 flows	Excel	D) FW Sewerage & Treatment
IN205	28-Jan-11	Suffolk Resilience Website		SCC	Multi Agency Flood Plan - Sept 10	Pdf	E) SW & Flood Risk
IN206	31-Jan-11	Steve Hopper		EA	Indicative Consent Results plus methodology description	Various	C) Water Quality
IN207	2-Feb-11	Steve Hopper		EA	Revised Indicative Consent Results plus methodology description	Various	C) Water Quality
IN208	19/10/2011	Suffolk CC Website		SCC	PFRA	Word	E) SW & Flood Risk
IN209	19/10/2011	Tom Parker		FHDC	Flood Map for Surface Water	GIS Files	E) SW & Flood Risk
IN210	20/10/2011	Tom Parker		FHDC	Areas Suceptible to Groundwater Flooding	GIS Files	E) SW & Flood Risk
IN211	20/10/2011	Lee Thornley		EA	Survey data for Tuddenham Stream. Supplied as part of Eastern Rivers SFRA but EA agreed we could use for FH.	GIS Files	E) SW & Flood Risk

Appendix C

Surface Water Vulnerability

Preferred Site	Settlement	% Site affected (More Vulnerable)	% Site affected (Intermediate Vulnerability)	SUDS Policy Unit
B/12	Brandon	0	32.37	4
B/12	Brandon	0	2.57	4
B/13	Brandon	0	93.35	6
B/14	Brandon	0.12	64.94	6
B/17	Brandon	0.34	1.08	6
B/27	Brandon	0.26	10.47	6
BR/01	Beck Row	0.05	16.36	2
BR/03	Beck Row	0	99.98	2
BR/07	Beck Row	0	43.22	2
BR/09	Beck Row	0	9.4	2
BR/10	Beck Row	0	2.5	#N/A
E/03	Exning	0	8.93	#N/A
E/04	Exning	0	39.38	6
F/02	Freckenham (potential/suggested inclusion in the settlement boundary)	0	20.01	4
HR/02	Holywell Row (potential/suggested inclusion in the settlement boundary)	0	0.97	2
I/02	Icklingham (potential/suggested inclusion in the settlement boundary)	0	14.65	#N/A
K/05	Kentford	0	1.28	#N/A
K/08	Kentford	0	3.15	2
K/09	Kentford	0	3.66	2
L/04	Lakenheath	12.83	0.35	4
L/12	Lakenheath	0	0.94	4
L/25	Lakenheath	1.05	13.04	#N/A

L/26	Lakenheath	0	3.25	#N/A
L/28	Lakenheath	0	2.99	6
L/29	Lakenheath	0	24.44	6
M/16	Mildenhall	0	5.16	2
M/19	Mildenhall	0	7.55	2
M/21	Mildenhall	0	4.25	2
M/29	Mildenhall	0	0.52	2
M/33	Mildenhall	0.34	66.37	2
M/34	Mildenhall	0	29.33	#N/A
M/40	Mildenhall	0	30.14	2
N/14	Newmarket	3.42	87.29	6
N/17	Newmarket	8.17	46.55	6
N/18	Newmarket	6.44	26.51	6
N/20	Newmarket	5.24	29.96	4
N/21	Newmarket	0	9.83	4
N/23	Newmarket	0	19.54	6
N/25	Newmarket	10.76	35.5	#N/A
N/27	Newmarket	83.51	10.01	#N/A
N/28	Newmarket	0	11.37	6
N/30	Newmarket	77.49	12.16	#N/A
RL/01	Red Lodge	0	2.66	#N/A
RL/02	Red Lodge	0	8.19	#N/A
RL/06	Red Lodge	2.61	0.24	#N/A
RL/06	Red Lodge	2.61	1.48	#N/A
RL/08	Red Lodge	0.46	0	4
RL/09	Red Lodge	0.05	10.89	#N/A
RL/13	Red Lodge	0	2.18	4
RL/16	Red Lodge	0.26	0.62	#N/A
WR/02	West Row	0	2.85	#N/A
WR/07	West Row	0	2.93	6
WR/08	West Row	0	0	#N/A

Table C-1: Surface Water Vulnerability Site Summary

Appendix D

Development Sites Details

All Sites Supplied September 2010

ID	Map Reference	Settlement	Site Location	Site Usage	Site Status	Site Area	Dwellings wholly in FZ1
157	BR/07	Beck Row	Land to the rear of Skeltons Drove	Mixed	Preferred	3.6	108
158	N/01	Newmarket	Land off Cricket Field Road	Residential	Preferred	0.28	18
159	K/07	Kentford	Former Friskies Pet Care site (Kennett Park), Moulton Road	Mixed	Preferred	6.16	92
160	BR/03	Beck Row	Land adjacent to Smoke House Inn, Skeltons Drove, Beck Row	Residential	Preferred	5.85	150
161	RL/17	Red Lodge	Land off Turnpike Road, The Carrops and Green Lane	Residential	Preferred	2.95	114
162	N/29	Newmarket	Former swimming pool site	Residential	Preferred	0.14	10
163	F/06	Freckenham	Land adjacent to Millfield, Fordham Road (potential/suggested inclusion in the settlement boundary)	Residential	Preferred	0.05	2
168	B/14	Brandon	Land off Green Road	Residential	Preferred	19	500
171	N/20	Newmarket	Land at Philipps Close & Churchill Avenue	Residential	Preferred	3.41	102
173	L/14	Lakenheath	Land off Maids Cross Way	Residential	Preferred	3.89	100
174	L/15	Lakenheath	Land off Covey Way & Maids Cross Hill	Residential	Preferred	2.51	75
176	RL/06	Red Lodge	Land adjoining Twins Belt, Land East of Red Lodge	Residential	Preferred	10.26	374
176	RL/06	Red Lodge	Land adjoining Twins Belt, Land East of Red Lodge	Residential	Preferred	18.6	374
177	K/09	Kentford	Fothergills, Gazeley Road	Residential	Preferred	1.46	44
178	WR/08	West Row	Land off Beeches Road	Residential	Preferred	3.13	94
179	F/01	Freckenham	Land South of Fordham Road	(potential/suggested inclusion in the settlement boundary)	Preferred	0.36	10
183	B/13	Brandon	Omar Homes	Residential	Preferred	5.45	218
184	B/12	Brandon	Land off Manor Road	Mixed	Preferred	9.5	220

ID	Map Reference	Settlement	Site Location	Site Usage	Site Status	Site Area	Dwellings wholly in FZ1
184	B/12	Brandon	Land off Manor Road	Mixed	Preferred	9.5	220
185	M/21	Mildenhall	Land West of Miles Hawk Way	Residential	Preferred	3.57	100
186	M/28	Mildenhall	Land at 54 Kingsway	Residential	Preferred	0.79	25
187	M/29	Mildenhall	Land South Worlington Road & adjacent to former Dairy Site	Residential	Preferred	3.05	90
188	N/15	Newmarket	Old Newmarket Station site car park	Residential	Preferred	0.52	20
189	N/02	Newmarket	Reynolds House, High Street, 7 Fitzroy Street and Equine Vets Centre	Mixed	Preferred	0.65	24
191	N/14	Newmarket	Land East of Newmarket, South of A14 (Hatchfield Farm)	Mixed	Preferred	64.69	1200
193	L/04	Lakenheath	35 Station Road	Residential	Preferred	0.49	14
194	L/11	Lakenheath	Land East of The Mallards	Residential	Preferred	0.29	10
195	L/13	Lakenheath	Rabbithill Covert, Station Road	Residential	Preferred	3.45	90
196	L/18	Lakenheath	Near Broom Road, off Eriswell Drive	Residential	Preferred	1.78	53
197	L/22	Lakenheath	Land south of Broom Road	Residential	Preferred	5.69	170
199	RL/01	Red Lodge	Land to rear 2-4 Elms Road and 6-8 Turnpike Road	Residential	Preferred	1.06	32
200	RL/02	Red Lodge	Land to rear 14-16 Turnpike Road	Residential	Preferred	0.91	27
201	RL/03	Red Lodge	Land off Turnpike Road Phase 2	Residential	Preferred	9.73	380
202	RL/04	Red Lodge	Coopers Yard and Café	Residential	Preferred	2.04	80
204	RL/09	Red Lodge	Land at Greenhays Farm	Residential	Preferred	1.3	52
205	RL/10	Red Lodge	Land West of Elderberry Road, Kings Warren	Residential	Preferred	0.45	15
206	BR/01	Beck Row	Lamble Close	Residential	Preferred	2.3	69
207	BR/09	Beck Row	Land at the corner of Wilde Street/Aspal Lane	Residential	Preferred	1.29	35
208	BR/10	Beck Row	Land adj. to and South of the Caravan Park on Aspal Lane	Residential	Preferred	4.14	124
209	E/03	Exning	Land to rear of Laceys Lane (Includes Frogmore)	Residential	Preferred	18.98	100
210	E/04	Exning	Land to South Burwell Road	Residential	Preferred	2.95	90
211	K/05	Kentford	South and East of Flint House, Bury Road (near Village Hall)	Residential	Preferred	0.48	14
212	K/10	Kentford	Land West of Herringswell Road	Residential	Preferred	1.23	37
214	WR/02	West Row	Land off Pott Hall Road	Residential	Preferred	0.58	17

ID	Map Reference	Settlement	Site Location	Site Usage	Site Status	Site Area	Dwellings wholly in FZ1
215	WR/07	West Row	Land East of Beeches Road	Residential	Preferred	1.94	58
216	WR/22	West Row	Land to rear of 21 Beeches Road	Residential	Preferred	0.92	28
218	F/05	Freckenham	Land opposite Village Hall and North Side Fordham Road	(potential/suggested inclusion in the settlement boundary)	Preferred	0.39	10
219	HR/02	Holywell Row	Land adj. Laurel Farm	(potential/suggested inclusion in the settlement boundary)	Preferred	0.54	10
220	M/16	Mildenhall	Land North of Brandon Road	Residential	Preferred	16.18	350
221	N/11	Newmarket	Land at Fitzroy Stables, Rowley Drive	Mixed	Preferred	3.33	133
224	L/01	Lakenheath	Lakenheath Hall	Residential	Preferred	3.79	15
225	L/09	Lakenheath	Land to the rear 11-13 Back Street	Residential	Preferred	0.52	16
226	L/10	Lakenheath	Land to the rear 27-29 Eriswell Road	Residential	Preferred	0.29	10
227	L/25	Lakenheath	Land East of Eriswell Road & South of South Road	Residential	Preferred	21.3	200
228	L/27	Lakenheath	Land South of Broom Road	Residential	Preferred	20.4	200
229	B/20	Brandon	Land at Brandon Cottage, Bury Road	Residential	Preferred	0.93	28
232	M/33	Mildenhall	Land to West Folly Road	Mixed	Preferred	8.06	130
233	M/34	Mildenhall	Land at St John's Close	Mixed	Preferred	1.17	35
242	L/28	Lakenheath	Middle Covert, Land South of Station Road	Residential	Preferred	5.2	150
243	L/29	Lakenheath	Matthews Nursery	Mixed	Preferred	1.86	30
244	RL/11	Red Lodge	Land East of Turnpike Road	Residential	Preferred	0.36	14
12	B/06	Brandon	Land off School Lane	Residential	Rejected	1.2	
13	B/08	Brandon	Evergreen, Bury Road	Residential	Rejected	0.2	
14	M/09	Mildenhall	Land off College Heath Road	Residential	Rejected	0.23	
15	M/12	Mildenhall	Woodlands Park off Brandon Road	Residential	Rejected	2.44	
16	M/27	Mildenhall	Site adjacent to Parkers Mill	Residential	Rejected	1.73	
17	M/30	Mildenhall	The Old Railway Station Site	Residential	Rejected	6.25	
18	M/08	Mildenhall	Land to the rear of Mill Street	Mixed	Rejected	1.31	
19	N/07	Newmarket	Land between Studlands Park Avenue and Parkers Walk	Residential	Rejected	0.25	
20	N/13	Newmarket	Land at junction between Exning Road and Brickfield Avenue	Residential	Rejected	0.26	

ID	Map Reference	Settlement	Site Location	Site Usage	Site Status	Site Area	Dwellings wholly in FZ1
21	L/03	Lakenheath	Land rear of 65, 69, 73 Station Road	Residential	Rejected	0.81	
22	L/19	Lakenheath	Land North East of South Road	Residential	Rejected	3.84	
23	L/21	Lakenheath	Land North of Broom Road	Residential	Rejected	2.34	
24	L/33	Lakenheath	Land at Sedge Fen North of Skeltons Drove	Residential	Rejected	4.29	
25	RL/05	Red Lodge	Land adjoining public house, Turnpike Road and Lane	Residential	Rejected	0.85	
26	BR/02	Beck Row	Land Adjacent to RAF Mildenhall, Beck Row	Residential	Rejected	34.72	
27	BR/05	Beck Row	Land off the Grove	Residential	Rejected	1.52	
28	BR/06	Beck Row	Land South of Rookery Drove	Residential	Rejected	5.32	
29	BR/08	Beck Row	Land at the junction of Holmsey Green and Aspal Lane	Residential	Rejected	0.23	
30	BR/11	Beck Row	Land between Aspal Lane and Wildmere Lane	Residential	Rejected	22.31	
31	BR/12	Beck Row	Land adj. to Beck Lodge Farm, St John's Street	Residential	Rejected	3.31	
32	BR/14	Beck Row	The Deals, Aspal Lane	Residential	Rejected	0.21	
33	BR/17	Beck Row	Land East of Skeltons Drove	Residential	Rejected	25.07	
34	BR/18	Beck Row	Former Coal Yard, Wilde Street	Residential	Rejected	0.66	
35	BR/19	Beck Row	Land adjacent Moss Edge Farm & West A1101	Residential	Rejected	5.73	
36	BR/20	Beck Row	Land at The Yard, The Grove, Stock Corner	Residential	Rejected	1.69	
37	BR/21	Beck Row	Aspal Nursery, Aspal Lane	Residential	Rejected	3.68	
38	E/01	Exning	Land off Windmill Hill Road	Residential	Rejected	3.37	
39	E/02	Exning	Land off The Drift/Burwell Road	Residential	Rejected	13.96	
40	K/03	Kentford	Land North of A14	Residential	Rejected	11.73	
41	K/04	Kentford	Land North of Bury Road	Residential	Rejected	6.54	
42	K/06	Kentford	Opposite 1 to 4, Bury Road	Residential	Rejected	2.88	
43	K/11	Kentford	Land at Animal Health Trust, Landwades Park	Residential	Rejected	3.66	
44	WR/04	West Row	Land at the junction of Jarman's Lane and Beeches Road	Residential	Rejected	0.92	
45	WR/06	West Row	Land North of Mildenhall Road	Residential	Rejected	0.43	
46	WR/09	West Row	Land off Manor Farm Road	Residential	Rejected	0.27	
47	WR/10	West Row	Land off Chapel Road	Residential	Rejected	0.85	

ID	Map Reference	Settlement	Site Location	Site Usage	Site Status	Site Area	Dwellings wholly in FZ1
48	WR/11	West Row	Land off Parker's Drove	Residential	Rejected	0.41	
49	WR/12	West Row	Land adj. to Park Garden, Friday Street	Residential	Rejected	0.9	
50	WR/13	West Row	Behind St Peter's Church, Church Lane	Residential	Rejected	0.55	
51	WR/14	West Row	Off Friday Street, behind Williams Way	Residential	Rejected	1.76	
52	WR/15	West Row	Popes Farm, Church Lane	Residential	Rejected	0.43	
53	WR/16	West Row	Land to North of Ferry Lane	Residential	Rejected	3.16	
54	WR/17	West Row	Access between 114 & 118 Eldo Road	Residential	Rejected	0.82	
55	WR/19	West Row	Land at junction of Mildenhall Road and Jarman's Lane	Residential	Rejected	0.52	
56	WR/20	West Row	Land to rear 82/84 Church Road	Residential	Rejected	0.28	
57	BM/01	Barton Mills	Land to West of Church Lane	(potential/suggested inclusion in the settlement boundary)	Rejected	0.81	
58	BM/02	Barton Mills	Land at Grange Farm Cottages	(potential/suggested inclusion in the settlement boundary)	Rejected	0.33	
59	BM/03	Barton Mills	Land at rear of 21 Mildenhall Road	(potential/suggested inclusion in the settlement boundary)	Rejected	0.44	
60	ER/01	Eriswell	Land South of The Street, adj. to Homecroft	(potential/suggested inclusion in the settlement boundary)	Rejected	0.27	
61	ER/02	Eriswell	Land at Sparks Farm South of Holley's Belt	(potential/suggested inclusion in the settlement boundary)	Rejected	68.17	
62	F/03	Freckenham	Land around Hall Farm	(potential/suggested inclusion in the settlement boundary)	Rejected	0.69	
63	F/04	Freckenham	Land on East side of North Street	(potential/suggested inclusion in the settlement boundary)	Rejected	0.5	

ID	Map Reference	Settlement	Site Location	Site Usage	Site Status	Site Area	Dwellings wholly in FZ1
64	HR/01	Holywell Row	Land North of A1101	(potential/suggested inclusion in the settlement boundary)	Rejected	27.46	
65	HR/03	Holywell Row	Land South of the Street	(potential/suggested inclusion in the settlement boundary)	Rejected	23.08	
66	HR/04	Holywell Row	Land at Laurel Farm	(potential/suggested inclusion in the settlement boundary)	Rejected	1.26	
67	HR/05	Holywell Row	Land to rear of Dolvers View, The Street	(potential/suggested inclusion in the settlement boundary)	Rejected	1.12	
68	MO/01	Moulton	Land (Depot) South of Gazeley Road	(potential/suggested inclusion in the settlement boundary)	Rejected	2.13	
69	T/02	Tuddenham	Land West of Higham Road	(potential/suggested inclusion in the settlement boundary)	Rejected	0.94	
70	T/03	Tuddenham	Land North of Cavenham Road	(potential/suggested inclusion in the settlement boundary)	Rejected	3.55	
71	W/01	Worlington	Land North of Isleham Road and West of Walnut Grove	(potential/suggested inclusion in the settlement boundary)	Rejected	10.54	
72	W/02	Worlington	Land South of The Street (Depot and Nursery)	(potential/suggested inclusion in the settlement boundary)	Rejected	0.26	
73	W/04	Worlington	Land North of Manor Farm (to settlement boundary)	(potential/suggested inclusion in the settlement boundary)	Rejected	0.47	
74	W/05	Worlington	Land North of the Street (up to cricket pitch)	(potential/suggested inclusion in the settlement boundary)	Rejected	0.68	

ID	Map Reference	Settlement	Site Location	Site Usage	Site Status	Site Area	Dwellings wholly in FZ1
75	W/06	Worlington	Land at Pen Kennels, Isleham Road	(potential/suggested inclusion in the settlement boundary)	Rejected	0.48	
76	W/07	Worlington	Land at rear Worlington House	(potential/suggested inclusion in the settlement boundary)	Rejected	0.25	
77	W/08	Worlington	Land adjacent to The Chestnuts off Newmarket Road	(potential/suggested inclusion in the settlement boundary)	Rejected	1.38	
78	D/01	Dalham	Land at The Woodyard, Stores Hill	(Site put forward by landowner but should not be treated as a site allocation or settlement boundary amendment as the small settlements will not retain a settlement boundary and are treated as countryside)	Rejected	0.96	
79	H/01	Herringswell	Land adjacent to Church Farm, North side of The Street	(Site put forward by landowner but should not be treated as a site allocation or settlement boundary amendment as the small settlements will not retain a settlement boundary and are treated as countryside)	Rejected	0.22	
80	B/02	Brandon	Land to rear of the High Street	Residential	Rejected	0.4	
81	B/03	Brandon	Land to the rear 9-11 Victoria Avenue	Residential	Rejected	0.21	
83	B/05	Brandon	Land to the rear of 99-107 Thetford Road and Webbs Row	Residential	Rejected	0.41	
84	B/07	Brandon	Land to the rear Bury Road Northumberland House	Residential	Rejected	0.23	
85	B/09	Brandon	Land at Station Way	Residential	Rejected	1.21	
86	B/10	Brandon	Land South West of Station Way	Residential	Rejected	1.75	
87	B/11	Brandon	Land North of Gas House Drove	Residential	Rejected	3.34	

ID	Map Reference	Settlement	Site Location	Site Usage	Site Status	Site Area	Dwellings wholly in FZ1
88	B/15	Brandon	Riverside Lodge off High Street	Residential	Rejected	0.51	
89	B/18	Brandon	Land South River Ouse & West of High Street	Residential	Rejected	5.02	
90	B/19	Brandon	Land South Railway Line inc. Lignacite Site	Residential	Rejected	9.28	
92	B/25	Brandon	Land to the rear of Thetford Road	Residential	Rejected	0.34	
93	M/01	Mildenhall	South of Gonville Close	Residential	Rejected	2.18	
94	M/03	Mildenhall	Land to the rear 91-105 Folly Road	Residential	Rejected	0.65	
95	M/04	Mildenhall	Land to the rear 98-108 Folly Road	Residential	Rejected	0.75	
96	M/05	Mildenhall	Land to the rear 41 Folly Road	Residential	Rejected	0.29	
97	M/06	Mildenhall	Land to the rear 7-23 North Terrace	Residential	Rejected	0.61	
98	M/07	Mildenhall	Land to the rear 22-28 Junction Road	Residential	Rejected	0.21	
99	M/10	Mildenhall	Land off Finchley Avenue	Residential	Rejected	1.15	
100	M/11	Mildenhall	Land adj. to College Heath Road	Residential	Rejected	2.34	
101	M/13	Mildenhall	Land between the River Lark and Worlington Road	Residential	Rejected	1.5	
102	M/14	Mildenhall	Builders Yard, Worlington Road	Residential	Rejected	0.57	
103	M/15	Mildenhall	Land South of Lark Road/Raven Close	Residential	Rejected	3.26	
104	M/17	Mildenhall	Land North of Thetford Road	Residential	Rejected	16.02	
105	M/18	Mildenhall	Land South of Lark Road	Residential	Rejected	1.15	
106	M/20	Mildenhall	Land South of Pine Trees Avenue	Residential	Rejected	4.89	
107	M/22	Mildenhall	Land South of Mildenhall to River Lark (inc. Jubilee Field)	Residential	Rejected	20.38	
108	M/23	Mildenhall	Land East of Mildenhall to A1065 and Fiveways Roundabout	Residential	Rejected	98.05	
109	M/24	Mildenhall	Land North of Mildenhall, East of the A1101 (inc. Airfield landing lights)	Residential	Rejected	69.94	
110	M/26	Mildenhall	Land South of Bury Road and East of A11	Residential	Rejected	7.54	
112	N/08	Newmarket	Allotments Studlands Park	Residential	Rejected	1.46	
113	N/09	Newmarket	Brickfield Stud, Exning Road	Residential	Rejected	23.49	
114	N/10	Newmarket	Land at Balaton Stables, Snailwell Road	Residential	Rejected	1.48	
115	N/12	Newmarket	Coronation Stables, Station Approach	Residential	Rejected	0.45	

ID	Map Reference	Settlement	Site Location	Site Usage	Site Status	Site Area	Dwellings wholly in FZ1
116	N/16	Newmarket	Land West of Dullingham Road	Residential	Rejected	2.88	
117	N/19	Newmarket	Land off Hamilton Road	Residential	Rejected	2.79	
118	L/06	Lakenheath	Land to rear of Chalk Farm and Gatehouse, High Street	Residential	Rejected	0.72	
119	L/07	Lakenheath	3 Cemetery Road	Residential	Rejected	0.58	
120	L/08	Lakenheath	Land to the rear 2-6 Cemetery Road	Residential	Rejected	0.33	
121	L/05	Lakenheath	Land to the rear 84-142 High Street	Mixed	Rejected	2.9	
122	RL/07	Red Lodge	The White House Stud, Warren Road	Residential	Rejected	6.78	
123	BR/04	Beck Row	Land to the rear 31-45 The Street	Residential	Rejected	0.37	
124	BR/13	Beck Row	Land West of Aspal Hall Road	Residential	Rejected	1.53	
126	K/01	Kentford	Land East of Moulton Road	Residential	Rejected	5.86	
127	K/02	Kentford	Meddler Stud, Bury Road	Residential	Rejected	2.33	
129	WR/05	West Row	Land North of Mildenhall Road	Residential	Rejected	0.2	
131	BM/04	Barton Mills	Land at 10 Newmarket Road	(potential/suggested inclusion in the settlement boundary)	Rejected	0.75	
132	I/01	Icklingham	Land to North East of The Street	(potential/suggested inclusion in the settlement boundary)	Rejected	9.88	
133	W/03	Worlington	Land North of the B1102 (to the River Lark)	(potential/suggested inclusion in the settlement boundary)	Rejected	3.67	
134	B/23	Brandon	Land off Bury Road	Residential	Rejected	9.94	
136	N/22	Newmarket	Icewell Hill Flats	Residential	Rejected	1.05	
137	N/24	Newmarket	Land North of High Street	Mixed	Rejected	0.56	
138	L/34	Lakenheath	Land opposite New Bungalow, Sedge Fen	Residential	Rejected	0.45	
140	RL/12	Red Lodge	Land East of Warren Road	Residential	Rejected	11.73	
141	RL/15	Red Lodge	Land North & East of Red Lodge, Either side of A11	Residential	Rejected	303.44	
142	BR/23	Beck Row	Land at White Gables, Stocks Corner	Residential	Rejected	0.9	
143	BR/24	Beck Row	Land between Wildmere Lane and Holmsey Green	Residential	Rejected	6.29	
147	WR/23	West Row	Land off Friday Street	Residential	Rejected	0.26	

ID	Map Reference	Settlement	Site Location	Site Usage	Site Status	Site Area	Dwellings wholly in FZ1
148	WR/24	West Row	Land off Chapel Road/Friday Street	Residential	Rejected	0.49	
149	WR/26	West Row	Land off Parkers Drove	Residential	Rejected	0.43	
154	WR/25	West Row	Land off Pott Hall Road	Mixed	Rejected	5.81	
155	G/01	Gazeley	Land at Sperrinks's Nursery	(potential/suggested inclusion in the settlement boundary)	Rejected	0.6	
156	HR/06	Holywell Row	Rear of 60 The Street	(potential/suggested inclusion in the settlement boundary)	Rejected	0.42	
164	B/16	Brandon	21 Market Hill	Residential	Rejected	0.03	
165	BR/25	Beck Row	Land at Flint Cottage	Residential	Rejected	0.08	
166	E/05	Exning	Land behind 163 Burwell Road	Residential	Rejected	0.06	
167	E/06	Exning	2nd field behind nos. 163-169 Burwell Road	Residential	Rejected	0.07	
181	WR/01	West Row	Allotments South of Chapel Road	Residential	Rejected	2.6	
182	T/01	Tuddenham	Land West of High Street behind Methodist Chapel	(potential/suggested inclusion in the settlement boundary)	Rejected	0.21	

Table D-1: Full List of Sites Wholly within Flood Zone 1

ID	Map Reference	Settlement	Site Location	Site Usage	Site Status	Site Area	Dwellings from sites wholly or partially in FZ2
169	B/17	Brandon	Land to West of Brandon	Mixed	Preferred	29.63/110	675
170	M/19	Mildenhall	Land West of Mildenhall, South of West Row Road	Mixed	Preferred	82.1	650
172	N/18	Newmarket	George Lambton Playing Fields	Mixed	Preferred	9.44	120
175	L/12	Lakenheath	Land North of Burrow Drive and Briscoe Way	Mixed	Preferred	8.77	150
198	L/26	Lakenheath	Land West of Eriswell Road	Residential	Preferred	5.4	161
203	RL/08	Red Lodge	Land to rear 4 to 14b Turnpike Lane	Residential	Preferred	5.42	216
217	F/02	Freckenham	Land East of Mortimer Lane	(potential/suggested inclusion in the settlement boundary)l	Preferred	0.55	10

Table D-2: Full List of Sites Wholly or Partially within Flood Zone 2

ID	Map Reference	Settlement	Site Location	Site Usage	Site Status	Site Area	Dwellings from sites wholly or partially in FZ3
169	B/17	Brandon	Land to West of Brandon	Mixed	Preferred	29.63	675
172	N/18	Newmarket	George Lambton Playing Fields	Mixed	Preferred	9.44	120
175	L/12	Lakenheath	Land North of Burrow Drive and Briscoe Way	Mixed	Preferred	8.77	150
198	L/26	Lakenheath	Land West of Eriswell Road	Residential	Preferred	5.4	161
217	F/02	Freckenham	Land East of Mortimer Lane	(potential/suggested inclusion in the settlement boundary)l	Preferred	0.55	10

Table D-3: Full list of Sites Wholly or Partially within Flood Zone 3

Appendix E

Distribution of Flood Zones Across Proposed Sites

Residential Sites

Figure E-1 Site M/19

FigureE-2 Site N/18

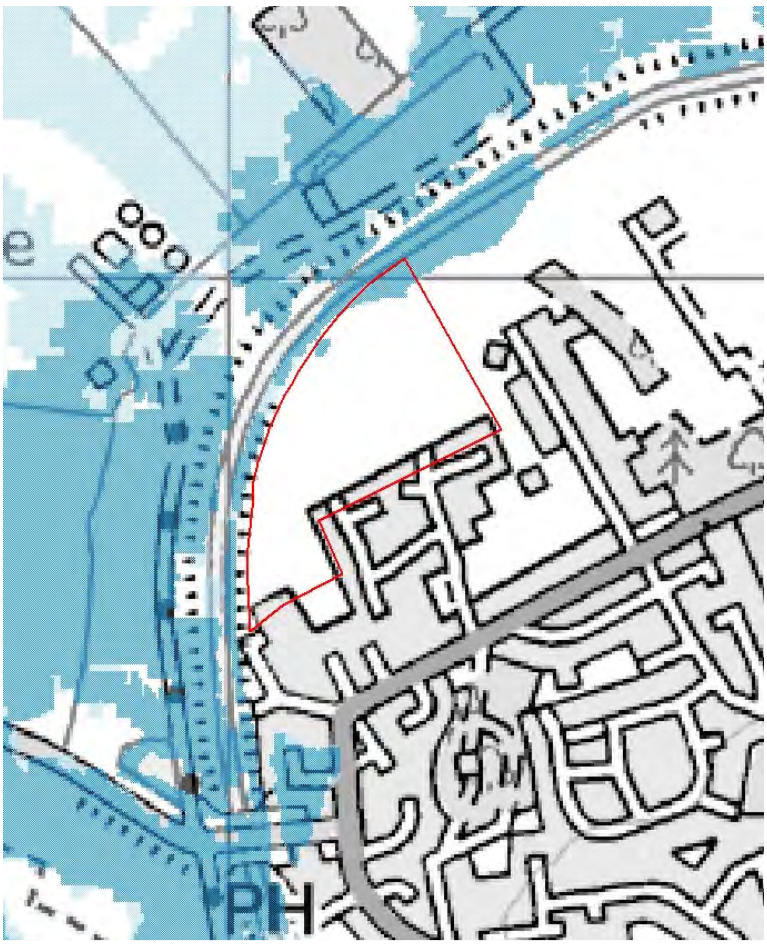

Figure E-3 Site L/12

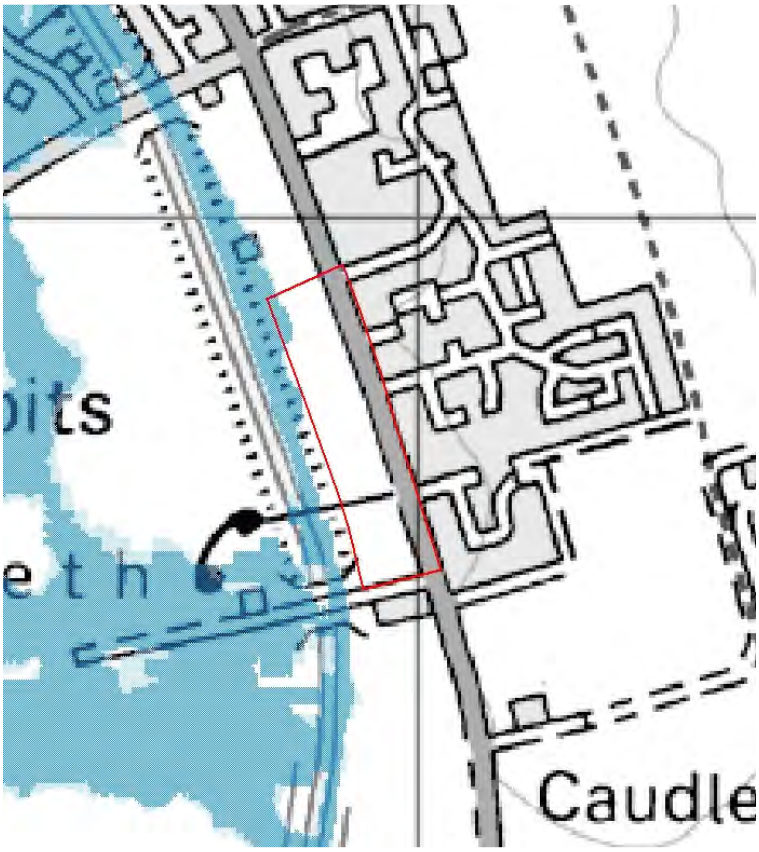

Figure E-4 Site L26

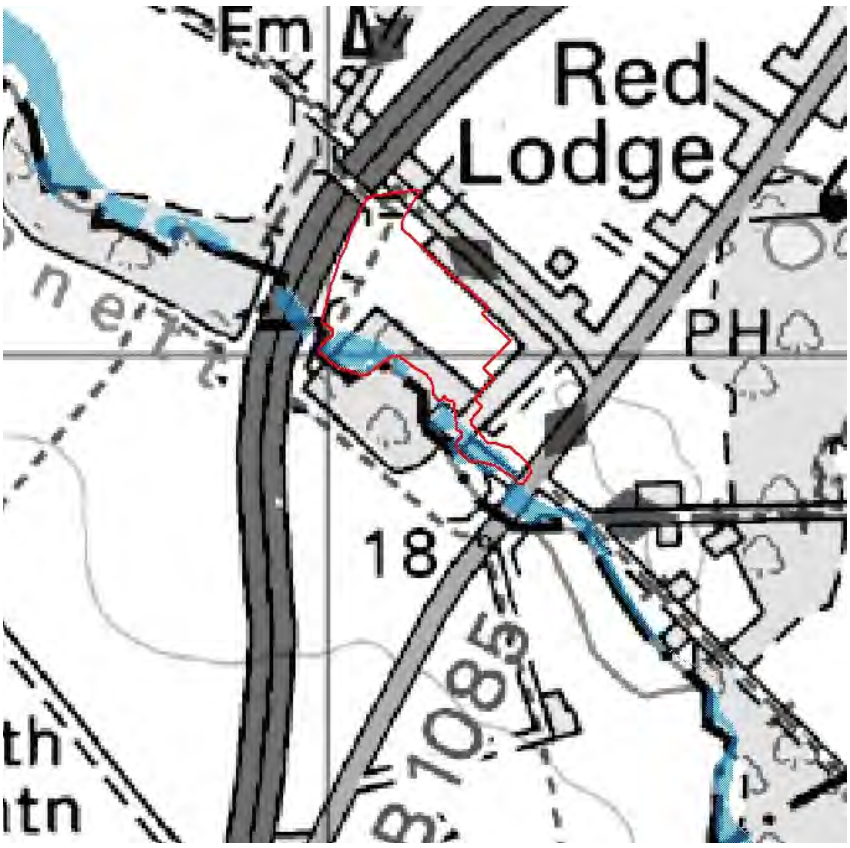

Figure E-5 Site RL/08

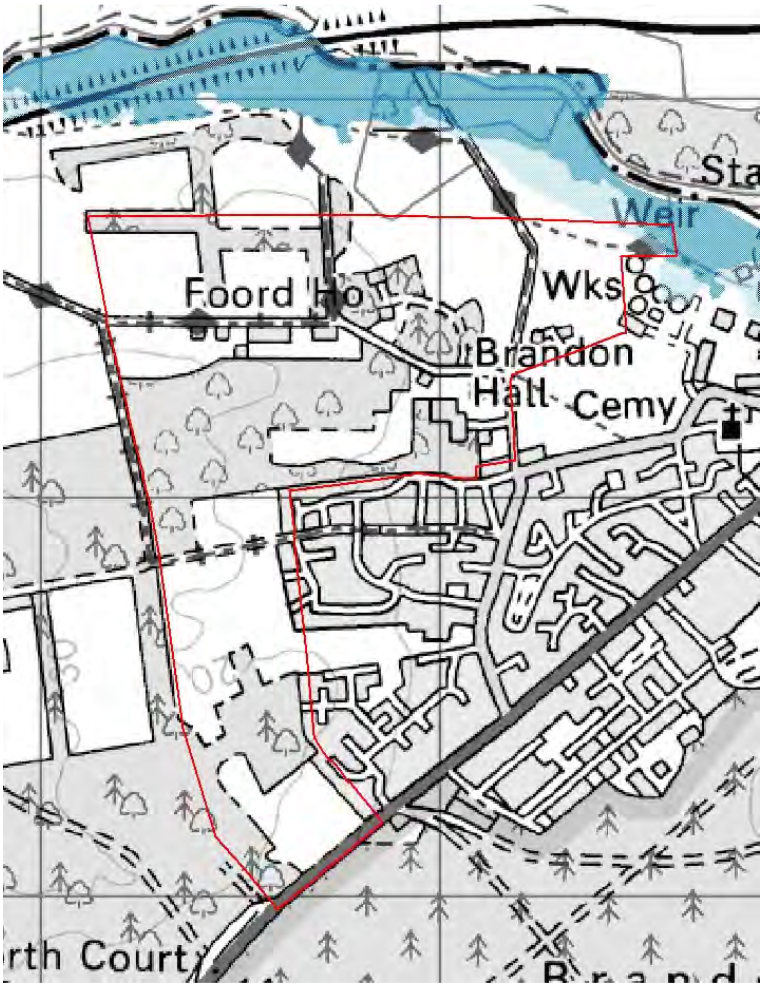

Figure E-6 Site B/17

Non Residential Sites

Figure E-7 Site N/17

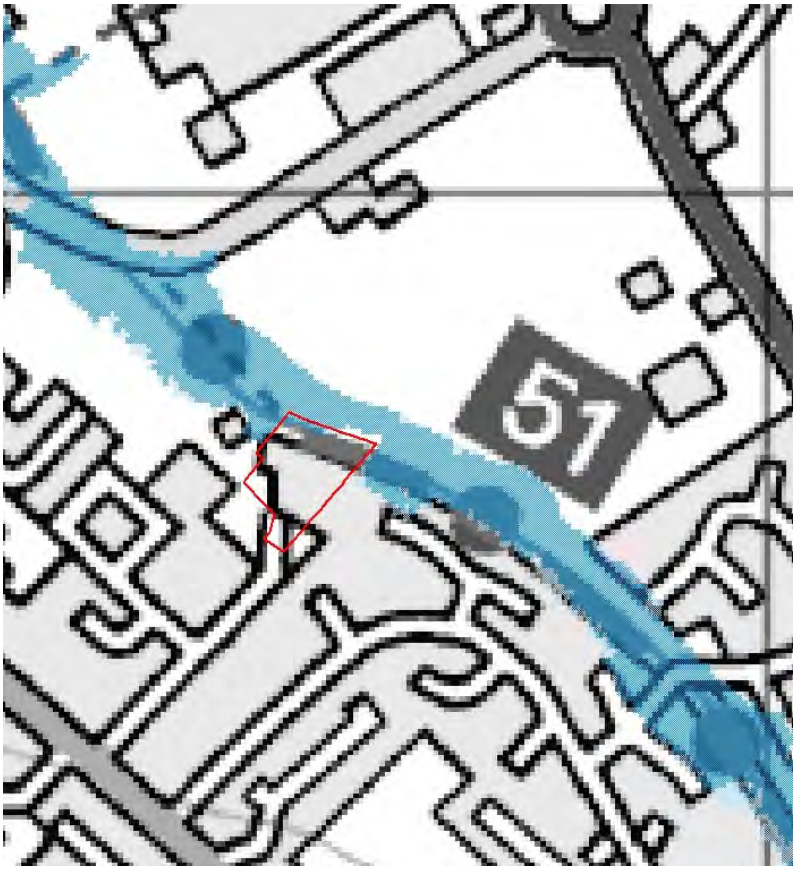

Figure E-8 Site N/30

Figure E-9 Site N/25

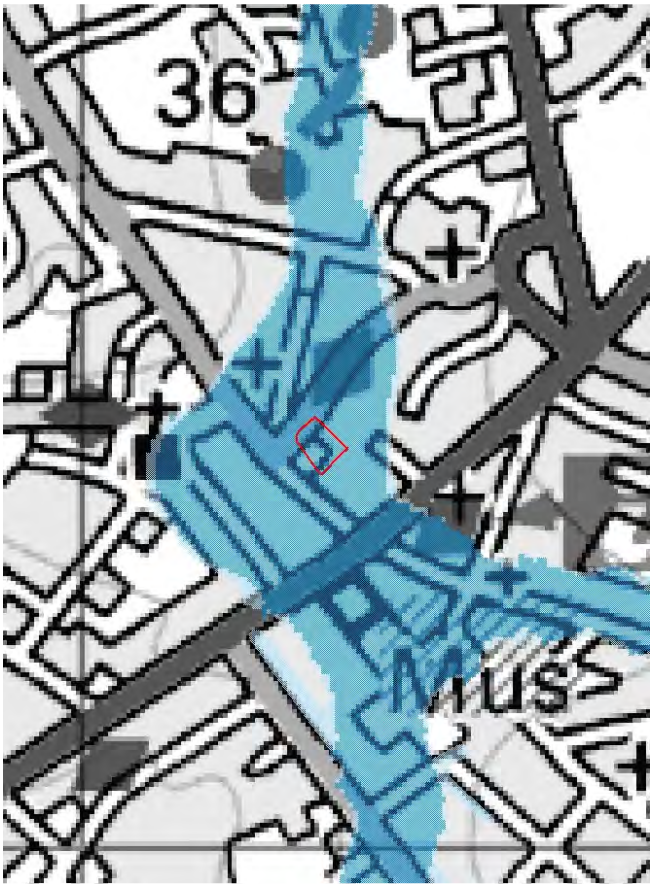

Figure E-10 Site N/27