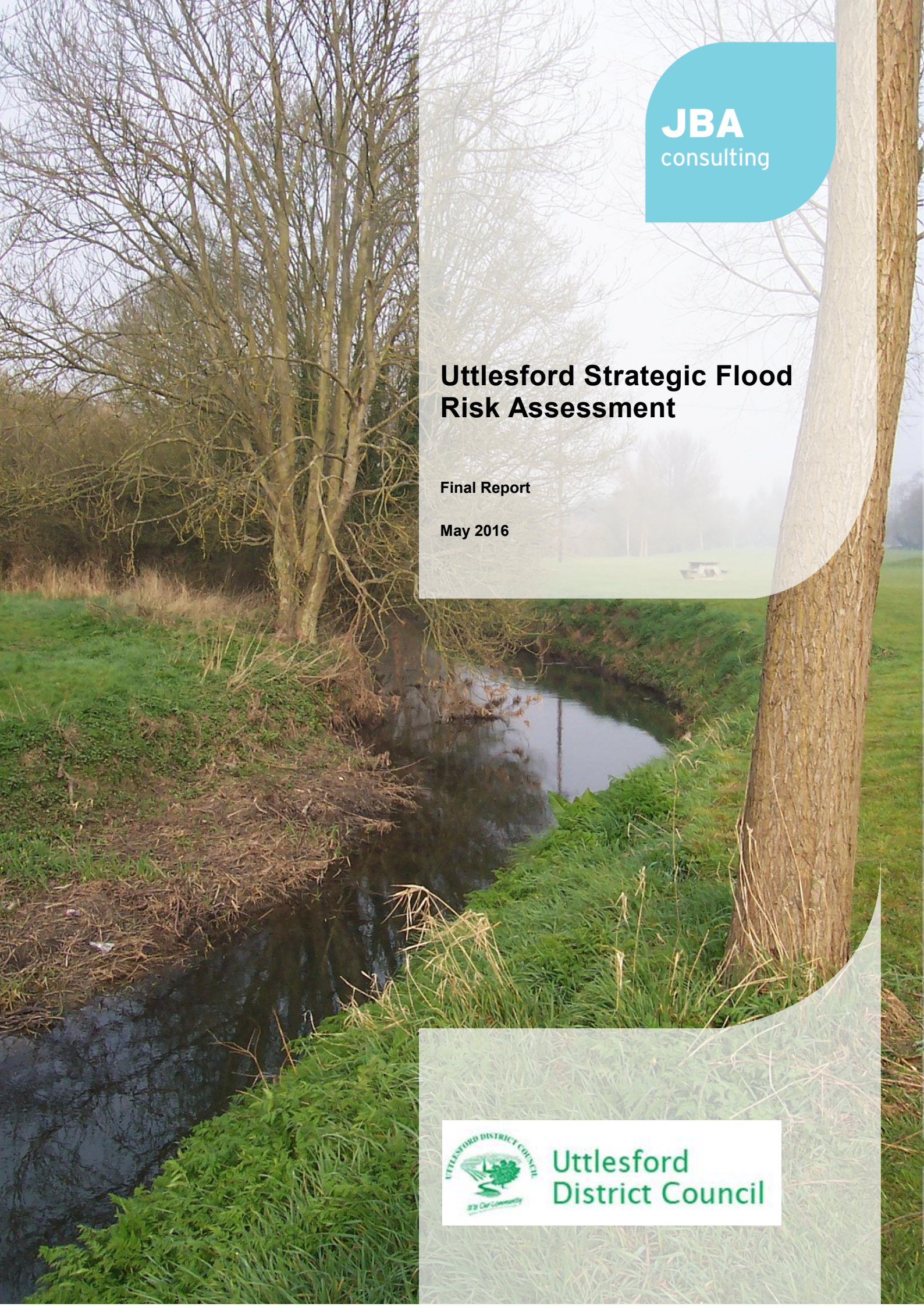

JBA consulting

Uttlesford Strategic Flood Risk Assessment

Final Report

May 2016

Uttlesford District Council

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Revision History

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Final v2.0 / January 2016	Revision following comments from Uttlesford District Council, Environment Agency and Essex County Council	Sarah Nicholas
Final v3.0 (updated) / May 2016	Revisions to section 4.1.4 and 6.4 following release of new government climate change guidance	Sarah Nicholas

Contract

This report describes work commissioned by Uttlesford District Council by an email dated 19 June 2015. Uttlesford District Council's representative for the contract was Sarah Nicholas. Anna Beasley, Elizabeth Gorton and Rebecca Price of JBA Consulting carried out this work.

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Purpose

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JBA Consulting has no liability regarding the use of this report except to Uttlesford District Council.

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Executive Summary

JBA Consulting completed the first Strategic Flood Risk Assessment (SFRA) for Uttlesford District Council (henceforth referred to as 'the Council') in March 2008. Since that time there have been significant changes to legislation relating to both flood risk and planning policy including the Flood Risk Regulations (2009), Flood and Water Management Act (2010), the National Planning Policy Framework (NPPF) (2012), recent guidance published in April 2015 on SuDS, and new guidance published in February 2016 on climate change allowances. There have also been a number of additions to the available flood risk data since the publication of the existing SFRA including Catchment Flood Management Plans (CFMPs), flood mapping studies and national scale mapping of surface water and groundwater flood risk.

The SFRA is a planning tool that will assist the Council in its selection and development of sustainable development sites away from vulnerable flood risk areas in accordance with the NPPF and its associated Planning Practice Guidance on Flood Risk and Coastal Change.

The purpose of this Level 1 SFRA is to provide updated high level assessment and mapping of flood risk from all sources across the district; an individual flood risk analysis of the Areas of Search identified within the district as part of the Local Plan preparation; guidance to planners and developers on flood risk; and an evidence base for the Council to apply the Sequential Test.

Existing flood risk

Chapter 3 describes flood risk from different sources in the District, including fluvial (flood risk from rivers), surface water, groundwater, sewers, reservoirs and other artificial sources. It also summarises the expected impact of climate change on flooding of all sources.

Many of the settlements across Uttlesford have experienced flooding in the past, including (but not limited to) Arkesden, Ashdon, Berden, Birchanger, Clavering, Debden, Elsenham, Great Chesterford, Great Dunmow, Great Sampford, Hadstock, Hatfield Heath, Hazelend, Hempstead, Henham, Howe Green, Littlebury, Little Hallingbury, Little Walden, Manuden, Newport, Quendon, Radwinter, Saffron Walden, Sewards End, Stansted Mountfitchet, Stebbing, Takeley, Thaxted, Wendens Ambo, Ugley, White Roding, Wicken Bonhunt and Wimbish. Sources of past flooding have been predominantly from main rivers, ordinary watercourses and surface water.

Uttlesford is located in the headwaters of three major catchments (Great Ouse, North Essex and Thames). Fluvial floodplains tend to be well-defined and limited in extent by the topography. The majority of the main rivers have hydraulic models from the Environment Agency and flood risk is well understood in the main settlements. The exacerbation of flood risk by poorly maintained or blocked culverts in the District, particularly in Saffron Walden, continues to be an issue for the Environment Agency and Lead Local Flood Authority (LLFA), Essex County Council.

Local sources of flooding, particularly from ordinary watercourses and surface water, are also a problem in the District. Saffron Walden has been identified as a Tier 2 area of local flood risk by the LLFA due to its surface water risk and flood history, and Clavering, Great Dunmow, Manuden, Radwinter, Takeley, Thaxted and Stansted Mountfitchet have been identified as Tier 3 areas. Other areas within Uttlesford that have been identified as having a surface water flooding problem through the flood history review include Little Hallingbury and Little Dunmow.

Groundwater and sewer flooding are limited and very localised.

The effect of climate change has been assessed. In most catchments, the extent of Flood Zone 3 is not likely to increase significantly with climate change due to the confined topography. However, climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources.

Chapter 4 explains how we assess flood risk for planning using the Flood Zones and explains the sequential approach. It outlines the sources of national and local flood risk mapping data, information and evidence available for use in the SFRA.

Assessment of flood risk in the Areas of Search

The Council has identified 14 Areas of Search for the SFRA to assess. Chapter 5, in conjunction with Appendix B, is intended to summarise flood risk information for each of the Council's Areas of Search in a way that can be easily utilised by the Council when carrying out their Sequential Test.

Other planning considerations aside, in this relatively rural district, it should be possible to keep the majority of major developments within Flood Zone 1 and away from other sources of flood risk. The Areas of Search are very large, and so none of them can be ruled out on flood risk grounds; however, all of them have some local flood risk identified. Some of the settlements have already been identified by the LFRMS as Tier 2 or 3 flood risk areas, and there should be close consultation with the LLFA if these are to be taken forward. There are also several Areas of Search where development could have a significant impact on flood risk downstream if SuDS principles and recommended controls on runoff are not strictly enforced.

Guidance for planners and developers

Chapters 6 and 7 introduce guidance aimed at both planners and developers. The guidance should be read in conjunction with the NPPF and flood risk guidance from the Environment Agency. The guidance addresses requirements for development in each of the Flood Zones, making development safe, river restoration and enhancement as part of development, dealing with existing watercourses and assets, developer contributions to flood risk improvements, dealing with surface water runoff and drainage, wastewater, water quality and biodiversity.

Next steps

It is important to remember that information on flood risk is being updated continuously. As the Council move forward with their Local Plan, they must use the most up to date information in the Sequential Test, and developers should be aware of the latest information for use in Flood Risk Assessments.

The Flood and Water Management Act (2010), the Localism Act (2011) and the National Planning Policy Framework (2012) all offer opportunities for a more integrated approach to flood risk management and development. As they are in the relatively early stages of developing a Local Plan, the Council have a real chance to make sure development provides improvements to flood risk overall and enhancements to the river environment.

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Abbreviations and definitions

Term	Definition
1D model	One-dimensional hydraulic model
2D model	Two-dimensional hydraulic model
AEP	Annual Exceedance Probability
AIMS	Asset Information Management System
BREEAM	Building Research Establishment Environmental Assessment Methodology
CC	Climate change - Long term variations in global temperature and weather patterns caused by natural and human actions.
CDA	Critical Drainage Area - A discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, Main River and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather thereby affecting people, property or local infrastructure.
CFMP	Catchment Flood Management Plan- A high-level planning strategy through which the Environment Agency works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
CIRIA	Construction Industry Research and Information Association
Cumecs	The cumec is a measure of flow rate. One cumec is shorthand for cubic metre per second; also m^3/s.
Defra	Department for Environment, Food and Rural Affairs
Designated Feature	A form of legal protection or status reserved for certain key structures or features that are privately owned and maintained, but which make a contribution to the flood or coastal erosion risk management of people and property at a particular location.
DPD	Development Plan Documents
DTM	Digital Terrain Model
Environment Agency	Environment Agency
EU	European Union
FCRMGiA	Flood and Coastal Risk Management Grant in Aid. Central government funding to flood risk management authorities to pay for a range of activities including schemes that help reduce the risk of flooding and coastal erosion.
FEH	Flood Estimation Handbook
Flood cell	A part of the floodplain that might be inundated in case of floods (in protected floodplains if the defences fail) but where the inundation cannot spread to the adjacent parts of the floodplain.
Flood defence	Infrastructure used to protect an area against floods as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Flood Risk Area	An area determined as having a significant risk of flooding in accordance with guidance published by Defra and WAG (Welsh Assembly Government).
Flood Risk Regulations	Transposition of the EU Floods Directive into UK law. The EU Floods Directive is a piece of European Community (EC) legislation to specifically address flood risk by prescribing a common framework for its measurement and management.
Floods and Water Management Act	Part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which is to clarify the legislative framework for managing surface water flood risk in England.
Fluvial Flooding	Flooding resulting from water levels exceeding the bank level of a Main River
Formal Defence	A flood risk asset which is maintained by any party to fulfil a flood defence function in agreement with the Environment Agency.
FRA	Flood Risk Assessment - A site specific assessment of all forms of flood risk to the site and the impact of development of the site to flood risk in the area.
Freeboard	A 'safety margin' to account for residual uncertainties in water level prediction and/or structural performance, expressed in mm
FRM	Flood Risk Management
Functional Floodplain	An area of land where water has to flow or be stored in times of flood

	(Flood Zone 3b).
FWMA	Flood and Water Management Act
FZ	Flood Zones
GI	Green Infrastructure – a network of natural environmental components and green spaces that intersperse and connect the urban centres, suburbs and urban fringe
Greenfield	Greenfield (sites or land) is a term in common usage that may be defined as 'development sites or land that has not previously been developed'.
Ha	Hectare
HFM	Historic Flood Map - National map produced by the Environment Agency showing historical flood extents.
Indicative Flood Risk Area	Nationally identified flood risk areas, based on the definition of 'significant' flood risk described by Defra and WAG.
Informal Defence	An asset which was not designed for flood defence and is not maintained for this purpose, but forms some flood defence function.
ISIS	One-dimensional river modelling software developed by Halcrow. Capable of steady and unsteady state simulation.
JBA	Jeremy Benn Associates
Jflow+	JBA's two-dimensional hydrodynamic model software
LDF	Local Development Framework
LFRMS	Local Food Risk Management Strategy - developed by the LLFA.
LIDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority - Local Authority responsible for taking the lead on local flood risk management
LDF	This term has been replaced by the term 'Local Plan'. It was used to describe a portfolio of Local Development Documents that provide a framework for delivering the spatial planning strategy for the area.
Local Plan	The plan for the future development of the local area, drawn up by the local planning authority in consultation with the community. In law this is described as the development plan documents adopted under the Planning and Compulsory Purchase Act 2004. Current core strategies or other planning policies, which under the regulations would be considered to be development plan documents, form part of the Local Plan. The term includes old policies which have been saved under the 2004 Act.
mAOD	metres Above Ordnance Datum
Main River	All watercourses shown as such on the statutory Main River maps held by the Environment Agency and Defra, and can include any structure or appliance for controlling or regulating the flow of water into, in or out of the channel. The Environment Agency has permissive powers to carry out works of maintenance and improvement on these rivers.
NPPF	National Planning Policy Framework
Ordinary Watercourse	All watercourses that are not designated Main River. Local Authorities or, where they exist, IDBs have similar permissive powers as the Environment Agency in relation to flood defence work. However, the riparian owner has the responsibility of maintenance.
OS NGR	Ordnance Survey National Grid Reference
PFRA	Preliminary Flood Risk Assessment
Pitt Review	Comprehensive independent review of the 2007 summer floods by Sir Michael Pitt, which provided recommendations to improve flood risk management in England.
PLP	Property Level Protection - Schemes that protect property from flooding at the property scale, for example installing flood barriers on doors, air brick covers etc.
Pluvial flooding	Flooding as a result of high intensity rainfall when water is ponding or flowing over the ground surface (surface runoff) before it enters the underground drainage network or watercourse, or cannot enter it because the network is full to capacity.
PPS25	Planning and Policy Statement 25: Development and Flood Risk - superseded by the NPPF
Resilience Measures	Measures designed to reduce the impact of water that enters property and businesses; could include measures such as raising electrical appliances.
Resistance Measures	Measures designed to keep flood water out of properties and businesses; could include flood guards for example.
Return Period	Is an estimate of the interval of time between events of a certain intensity

	or size, in this instance it refers to flood events. It is a statistical measurement denoting the average recurrence interval over an extended period of time.
Risk	In flood risk management, risk is defined as a product of the probability or likelihood of a flood occurring, and the consequence of the flood.
SAB	SuDS Approval Body - responsible for approving, adopting and maintaining drainage plans and SuDS schemes that meet the National Standards
Sewer flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
Sewer Flooding Register	A water-company held register of properties which have experienced sewer flooding due to hydraulic overload, or properties which are 'at risk' of sewer flooding more frequently than once in 20 years.
SHLAA	Strategic Housing Land Availability Assessment - The Strategic Housing Land Availability Assessment (SHLAA) is a technical piece of evidence to support local plans and Sites & Policies Development Plan Documents (DPDs). Its purpose is to demonstrate that there is a supply of housing land in the District which is suitable and deliverable.
SFRA	Strategic Flood Risk Assessment
SFRM	Strategic Flood Risk Mapping
SoP	Standard of Protection - Defences are provided to reduce the risk of flooding from a river and within the flood and defence field standards are usually described in terms of a flood event return period. For example, a flood embankment could be described as providing a 1 in 100 year standard of protection.
Stakeholder	A person or organisation affected by the problem or solution, or interested in the problem or solution. They can be individuals or organisations, includes the public and communities.
STW	Sewage Treatment Works
SuDS	Sustainable Drainage Systems - Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques
SUE	Sustainable Urban Extension
Surface water flooding	Flooding as a result of surface water runoff as a result of high intensity rainfall when water is ponding or flowing over the ground surface before it enters the underground drainage network or watercourse, or cannot enter it because the network is full to capacity, thus causing what is known as pluvial flooding.
SWMP	Surface Water Management Plan - an investigation of local flooding issues such as flooding from sewers, drains, groundwater, and runoff from land, small watercourses and ditches that occurs as a result of heavy rainfall. Carried out through a partnership of all relevant stakeholders including local authorities, internal drainage boards, sewerage undertakers and the Environment Agency. The SWMP plan should outline the preferred surface water management strategy and identify the actions, timescales and responsibilities of each partner. It is the principal output from the SWMP study.
uFMfSW	Updated Flood Map for Surface Water In 2013, the Environment Agency produced the updated Flood Map for Surface Water (uFMfSW). The aim of the uFMfSW is to provide the best single source of information on surface water flooding for England and Wales that includes local information and knowledge. To meet the requirements of the Flood Risk Regulations, the uFMfSW assesses a flooding scenario as a result of rainfall with the following chance of occurring in any given year: 1 in 30, 1 in 100, 1 in 1000
Uncertainty	A reflection of the (lack of) accuracy or confidence that is considered attributable to a predicted water level or flood extent
WFD	Water Framework Directive, European Union directive designed to improve and integrate the way water bodies are managed throughout Europe

1 Introduction

1.1 Background

JBA Consulting completed the first Level 1 Strategic Flood Risk Assessment (SFRA) for Uttlesford District Council (henceforth referred to as 'the Council') in March 2008. There are several drivers for an update to the document.

Since 2008 there have been significant changes to legislation relating to both flood risk and planning policy including the Flood Risk Regulations (2009), Flood and Water Management Act (2010), the National Planning Policy Framework (NPPF) (2012), the Localism Act (2011) and the Climate Change Act (2008). In addition there has been recent guidance published in April 2015 regarding the role of Lead Local Flood Authorities (LLFAs), Local Planning Authorities (LPAs) and the Environment Agency with regards to SuDS.

There have also been a number of additions to the available flood risk data since the publication of the existing SFRA including North Essex, and Great Ouse Catchment Flood Management Plans, Essex Preliminary Flood Risk Assessment (2011), Essex Local Flood Risk Management Strategy (2013), River Cam Tributaries fluvial modelling (2013), Upper Roding fluvial modelling (ongoing), and the availability of the updated Flood Map for Surface Water (UFMfSW) and Areas Susceptible to Groundwater Flooding (AStGWF) maps.

The Council require an up-to-date SFRA in order to support the development of their Local Plan and future selection of site allocations, as well as for use for future development management and policy decisions.

1.2 Objectives

The Planning Practice Guidance advocates a tiered approach to risk assessment and identifies the following two levels of SFRA:

> Level 1: where flooding is not a major issue and where development pressures are low. The assessment should be sufficiently detailed to allow application of the Sequential Test.
>
> Level 2: where land outside Flood Zones 2 and 3 cannot appropriately accommodate all the necessary development creating the need to apply the NPPF's Exception Test. In these circumstances the assessment should consider the detailed nature of the flood characteristics within a Flood Zone.

This updated SFRA is a Level 1 SFRA with the aim of providing guidance to planners and developers on flood risk and to enable the application of the Sequential Test.

In preparing its Local Plan, the Council is considering a number of Areas of Search. These consist of nine new settlement Areas of Search, three urban extension Areas of Search (Saffron Walden, Great Dunmow, Bishop's Stortford), and Areas of Search covering the key villages. They are also considering Areas of Search for each of the smaller 'Type A' villages (villages with primary schools). The Areas of Search under consideration are shown in Map 1.

The key objectives are:

- Critically review and update the 2008 SFRA, taking into account the latest flood risk information and any updates to legislation and policy;
- Provide an individual flood risk analysis of the Areas of Search identified within the district as part of the Local Plan preparation.
- Provide mapping showing the Flood Zones for planning and flood risk from other sources in accordance with the provision of national flood risk guidance.

1.3 Study area

Uttlesford District (Map 1) is situated in the west of Essex. Its main towns are Great Dunmow and Saffron Walden. The district is relatively rural but is under continuous development pressure as a consequence of the proximity to London, Stansted International Airport and development of the M11 corridor.

Uttlesford District is at the watershed of three major river catchments: Great Ouse (River Cam, The Slade, River Bourn); Thames (River Roding, Pincey Brook, River Stort, Bourne Brook,

Stansted Brook, Ugley Brook), and North Essex (River Pant, River Chelmer, Stebbing Brook, River Ter, River Can). As a consequence the SFRA will need to consider downstream impacts of development and land use change.

Many of the settlements across Uttlesford have experienced flooding in the past, including (but not limited to) Arkesden, Ashdon, Berden, Birchanger, Clavering, Debden, Elsenham, Great Chesterford, Great Dunmow, Great Sampford, Hadstock, Hatfield Heath, Hazelend, Hempstead, Henham, Howe Green, Littlebury, Little Hallingbury, Little Walden, Manuden, Newport, Quendon, Radwinter, Saffron Walden, Sewards End, Stansted Mountfitchet, Stebbing, Takeley, Thaxted, Wendens Ambo, Ugley, White Roding, Wicken Bonhunt and Wimbish. Sources of past flooding have been predominantly from main rivers, ordinary watercourses and surface water.

1.4 Consultation

This document has been prepared with the guidance and input of the Environment Agency and Essex County Council throughout the process. Thames Water and Anglian Water and provided data.

2 The planning framework and flood risk policy

2.1 Introduction

The overarching aim of development and flood risk planning policy in the UK is to ensure that the potential risk of flooding is taken into account at every stage of the planning process. This section of the SFRA provides an overview of any significant changes to the planning framework, flood risk policy and flood risk responsibilities since the original Uttlesford SFRA was published in 2008. In preparing the subsequent sections of this updated SFRA, appropriate planning and policy amendments have been acknowledged and taken into account.

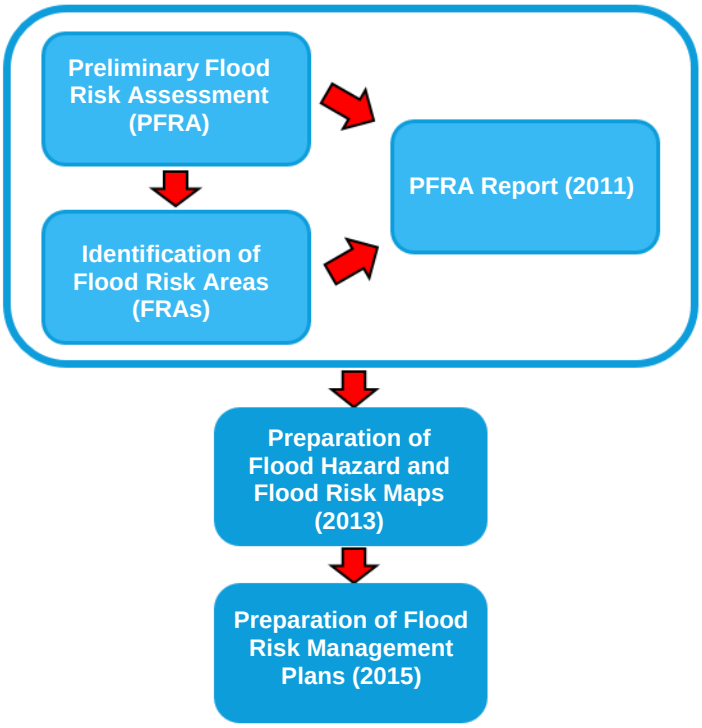
2.2 Flood Risk Regulations (2009) and Flood and Water Management Act (2010)

2.2.1 Flood Risk Regulations, 2009

The Flood Risk Regulations (2009) were intended to translate the current EU Floods Directive into UK law and place responsibility upon all Lead Local Flood Authorities (LLFAs) to manage localised flood risk. Under the Regulations, the responsibility for flooding from rivers, the sea and reservoirs lies with the Environment Agency; however, responsibility for local and all other sources of flooding rests with LLFAs. In the instance of this SFRA, the LLFA is Essex County Council.

Figure 2-1 illustrates the steps that have / are being taken to implement the requirements of the EU Directive in the UK via the Flood Risk Regulations.

Figure 2-1: Flood Risk Regulation Requirements



Under this action plan and in accordance with the Regulations, LLFAs have the task of preparing a Preliminary Flood Risk Assessment (PFRA) report. The PFRA for Essex, covering Uttlesford District, was produced in 2011[1].

[1] Essex PFRA (2011): http://www.essex.gov.uk/Environment%20Planning/Environment/local-environment/flooding/Documents/Preliminary%20Flood%20Risk%20Assessment.pdf

2.2.2 Flood and Water Management Act, 2010

The Flood and Water Management Act (FWMA) (2010)[2] aims to create a simpler and more effective means of managing both flood risk and coastal erosion and implements Sir Michael Pitt's recommendations following his review of the 2007 floods. The FWMA received Royal Assent in April 2010.

2.2.3 Lead Local Flood Authorities

The FWMA established Lead Local Flood Authorities (LLFAs). Duties for Essex County Council, the LLFA for Uttlesford, include:

- Lead responsibility for managing the risk of flooding from surface water, groundwater and Ordinary Watercourses (often described as 'local flood risk').
- Local Flood Risk Management Strategy (LFRMS): LLFAs must develop, maintain, apply and monitor an LFRMS to outline how we will manage flood risk, identify areas vulnerable to flooding and target resources where they are needed most.
- Flood investigations: When appropriate and necessary LLFAs must investigate and report on flooding incidents.
- Register of flood risk features: LLFAs must establish and maintain a register of structures or features which, in their opinion, are likely to have a significant effect on flood risk in the LLFA area.
- Designation of features: LLFAs may exercise powers to designate structures and features that affect flood risk, requiring the owner to seek consent from the authority to alter, remove or replace it.
- Consenting: When appropriate LLFAs will perform consenting of works on Ordinary Watercourses.

On 18 December 2014 a Written Ministerial Statement laid by the Secretary of State for Communities and Local Government set out changes to the planning process that would apply for major development from 6 April 2015. In considering planning applications, local planning authorities should consult the LLFA on the management of surface water, satisfy themselves that the proposed minimum standards of operation are appropriate and ensure, through use of planning conditions or obligations, that there are clear arrangements in place for ongoing maintenance over the lifetime of the development.

In March 2015 the LLFA was made a statutory consultee which came into effect on 15 April 2015. As a result, Essex County Council, will be required to provide technical advice on surface water drainage strategies and designs put forward for new major developments.

Major developments are defined as

- Residential development: 10 dwellings or more, or residential development with a site area of 0.5 hectares or more where the number of dwellings is not yet known
- Non-residential development: provision of a building or buildings where the total floor space to be created is 1,000 square metres or more or, where the floor area is not yet known, a site area of 1 hectare or more.

2.2.4 Essex Preliminary Flood Risk Assessment (PFRA)

The Flood Risk Regulations required Essex County Council (as the LLFA) to prepare and publish a PFRA on past and future flood risk from local sources of flooding. The PFRA reports on significant past and future flooding from all sources except from Main River and Reservoir, which are covered by the Environment Agency, and sub-standard performance of the adopted sewer network (covered under the remit of Thames Water and Anglian Water). The Regulations also require the LLFA to identify significant Flood Risk Areas. Of the ten national indicative Flood Risk Areas that were identified by the Environment Agency, there is one (Basildon) that falls within the administrative area of Essex County Council. However, this area does not fall within Uttlesford District.

[2] Flood and Water Management Act (2010): http://www.legislation.gov.uk/ukpga/2010/29/pdfs/ukpga_20100029_en.pdf

2.2.5 Essex Local Flood Risk Management Strategy

The Essex Local Flood Risk Management Strategy[3], produced in February 2013, sets out the roles and responsibilities of the various authorities in terms of local flood risk from surface water, Ordinary Watercourses and groundwater, details actions that can be or are being taken to reduce flood risk, how these actions can be implemented and available funding sources, and looks a wider environmental benefits. The Strategy defines nine objectives for management of local flood risk which will be delivered through a series of local measures and actions.

The flood risk information in the PFRA has been used to prioritise areas of locally important flood risk, and assigned them into three tiers in order to prioritise flood risk management actions (Tier 1 - more than 1,000 people at risk, Tier 2 - 500-1,000 people at risk and Tier 3 - less than 500 people at risk). Within Uttlesford, Saffron Walden has been identified as a Tier 2 area due to its surface water risk and flood history, and Clavering, Great Dunmow, Manuden, Radwinter, Takeley, Thaxted and Stansted Mountfitchet have been identified as Tier 3 areas.

Flood risk management actions included in the Local Flood Risk Management Strategy have been split into two categories, county-wide strategic actions and site level specific actions. County-wide strategic actions with the aim of following the guiding principles and meeting the overall objectives of this strategy and of the Environment Agency's national strategy, focus on:

- Improving understanding of local flood risk through Surface Water Management Plans (SWMPs) and recording and reporting flood incidents
- Adapting spatial planning policy to reflect local flood risk
    - Introduction of a robust Sustainable Drainage System (SuDS) framework (Essex County Council have produced a SuDS Design and Adoption Guide and put in place interim guidance on SuDS)
    - Inclusion of local flood risk concerns in all future Strategic Flood Risk Assessments
    - Provision of new guidance to supplement the NPPF provisions for flood risk Management
- Raising community awareness
- Establishing a working framework with other RMAs (Risk Management Authority) through Essex Partnership for Flood Management and collaborative working
- Providing a policy for regulation of works on Ordinary Watercourses including consenting and enforcement
- Proactively seeking funding to deliver capital works schemes
- Addressing the skills gap in Local Authorities through recruitment and training

Site level specific management actions could be implemented within locally important flood risk areas in order to translate the aims of the overall strategic actions onto a local scale. These are to be mainly delivered by lower tier councils such as Uttlesford District Council and communities, supported by Essex County Council, and include:

- Implementing sustainable drainage and source control measures
- Managing overland flow paths
- Reviewing land management methods
- Reviewing asset management and maintenance methods
- Achieving wider environmental benefits
- Investigating local flooding issues and identify significant features
- Implementing surface water flood forecasting and flood warning
- Encouraging implementation of flood resilience measures and property protection schemes
- Establishing community flood groups

[3] Essex County Council

Of particular relevance to the SFRA are the actions on spatial planning policy. This SFRA has consulted closely with Essex County Council throughout its development to ensure that it is in line with the Strategy.

2.3 Localism Act

The Localism Act outlines plans to shift and re-distribute the balance of decision making from central government back to councils, communities and individuals. The Localism Act was given Royal Assent on 15 November 2011.

In relation to the planning of sustainable development, provision 110 of the Act places a duty to cooperate on local authorities. This duty requires local authorities to "engage constructively, actively and on an ongoing basis in any process by means of which development plan documents are prepared so far as relating to a strategic matter" [4].

The Localism Act also provides new rights to allow local communities to come together and shape new developments by preparing neighbourhood plans. This means that local people can decide not only where new homes and businesses should go and but also what they should look like. As neighbourhoods draw up their proposals, local planning authorities will be required to provide technical advice and support.

2.4 National Planning Policy Framework

The National Planning Policy Framework (NPPF)[5] was issued on 27 March 2012 to replace the previous documentation as part of reforms to, firstly, make the planning system less complex and more accessible, and, secondly, to protect the environment and promote sustainable growth. It replaces most of the Planning Policy Guidance Notes (PPGs) and Planning Policy Statements (PPSs) that were referred to in the previous version of the SFRA. The NPPF is a source of guidance for local planning authorities to help them prepare Local Plans and for applicants preparing planning submissions.

Paragraph 100 of the NPPF states that**:** *"Local Plans should be supported by a strategic flood risk assessment and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as Lead Local Flood Authorities and Internal Drainage Boards. Local Plans should apply a sequential, risk-based approach to the location of development to avoid, where possible, flood risk to people and property and manage any residual risk, taking account of the impacts of* climate change".

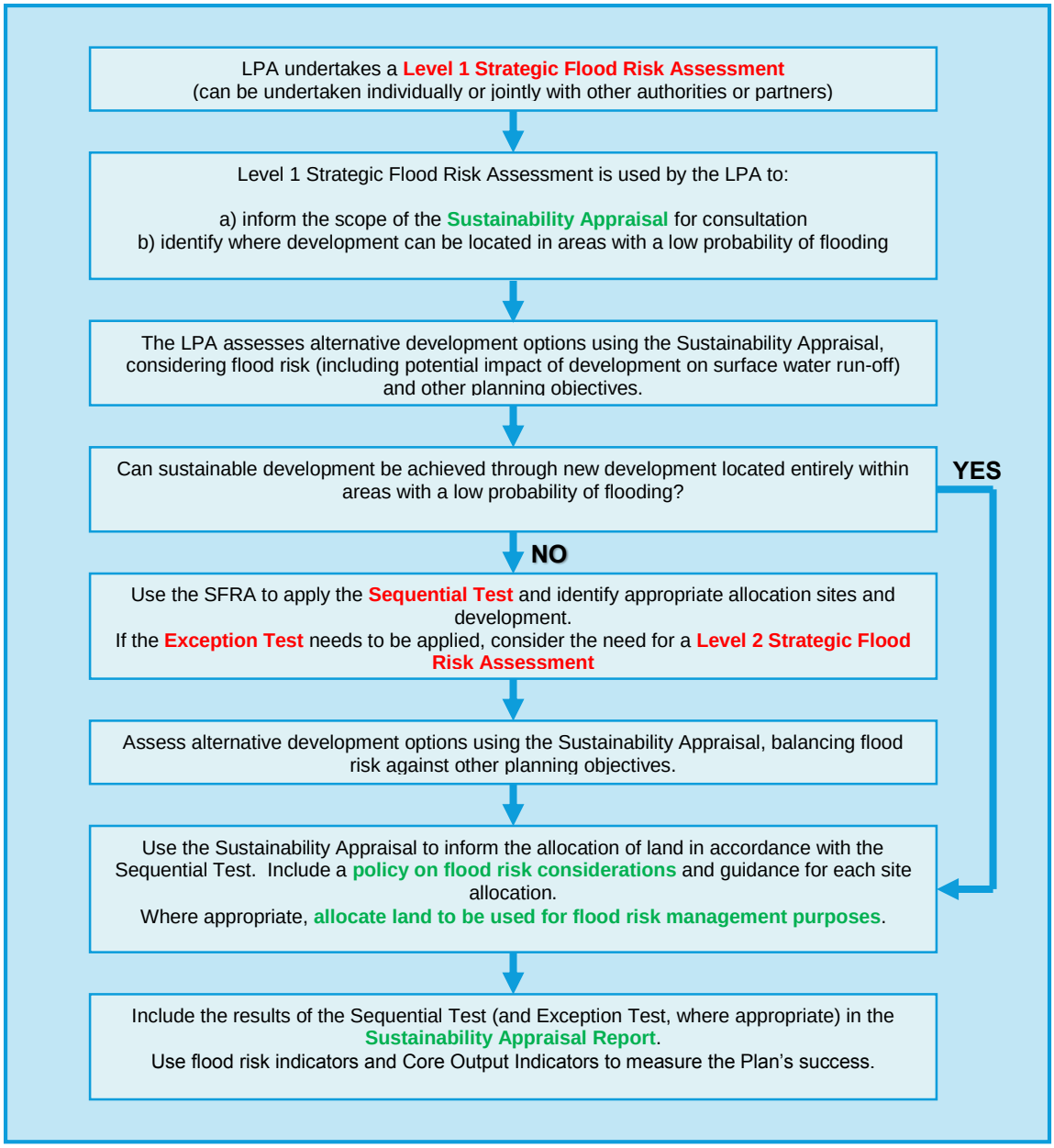
A web-based Planning Practice Guidance on Flood Risk and Coastal Change[6] (henceforth referred to as 'the Planning Practice Guidance'**)** was published alongside the NPPF and was most recently updated in April 2015. It sets out how the policy should be implemented. A description of how flood risk should be taken into account in the preparation of Local Plans is outlined in Diagram 1 contained within the Planning Practice Guidance (Figure 2-2).

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

[5] National Planning Policy Framework (Department for Communities and Local Government, March 2012) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf

[6] Planning Practice Guidance: Flood Risk and Coastal Change (Department for Communities and Local Government, April 2015) http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/

Figure 2-2: Flood risk and the preparation of Local Plans†



† Based on Diagram 1 of the Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 004, Reference ID: 7-021-20140306) A

2.5 Flood Risk Management Plans

Flood Risk Management Plans (FRMPs) are currently being developed to highlight the hazards and risks of flooding from rivers, the sea, surface water, groundwater and reservoirs, and set out how RMAs work together with communities to manage flood risk.

By law, the Environment Agency must produce a FRMP for each River Basin District. These FRMPs must cover flooding from main rivers, the sea and reservoirs. Lead Local Flood Authorities (LLFAs) must produce FRMPs for all significant Flood Risk Areas identified under the Flood Risk Regulations covering flooding from local sources (surface water, ordinary watercourses and groundwater). There are no significant Flood Risk Areas in Uttlesford District.

This approach co-ordinates flood risk management planning with river basin management planning under the Water Framework Directive, in particular the statutory consultation on proposed updates of River Basin Management Plans (RBMPs) and draft FRMPs.

The final FRMPs were due to be published in December 2015, but were not available before the SFRA was completed. Uttlesford will fall partly in the Thames River Basin FRMP and partly in the Anglian River Basin FRMP.

2.6 Catchment Flood Management Plans

Catchment Flood Management Plans (CFMP) are high level policy documents covering large river basin catchments. They aim to set policies for sustainable flood risk management for the whole catchment covering the next 50 to 100 years.

Uttlesford is part of three different Catchment Flood Management Plan (CFMP) areas: the Great Ouse CFMP[7], the Thames CFMP[8] and the North Essex CFMP[9]. CFMPs split their catchments into sub areas with similar flood risk management types and assign one of six policies to each sub area.

Table 2-1 summarises the policy statements relating to Uttlesford for each CFMP.

Table 2-1 CFMP policies

CFMP	Sub Area	Policy
Great Ouse	Bedford Ouse rural and eastern rivers	Policy 3 - Areas of low to moderate flood risk where we are generally managing existing flood risk effectively.
Thames	Towns and villages in open floodplain (north and west)	Policy 6 - Areas of low to moderate flood risk where we will take action with others to store water or manage runoff in locations that provide overall flood risk reduction or environmental benefits.
North Essex	Blackwater and Chelmer, upper reaches and coastal streams	Policy 2 - Areas of low to moderate flood risk where we can generally reduce flood management actions.

Action and objectives are then identified for each sub area based on the policy assigned. These actions have been summarised in Table 2-2. Despite the different policies, all areas have been identified as rural areas of low to moderate risk and therefore there are some common themes in the actions, most notably the need to work with LPAs to ensure that floodplain is protected from development, and to maintain or improve local flood warning services.

Table 2-2 CFMP actions

CFMP	Policy	Summary of main actions
Great Ouse	Policy 3	Investigate opportunities to reduce levels of flood risk management on Main Rivers Continue with current levels of flood risk management on Ordinary Watercourses Improve flood warning service Work with partners to develop emergency response plans for critical infrastructure/transport Take opportunities to use mineral extraction sites to store water Investigate land use change Develop environmental enhancement projects to improve river state/habitats
Thames	Policy 6	Maintain existing capacity of the system Identify locations where storage of water could benefit communities Work with LPAs to retain the floodplain for flood storage and adapt the urban environment to flood risk Continue flood warning service Help local communities manage flood risk (e.g. flood resilience)
North Essex	Policy 2	Reduce flood risk management activities e.g. channel maintenance Investigate land use change Work with LPAs to reduce the number of properties in the floodplain Continue flood warning service and maintain flood warning infrastructure Work with partners to develop emergency response plans for critical infrastructure/transport

[7] Environment Agency (January 2011) Great Ouse Catchment Flood Management Plan Summary Report. https://www.gov.uk/government/publications/great-ouse-catchment-flood-management-plan

[8] Environment Agency (December 2009) Thames Catchment Flood Management Plan Summary Report. https://www.gov.uk/government/publications/thames-catchment-flood-management-plan

[9] Environment Agency (December 2009) North Essex Catchment Flood Management Plan Summary Report. https://www.gov.uk/government/publications/north-essex-catchment-flood-management-plan

2.7 Surface Water Management Plans (SWMPs)

SWMPs outline the preferred surface water management strategy in a given location. SWMPs are undertaken, when required, by LLFAs in consultation with key local partners who are responsible for surface water management and drainage in their area. SWMPs establish a long-term action plan to manage surface water in a particular area and are intended to influence future capital investment, drainage maintenance, public engagement and understanding, land-use planning, emergency planning and future developments.

There are currently no SWMPs covering Uttlesford District. Saffron Walden has been identified by Essex County Council as a Tier 2 area, to be completed in the future. Clavering, Great Dunmow, Manuden, Radwinter, Takeley, Thaxted and Stansted Mountfitchet have been identified as Tier 3 areas. Any future SWMPs carried out for these areas must be considered by the Local Plan.

2.8 Water Cycle Studies

Future changes in climate and increases in new development are expected to exert greater pressure on the existing waste water and water supply infrastructure. A large number of new homes for instance may cause the existing water management infrastructure to be overwhelmed which would result in adverse effects on the environment both locally and in wider catchments. Planning for water management therefore has to take these potential challenges into account.

Water Cycle Studies (WCS) assist local authorities to select and develop sustainable development allocations so that there is minimal impact on the environment, water quality, water resources, infrastructure and flood risk. This can be achieved in areas where there may be conflict between any proposed development and the requirements of the environment through the recommendation of potential sustainable solutions.

The Council has previously prepared a Stage 1 (Scoping and Outline Strategy) (2010)[10] and Stage 2 (Detailed Strategy) (2012)[11] WCS. The WCS is now out of date as it was prepared in relation to a previous Local Plan that did not proceed to adoption. However it did highlight that there were potential constraints to development related to sewer capacity or wastewater treatment in some areas, including Great Dunmow, Newport, Saffron Walden, Great Chesterford and Thaxted. A revised WCS will need to be completed when the current Local Plan is sufficiently advanced.

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

The Association of British Insurers (ABI) and the National Flood Forum have published guidance for local authorities with regards to planning in flood risk areas[12]. The guidance aims to assist local authorities in England in producing local plans and dealing with planning applications in flood risk areas. The guidance complements the National Planning Policy Framework. The key recommendations from the guidance are:

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

The insurance companies and the government have been working together to develop a new flood re-insurance scheme, known as FloodRe. It will be launched in April 2016, and is designed to:

- Enable flood cover to be affordable for those households at highest risk of flooding
- Increase availability and choice of insurers for customers

[10] Hyder (2010) Uttlesford District Water Cycle Study Stage 1: Scoping and Outline Strategy http://www.uttlesford.gov.uk/CHttpHandler.ashx?id=1824&p=0

[11] Hyder (2010) Uttlesford District Water Cycle Study Stage 2: Detailed Strategy http://www.uttlesford.gov.uk/CHttpHandler.ashx?id=1757&p=0

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

- Allow time for the Government, local authorities, insurers and communities to become better prepared for flooding
- Create a 'level playing field' for new entrants and existing insurers in the UK home insurance market.

Further details are available on the FloodRe website at www.floodre.co.uk.

2.10 Roles and responsibilities in Uttlesford District

The new and emerging responsibilities under the Flood and Water Management Act 2010 and the Flood Risk Regulations 2009 are summarised in Table 2-3.

Table 2-3: Roles and responsibilities in Uttlesford

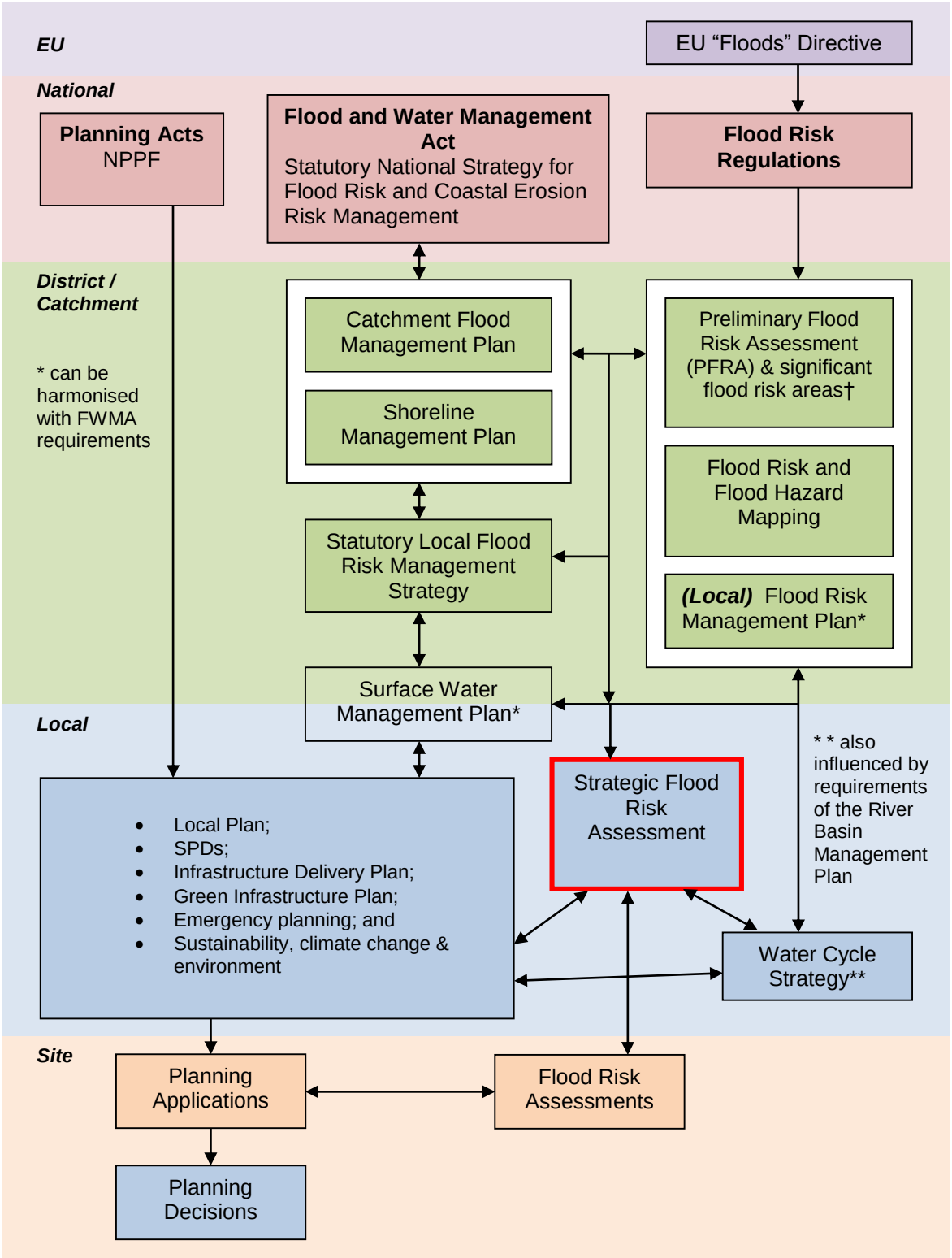
Risk Management Authority (RMA)	Strategic Level	Operational Level
Environment Agency	National Statutory Strategy Reporting and supervision (overview role)	Preliminary Flood Risk Assessment (per River Basin District)* Main Rivers, reservoirs Identify Significant Flood Risk Area* Flood Risk and Hazard Maps Flood Risk Management Plan Enforcement authority for Reservoirs Act 1975
Lead Local Flood Authority (Essex County Council)	Input to national strategy. Formulate and implement local flood risk management strategy.	Ordinary Watercourses Enforce and consent works Surface water, groundwater, other sources of flooding Prepare and publish a PFRA Identify Flood Risk Areas Prepare Flood Hazard and Flood Risk Maps Prepare Flood Risk Management Plans Statutory consultee for surface water drainage proposals on large scale developments
Lower Tier authorities (Uttlesford District Council)	Input to National and Local Authority Plans and Strategy	Ordinary Watercourses Designating authority for essential flood infrastructure Duty to act consistently with local and national strategies

* The Environment Agency did not prepare a PFRA; instead they exercised an exception permitted under the Regulations

Figure 2-3 outlines the key strategic planning links for flood risk management and associated documents. It shows how the Flood Risk Regulations and Flood and Water Management Act, in conjunction with the Localism Act's "duty to cooperate", introduce a wider requirement for the mutual exchange of information and the preparation of strategies and management plans.

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

Figure 2-3: Strategic planning links and key documents for flood risk



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

3 Understanding flood risk in the District

3.1 Topography, geology, soils and hydrology

Uttlesford District covers an area approximately 641 km^2 and has a population of approximately 79,000 (2011 census)[13]. The largest urban areas within Uttlesford are Great Dunmow and Saffron Walden. Outside of the main towns the district is relatively rural with a number of dispersed villages. Map 2 gives an overview of the study area.

3.1.1 Topography

The topography and landscape of Uttlesford (Map 2) is a result of the region being located at the headwaters of three separate river catchments.

The chalk hills in the northwest rise to 140m AOD and the land slowly falls in height towards the southeast where clay soils dominate. The land is cut by river valleys running north towards Cambridgeshire (River Cam (or Granta)), southeast towards the centre of the county (River Chelmer and River Pant), and south towards the Thames river basin (Pincey Brook, River Roding, River Stort and Stansted Brook). There are also a number of valleys formed by the tributaries to these Main Rivers. The valleys are steep, with the lowest elevations within the region located in the River Cam and River Chelmer valleys (approximately 35m AOD) and the highest area of the District, at the headwaters of the River Stort in the northwest of the District rising to approximately 147.0m AOD.

3.1.2 Geology and soils

The geology of the catchment can be an important influencing factor on the way that water runs off the ground surface. This is primarily due to variations in the permeability of the surface material and bedrock stratigraphy.

Superficial (at the surface) deposits in Uttlesford District, shown in Map 3,consist of glacial sand and gravel in the river valley networks and widespread diamicton (till) deposits on the valley sides and higher elevations. Although diamicton commonly refers to unsorted glacial deposits it can be formed by a number of processes including deposition by current and ancient river networks, landslides and debris flows.

The underlying geology in the Uttlesford District, shown in Map 4, is split into two distinct regions. To the north of the region the bedrock is composed of White Chalk of Cretaceous age and to the south the bedrock is composed of the London Clay formation, a mixture of clay, silt, sand and gravel. There is band of Lambeth Group bedrock between the two main bedrock types within the District. Geology information can be viewed on the British Geological Society website (http://mapapps.bgs.ac.uk/geologyofbritain/home.html).

As a result of the superficial deposits the soils on the valley sides and higher elevations are loamy and clayey soils which suffer from impeded drainage. Within the river valleys of the district the soils are more freely draining loamy soils. Soil information can be viewed on the Soilscapes website (http://www.landis.org.uk/soilscapes/).

3.1.3 Hydrology

Uttlesford District consists of a number of watercourses flowing away from the centre of the District to beyond its boundary. The principal watercourses in the Uttlesford District are:

- The River Cam (or Granta) in the north of the district;
- The River Pant in the east of the district;
- The River Chelmer and Stebbing Brook in the southeast of the district;
- The River Roding, River Stort, Pincey Brook and Stansted Brook in the south and west of the district.

There are a numerous tributaries to these watercourses including smaller Ordinary Watercourses and unnamed drains. A summary of the principal watercourses within the Uttlesford District are provided in Appendix A.

[13] West Essex: Census profile data (2013). http://www.uttlesford.gov.uk/CHttpHandler.ashx?id=2413&p=0

Uttlesford is one of the driest parts of the UK, with an average annual rainfall of 500 mm.

3.2 Flood history

There is a reasonably good record of historical flooding within the District. A summary of the areas affected and impacts of the major recorded flood events is given in Table 3-1. A detailed and full listing of all recorded events in the District, and sources of information, is provided in Appendix A. Map 5 shows the Environment Agency's Historic Flood Map.

The region is prone to localised flooding, with the main source of flooding from fluvial and surface water sources. Within recent years the February 2014 and October 2001 events have been the most serious, leading to widespread flooding across the District.

Table 3-1: Summary of flood events

Date	Settlement / location	Severity / description of incident
10 November 1875	Saffron Walden	1.02 inches of rain fell in two to three hours during the night and resulted in flooding.
5 August 1917	Saffron Walden	3.08 inches of rain recorded in 2 hours caused much flooding.
19 September 1960	Saffron Walden	Police worked late into night placing warning traffic lights on flooded roads; houses in some villages completely covered by flood water.
Summer 1987	Ashdon	48 properties including 21 residential properties flooded in 3 separate events.
October 2001	Clavering, Manuden, Stansted Mountfitchet, Great Chesterford, Littlebury, Newport, Saffron Walden, Little Walden, Great Dunmow, Ashdon	Widespread fluvial flooding across District. At least 95 flood incidents reported.
January 2003	Widespread across district.	70 flood incidents reported for 1st to 3rd January.
14 June 2007	Ashdon	14 properties flooded and roads blocked.
7 February 2014	Saffron Walden, Newport, Wendens Ambo, Debden, Stansted, Arkesden, Ashdon, Quendon, Henham, Stansted Mountfitchet.	Widespread flooding through District (particularly north west).
23 November 2014	Clavering, Berden, Manuden, Wimbish	Persistent rain brought return of flooding to villages affected in February 2014.

3.3 Fluvial flood risk

Fluvial flooding is flooding caused by high flows in rivers or streams exceeding the capacity of the river channel and spilling onto the floodplain, usually after a period of heavy rainfall. Fluvial risk is present on both Main Rivers (which are the responsibility of the Environment Agency and riparian owners) and Ordinary Watercourses (which are the responsibility of the Council and riparian owners).

The fluvial risk from Main Rivers has been discussed below by river catchment area. Where Ordinary Watercourses impact upon key settlements they have been discussed in Appendix B. Most of the minor rivers (or Ordinary Watercourses) in the District are upstream reaches of Main Rivers.

3.3.1 Fluvial flood risk by catchment

There are numerous Main Rivers in the Uttlesford District which form part of three larger catchment areas; the Great Ouse catchment in the north, the North Essex catchment in the east and the Thames catchment in the southwest of the District respectively. The watercourses within the District are described in Appendix A. Fluvial flood risk is shown by the Environment Agency Flood Zones in Map 6. More information on the definition of the Flood Zones is given in Section 4.1.1.

Within the Great Ouse catchment the primary fluvial flood risk is from the River Cam (or Granta) and from the River Slade. The River Cam (or Granta) has its source near Widdington and

continues as an Ordinary Watercourse for 4km. It is a source of flood risk along its course for the settlements of Newport, Wendens Ambo, Audley End, Little Chesterford and Great Chesterford.

Saffron Walden is at flood risk from the River Slade, a tributary of the River Cam (or Granta). The River Slade consists of three branches, the north and east of which converge at the sewerage works, whereas the east and the south converge at the corner of Audley Road and East Street. The Slade is a highly modified with much of the watercourse culverted within Saffron Walden. Within Saffron Walden, 188 properties are at risk of flooding from The Slade in a 1% annual probability flood event[14].

Within the North Essex catchment the main concentration of properties at risk are located within Great Dunmow on the River Chelmer. The River Chelmer also flows through the settlements of Thaxted, Great Easton, Mill End and Little Dunmow. The River Pant and Stebbing Brook are also a source of flood risk in the area; however, the consequences of flooding are low as people and properties are located in smaller towns and villages throughout the rural area.

Within the Thames catchment the primary fluvial flood risk is in Stansted Mountfitchet from the Stansted Brook and Ugley Brook. The two watercourses converge at the intersection of the railway line with Church Road where the flood risk is greatest. Downstream of Stansted Mountfitchet the Stansted Brook converges with the River Stort and Bourne Brook and then flows through Bishop's Stortford in the neighbouring district of East Hertfordshire. The risk of fluvial flooding in Bishop's Stortford is high and it should be noted that winter flooding of the upstream undeveloped floodplain in Uttlesford is a regular occurrence and this floodplain provides a large area to store water which reduces the risk to downstream communities such as Bishop's Stortford. Elsewhere in the Thames catchment there is risk to small communities from the River Roding and Pincey Brook.

3.4 Flood defences, assets and structures

The Flood Zones do not take into account the effect of flood defences and assets on flood risk. Three broad scale 'national' GIS layers are provided alongside the Flood Map which define flood defences: Defences (recognised formal defences with a standard of protection of 1% or greater annual probability), Areas Benefiting from Defences (ABD) and Flood Storage Areas.

The Environment Agency has also provided more detailed local data from its Asset Information Management System (AIMS) system, which is a database of all known assets on Main Rivers. AIMS data was provided for two of the three Environment Agency areas which cover the District. The data is in GIS format and includes points (e.g. for individual structures like weirs and bridges) and lines (e.g. for embankments or walls). This database includes both structures owned or maintained by the Environment Agency, by the Districts and by third parties. Data was not available for the Cambridgeshire and Bedfordshire area, including the Cam and The Slade.

Essex County Council provided an asset database which covered certain locations in detail including Chrishall, Radwinter Farm, Elsenham (specifically Old Mead Lane), Takeley (specifically Dunmow Road), Little Canfield (specifically Fleming Road), Hatfield Heath, Pleshey.

The available flood defence/asset data is shown on Map 7 and summarised below. The Essex County Council data was too detailed to show on Map 7, but the database has been converted to a GIS format and provided digitally with this report.

3.4.1 Flood defence structures and raised defences

The Environment Agency's national Defences layer (recognised formal defences with a standard of protection of 1% or greater annual probability) identifies nine flood defences within the Uttlesford District (Map 5). Two are located in Clavering and three in Manuden for protection from the River Stort. These are local earth embankments raised above the adjacent ground. Whilst there are numerous flood defences over the boundary in Bishop's Stortford there are also four located on the River Stort downstream of Bishop's Stortford on the boundary between Uttlesford District and East Hertfordshire District. These are earth embankments with either the towpath running along or alongside the crest.

There is an Area Benefiting from Defences (Map 7) located on the River Stort downstream of Bishop's Stortford adjacent to one of the defences. There is a flood storage area (FSA) identified

[14] Environment Agency (January 2011) Great Ouse Catchment Flood Management Plan Summary Report

at the Balancing Ponds at London Stansted Airport and two located at the confluence of the Stansted Brook and Bourne Brook, upstream of Stansted Mountfitchet, between the railway tracks.

The AIMS dataset describes point and linear flood defence and asset features. The majority of the points are single structure assets such as weirs, bridges and control structures that affect or control water levels in the event of a flood (shown on Map 7). The descriptions of the linear features vary and include embankments, natural banks, high ground and culverts - most could not be described as formal defences but they may locally affect the movement of water in a flood. Most are privately owned with a few under Local Authority ownership. Map 7 highlights those described as 'embankments' and 'culverts'.

3.4.2 Culverts

Culverts can increase flood risk, due to either blockages of the culvert itself or trash screens, or because they are hydraulically inadequate due to under-capacity or condition. The risk of flooding can be exacerbated as a result of culverts and trash screens not being regularly maintained. Responsibility for maintenance of culverts can sometimes be difficult to determine between riparian owners, Uttlesford District Council, Essex County Council and the Environment Agency. As well as contributing to flooding, culverts can be problematic in ecological terms often causing Water Framework Directive (WFD) compliance issues.

Saffron Walden has a number of significant structures including two long culverts on the Thaxted Slade, two long culverts on the Kings Slade and a culvert on the Madgate Slade[15]. A 60m length of the Elizabeth Way culvert was found to be in danger of collapse in 2007[16] and was replaced in 2013. The Environment Agency has an ongoing programme of inspections and repairs to the culverts. They have also carried out modelling of the long culvert on the Kings Slade in the town centre to determine the effect of a blockage scenario at the entrance at Common Hill[17]. The study modelled what would happen if the culvert became 100% blocked in a 1 in 100 year event. It found that water unable to flow through the culvert begins to flow over the road at Common Hill, down Hill Street and Georges Street across High Street towards Park Lane and New Pond Lane. The flood extent is similar to Flood Zone 2 (because the higher 1 in 1000 year flow causes the culvert to surcharge). Approximately 148 additional properties are at risk in the 1 in 100 year event if the culvert becomes blocked. The Environment Agency can be contacted for more information.

A 2002 report investigated the flooding which occurs along Gall End Lane and Lower Street in Stansted Mountfitchet from the Ugley Brook culvert[18]. The first of three sections which make up the culvert is 825mm in diameter which can result in capacity exceedances during larger rainfall events; this can be further exacerbated as a result of trash screen blockages with debris. The study indicated that the area around the culvert has a Standard of Protection of 1 in 10 years (it is only protected against floods with a 10% or more chance of occurring each year).

3.4.3 Future local flood alleviation schemes (FAS)

The Hertfordshire and North London Environment Agency area provided a list of future schemes which would reduce flooding within Uttlesford. These schemes were:

1. Stansted Mountfitchet Flood Alleviation Scheme - an initial assessment of combined pluvial and fluvial flooding within Stansted Mountfitchet is currently ongoing.
2. Clavering and Manuden Flood Alleviation Scheme - the issue is an undersized culvert causing the river to surcharge, therefore a proposed solution is to increase culvert capacity or attenuate high flows.
3. Takeley - Frequent blocking of a culvert is to be remedied by installing a new screen and de-culverting

No information regarding future flood alleviation schemes in the Cambridgeshire and Bedfordshire or Essex Norfolk and Suffolk Environment Agency areas was received.

[15] JBA (2007) River Slade Standard of Protection Study. On behalf of the Environment Agency.

[16] Uttlesford District Council (20 September 2007) Elizabeth Way Culvert, Saffron Walden, Finance and Administration Committee, item 8

[17] Environment Agency (September 2013) Saffron Walden Culvert Blockage Analysis: Final Technical Note.

[18] Atkins (2002) Ugley Brook Priority Study. On behalf of the Environment Agency.

Essex County Council are currently implementing a Flood Alleviation Scheme in Thaxted[19].

3.5 Surface water flooding

Flooding of land from surface water runoff is usually caused by intense rainfall that may only last a few hours, and tends to occur in lower lying areas, often where the drainage system is unable to cope with the volume of water. Surface water flooding problems are inextricably linked to issues of under-capacity or blocked drainage, and sewer flooding.

The geology of Uttlesford (see Section 3.1), particularly in the south of the District, has large areas underlain with clay deposits. Extensive areas of clay and undulating topography results in the study area responding quickly to rainfall events and therefore increases the risk of surface water flooding. In addition, built up areas with a large percentage coverage of man-made impervious surfaces may also be at risk of surface water flooding, especially when local intense rainstorms occur.

Surface water flooding is a problem throughout the District with reported incidents referring to runoff from fields and drains being unable to cope with the storm water. Saffron Walden has been identified as a Tier 2 area of local flood risk due to its surface water risk and flood history, and Clavering, Great Dunmow, Manuden, Radwinter, Takeley, Thaxted and Stansted Mountfitchet have been identified as Tier 3 areas. Other areas within Uttlesford that have been identified as having a surface water flooding problem through the flood history review include Little Hallingbury and Little Dunmow.

The Environment Agency's updated Flood Map for Surface Water (uFMfSW) is provided in Map 8. The uFMfSW is a national scale modelled output that shows the flooding that takes place from the 'surface runoff' generated by rainwater (including snow and other precipitation) which:

a. is on the surface of the ground (whether or not it is moving), and

b. has not yet entered a watercourse, drainage system or public sewer.

The uFMfSW predominantly follows topographical flow paths of existing watercourses or dry valleys with some isolated ponding located in low lying areas.

If the uFMfSW indicates a risk to an Area of Search this has been discussed in further detail in Appendix B. It should be noted that because of its broad-scale nature, wherever possible, these mapped outlines should be used in conjunction with other sources of local flooding information to confirm the presence of a surface water risk. Any site-specific FRA would need to adequately assess the risk from surface water flooding; not only at the site but to also ensure there is not an increased risk of flooding to areas downstream. Further guidance for planners and developers is provided in Section 6.

3.6 Groundwater flooding

In comparison to fluvial and tidal flooding, the understanding of the risks posed by groundwater flooding is limited and mapping of flood risk from groundwater sources is in its infancy. The risks and mechanisms of groundwater flooding have traditionally been poorly reported. However, under the Flood and Water management Act (2010), the LLFA now has powers to undertake risk management functions in relation to groundwater flood risk.

The risk of groundwater flooding is dependent on local conditions at any given time. Groundwater levels rise during wet winter months, and fall again in the summer when effective rainfall is low and extractions are higher. In very wet winters, rising groundwater levels may lead to the flooding of normally dry land, as well as reactivating flow in streams that only flow for part of the year.

The north of Uttlesford is underlain by a chalk aquifer; however, due to the actual depth (20 to 50m) of the water table compared to the ground surface and the clay till that overlays the underlying chalk the risk from groundwater flooding is low.

The Environment Agency's Areas Susceptible to Ground Water Flooding (AStGWf) map is provided in Map 9. The AStGWf is a strategic scale map showing groundwater flood areas on a 1km square grid. The data was produced to annotate indicative Flood Risk Areas for PRFA studies and allow the LLFAs to determine whether there may be a risk of flooding from groundwater.

[19] Comment in meeting 01/12/2015

The map indicates the proportion of each 1km grid square for which geological and hydrogeological conditions show that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring. The dataset covers a large area of land, and only isolated locations within the overall susceptible area are actually likely to suffer the consequences of groundwater flooding.

The AStGWf data should be used only in combination with other information, for example local data or historic data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. The data can however help to identify areas for assessment at a local scale where finer resolution datasets exist

The AStGWf mapping shows that the region is generally at low risk from groundwater flooding. The main areas at risk of groundwater emergence are the superficial deposits (glacial sand and gravels) in the river valleys. These deposits tend to have a shallow water table and are drained by the surface watercourses running through them. When water levels in these watercourses are high, less groundwater is able to drain away, leading to water-logging and groundwater emergence.

There are only two historical records that were recorded as 'groundwater flooding' in Uttlesford, at Hatfield Broad Oak and Debden. The risk from groundwater flooding is considered to be low.

3.7 Flooding from sewers

Sewer flooding occurs when intense rainfall overloads the sewer system capacity (surface water, foul or combined), and/or when sewers cannot discharge properly to watercourses due to high water levels. Infiltration (entry of soil or groundwater into the sewer system via faults within the fabric of the sewerage system) is another cause of sewer flooding. Infiltration is often related to high groundwater levels, and may cause high flows for prolonged periods of time. Sewer flooding can also be caused when problems such as blockages, collapses or equipment failure occur in the sewerage system.

Since 1980, the Sewers for Adoption guidelines have meant that most new surface water sewers have been designed to have capacity for a rainfall event with a 1 in 30 chance of occurring in any given year, although until recently this did not apply to smaller private systems. This means that, even where sewers are built to current specification, they are likely to be overwhelmed by larger events of the magnitude often considered when looking at river or surface water flooding (e.g. a 1 in 100 chance of occurring in a given year). Existing sewers can also become overloaded as new development adds to their catchment, or due to incremental increases in roofed and paved surfaces at the individual property scale (urban creep). Sewer flooding is therefore a problem that could occur in many locations across the study area.

Anglian Water and Thames Water provided extracts from their Sewer Flooding Registers for the purposes of the SFRA. These are water-company held registers of properties which have experienced sewer flooding due to hydraulic overload, or properties which are 'at risk' of sewer flooding more frequently than once in 20 years. In total there are 31 recorded properties at risk of sewer flooding within Uttlesford, eight within the Anglian Water region and 23 within Thames Water's region. The records were provided in slightly different formats by postcode area, and are summarised in Table 3-2 and Table 3-3. Map 10 displays the locations and number of properties on the sewer flooding register in Uttlesford.

Table 3-2: Anglian Water sewer flooding register for Uttlesford

Post code area	Locations covered by postcode	Internal flooding	External flooding	Total
CM6 1F	Great Dunmow	0	1	1
CM6 1H	Great Dunmow	0	1	1
CB11 3U	Wicken Bonhunt, Newport	0	4	4
CB10 1A	Saffron Walden	1	1	2
Total		**1**	**7**	**8**

Table 3-3: Thames Water sewer flooding register for Uttlesford

Post code area	Locations covered by postcode	Internal flooding	External flooding	Total
CB11 4	Arkesden, Clavering, Saffron Walden, Wendens Ambo, Langley	0	2	2

	Upper Green, Littlebury, Elmdon, Great Chesterford			
CM22 6	Takeley, Elsenham, Ugley, Henham	0	1	1
CM22 7	Hatfield Broad Oak, Hatfield Heath, Great Hallingbury, Little Hallingbury	1	1	2
CM23 2	Bishop's Stortford	2	0	2
CM23 3	Bishop's Stortford	1	0	1
CM23 5	Bishop's Stortford, Birchanger	1	7	8
CM24 8	Stansted Mountfitchet	0	7	7
Total		**5**	**18**	**23**

3.8 Flooding from reservoirs, canals and other artificial sources

3.8.1 Reservoirs

Reservoirs are artificial lakes where water is collected and stored behind a man-made structure and released under control either to control downstream flows or to meet a requirement when needed for purposes such as irrigation, municipal needs or hydroelectric power[20]. A reservoir is considered large if volume exceeds 10,000 cubic metres[21]. However, at the time of preparing this version of the SFRA special measures relating to the assessment of reservoir risk only apply to reservoirs with a storage capacity greater than 25,000 cubic metres.

Flooding from reservoirs may occur following partial or complete failure of the control structure designed to retain water in the artificial storage area. It is estimated that although the risk of such failure is low and the occurrence of complete reservoir failure is exceptionally rare since the introduction of safety legislation in 1930, 1.1 million properties in England are in areas to be considered at risk of flooding from reservoir failure[22].

Reservoir flooding is very different from other forms of flooding. It may happen with little or no warning and evacuation would need to happen immediately. The likelihood of such flooding is very difficult to estimate, but it is less likely than flooding from rivers or surface water. It may not be possible to seek refuge from floodwaters upstairs as buildings could be unsafe or unstable due to the force of water from the reservoir breach or failure. The Environment Agency maps represent a credible worst case scenario. In these circumstances it is the time to inundation, the depth of inundation, the duration of flooding and the velocity of flood flows that will be most influential.

There are five reservoirs in Uttlesford District, displayed in Table 3-4. The risk of flooding from these reservoirs can be viewed on the Environment Agency's website[23]. There have been no recorded instances of flooding from these reservoirs. According to the Environment Agency's Risk of Flooding from Reservoirs maps, there are no reservoirs outside of the District that could have an effect within the District.

Table 3-4: Reservoirs in the Uttlesford District

Reservoir	Locations (grid reference)	Reservoir owner	Environment Agency area	Local authority
Little Easton reservoir	560303, 224220	Trembath	Essex, Norfolk and Suffolk	Essex
Balancing Pond C	554966, 221427	Stansted Airport Ltd	Hertfordshire and North London	Essex
Kingstons reservoir	555577, 212874	McGowan	Hertfordshire and North London	Essex
Hatfield Forest Lake	554187 219751	The National Trust	Hertfordshire and North London	Essex
Shrubbs Farm Reservoir	551864, 213504	Liddell	Hertfordshire and North London	Essex

[20] Defra – national flood and coastal erosion risk management strategy for England (2011): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/228898/9780108510366.pdf

[21] Flood and Water Management Act 2010 - www.legislation.gov.uk/ukpga/2010/29/pdfs/ukpga_20100029_en.pdf

[22] Defra – national flood and coastal erosion risk management strategy for England (2011): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/228898/9780108510366.pdf

[23] Environment Agency's Risk of Flooding from Reservoirs - http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=reservoir#x=357683&y=355134&scale=2

3.8.2 Canals

There are no canals within Uttlesford District.

3.9 The impact of climate change

3.9.1 Fluvial flooding

A climate change outline for the 1 in 100 year event (Flood Zone 3a plus climate change) for the period up to 2115 has been provided in Map 6 as well as information provided for individual Areas of Search in Appendix B. Further detail on the choice of climate change scenario used for this SFRA is given in Section 4.1.4.

The effect of climate change on the fluvial flood extents tends to be small in the district because Uttlesford covers the upper reaches of three river basins. This means the topography is relatively steep resulting in a confined floodplain. The largest increase in flood extent is on the River Cam in Newport, The Slade system in Saffron Walden and in Clavering on the River Stort.

However, climate change does not just affect the extent of flooding. It is important to remember that even where extent does not significantly increase; flooding is likely to become more frequent under a climate change scenario. For example, what is currently an event with a 2% probability of occurring in any one year, may increase to say a 5% probability under climate change.

The impact of an event with a given probability is also likely to become more severe. For example as water depths, velocities and flood hazard increase, so will the risk to people and property.

Although qualitative statements can be made as to whether extreme events are likely to increase or decrease over the UK in the future, there is still considerable uncertainty regarding the magnitude of the localised impact of these changes.

3.9.2 Surface water

Climate change is predicted to increase rainfall intensity in the future by up to 30% (the recommended national precautionary sensitive range for 2085 to 2115). This will increase the likelihood and frequency of surface water flooding across catchments, but particularly in impermeable urban areas that are already susceptible such as Clavering, Great Dunmow, Manuden, Radwinter, Takeley, Thaxted, Stansted Mountfitchet, Little Hallingbury and Little Dunmow.

3.9.3 Groundwater

The effect of climate change on groundwater flooding, and those watercourses where groundwater has a large influence on winter flood flows is more uncertain. Milder wetter winters may increase the frequency of groundwater flooding incidents in areas that are already susceptible, but warmer drier summers may counteract this effect by drawing down groundwater levels to a greater extent during the summer months.

4 Mapping and the sequential risk-based approach

4.1 How flood risk for planning is assessed

4.1.1 Flood Map for Planning (Rivers and Sea) (Flood Zone 2 and 3a)

The NPPF sets out a sequential approach to steer new development to areas with the lowest probability of flooding. This is initially based on the Flood Map for Planning (Rivers and Sea), as provided by the Environment Agency, but should be refined by the SFRA to take into account the probability of flooding, other sources of flooding and the impact of climate change.

The Flood Map for Planning (Rivers and Sea) is made up of a suite of GIS layers, including Flood Zone 2 and 3a, Defences, Areas Benefiting from Defences and Flood Storage Areas.

The Flood Zones describe the land that would flood from rivers if there were no defences present. They are based on broad scale modelling that has been refined with detailed hydraulic models in areas of higher risk. Areas Benefiting from Defences can be identified using the accompanying layers.

Where outlines are not informed by detailed hydraulic modelling, the Flood Map for Planning is based on generalised modelling to provide an indication of flood risk. Whilst the generalised modelling is generally accurate on a large scale, they are not provided for specific sites or for land where the catchment of the watercourse falls below 3km^2. For this reason, the Flood Map for Planning is not of a resolution to be used as application evidence to provide the details of possible flooding for individual properties or sites and for any sites with watercourses on, or adjacent to the site. Accordingly for site specific assessments it will be necessary to perform more detailed studies in circumstances where flood risk is an issue. Where the Flood Map for Planning is based on generalised modelling, developers should undertake a more detailed analysis and assessment of the flood risk at the planning application stage.

The most up to date version of the Flood Map for Planning (Rivers and Sea) should always be used, and can be viewed on the Environment Agency's website[24].

For planning purposes under the NPPF, a more detailed breakdown of risk within the Flood Zones is required, and the SFRA is required to define Flood Zone 3b (also known as Functional Floodplain) and Flood Zone 3a with climate change, using more detailed data from hydraulic models where available. These layers are shown on Map 6.

4.1.2 Hydraulic modelling

A number of detailed fluvial hydraulic models and outputs were available from the Environment Agency that have been used to define the Flood Zones on some rivers. These include:

- Upper & Middle Stort Flood Mapping Model - 1D-2D ISIS-TUFLOW model, last updated 2010
- Upper Roding Modelling Study - 1D-2D ISIS-TUFLOW model, under development by JBA at the time of writing this report however the Environment Agency gave their permission for the draft model and outputs to be available for use within this study.
- Upper Roding Section 105 Modelling - 1D ISIS only model, last updated 2003; not used within this study
- River Chelmer SFRM Study - 1D-2D ISIS-TUFLOW model, last updated 2010
- River Cam Flood Mapping Improvements Phase 2 - 1D-2D ISIS-TUFLOW model, last updated 2012. Used in this study for The Slade only.
- River Cam & Tributaries Mapping Study - 1D-2D ISIS-TUFLOW model, last updated 2014.

4.1.3 Functional floodplain (Flood Zone 3b)

The 'functional floodplain' is defined as an area of land where water has to flow or be stored in times of flood. This forms Flood Zone 3b in terms of the NPPF. Following discussion between the Council and Environment Agency, the following definition of the functional floodplain was agreed:

- Use the 1 in 20 year modelled flood extent wherever suitable hydraulic models are available. In the case of the River Cam, River Granta and The Slade the 1 in 25 year modelled flood extent
- Elsewhere, take a precautionary approach and assume that Flood Zone 3a (1 in 100 year flood extent) represents the functional floodplain

The extent is shown in Map 6.

4.1.4 Climate change (Flood Zone 3a plus climate change)

The Flood Map supplied by the Environment Agency does not provide any allowance or information on the impact of climate change on the Flood Zones.

Updated government guidance on assessing the impact of climate change on flooding in line with the UKCP09 Climate Change Projections[25] was released in February 2016[26]. The guidance provides a range of climate change allowances which are dependent on location (by river basin) and timescale of development (epoch). It also provides several bands (termed 'central', 'higher

[24] Environment Agency website - What's in my backyard - Flood Map for Planning (Rivers and Sea) http://apps.environment-agency.gov.uk/wiyby/37837.aspx

[25] UK Climate Projections (UKCP09) http://ukclimateprojections.metoffice.gov.uk/21678

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

central' and 'upper end') to test depending on the vulnerability of the development and the Flood Zone within which it is located. For example for 'more vulnerable' development in Flood Zone 3a, FRAs should use the higher central and upper end estimates to assess a range of allowances.

For the purposes of strategic planning, the key epoch is 2070-2115 as this reflects the lifetime of development; and the key vulnerability is 'more vulnerable'. The key allowances to consider for Flood Zone 3a are therefore the higher central and upper end (35% and 65/70% in Anglian/Thames respectively).

A review of the available data with which to produce a map of Flood Zone 3a plus climate change for Uttlesford found that existing Environment Agency modelling studies for the area were carried out before the new guidance was released. The majority have a 'climate change' flood outline for the 100 year +20% event, with the exception of the two studies of the River Cam and its tributaries (including The Slade), which both used +25%. These outlines reasonably represent the 'Central' allowance for both river basin districts.

Analysis of the 1000 year flow estimation points for these studies (most studies usually include a 1000 year event) shows the average increase for each model is between +39% and +79% above the 100 year flows (see Table 4-1). These outlines can therefore be used as an approximation for the 'Upper end' estimate for most areas. The exception is the River Stort catchment, which is probably more representative of the 'Higher central' estimate.

Table 4-1 Climate change allowances (% increase in river flow)

River basin district	Model	Average % increase on 100 year flow
Anglian	River Chelmer	76%
	River Cam and tributaries	79%
Thames	River Stort	39%
	River Roding	78%

Following discussion with the Environment Agency it was decided to take a precautionary approach based on the assumption that the current Flood Zone 2 outline (1 in 1,000 year flood extent) represents a future Flood Zone 3a taking into account climate change, as shown in Map 6.

There is no direct planning guidance for Flood Zone 3a plus climate change under the NPPF; however, it suggests that the impact of climate change must be taken into account when considering location and potential future flood risks to developments and land uses. Any site-specific FRA must carry out more detailed modelling of climate change (see section 6.4).

4.1.5 Surface Water

Mapping of surface water flood risk in Uttlesford has been taken from the updated Flood Map for Surface Water (uFMfSW) published online by the Environment Agency. This information is based on a national scale map identifying those areas where surface water flooding poses a risk. Surface water flood risk is subdivided into the following four categories:

- High: An area has a chance of flooding greater than 1 in 30 (3.3%) each year
- Medium: An area has a chance of flooding between 1 in 100 (0.1%) and 1in 30 (3.3%) each year
- Low: An area has a chance of flooding between 1 in 1000 (0.1%) and 1in 100 (1%) each year
- Very Low: An area has a chance of flooding of less than 1 in 1000 (0.1%) each year

4.1.6 Updating the Flood Zone mapping

The Environment Agency's Flood Zone 3a and 2 are updated quarterly with any new detailed hydraulic modelling information, and planners and developers should always refer to the most up to date issue.

The Flood Zone 3b and 3a plus climate change provided by the SFRA will not be automatically updated. However, users should be aware that if Flood Zone 3a and 2 have changed, this is an

indication that new modelled information is also available which are could be used to refine Flood Zone 3b and 3a plus climate change.

4.1.7 Identification of flood risk from other sources

Planners and developers should use the evidence and maps presented in this SFRA, along with any other available evidence to identify any risk of flooding from all sources for a particular site. Table 4-2 gives some guidelines on sources of evidence and criteria for identifying a significant level of risk.

Table 4-2: Identifying areas at risk of flooding from all sources

Source of flooding	Sources of evidence	Criteria for identifying risk
Ordinary Watercourses (not included in Flood Zone maps)	Detailed River Network UDC/ECC records Anecdotal evidence	Within 8m of the watercourse Local evidence of historic flooding from the watercourse.
Surface water	Environment Agency Updated Flood Map for Surface Water UDC/ECC records Anecdotal evidence	Within the high, medium or low categories on the uFMfSW Local evidence of surface water flooding in the area.
Groundwater	Environment Agency Areas Susceptible to Groundwater Flooding UDC/ECC records Anecdotal evidence	Risk in highest category on AStGWF. Local evidence of groundwater flooding problems in the area.
Sewer	SFRA Sewer Flooding Map UDC/ECC records Anecdotal evidence	Local evidence of sewer flooding to existing properties on or near the site. Sewer flooding records provided by Thames Water are not detailed enough to identify site-specific risks. However, Thames Water will comment on larger planning applications, and on Local Plans.
Flooding from reservoirs, canals and other artificial sources	Environment Agency reservoir flood plans - can be viewed on the Environment Agency website under Risk of Flooding from Reservoirs[23]	Within flood envelope on Environment Agency reservoir flooding maps. Within 8m of a canal or other waterbody.

4.2 Appropriate development in the Flood Zones

4.2.1 Vulnerability of development

Under the NPPF, development is classed as 'Essential Infrastructure', 'Less Vulnerable', 'More Vulnerable', 'Highly Vulnerable' or 'Water Compatible'. Table 2 and Table 3 of the Planning Practice Guidance provide further detail of the type of development considered appropriate for each Flood Zone, where development is not permitted, and where development is allowed only when the Exception Test is passed.

4.2.2 Appropriate development in the Flood Zones

A concept diagram showing the classification of NPPF Flood Zones graphically is included in Figure 4-1 below. Table 4-3 includes a description and discussion of appropriate development. A fuller discussion of Flood Zones and their relation to planning policy can be found in the NPPF and the Planning Practice Guidance.

Figure 4-1: Definition of Flood Zones

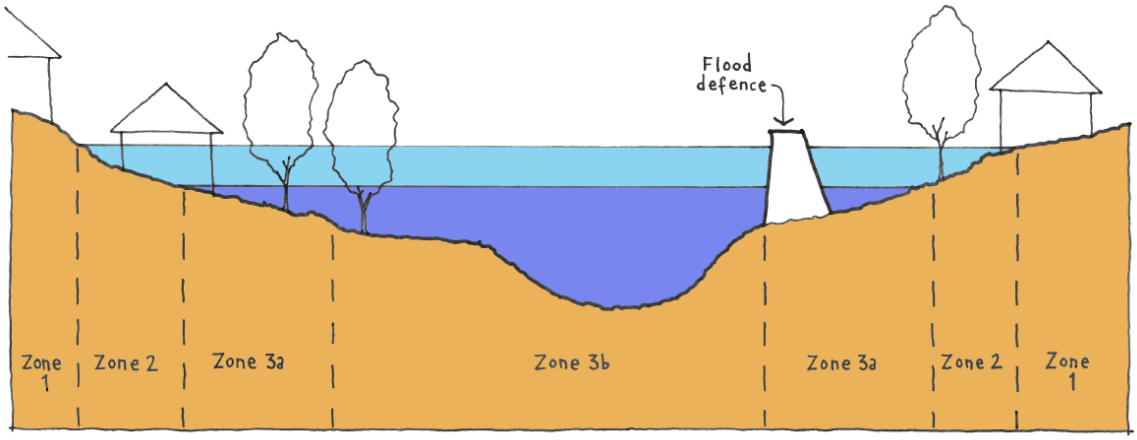


Table 4-3: Flood Zone descriptions

	Probability	Description	Suitable Development under NPPF
Zone 1	Low	This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).	All uses of land
Zone 2	Medium	This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (0.1% - 1%) or between 1 in 200 and 1 in 1000 annual probability of sea flooding (0.1% – 0.5%) in any year.	Water compatible, less vulnerable and more vulnerable uses of land and essential infrastructure are appropriate. The highly vulnerable uses are only appropriate if the Exception Test is passed.
Zone 3a plus climate change		The likely extent of Flood Zone 3a in the future taking into account the effects of climate change.	Assessment of impact only.
Zone 3a	High	This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1.0%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.	Water compatible and less vulnerable uses of land are appropriate. More vulnerable and essential infrastructure should only be permitted if the Exception test is passed. Highly vulnerable uses should not be permitted.
Zone 3b	Function Floodplain	This zone comprises land where water has to flow or be stored in times of flood. SFRAs should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes.	Water compatible uses of land are appropriate. Essential infrastructure should only be permitted if the Exception Test is passed. If the Exception Test is passed essential infrastructure should be designed and constructed to meet a number of flood risk related targets. Less vulnerable, more vulnerable and highly vulnerable uses should not be permitted

4.3 The sequential, risk-based approach

The sequential, risk-based approach outlined in the NPPF and the Planning Practice Guidance is designed to ensure areas with little or no risk of flooding (from any source) are developed in preference to areas at higher risk, with the aim of keeping development outside of medium and high flood risk areas (Flood Zones 2 and 3).

Within Flood Zone 1, a sequential approach should be taken to ensure that, wherever possible, development is situated away from areas at risk from other sources of flooding, including Ordinary Watercourses, surface water, groundwater and sewer flooding.

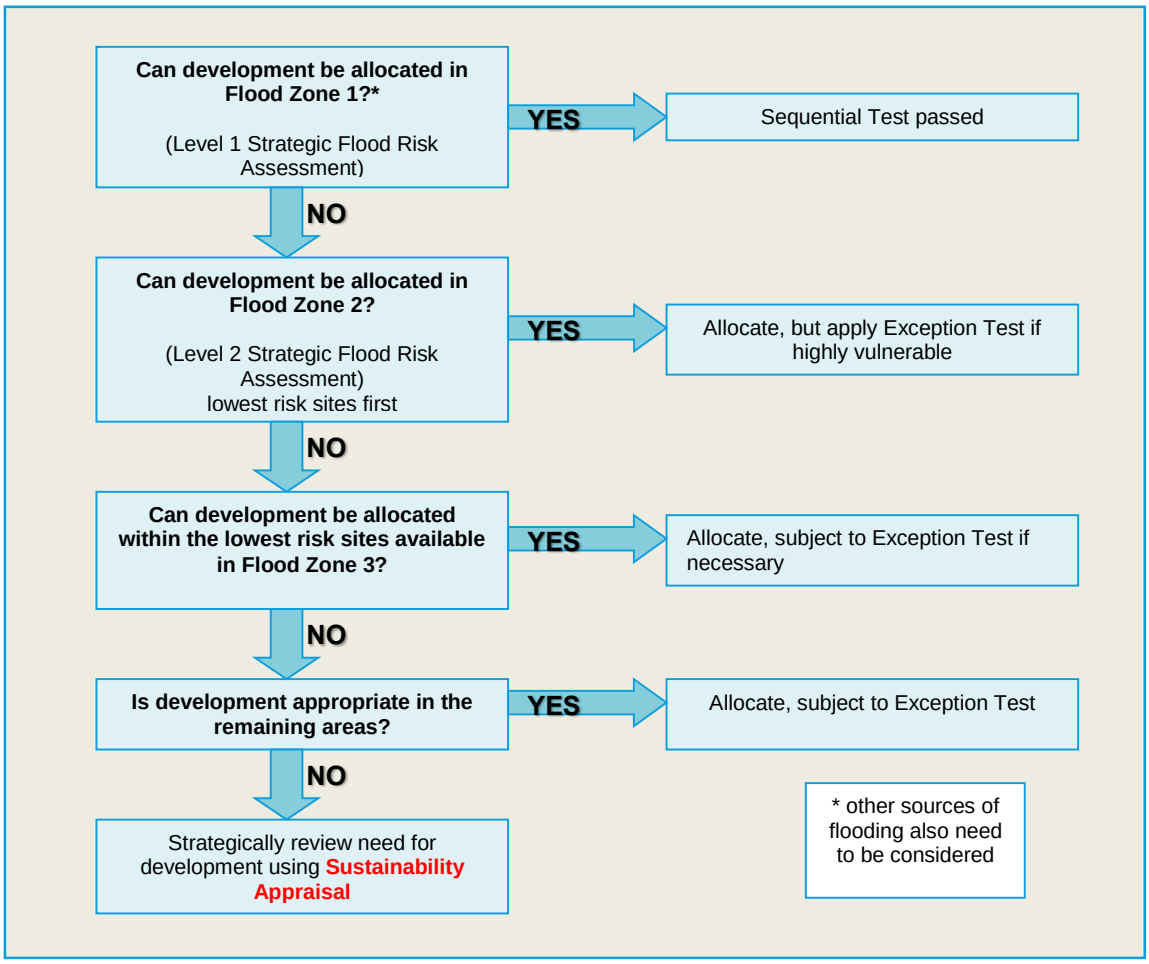
4.3.1 Applying the Sequential Test and Exception Test in the preparation of a Local Plan

When preparing a Local Plan, the LPA should demonstrate it has considered a range of possible site options for development, using SFRAs to apply the Sequential and Exception Tests where necessary.

The Sequential Test should be applied to the whole LPA area to increase the likelihood of allocating development in areas not at risk of flooding. The Sequential Test can be undertaken as part of a local plan sustainability appraisal. Alternatively, it can be demonstrated through a free-standing document, or as part of strategic housing land or employment land availability assessments. The Planning Practice Guidance describes how the Sequential Test should be applied in the preparation of a Local Plan (Figure 4-2).

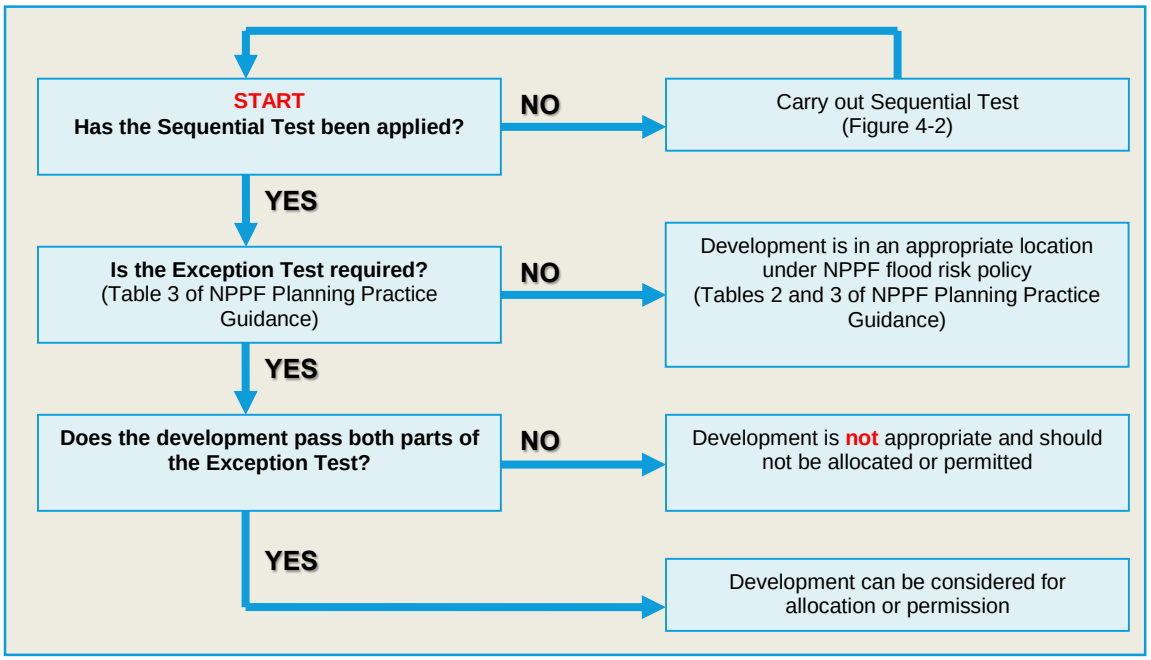
The Exception Test should only be applied following the application of the Sequential Test and as set out in Table 3 of the Planning Practice Guidance. The guidance also explains how the Exception Test should be applied in the preparation of a Local Plan (Figure 4-3). If the Exception Test is required, then a Level 2 SFRA is likely to be needed.

Figure 4-2: Applying the Sequential Test in the preparation of a Local Plan



† Based on Diagram 2 of the Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 020, Reference ID: 7-021-20140306) March 2014

Figure 4-3: Applying the Exception Test in the preparation of a Local Plan



† Based on Diagram 3 of NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 028, Reference ID: 7-021-20140306) March 2014

4.3.2 Applying the Sequential Test and Exception Test to individual planning applications

4.3.2.1 Sequential Test

The Sequential Test must be performed when considering the placement of future development and for planning application proposals. The sequential approach to locating development should be followed for all sources of flooding. The Planning Practice Guidance gives detailed instructions on how to perform the test.

The Sequential Test does not need to be applied for individual developments under the following circumstances:

- The site has been identified in the Local Plan through the Sequential Test
- Applications for minor development or change of use (except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site)

It should not be assumed that individual sites within Flood Zone 1 satisfy the requirements of the Sequential Test. Consideration should be given to flood risks from all sources, areas with known drainage problems and critical drainage areas (if any are designated in the future).

For individual planning applications that do not fall under the above categories, local circumstances must be used to define the area of application of the Sequential Test (within which it is appropriate to identify reasonably available alternatives). The criteria used to determine the appropriate search area relate to the catchment area for the type of development being proposed. For some sites this may be clear, in other cases it may be identified by other Local Plan policies. A pragmatic approach should be taken when applying the Sequential Test.

The Council, with advice from the Environment Agency, are responsible for considering the extent to which Sequential Test considerations have been satisfied, and will need to be satisfied that the proposed development would be safe and not lead to increased flood risk elsewhere.

The information provided in this SFRA can be used to:

- Identify the area to be assessed (including alternatives) on the Flood Zone maps that are provided with this assessment;
- Establish the risk of flooding from other sources
- Follow the instructions given in the Planning Practice Guidance.

4.3.2.2 Exception Test

If, following application of the Sequential Test, it is not possible for the development to be located in areas with a lower probability of flooding the Exception Test must then be applied if deemed appropriate. The aim of the Exception Test is to ensure that more vulnerable property types, such as residential development can be implemented safely and are not located in areas where the hazards and consequences of flooding are inappropriate. For the Test to be satisfied, both of the following elements have to be accepted for development to be allocated or permitted:

Firstly, it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared. The Council will need to consider what criteria they will use to assess whether this part of the Exception Test has been satisfied, and provide advice to enable applicants to provide evidence to demonstrate that it has been passed. If the application fails to prove this, the Council should consider whether the use of planning conditions and/or planning obligations could allow it to pass. If this is not possible, this part of the Exception Test has not been passed and planning permission should be refused.

Secondly a site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime, taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall. Further information on FRAs is given in Section 6.2.

The NPPF and Planning Practice Guidance provide detailed information on how the Exception Test can be applied.

4.3.3 Sites not identified in the Local Plan (windfall sites)

The Local Plan will include sufficient allocation to meet the need for development over the plan period. However, in addition to those sites, other sites may become available. The Local Plan will need to be flexible enough to ensure that where sites can contribute to the sustainable development of the District they can be developed.

In these circumstances the Local Plan will need to contain policies which set out how sites not identified in the Local Plan will require the Sequential Test to be applied on an individual site basis.

Developers should use evidence provided in this SFRA to apply the Sequential Test as well as provide evidence to show that they have adequately considered other reasonably available sites, including other sites allocated as suitable for residential development. When assessing sites not identified in the local plan, the following procedure should be followed

1. Identify if the Sequential Test is required (see Section 4.3.2)
2. If the Sequential Test is required, Environment Agency flood maps and the data in this SFRA should be used to identify what Flood Zone the site is located in
3. If the site is located within Flood Zones 2, 3a or 3b then further information will need to be provided. The scope and considerations for site specific Sequential and Exception tests, if necessary, should be agreed with the Council and the Environment Agency.

When assessing flood risk at windfall sites consideration must be given to Local Plan policies and it must be demonstrated that the proposals are compliant with these higher level policies. This assessment should be included in the site specific FRA.

5 Assessment of flood risk in Areas of Search

5.1 Areas of Search

At the time of production of the SFRA, the Council had identified 14 Areas of Search for the SFRA to assess[27]. These consist of nine new settlement Areas of Search, three urban extension Areas of Search, one Area of Search covering key villages and one covering for smaller 'Type A' villages. For the purposes of this assessment the seven key villages within Area of Search 13 have been assessed individually. The numerous 'Type A' villages were grouped into those located in each of the three major catchments for assessment. Table 5-1 lists the Areas of Search assessed.

This assessment is intended to provide an evidence base for the development of the Local Plan and the application of the Sequential Test.

Table 5-1: Areas of Search assessed by the SFRA

Area of Search number	Name	Type
1	M11 Junction 9a – east	New settlement
2	M11 Junction 9 – west	New settlement
3	Elsenham area	New settlement
4	M11 Junction 8 – north-west	New settlement
5	M11 Junction 8 – south-east	New settlement
6	South of A120, North of Hatfield Forest	New settlement
7	North of A120, west of Great Dunmow	New settlement
8	South of the A120	New settlement
9	West of Braintree	New settlement
10	Saffron Walden	Urban extension
11	Edge of Bishop's Stortford	Urban extension
12	Great Dunmow	Urban extension
13	Stansted Mountfitchet	Key village
13	Great Chesterford	Key village
13	Newport	Key village
13	Thaxted	Key village
13	Elsenham	Key village
13	Takeley	Key village
13	Hatfield Heath	Key village
14	Ashdon, Quendon & Rickling, Chrishall, Debden, Henham (Great Ouse catchment)	Type A Villages
14	Hatfield Broad Oak, Leaden Roding, Birchanger, Manuden, Farnham, Clavering, Little Hallingbury (Thames catchment)	Type A Villages
14	Radwinter, Wimbish, Great Sampford, Felstead, Flitch Green, Stebbing, Great Easton (North Essex catchment)	Type A Villages

[27] Uttlesford District Council (July 2015) Preparing a Justified Local Plan.

5.2 Area of Search summary sheets

Flood risk from all sources has been assessed for each of the above Areas of Search. This information is provided in a 'summary sheet' format for easy reference in Appendix B. Each summary sheet also gives further information about SuDS suitability and implications for development. The following information is provided for each site:

- Geology, soils and hydrology
- Historic flooding
- Flood defences and assets
- Availability of detailed modelling
- Fluvial flood risk summary
- Surface water flood risk summary
- Groundwater flood risk summary
- Sewer flood risk summary
- Reservoir flood risk summary (where applicable)
- Potential downstream impact of development
- Effects of climate change
- Suitability of SuDS
- Implications for potential development

Maps showing the available flood risk information are provided with this report.

5.3 Conclusions

Other planning considerations aside, in this relatively rural district, it should be possible to keep the majority of major developments within Flood Zone 1 and away from other sources of flood risk. The Areas of Search are very large, and so none of them can be ruled out on flood risk grounds; however, all of them have some local flood risk identified. Some of the settlements have already been identified by the LFRMS as Tier 2 or 3 flood risk areas, and there should be close consultation with the LLFA if these are to be taken forward. There are also several Areas of Search where development could have a significant impact on flood risk downstream if SuDS principles and strict controls on runoff are not enforced.

As the preparation of the Local Plan progresses and the sequential approach is applied, it may be found that land in Flood Zone 1 cannot appropriately accommodate all the necessary development (creating the need to apply the NPPF's Exception Test). In these circumstances a Level 2 SFRA should be undertaken to consider the detailed nature of the flood characteristics within the Flood Zones for such sites in more detail (depths, velocities, hazard etc).

There are also likely to be very large sites where a small percentage of the site is within Flood Zone 2 or 3. Here, the expectation must be that all built development is within Flood Zone 1 and Flood Zone areas are preserved as green space. In these cases, detailed site-specific FRAs should be enough to ensure that the Flood Zones are defined by hydraulic modelling, the effect of climate change is considered and that development is compliant with the NPPF. However, the Council may need to consider that such sites will not be able to use their full area for housing, meaning that expected housing numbers may be reduced.

6 Guidance for planners and developers: Flood risk

6.1 Introduction

In terms of planning for future development, the preparation of SFRAs has become essential evidence that is required to help support Local Plans. Planners and developers should follow the online Planning Practice Guidance as a starting point when considering applications for new development. In addition, developers should engage with the LPA (Uttlesford District Council), LLFA (Essex County Council) and/or Environment Agency where relevant in the early stages of planning.

6.2 Flood risk assessments in Flood Zone 1, 2 and 3

6.2.1 Consultation and requirements for Flood Risk Assessments

Government guidance is available online for both LPAs and developers setting out the requirements for who should be consulted on flood risk prior to making a planning application and the requirements for a FRA.

The guidance for planning authorities[28] sets out who should be consulted and how to review a flood risk assessment. The guidance for planning applications[29] describes when a flood risk assessment is needed as part of a planning application, how to do one and how it is processed.

Sites which are in Flood Zone 2 or 3, or major developments over 1ha in Flood Zone 1, have a well-established process of flood risk assessment under the NPPF. However, sites in Flood Zone 1 which may be at risk from local sources of flooding (Ordinary Watercourses, surface water, groundwater, sewer flooding, reservoir flooding) can sometimes be missed under the current system.

The LLFA (Essex County Council) and the Council wish to address this by ensuring that all developments classified as 'major developments' in the Development Planning Order (this includes for example minerals and waste development, residential development of 10 or more dwellings, floor space of 1,000m² or more) will be required to consult with the LLFA and submit an FRA and drainage plan at an early stage.

For minor developments, it was agreed that it would be left to the discretion of the LPA and LLFA whether consultation was required. Planners may wish to take advice from the LLFA if a source of local flood risk is identified. This may include, but is not limited to, any site that:

- Is close to an Ordinary Watercourse which is not covered by the Flood Zones because it has a catchment of less than 3km² (Ordinary Watercourses are shown on Map 2).
- Is close to the upstream end of a culvert (known culvert locations are shown on Map 7).
- Is within an area of surface water flood risk on the uFMfSW (see Map 8).

The requirements for consultation, flood risk assessments and drainage plans are outlined in Table 6-1. More detail is given online at https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications[30].

[28] https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities
[29] https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications
[30] https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications

Table 6-1: Consultation and requirements for flood risk assessments

Type of development	Consultation and assessment required
In Flood Zone 2 or 3 including minor development and change of use	Environment Agency (statutory consultee) FRA and drainage plan are mandatory
More than 1 hectare (ha) in Flood Zone 1	Essex County Council (SuDS team) (statutory consultee) FRA and drainage plan are mandatory
Less than 1 ha in Flood Zone 1	Essex County Council (SuDS team) must be consulted for all major developments in Flood Zone 1 and may be consulted for advice for minor developments in areas that have known drainage issues or may be at flood risk from local sources such as Ordinary Watercourses or surface water. FRA and drainage plan may be required.
In an area within Flood Zone 1 which has critical drainage problems	No Critical Drainage Areas have been identified yet within Uttlesford by the LLFA
Minor extensions and certain categories of development in Flood Zone 2.	Follow Environment Agency Standing advice[31]

6.2.2 Carrying out a Flood Risk Assessment

Any proposed development will be required to provide evidence that the Sequential Test and, if required, the Exception Test have been passed (see Section 4.3.2). A preliminary FRA, using data from the SFRA, PFRA and any necessary further modelling work (where detailed modelling has not already been provided as part of the SFRA), will be required to ascertain the level of flood risk for Sequential Test purposes. It is strongly recommended that the Sequential Test, and, if necessary, the Exception Test be satisfied before a full FRA detailing design and mitigation measures is commenced.

Planners and developers are to be aware that a FRA should be appropriate to the scale and size of the development and undertaken by a suitably qualified professional.

The requirements for FRAs in Flood Zone 2 and 3[32] and FRAs in Flood Zone 1[33] are available online. Environment Agency Standing Advice[31] should be followed for minor extensions and certain categories of development in Flood Zone 2. Below are aspects that should be considered as part of an FRA:

Assessing the flood risk:

- Assess risk from all sources of flooding (e.g. fluvial, surface water, sewer, and groundwater) for the lifetime of the development, accounting for climate change.
- Provide an assessment of the risk to an appropriate level of detail using Environment Agency data, LLFA data, hydraulic modelling, and surface water modelling or groundwater investigations as appropriate. Where necessary Ordinary Watercourses may need to be surveyed and modelled as part of the FRA to properly define risk, if the Flood Zone modelling is inaccurate or there is no Flood Zone.
- Proposed developments located in proximity to formal defences, water retaining structures (reservoirs or canals) will require a detailed breach and overtopping analysis to ensure that the residual risk can be managed for the lifetime of the development. The nature of the breach analysis should be discussed with the Environment Agency.

Propose appropriate mitigation measures in response to any identified flood risk, such as:

- Sequentially design the site to locate the built element of the development away from the source of flood risk.

[31] https://www.gov.uk/guidance/flood-risk-assessment-standing-advice
[32] https://www.gov.uk/guidance/flood-risk-assessment-in-flood-zones-2-and-3
[33] https://www.gov.uk/guidance/flood-risk-assessment-in-flood-zone-1-and-critical-drainage-areas

- Substitute less vulnerable development types for those incompatible with the degree of flood risk.
- Finished floor levels should be situated above the 1 in 100-year plus climate change predicted maximum level with a minimum freeboard of 300mm.
- Any new 'More Vulnerable' development, particularly involving the creation of new residential units, will require dry access and egress up to the 1 in 100 year flood event, with an allowance for climate change over the lifetime of the development.
- Demonstration that suitable flood resilience/ resistance and emergency escape measures have been incorporated where appropriate. This may include flood defences, flood resilient and resistant design, effective flood warning and emergency planning.

Ensure that flood risk is reduced overall, for example that:

- Flood flow routes are preserved.
- Floodplain storage capacity is not reduced, and where necessary is compensated for on a level for level basis using land on the edge of the floodplain and above the 1% annual probability (1 in 100) with an allowance for climate change flood extent.

Provide a surface water drainage plan (see also Section 7):

- A FRA must consider how surface water will be managed on the development site. A preliminary drainage plan/strategy at an appropriate level of detail should be fully outlined in the FRA, even at an outline application stage.
- Assess the impact of proposed development upon surface water drainage following any increase in impermeable area. This should include the potential impact upon areas and receiving watercourses downstream, and recommend the approach to control surface water discharge.
- Demonstrate that a proposed development can reduce flood risk elsewhere through the addition of SuDS, to control the potential impact new development may have on the surface water run-off regime.
- Consider the impact of climate change on rainfall intensity as outlined in the NPPF Practice Guidance.
- Appropriate space should be allocated within the site for SuDS.

6.3 Functional floodplain (Flood Zone 3b)

The functional flood plain is defined as “land where water has to flow or be stored in times of flood.” Only water-compatible uses are allowed in this Flood Zone. Essential infrastructure can be permitted after the Exceptions Test is passed. Essential Infrastructure is defined as essential transport infrastructure (including mass evacuation routes); and strategic utility infrastructure (including electricity generating power stations, grid and primary stations). Therefore essential infrastructure built within the functional floodplain should:

- Remain operational and safe for users in times of flood;
- Result in no net loss of floodplain storage;
- Not impede water flows.
- Not increase flood risk elsewhere.
- Not impact upon the groundwater regime

The Council should be seeking risk reduction on any sites within Flood Zone 3b. When such land comes up for redevelopment, planning applications should strive for:

- Removal of buildings, culverts and other structures, and restoration of the functional floodplain, including linkage between the watercourse and floodplain.
- Changing the land use to a less vulnerable classification.
- Changing the layout and form of the development (e.g. reducing the building footprint).
- Preserving flow routes.
- Improving conveyance/storage, e.g. replacing solid building with floodable structures.
- Sequential approach to design of site (see Section 6.5)

6.4 Assessing the impact of climate change for flood risk assessments

At all stages of the development process it is important to understand not only the current flood risk to a site but also the flood risk for the lifetime of the development, taking into account the future impact of predicted climate change.

Flood Zone 3a plus climate change (Map 6) is based on existing information (see section 4.1.4 for more details on how the Flood Zone 3a plus climate change was produced for Uttlesford) and provides a starting point for applying the Sequential Test. However, more detail will be required for any site-specific FRA.

An FRA must demonstrate that the impact of climate change on the development has been taken into account and, if appropriate, mitigated against. Government guidance on assessing climate change in flood risk assessments can be found at:

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

The guidance provides a range of climate change allowances which are dependent on location (by river basin) and timescale of development (termed 'epoch'). Different allowances are given for different epochs but it is envisaged that the '2070-2115' epoch will be appropriate for most developments (Table 6-2).

The guidance also gives several categories (termed ‘central’, ‘higher central’ and ‘upper end’) to test depending on the vulnerability of the development and the Flood Zone within which it is located (summarised in Table 6-3). For example for 'more vulnerable' development in Flood Zone 3a, FRAs should use the higher central and upper end estimates to assess a range of allowances.

When carrying out an FRA, it may be necessary to carry out new or additional modelling to properly test these climate change allowances. It is advisable to contact the Environment Agency to establish what is expected for any particular site, and whether any new modelling is available.

Table 6-2: Climate change allowances (% increase in river flow)

River basin district	Allowance category	Total potential change anticipated for the ‘2080s’ (2070 to 2115)
Anglian	Upper end	65%
	Higher central	35%
	Central	25%
Thames	Upper end	70%
	Higher central	35%
	Central	25%

Table 6-3: Using peak river flow allowances in FRAs

	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Flood Zone 2	Higher central/upper end	Higher central/upper end	Central/higher central	Central	None
Flood Zone 3a	Upper end	Development not permitted	Higher central/upper end	Central/higher central	Central
Flood Zone 3b	Upper end	Development not permitted	Development not permitted	Development not permitted	Central

6.5 Sequential site design

Flood risk should be considered at an early stage in deciding the layout and design of a site to provide an opportunity to reduce flood risk within the development. In particular large development proposals may include a variety of land uses of varying vulnerability to flooding.

Where a large site covers more than one Flood Zone, or varies in flood risk, a sequential, risk-based approach should be applied to try to locate more vulnerable land use to higher ground, while more flood-compatible development (e.g. recreational space) can be located in more high risk areas subject to appropriate management.

Low-lying waterside areas, or areas along known surface water flow routes, can be used for recreation, amenity and environmental purposes, allowing the preservation of flow routes and flood storage, and at the same time providing valuable social and environmental benefits contributing to other sustainability objectives.

Landscaping should ensure safe access to higher ground from these areas, and avoid the creation of isolated islands as water levels rise.

6.6 Change of use and redevelopment within Flood Zones 2 and 3

Below are recommendations for specific flood risk management policies within Flood Zones 2 and 3 which could be applied in order to reduce flood risk overall. There is an opportunity for the Council to incorporate these policies into site allocations and Development Management policies within the Local Plan respectively:

- On change of use of sites, opportunities should be taken to reduce vulnerability to flooding, by promoting less vulnerable and water compatible land uses.
- On redevelopment of a site, opportunities should be taken to reduce the building footprint, thus improving floodplain storage and flow paths. Also, opportunities should be considered for the allocation of SuDS to be included with the revised footprint.
- Extensions to existing properties should not be permitted in Flood Zone 3a, unless their design is flood resilient.
- Residential developments above shops in Flood Zone 3 should demonstrate that dry access and egress will be maintained. Where this is not feasible, safe access should be ensured. Where safe access cannot be achieved, the production of a Flood Emergency Plan needs to be undertaken (this will be reviewed by the Council's Emergency Planners).

6.7 Assessing residual risk from flood defences and culverts

Developers should consult Map 7 to determine the location of defences. An FRA should consider the mechanisms of potential failure, the standard of protection, the worst case scenario breach and the residual risk. Parameters for the breach should be discussed with the Environment Agency prior to the building of a hydraulic model.

Where a culvert is present, an FRA must consider risk from the culvert being blocked. Advice on what blockage scenario(s) to consider in an FRA varies on a case by case basis and should be sought from the Environment Agency (in the case of Main Rivers) or from the LLFA for Ordinary Watercourses.

6.8 Making development safe

6.8.1 Flood resistance and resilience

Resistance and resilience measures are measures which reduce the impact of flooding or increase the ability of people or buildings affected to recover from flooding. However, these measures should not be used to justify development in inappropriate locations. These measures are particularly relevant where minor developments (such as domestic extensions) are allowed in flood risk areas. Further useful guidance is provided in the Planning Practice Guidance, which describes the possible measures:

- Flood resistance measures are used to prevent water from entering a building, e.g. flood barriers across doorways and airbricks; non-return valves and raising flood levels.
- Flood resilience measures are used when water is designed to enter the building, but cause minimal damage and can be quickly returned to use after a flood, e.g. raising electrical sockets, tiled floors.

The measures chosen will depend on the nature of the flood risk. Development vulnerable to sewer flooding will require a different approach to one, for example at risk from flooding from a river.

Further guidance is available in the Department of Communities and Local Government's document, Improving the flood performance of new buildings[34].

6.8.2 Safe access and egress

For development in Flood Zone 3 it is necessary to provide safe access and egress during a flood. Within Flood Zone 3, 'safe' access should remain dry for 'more vulnerable' uses. Dry escape for residential dwellings should be up to the 1% annual probability event (100 year return period) taking into account climate change for fluvial flood risk.

Access should preferably be dry for 'less vulnerable' land use classifications, but if this is not possible the FRA needs to demonstrate that depths and velocities of flood water will be no greater than the 'risks to some' category of the 'Flood Risk to People' FD 2320 calculator.

Within Flood Zone 2, people (including those with restricted mobility) should be able to remain safe inside a new development in the 1 in 1,000-year; and rescue and evacuation of people from a development should be practicable up to a 1 in 1,000-year event. Where safe access and egress cannot be achieved a Flood Emergency Plan needs to be produced (and be assessed by the Council's Emergency Planners).

6.9 River restoration and enhancement

All new development close to rivers and culverts should consider the opportunity presented to improve and enhance the river environment. As a minimum, the Council and developers should aim to set back development 8m from the river, providing a buffer strip to 'make space for water' and allow additional capacity to accommodate climate change. The 8m buffer should not contain any built environment including roads, lighting and fencing.

Developments should look at opportunities for river restoration, de-culverting and river enhancement as part of the development. Restoration can take place on various scales, from small enhancement measures to full river restoration. Options include backwater creation, in-channel and bank habitat enhancement, removal of structures e.g. weirs, removal of toe-boarding, restoration of banks and reinstatement of meanders.

When designed properly, such measures can have benefits such as reducing the costs of maintaining hard engineering structures, reducing flood risk, improving water quality and increasing biodiversity. Social benefits are also gained by increasing green space and access to the river. Advice on river restoration, de-culverting and providing other environmental enhancements on development sites is available from the Environment Agency[35]. Early consultation is recommended.

Any modifications made as part of a proposed opening up and/ or restoration of river channels and corridors should be designed by suitable professionals and a full flood risk assessment of the impact of the modifications will be required to be carried out.

6.10 Existing watercourses and assets

Permanent or temporary works within or adjacent to a watercourse require a Flood Defence Consent from the Environment Agency (in the case of Main Rivers) or Ordinary Watercourse Consent from Essex County Council (in the case of Ordinary Watercourses) under the Land Drainage Act 1991.

Proposed developments which are adjacent to Environment Agency assets, including Main River channels, must demonstrate a minimum clearance of 8m or 9m (depending on the area) from these assets to permit maintenance and renewal.

The Environment Agency have a presumption against allowing further culverting and building over culverts on Main Rivers. All new developments with culverts running through the site should seek to de-culvert rivers for flood risk management and conservation benefit. Existing watercourses and drainage channels should be retained, offering risk management authorities benefits in terms

[34] Department of Communities and Local Government (2007) Improving the Flood Performance of New Buildings: Flood Resilient Construction http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf

[35] Environment Agency (2006). Building a better environment. A guide for developers http://www.environment-agency.gov.uk/static/documents/1_GETH1106BLNE-e-e(1).pdf

of maintenance, future upgrading, biodiversity and pollution prevention. The CIRIA (2010) Culvert Design and Operation Guide provides guidance in this area[36].

Essex County Council culverting policy sets out guideline and principles in relation to culverting on Ordinary Watercourses. Further information can be found at www.essex.gov.uk/flooding. Due to the inherent issues around culverting, consent will only be granted where justification can be given, for example for the purposes of vehicle access.

Where developers are riparian owners, they should also assess existing assets (e.g. bridges, culverts, river walls, embankments) and renew them to last the lifetime of the development. Enhancement opportunities should be sought when renewing assets, e.g. bioengineered river walls, raising bridge soffits to account for climate change. Any works should be designed to be maintenance free, but there is an obligation to the riparian owner to undertake maintenance when required.

6.11 Developer contributions to flood risk improvements

Major development offers a unique opportunity to reduce the level of flood risk, both to the development area, and also to existing communities downstream. Changes to legislation mean that it is now much easier for developers to contribute towards the cost of flood risk management infrastructure.

Without allocated sites, location specific recommendations on developer contributions or strategic options cannot be made at this stage. In the case of Uttlesford, there are no large strategic alleviation schemes planned, but improvements tend to be small scale channel and culvert improvements works. These are generally funded by the LLFA and/or Flood and Coastal Risk Management Grant in Aid (FCRMGiA), central government funding to flood risk management authorities to pay for a range of activities including schemes that help reduce the risk of flooding and coastal erosion.

Developers can be asked to make direct contributions to fund improvements to flood risk infrastructure for communities close to developments, for example:

- If a Section 19 Flood Investigation Report which recommends the improvement or installation of flood defence infrastructure has been completed in the community.
- If it has been shown that the proposed development would increase flood risk from the affected sewers, ordinary watercourses and surface water drainage on the site and/or place undue strains on the existing flood risk management infrastructure on site.
- If the site is in an area at risk from surface water flooding identified on the Environment Agency's uFMfSW.

[36] CIRIA (2010) Culvert Design and Operation Guide. CIRIA report C689

7 Guidance for planners and developers: Surface water runoff and drainage

7.1 Introduction

Sustainable Drainage Systems (SuDS) are management practices which enable surface water to be drained in a more sustainable manner and to endeavour to mimic the local natural drainage. They are now the preferred method for managing surface water runoff from a development area. Individual SuDS are connected in series known as the 'SuDS management train' or 'treatment train', with the aim of reducing flow rates and volumes and minimising pollution. The techniques are applied at a range of scales from prevention through source control and site control to regional control.

Further general guidance on SuDS can be found in the documents and websites below:

- Susdrain website[37] - online community for delivering sustainable drainage.
- Defra Non-statutory Technical Standards for Sustainable Drainage Systems[38]
- CIRIA documents - there are several CIRIA guides relating to SuDS, most notably the recently updated SuDS Manual[39]. The Susdrain website is a good guide to the available documentation.
- National SuDS Working Group Interim Code of Practice for Sustainable Drainage Systems[40]
- Local Authority SuDS Officer Organisation - Non-Statutory Technical Standards for Sustainable Drainage: Best Practice Guidance[41]
- BSI Standards Publication BS8582 Code of practice for surface water management for development sites.[42]

7.2 Site-scale surface water management

The effectiveness of a flow management scheme within a single site is defined by site constraints including (but not limited to) topography, geology, soil permeability, and available area. However even on heavily constrained sites such as space-limited urban redevelopments or sites with poor permeability, there are still SuDS techniques that can provide benefits.

A clear and comprehensive understanding of the catchment hydrological processes (i.e. nature and capacity of the existing drainage system) is essential. Additionally, for infiltration SuDS it is imperative that the water table is low enough and a site specific infiltration test is undertaken. Where sites lie within or close to source protection zones further restrictions may be applicable, and guidance should be sought from the Environment Agency.

The design, construction and ongoing maintenance regime of such a scheme must be carefully defined, and consideration of SuDS design and surface water flow routes from the concept design onwards will ensure that the scheme is effective. FRAs should consider the long-term maintenance and ownership of SuDS.

The destination of surface water that is not collected for use on site should be prioritised, with infiltration preferred, then discharge to surface waters, followed by discharge to a surface water sewer. Discharge to a combined sewer is the least preferred option. Discharge to a foul sewer

[37] Susdrain website http://www.susdrain.org/

[38] Defra (March 2015) Non-statutory technical standards for sustainable drainage systems https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf

[39] CIRIA (2015) The SuDS Manual (C753) http://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx

[40] National SuDS Working Group (2004) Interim Code of Practice for Sustainable Drainage Systems. http://www.susdrain.org/files/resources/other-guidance/nswg_icop_for_suds_0704.pdf

[41] Local Authority SuDS Officer Organisation - Non-Statutory Technical Standards for Sustainable Drainage: Best Practice Guidance http://www.lasoo.org.uk/?publications=non-statutory-technical-standards-for-sustainable-drainage

[42] BSI Standards Publication (2013) Code of practice for surface water management for development sites http://shop.bsigroup.com/en/ProductDetail/?pid=000000000030253266

should not be considered as a possible option. The sewerage undertaker should be consulted at an early stage to ensure that sufficient capacity is available in the existing drainage system.

7.2.1 Local SuDS guidance for Essex

Essex County Council, as LLFA, plays a lead role in ensuring that SuDS are implemented in all new developments. It has produced a SuDS Design Guide[43] to reflect local circumstances and guide SuDS design in Essex, which was formally adopted on 31 March 2015. The guidance sets out a series of local principles and standards to work to in the design of SuDS, intended to supplement the National Standards and aid in the evaluation of SuDS proposals. The local principles highlight the need to plan SuDS at an early stage, consider the multiple benefits of SuDS and consider maintenance and the long-term life of the feature.

Essex County Council SuDS team are a statutory consultee to the planning application process (see Table 6-1). Further detail is provided on their website[44]. It is recommended that the SuDS team are consulted at the pre-application stage of the planning process to make sure that the development meets all of the requirements.

Essex County Council has also developed and adopted a SuDS Adoption Policy[45], stating that they will only adopt SuDS for highways and private water in certain exceptional circumstances.

7.2.2 Design standards

The Defra non-statutory technical standards[38] set a basic minimum for SuDS design in terms of runoff rates and volume. The Essex SuDS Design Guide sets out more stringent local design standards for water quantity and quality and these should be followed for all developments in Uttlesford. In terms of runoff rates and volumes, local standards are as follows:

- SuDS should be designed so that runoff does not occur for the first 5mm of any rainfall event for 80% of summer events and 50% of winter events.
- In all cases, including on brownfield sites, runoff should where possible be restricted to the greenfield 1 in 1 year runoff rate during all events up to and including the 1 in 100 year rainfall event with climate change. If it is deemed that this is not achievable, evidence must be provided and developers should still seek to achieve no increase in runoff from greenfield sites and a 50% betterment of existing run off rates on brownfield sites (provided this does not result in a runoff rate less than greenfield).
- For rainfall events with a return period up to and including the 1 in 100 year rainfall event with an allowance for climate change SuDS should be sized to contain all surface water volumes.
- Safe conveyance routes and overflow flood storage areas must be established and agreed with the SuDs Team for the 1 in 100 year rainfall event with 30% allowance for climate change before adoption.

Further detail on local design standards is given in the Essex SuDS Design Guide.

7.3 Large-scale integrated surface water management

In considering the development of new settlements, Uttlesford has real opportunities for developing an integrated water management strategy across development site boundaries, and a catchment-led approach should be adopted. Integrated drainage systems may be considered suitable for catchments where other development is being planned or constructed, and where on-site measures are set in isolation of the systems and processes downstream.

An integrated approach to controlling surface water drainage can lead to a more efficient and reliable surface water management system as it enables a wider variety of potential flood mitigation

[43] Essex County Council (December 2014) Sustainable Drainage Systems Design Guide
http://www.essex.gov.uk/Environment%20Planning/Environment/local-environment/flooding/View-It/Documents/suds_design_guide.pdf

[44] Essex County Council website - Sustainable Drainage Systems page
http://www.essex.gov.uk/Environment%20Planning/Environment/local-environment/flooding/View-It/Pages/Sustainable-drainage-systems.aspx

[45] Essex County Council (June 2015) SuDS Adoption Policy
http://www.essex.gov.uk/Environment%20Planning/Environment/local-environment/flooding/View-It/Documents/SuDSAdoptionPolicy.pdf

options to be used, and delivers numerous other benefits, including improved water quality and a reduction of water demand through rain-water recycling and reuse.

Considering SuDS at an early master planning stage for new settlements, alongside other planning requirements, for instance green infrastructure and public space/amenity, habitat and landscape needs, water recycling needs (for example to meet Building Research Establishment Environmental Assessment Methodology (BREEAM) targets), enables them to be fully integrated and to contribute to and complement these other requirements. These other benefits can also make SuDS much more economically viable.

7.4 Wastewater

Major developments and those upstream of areas where sewer flooding is known to be a problem must carry out wastewater capacity checks and should liaise with the sewerage undertaker at an early stage to prevent an increase in sewer flooding and/or spills from combined sewer overflows (CSOs) further down the wastewater system as a result of the development.

The impact of an increased volume of foul water discharge on watercourses should also be considered for large sites, or where several sites are likely to be developed in the same Sewage Treatment Works (STW) catchment, particularly where the receiving STW discharges into the same watercourse as the surface water runoff from the site.

The Uttlesford District Water Cycle Study (Stage 1 and 2)[46] contained information on wastewater capacity but is now out of date as it was prepared in relation to a previous Local Plan that did not proceed to adoption. A revised WCS will need to be completed when the current Local Plan is sufficiently advanced.

7.5 Water quality and biodiversity

All development should assess the impact of site drainage on the Water Framework Directive (WFD) status of the waterbody the water will drain into or groundwater. The assessment should consider both water quality and quantity as a change to one or both of these may have a detrimental impact on the waterbody for which mitigation may be required.

For example SuDS schemes can alter the discharge runoff rate into watercourses and consideration needs to be given to the impact of this change on the physical structure of the watercourse and its ecology.

It must also be established that SuDS schemes will not lead to any other environmental problems. For example, using [deep /infiltration borehole] soakaways or other infiltration methods on contaminated land carries groundwater pollution risks and may not work in areas with a high water table. Where the intention is to dispose to soakaway, these should be shown to work through an appropriate assessment carried out under BRE Digest 365.

An impact assessment should also be carried out if the floodplain habitat currently depends on periodic inundation, for example water meadows.

Further information on water quality should be provided by any future updates to the Uttlesford District Water Cycle Study.

46 Uttlesford District Water Cycle Study (Hyder Consulting, January 2010 & November 2012) (http://www.uttlesford.gov.uk/backgroundstudies#Water%20Cycle%20Study)

8 Summary and conclusions

8.1 Summary

The Uttlesford SFRA has been updated to reflect changes in policy and legislation, to bring the planning context and flood risk information up to date and to aid the development of the Local Plan.

The SFRA provides general advice for planners and developers on:

- Sources of flood risk mapping and other evidence to inform the Sequential Test
- Flood risk from each source of flooding in the District
- What is required from a Flood Risk Assessment
- Other issues that need to be considered when carrying out development close to watercourses.

It also provides more specific flood risk information and advice for each of the Areas of Search under consideration by the Council as potential development areas at the time of writing.

8.2 Use of SFRA data

The SFRA has been developed using the best available information at the time of preparation. This relates both to the current risk of flooding from rivers, and the potential impacts of future climate change.

It is important to remember that information on flood risk is being updated continuously. This is particularly true now that the LLFA have taken responsibility for carrying out and recording flood investigations under the FWMA. The Environment Agency has a rolling programme of flood modelling and mapping studies, and updates to the Flood Map are made quarterly. Where new mapping studies are carried out this will also affect the definition of the functional floodplain (Flood Zone 3b) and Flood Zone 3a + climate change. It is important that the Environment Agency is consulted to determine whether updated information is available prior to commencing a detailed Flood Risk Assessment.

The SFRA should be periodically updated when new information on flood risk, flood warning or new planning guidance or legislation becomes available. New information on flood risk may be provided by Uttlesford District Council, Essex County Council, the Highways Authority, Anglian Water and the Environment Agency. It is recommended that the SFRA is reviewed internally on an annual basis, allowing a cycle of review, by checking with the above bodies for any new information to allow a periodic update.

8.3 Next steps

As the Council move forward with their Local Plan, they must use the most up to date information in the applying the Sequential Test, and developers should be aware of the latest information for use in FRAs. Both should be aware of any future changes to advice in the consideration of climate change for planning and FRAs.

The Flood and Water Management Act (2010), the Localism Act (2011) and the NPPF all offer opportunities for a more integrated approach to flood risk management and development. As it is in the relatively early stages of developing its Local Plan, the Council has a real chance to approach planning for flood risk, sustainable drainage, green infrastructure, water quality, amenity, bio-diversity and habitat, and Water Framework Directive considerations in an integrated way. The Council's planning policies should focus on supporting the LLFA in ensuring that all developments, even minor ones, build SuDS into their design. New settlements on greenfield sites (and other major developments) offer excellent opportunities to ensure that master planning integrates SuDS and making space for water into site design right from the concept stage.

Uttlesford District Council

Appendices

A Watercourses and flood history

A.1 Watercourses in Uttlesford District

Major catchment	Watercourse name	Classification	Description
Great Ouse	River Cam (or Granta)	Main River	Flows south to north from its source near Widdington to merge with another tributary of the River Cam a mile south of Granchester. It passes through the urban areas of Newport, Wendens Ambo, Audley End and Great Chesterford. Two of its tributaries are also classified as Cam / Tributaries Main River. A watercourse from downstream of the M11 at Newport (Wicken Cottage) to its confluence with River Cam at Newport, and a watercourse downstream from M11 at Wendens Ambo to its confluence with River Cam at Wendens Ambo.
	The Slade	Main River	Tributary to River Cam (or Granta) at Audley End. Consists of three tributaries which confluence in Saffron Walden. Upstream of Saffron Walden the watercourses are classified as Ordinary Watercourses.
	Wicken Water	Main River / Ordinary Watercourse	Flows northwest to southeast from Upper Pond Street to its confluence with the River Cam (or Granta) at Newport. Mostly Ordinary Watercourse with the 1.5km section downstream of M11 classified as Main River. Flows through Arkesden and Wicken Bonhunt.
	River Bourn	Ordinary Watercourse	Flows south to north from its source near Red Oaks Hill to its confluence with the River Granta (the second of the four River Cam tributaries called the River Granta) at Bartlow. Flows through Ashdon.
	Fulfen Slade	Ordinary Watercourse	Tributary to the River Cam (or Granta) at Audley End. Flows through a rural catchment.
	Debden Water	Ordinary Watercourse	Tributary to River Cam (or Granta) at Newport. Flows through a rural catchment.
North Essex	River Pant	Main River	Flows generally northwest to southwest from its source at Elder Street to Braintree where it becomes the River Blackwater. Upstream of Wimbish it is Ordinary Watercourse. It passes through the urban areas of Radwinter, Great Sampford and Little Sampford.
	River Chelmer	Main River	Flows north to south from its source near Debden Green to Chelmsford where the River Can flows into it. It flows through the urban areas of Thaxted, Great Easton, Mill End, Great Dunmow and Little Dunmow.
	River Ter	Main River	The river rises in Stebbing Green and flows predominantly south eventually joining the River Chelmer near Nounsley. The river flows through Blake End and Pye's Green.
	River Can	Main River	The river flows north to south from near High Roding to Chelmsford where it joins the River Cherwell. Within Uttlesford District it has flows through a rural catchment.
	Stebbing Brook	Main River	The watercourse flows north to south from Lindsell to its confluence with the River Chelmer at Little

			Dunmow. It flows through Bran End and Stebbing.
	Little Bardfiled Brook	Main River	Tributary of River Pant at Little Bardfield.
	Lower House Brook	Main River	Tributary of River Pant at Radwinter.
	Water Lane Ditch	Main River	Tributary of Lower House Brook at Radwinter.
	Bumpstead Brook	Main River	Tributary of River Pant 1.5km upstream Great Sampford.
	Barnston Brook	Main River	Tributary of River Chelmer at Barnston.
	Tilty Brook	Main River	Tributary of River Chelmer at Duton Hill.
	Broxted Brook	Main River	Tributary of River Chelmer near Great Easton/Duton Hill.
	Tributary of River Chelmer, Godfrey Way, Great Dunmow	Main River	Tributary of River Chelmer. Flows from Godfrey Way, Great Dunmow to Counting House Lane where it joins the River Chelmer. Approximately 0.6km length.
	Tributary of River Chelmer, Ash Grove, Great Dunmow	Main River	Tributary of River Chelmer. Flows from Ash Grove, Great Dunmow to beyond B1008 where it joins the River Chelmer. Approximately 0.9km length.
	Martel's Brook	Main River / Ordinary Watercourse	Tributary of the River Chelmer, just downstream of Great Dunmow. Flows through a rural catchment. Becomes Main River downstream of B1008.
	Stan Brook	Ordinary Watercourse	Tributary of the River Chelmer at Stanbrook. Flows through a rural catchment.
	Parsonage Brook	Ordinary Watercourse	Tributary to the River Can. Flows through High Easter.
	Hoblong's Brook	Ordinary Watercourse	Tributary of the River Chelmer, just downstream of Great Dunmow. Flows through a rural catchment.
	Barnston Brook	Ordinary Watercourse	Tributary of the River Chelmer near to Barnston. Flows through a rural catchment.
	Daisyley Brook	Ordinary Watercourse	Tributary of the Stebbing Brook. There are two branches to the Daiseyley Brook which join at Lindsell. Flows through a rural catchment.
River Thames	River Roding	Main River	River Roding rises near Molehill Green and flows north to south joining the River Thames at Barking in London. Flows through Little Canfield and Great Canfield.
	Pincey Brook	Main River	Pincey Brook flows north to south from London Stansted Airport to the River Stort upstream of Harlow. Flows through Takeley Street and Hatfield Broad Oak.
	River Stort	Main River	The watercourse flows northwest to south east from Killem's Green to the River Lee at Hoddesdon. Flows through Lower Green, Ford End, Deer's Green, Clavering, Manuden and Stansted Mountfitchet.
	Bourne Brook	Main River	Tributary of the River Stort at Bishop's Stortford. Flows through a rural catchment.
	Stansted Brook	Main River	Tributary of the River Stort downstream of Stansted Mountfitchet. Flows through Elsenham, and Stansted Mountfitchet.
	Ugley Brook	Main River	Tributary of the Stansted Brook at Stansted Mountfitchet.
	Stickling Green Brook	Main River	Tributary of River Stort at Clavering. Rural catchment.
	Strood Hall Brook	Main River	Tributary of River Roding approximately 0.6km upstream of Great Canfield.
	Takeley Drain	Main River	Tributary of Pincey Brook at Stansted Airport junction of A120. Flows from Takeley.
	Little Hallingbury Brook	Main River	Tributary of River Stort at Little Hallingbury. Flows through Little Hallingbury.

	Woodside Green Brook	Main River	Tributary of Little Hallingbury Brook.
	Tye Green Brook	Main River	Tributary of Stansted Brook approximately 1.1km upstream of Stansted Mountfitchet.
	Berden Brook	Main River	Tributary of River Stort near Berden.
	Colville Hall Brook	Main River	Tributary of Pincey Brook near Hatfield Heath.
	Farnham Bourne	Main River	Tributary of River Stort in north Bishop's Stortford.
	Great Hallingbury Brook	Main River	Tributary of River Stort to the south of Bishop's Stortford.
	Mus Brook	Ordinary Watercourse	Tributary of Pincey Brook. Flows through and joins at Hatfield Broad Oak.

A.2 Sources of flood event data

Records of local flooding incidents have been collected from a range of sources and used to inform the SFRA. These sources of information are summarised below:

Source	Data	Description	When provided/ updated?
Environment Agency (North East Thames)	Stort Modelling and Mapping Flood Risk Hydraulic Modelling and Mapping Final Technical Report[47]	Environment Agency hydraulic modelling and mapping study undertaken for the Upper and Middle Stort.	2010
Environment Agency (North East Thames)	Flood Data Recording Reports	Flood recording sheets for flood events between February 2010 and January 2015 on the River Roding.	Feb 2010 - Jan 2015
Essex CC	Preliminary Flood Risk Assessment[48]	High level overview of flood risk from surface water, groundwater and Ordinary Watercourses across Essex. Flood risk data and records of historic flooding were collected from a number of local and national sources.	2011
Essex CC	Lead Local Flood Risk Management Strategy[49]	High level strategy to understand and manage local (surface water, Ordinary Watercourse and	2013

[47] Halcrow Group Ltd (March 2010) Stort Modelling and Mapping Flood Risk Hydraulic Modelling and Mapping Final Technical Report

[48] Essex County Council (January 2011) Preliminary Flood Risk Assessment Final Report

[49] Essex County Council (February 2013) Lead Local Flood Risk Management Strategy

Source	Data	Description	When provided/ updated?
		groundwater) flood risk within Essex.	
Essex CC	Flood incidents	Excel spreadsheet of historical incidents of flooding within the Uttlesford District.	Oct 2001 - Jul 2014
Essex CC	Fire service flood incidents	Excel spreadsheet of incidents of flooding the fire service has dealt with within the Uttlesford District.	Jun 2009 - February 2010
Essex CC	Flood investigation reports	Flood investigation reports for Thaxted[50], Lower Road Little Hallingbury[51] and Old Mead Lane Henham[52].	2015, 2013 and 2013 respectively
Uttlesford DC	Uttlesford Strategic Flood Risk Assessment[53]	The first SFRA Uttlesford produced in 2008.	March 2008
Environment Agency	Historic Flood Map	A GIS layer showing areas of Historic flooding	2015
Uttlesford DC	Uttlesford Water Cycle Study - Stage 1: Scoping and Outline Strategy[54]	Document to ensure water supply, wastewater collection and wastewater treatment infrastructure in the District can accommodate the required growth levels whilst minimising flood risk.	2010
Uttlesford DC	Uttlesford Water Cycle Study - Stage 2: Detailed Strategy[55]	Document to ensure water supply, wastewater collection and wastewater treatment infrastructure in the District can accommodate the required growth levels whilst	2012

[50] Essex County Council (July 2015) Flood Investigation Report Thaxted
[51] Essex County Council (July 2015) Flood Investigation Report Lower Road, Little Hallingbury
[52] Essex County Council (April 2013) Flood Investigation Report Old Mead Lane, Henham
[53] Uttlesford District Council (March 2008) Strategic Flood Risk Assessment
[54] Uttlesford District Council (January 2010) Uttlesford District Council Water Cycle Study Stage 1: Scoping and Outline Strategy
[55] Uttlesford District Council (November 2012) Uttlesford District Council Water Cycle Study Stage 2: Detailed Strategy

Source	Data	Description	When provided/ updated?
		minimising flood risk.	
Internet	Flood Mapping Study of River Bourn in Ashdon.	Study of River Bourn and its tributaries through Ashdon village.	2008
Internet	Newspaper reports of flood events	Online reports of historic flood events in Uttlesford.	2014

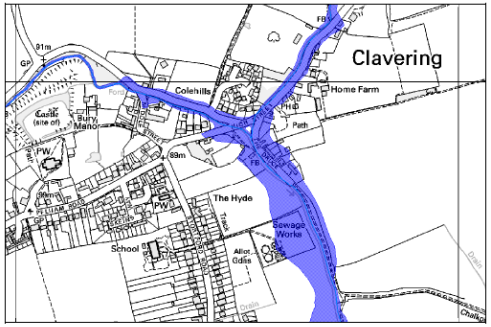
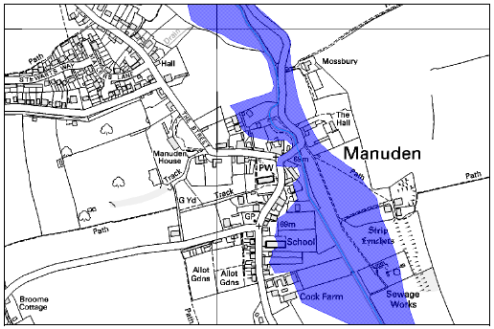
A.3 Flood history

Date	Watercourse / Type of flooding	Town / village affected	Source	Details of flood event
10 November 1875	The Slade	Saffron Walden	Uttlesford SFRA[56]	1.02 inches of rain fell in two to three hours during the night and resulted in flooding.
5 August 1917	The Slade	Saffron Walden	Uttlesford SFRA[57]	3.08 inches of rain recorded in 2 hours caused much flooding.
1947	River Bourne	Ashdon	Flood Mapping Study of River Bourn in Ashdon[58]	No details available.
19 September 1960	The Slade	Saffron Walden	Uttlesford SFRA	Police worked late into night placing warning traffic lights on flooded roads; houses in some villages completely covered by flood water. 'Remarkable' rainfall in Framlingham, Suffolk of 1.5 inches in 45 minutes.
1968	River Bourne	Ashdon	Flood Mapping Study of River Bourn in Ashdon	Was due to 'freak' storm
1978	River Bourne	Ashdon	Flood Mapping Study of River Bourn in Ashdon	No details available.
19 June 1987	River Bourne	Ashdon	Uttlesford SFRA	Heavy storm over 40mm in 1 hour. 22properties including 9 residential properties flooded.

[56] Uttlesford District Council (March 2008) Strategic Flood Risk Assessment / JBA (2007) River Slade Standard of Protection Study. On behalf of the Environment Agency.
[57] Uttlesford District Council (March 2008) Strategic Flood Risk Assessment
[58] JBA Consulting (October 2008) Flood Mapping Study of River Bourn in Ashdon. On behalf of Uttlesford District Council.

			/ Flood Mapping Study of River Bourn in Ashdon	
29July 1987	River Bourne	Ashdon	Uttlesford SFRA / Flood Mapping Study of River Bourn in Ashdon	Heavy storm after prolonged rainfall. 17 properties including 8 residential properties flooded.
25 August 1987	River Bourne	Ashdon	Uttlesford SFRA / Flood Mapping Study of River Bourn in Ashdon	Persistent rainfall. 9 properties including 4 residential properties flooded.
9 October 1987	River Bourne	Ashdon	Uttlesford SFRA / Flood Mapping Study of River Bourn in Ashdon	40mm of rainfall in two days. 11 properties including 5 residential properties flooded. Road at Knox End flooded.
19 November 1987	River Bourne	Ashdon	Flood Mapping Study of River Bourn in Ashdon	Minor property flooding
1993	River Bourne	Ashdon	Flood Mapping Study of River Bourn in Ashdon	No details available
August 1998	Ordinary Watercourse	Henham	Old Mead Lane Flood Investigation Report[59]	The most severe flooding incident to occur along Old Mead Lane was in August 1998 when four properties were flooded internally. Since then [until April 2013] it has been suggested that there have been a further 4 or 5 flood incidents although these haven't led to all four properties being flooded internally. Flooding occurs due to overtopping of an Ordinary Watercourse which follows Old Mead Lane along its northern side flowing East to West. Upstream flows are contributed to by field drainage ditches draining the surface water from arable use farm land and Old Mead Lane and properties along it. Photographic evidence supplied by residents of the 1998 flood incident shows Old Mead Road disappearing under a channel of fast flowing water where flood water has overtopped the Ordinary Watercourse. It has been reported that during flood incidents much of Old Mead Lane becomes consumed by flood water along with at least four properties during the most severe events.
2000	River Bourne	Ashdon	Flood Mapping Study of River	No details available

[59] Essex County Council (April 2013) Flood Investigation Report Old Mead Lane, Henham

			Bourn in Ashdon	
1 May 2000	Groundwater	Debden Green	PFRA[60]	Water in pit in garden
October 2001	Confluence River Stort / Stickling Green Brook	Clavering	River Stort hydraulic modelling report[61]	Floods at High Street and properties at The Druce; Properties at right bank of the River Stort immediate south of High Street Back of Sewage Works  Figure 1-2: October 2001 flooding extent at Clavering
	River Stort	Manuden	River Stort hydraulic modelling report	Properties at upstream and downstream Pinchpools Road including school, Cock Farm and the Hall  Figure 1-3: October 2001 flooding extent at Manuden
	Ugely Brook	Stansted Mountfitchet	River Stort hydraulic	Back up from culvert inlet and floods at properties and commercial premises at Lower Street (B1351)/Gall End Lane

[60] Essex County Council (January 2011) Preliminary Flood Risk Assessment Final Report

[61] Halcrow Group Ltd (March 2010) Stort Modelling and Mapping Flood Risk Hydraulic Modelling and Mapping Final Technical Report

			modelling report	
	Stansted Brook	Stansted Mountfitchet	River Stort hydraulic modelling report	Elms Farm south of Railway Line (East of Church Road)
	Cam and Granta	Great Chesterford, Littlebury and Newport	Uttlesford SFRA[62]	3 properties and 4 garages affected in Great Chesterford. 4 properties in Littlebury affected. 4 properties in Newport affected.
	The Slade	Saffron Walden and Little Walden	Uttlesford SFRA[62]	19 properties affected in Saffron Walden, 5 properties affected in Little Walden
	River Chelmer	Great Dunmow	Uttlesford SFRA[62]	10 Houses flooded. Riverside Close no. 2-7, water level 51.159m AOD Churchend no.1-2 The Six Bells and Falcons, water level 53.084 and 53.223m AOD
	River Bourne	Ashdon	Uttlesford SFRA	18 properties affected
21 October 2001	Unknown	Ashdon, Birchanger, Debden, Elsenham, Great Chesterford, Great Dunmow, Great Sampford, Hatfield Heath, Hazelend, Hempstead, Howe Green, Little Walden. Manuden, Monk Street., Newport, Saffron Walden, Stansted Mountfitchet, Stebbing, Thaxted, Wendens Ambo, White Roding, Wimbish Green	Flood incident spreadsheet	71 flood incidents reported. Locations widespread across the District.
21 October 2001	River Bourne	Ashdon	Flood Mapping Study of River Bourn in Ashdon	Post flood survey done by the Environment Agency. This event was 3 inches higher than previous highest recorded (June 1987) 93mm rainfall over two days 20/21.
22 October 2001	Unknown	Arkesden, Ashdon, Birchanger, Chrishall, Clavering, Debden, Great Dunmow, Great Chesterford, Great	Flood incident spreadsheet	95 flood incidents reported. Locations widespread across the District.

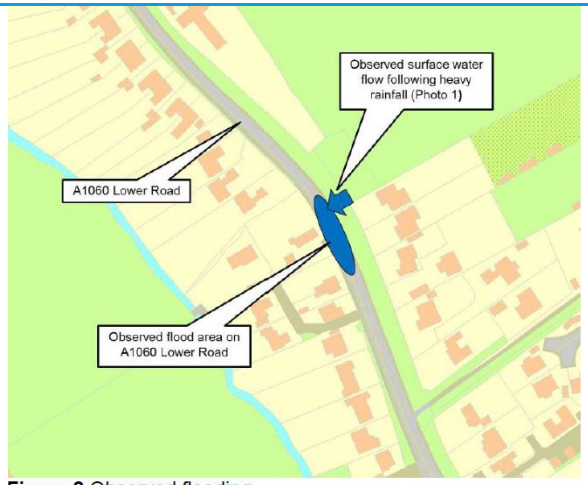
[62] Uttlesford District Council (March 2008) Strategic Flood Risk Assessment / Black and Veatch (2005) River Chelmer Strategy Study. Hydraulic Modelling of the River Chelmer: Thaxted to Beeleigh Falls. On Behalf of the Environment Agency.

		Sampford, Hadstock, Hempstead, Henham, Littlebury, Lt. Walden, Manuden, Radwinter, Saffron Walden, Stebbing, Sewards End, Takeley, Stansted Mountfitchet, Thaxted, White Roding, Wicken Bonhunt, Wimbish.		
2002	River Stort	Clavering and Langley Lower Green	Uttlesford SFRA	Post flood reports have been compiled by the Environment Agency Hatfield.
30 July 2002	Unknown	Saffron Walden	Flood incident spreadsheet	3 flood incidents reported (Saxon Way and Bridge Street, Saffron Walden; Bridge End, Newport)
3 August 2002	Unknown	Saffron Walden	Flood incident spreadsheet	7 flood incidents reported (Saxon Way and High Street, Saffron Walden; Bridge End, Newport; Commercial properties on King Street and George's Hill St, Saffron Walden)
5 August 2002	Unknown	Saffron Walden & Debden	Flood incident spreadsheet	2 flood incidents reported (High St, Debden and Limefields Saffron Walden)
9 September 2002	Unknown	Gt Chesterford, Henham, Saffron Walden	Flood incident spreadsheet	7 flood incidents reported (South St, Great Chesterford; Weekly News, Saffron Walden; Rowntree Way and Hargrave Close Saffron Walden)
18 October 2002	Unknown	Saffron Walden	Flood incident spreadsheet	1 flood incident reported (Whiteshot Way)
12 November 2002	Unknown	Arkesden, Manuden & White Roding	Flood incident spreadsheet	8 flood incidents reported (Wicken Road, Arkesden, The Street Manuden and Church Lane, White Roding)
1 January 2003	Unknown	Molehill Green, Henham, Lt. Canfield, Newport, Wicken Bonhunt,	Flood incident spreadsheet	6 flood incidents reported (Brown End Road, Molehill Green; Old Mead Lane, Elsenham; Stortford Road, Lt. Canfield; Bridge End, Newport and The Meads, Wicken Bonhunt).
2 January 2003	Unknown	Arkesden, Berden, Clavering, Debden, Duddenhoe End, Elmdon, Felsted, Great Dunmow, Great Easton, Great Hallingbury, Great Sampford, Henham, Littlebury, Manuden, Newport,	Flood incident spreadsheet	61 flood incidents reported. Locations widespread across the district.

		Radwinter, Rickling Green, Saffron Walden, Sewards End, Stansted Mountifitchet, Takeley, Thaxted, White Roding, Wimbish Lower Green and Wimbish		
3 January 2003	Unknown	Berden, Debden and Stebbing	Flood incident spreadsheet	3 flood incidents reported (White House Farm, Berden; High Street Debden and Mill Lane, Stebbing)
15 January 2003	Unknown	Ugley	Flood incident spreadsheet	1 flood incident reported (Old School House, Ugley)
14 June 2007	River Bourne	Ashdon	Uttlesford SFRA	Affected Church Hill Road (not shown to be in Flood Zone 3)
			Flood Mapping Study of River Bourn in Ashdon	76mm of rainfall in two days. 14 properties flooded and roads blocked. Severe disruption and more severe than recent past events. David Green, Clerk to the parish council recorded for the 2007 event: "I received a call at approximately 1900 to say the Village Hall had started to flood and that it was being bailed out. I rang the UDC Emergency response number at approx 1940 to request sand bags. The call was returned at approx 2000 by the Emergency Planning Officer. The police were also notified at this time about the flooding of the Ashdon/Radwinter Road. By this time it had stopped raining and the river was rising fast. It started to break its banks and cause serious flooding of the Village Hall at 2100 at which time the sand bags had arrived. The river continued to rise and completely surrounded the Village Hall, Crown Hill was severely flooded and was impassable. The village was completely cut off due to flooding at Bartlow, Steventon End, Plumtree Grove and the bridge at Ridgeons on the Ashdon Road. The water peaked and started to recede at approx 21:30." The houses at Water End were flooded to waist depth and at 6 Church Hill it is believed that water reached the highest level in 35 years.
February 2009	River Bourne	Ashdon	Uttlesford WCS - Stage 1	A fluvial flood event in June 2007 in Ashdon (UDC have since confirmed that a similar fluvial flood event took place here as recently as February 2009)
15 June 2009	Unknown	Great Chesterford	Fire service incident spreadsheet	Great Chesterford Primary School. Flooding within school affecting electrics.
26 June 2009	Unknown	Saffron Walden	Fire service incident spreadsheet	3 flood incidents reported. High Street, Saffron Walden, a manhole cover come up and flooding in the street. High Street, Saffron Walden, flooding by computer system. Hatherley Elderly Peoples Home, Chaters Hill, Saffron Walden.
7 July 2009	Unknown	Great Dunmow	Fire service	3 flood incidents reported. Two residential properties on Willow Road (Flooding due to rain

			incident spreadsheet	into garages; Flooding in garden) and one property on Stacey Court, Great Dunmow (flooding entering back door).
9 July 2009	Unknown	Stansted Mountifitchet	Fire service incident spreadsheet	1 flood incident reported. Spencer Close. Flooding affecting electrics. Pumping required.
29 January 2010	Unknown	Stansted Mountifitchet	Fire service incident spreadsheet	1 flood incident reported. Cambridge Road. Flooding in cellar and affecting electrics. Pumping required.
28 February 2010	Unknown	Broxted	Fire service incident spreadsheet	1 flood incident reported. The Maltings, Broxted. Car stuck in flood water. Rescue or evacuation from water.
11 October 2011	Groundwater	Hatfield Broad Oak	PFRA	Clay and London Clay Drainage problem
April 2012	Ordinary Watercourse	Henham	Old Mead Lane Flood Investigation Report	The most recent flood [as of April 2013] incident (along Old Mead Lane) affecting at least one property internally took place in April 2012.
3 May 2012	Possible blocked ditch	Saffron Walden	Flood incident spreadsheet	2 flood incidents reported (Summerhill Road). Letters sent to landowners regarding ditch clearance.
15 May 2012	Ordinary Watercourse	Tilty	Flood incident spreadsheet	1 flood incident reported (Abbeygates). Outbuildings and cellar flooded.
16 May 2012	Ordinary Watercourse	Chrishall	Flood incident spreadsheet	1 flood incident reported (The Red Cow pub). Flooding foundations of extension to pub. Highways maintenance was subsequently carried out.
28 May 2012	Surface water, possibly blocked ditches	Little Dunmow	Flood incident spreadsheet	1 flood incident reported (New Key, The Street). 1 residential property affected. Letters sent to landowners.
14 July 2012	Possibly runoff from fields	Little Hallingbury	Flood incident spreadsheet	1 flood incident reported (The Thatch, Lower Road). Property flooded on 4 separate occasions since 2005 (2 internally). Flood investigation carried out.
	Surface water	Little Hallingbury	Lower Road Flood Investigation Report[63]	Flooding at this location has led to the internal flooding of at least one property on more than one occasion, the most recent incident occurred on July 14th 2012. Following heavy and prolonged rainfall events, surface water is observed flowing off a field and onto the A1060 Lower Road. Surface water then ponds at the low point in the highway before it reaches a depth where it overtops the kerb line and spills into adjacent property.

[63] Essex County Council (July 2015) Flood Investigation Report Lower Road, Little Hallingbury

				 **Figure 2** Observed flooding.
20 July 2012	Ordinary Watercourse	Henham	Flood incident spreadsheet	1 flood incident reported (Old Mead Lane). 4 properties affected with 5 properties affected (not clear if internal) regularly in heavy storm event. Flood investigation carried out.
1 November 2012	Unknown	Great Dunmow	Flood incident spreadsheet	1 flood incident reported (Beaumont House, Beaumont Hill).
2 August 2013	Highway culvert blocked	Duton Hill	Flood incident spreadsheet	1 flood incident reported (Brick House Farm, Cherry Street). Outhouses flooded.
31 January 2014	Highway	Arkesden	Flood incident spreadsheet	1 flood incident reported (Sextons, Arkesden). Driveway flooded
7 February 2014	Surface water	Rickling Green	Flood incident spreadsheet	1 flood incidents reported (Brick Kiln Lane). Internal flooding reported. 1 residential property affected.
	Unknown	Saffron Walden		1 flood incidents reported (Lavender Fields). Internal flooding reported. 1 residential property affected.
	Ditch unable to cope with amount of water	Henham		1 flood incidents reported (The Willows, Old Mead Lane). Flooding of garage with signs of salt deposits on conservatory tiles but water did not enter. 3 residential properties affected.
	Unknown	Wicken Bonhunt		1 flood incidents reported (Wisbey Cottage). Flooding to garden and walkway.
	Surface water	Arkesden		1 flood incidents reported (Sextons). Internal flooding reported.
	River Stour, River Cam, The Slade and	Saffron Walden, Newport, Wendens Ambo, Debden,	Cambridge	"Residents in flats in Saffron Walden had to be rescued by a fire service boat as heavy overnight rain caused flooding. Firefighters were called out early this morning to assist with rescuing residents affected by

	surface water	Stansted Mountifitchet, Arkesden, Ashdon, Quendon, Henham,	news[64]	flood waters in Saffron Walden. At 5am today, crews from Saffron Walden, Harlow and Waltham Abbey were called to 20 flats on Radwinter Road affected by flood waters. Firefighters rescued eight adults, including two disabled people from a ground floor flat, two children and two dogs from The Spike flats. Crews used the rescue boat to assist the residents to safety by 8am. Just before 12pm today, an 84-year-old disabled man had to be rescued from his car which got stuck in 12 inches of flood water on Ashdon Road, Saffron Walden. A number of schools have been closed because of flooding including: Saffron Walden County High School (SWCHS), Newport Free Grammar School, Newport Primary, Clavering Primary and Rickling Primary. SWCHS students have been assembled in Saffron Hall and the Boatman Centre until they can return home safely. Since 4am this morning Essex fire crews have dealt with at least 70 incidents involving flood waters in the Saffron Walden area. Crews have been pumping water from flooded homes and rescuing motorists trapped in flood water in Saffron Walden, Newport, Wendens Ambo, Debden, Stansted Mountifitchet, Arkesden, Ashdon, Quendon and Henham. In Saffron Walden, there was severe flooding on Elizabeth Way - where a car was almost completely underwater - Thaxted Road, Radwinter Road and Victoria Avenue. Parts of the Audley End Miniature Railway is also under water and ducks are swimming on the fairy walk in the woods. In Newport, roads have been closed due to severe flooding and a vehicle was trapped in flood water under a railway bridge. Severe flooding has affected the M11 around Stansted Mountfitchet after the motorway was closed northbound following a multi-vehicle accident. Flooding has also resulted in Elsenham being cut off and shops in Lower Street, Stansted Mountfitchet, being flooded. The Queens Head pub in Stansted Mountfitchet was also flooded. Elsenham Golf's course is also closed, though the driving range, gym and restaurant remain open. The Environment Agency has issued two flood warnings and several alerts for rivers across Essex. A spokesman for the police said "many minor roads and some major routes" had been affected by high water and urged drivers to avoid using such roads "whenever possible". A fire service spokesman said its crews had rescued a number of people trapped by

[64] Cambridge News (07 February 2014). Accessed online at http://www.cambridge-news.co.uk/UTTLESFORD-FLOODS-Residents-rescued-homes-schools-closed-Saffron-Walden-area/story-22381892-detail/story.html on 30/09/2015.

				flooding, pumped water from flooded homes and rescued motorists trapped in flood water." 07/02/14 Flooding Saffron Walden area. Car is stuck on the road out of Saffron Walden  The path that leads into Bridge End Gardens in Saffron Walden.  Flooding in Saffron Walden

				 Landlord Steve Betts stands in the door way of his pub The Queens Head after it was flooded this morning in Stansted Mountfitchet  Audley End Miniature Railway in Saffron Walden is flooded.

				 Flooding in Newport

				 Figure 8-1: Flooding in Clavering Ford 
	River Stour,	Saffron Walden,	BBC news -	"Thousands of pupils were sent home and residents rescued by boat after heavy rain in

	River Cam, The Slade and surface water	Newport, Wendens Ambo, Debden, Stansted Mountfitchet, Arkesden, Ashdon, Quendon and Henham.	Essex[65]	Essex caused flooding. The occupants of 20 flats in Radwinter Road, Saffron Walden, were helped to safety by fire crews. The service received more than 200 calls about flooding from people in the north and west of the county. Flood warnings for five rivers - the Stour, Brook, Chelmer, Colne and Box were issued by the Environment Agency. Amanda Jane Richards, of Saffron Walden, said: "All the fields are under water"…"A lot of the roads are so badly flooded they are shut, so basically we can't get out of the village." A number of schools were closed because of flooding including Clavering Primary School near Saffron Walden, Newport Free Grammar, Newport Primary and the 2,000-pupil Saffron Walden County High School. Soldiers from Carver Barracks at Wimbish were sandbagging properties affected by flooding just outside Saffron Walden. The authority said in "preparation for the potential of further flooding over the weekend" it would be checking culverts in the area and removing any debris it finds. A fire service spokesman said its crews had rescued a number of people trapped by flooding, pumped water from flooded homes and rescued motorists trapped in flood water. The areas affected were in been in the north west of the county and crews had been to incidents in Saffron Walden, Newport, Wendens Ambo, Debden, Stansted Mountfitchet, Arkesden, Ashdon, Quendon and Henham." A car was marooned in flood water in Victoria Avenue, Saffron Walden 
10 March 2014	Surface water	Webdons Ambo	Flood incident	1 flood incidents reported (Old Rectory Cottage). Internal flooding. 5 residential and 1

[65] BBC News - Essex (7 February 2014). Accessed online at http://www.bbc.co.uk/news/uk-england-essex-26082119 on 30/09/2015.

			spreadsheet	commercial property affected.
19 March 2014	Unknown	Manuden	Flood incident spreadsheet	1 flood incidents reported (The Street)
27 July 2014	Unknown	Thaxted	Flood incident spreadsheet	1 flood incidents reported (Barnards Field). Not internal flooding, flooded garden and garage. 1 commercial property affected.
28 July 2014	Ordinary Watercourse and surface water	Thaxted	Thaxted Flood Investigation Report[66]	Thaxted has experienced flooding on several occasions, with the most significant event experienced in recent years taking place on 28th July 2014. During this event a very large storm led to flooding in excess of 10 properties. The majority of flooding was centred on two areas in the town, to the north and the east. In the north of the town the source of flooding was from the Ordinary Watercourse running from north to south, whilst in the east of the town the source was reportedly runoff from the fields. Anecdotal evidence from residents suggested that in some locations floodwaters reached in excess of 20-30cm within residential properties and caused substantial damage, resulting in some residents requiring temporary alternative accommodation. An approximate indication of the flood areas based on reports from residents, Thaxted Parish Council and partner authorities is shown in the figure below.  Figure 3 – Indicative flood area during the events [Not to be used as indication of individual properties experiencing internal flooding]. (Base Map: Ordnance Survey, 2014).
23 November	River Stort	Clavering, Berden,	Herts & Essex	"Persistent heavy rain today [23/11/14] has brought a return of flooding to villages that were

[66] Essex County Council (July 2015) Flood Investigation Report Thaxted

2014		Manuden, Wimbish	Observer[67]	badly affected by the great deluge on February 7. Earlier today the Environment Agency issued a flood warning - meaning flooding is expected and immediate action is required - for the River Stort at Clavering, but this has since been downgraded to a flood alert - meaning flooding is possible, be alert. Elsewhere, the stream along the main road into Berden has burst its banks and flooded the road, Manuden is flooded as a result of a blocked pipe in Mallows Green Road and the road from Saffron Walden to Thaxted is flooded by Wimbish."
Not specified	Ugley Brook	Stansted Mountfitchet	Uttlesford SFRA	Backing up from culverted section affects Gall End Lane and Lower Street.
Not specified	Tributary of River Pant	Great Sampford	Uttlesford SFRA	Properties in Sparepenny Lane South, Parsonage Farm Lane, Watson's Close, and Monk's Corner affected.
Not specified	River Stort	Maunden	Uttlesford SFRA	Properties in The Street, Pinchpools Road, Watts Yard, and Mallows Green Road affected.
Not specified	Cam and Wicken Water	Newport	Uttlesford SFRA	Properties in Water Lane, Cambridge Road, White Horse Lane, and the sewerage works affected. Properties at the back of Bury water Cottages affected.
Not specified	The Slade	Saffron Walden	Uttlesford SFRA	Properties in Bridge End, Friends Walk, St John's Close and Rowntree Way affected.
Not specified	Stansted Brook	Stansted Mountfitchet	Uttlesford SFRA	Properties at either end of Blythwood Gardens, and properties in Lower Street affected.
Not specified	Tributary of Pincey Brook	Takeley	Uttlesford SFRA	Properties in Roseacres, South Road, Jack's Lane and Warren Close affected.
Not specified	Tributary of River Chelmer	Thaxted	Uttlesford SFRA	Properties in Copthall Lane and Mill Lane/Dunmow Road affected.
Not specified	Cam	Great Chesterford	Uttlesford SFRA	Properties in Cambridge Road, Ickleton Road, Walden Road, Sewerage Pumping Station and Playing Field affected.
Not specified	Tributary of Cam	Elsenham	Uttlesford SFRA	Properties in Old Mead Road affected.
Not specified	River Stort	Clavering	Uttlesford SFRA	Properties in The Druce, High Street, Middle Street, and Colehill Lane affected.
Not specified	Unknown	Saffron Walden, Stansted Mountfitchet and Newport	Dunmow Broadcast[68]	Three Uttlesford roads labelled flooding 'hotspots' are among those set to benefit from portion of £1m emergency fund Elizabeth Way in Saffron Walden, Lower Street in Stansted Mountfitchet and the area near the railway bridge on Cambridge Road, in Newport, have all been identified following a hastily arranged meeting of councillors and officers. Uttlesford District Council has yet to confirm the final five but, according to the chairman of Stansted Parish Council, three are set in stone and two more will be finalised tomorrow. Action will also be taken to clear culverts, empty and jet gullies and remove debris.

[67] Herts & Essex Observer (23 November 2014). Accessed online at http://www.hertsandessexobserver.co.uk/pictures/Flood-warning-River-Stort-deluge-heavy-rain/pictures-24628348-detail/pictures.html on 30/09/2015.

68 Dunmow Broadcast (13 February 2014). Accessed online at http://www.dunmowbroadcast.co.uk/news/three_uttlesford_roads_labelled_flooding_hotspots_are_among_those_set_to_benefit_from_portion_of_1m_emergency_fund_1_3320242 on 30/09/2015.

Uttlesford
District Council

Uttlesford District Council

B Area of Search flood risk summary sheets

Reference	**Area of search number**	1
	Name	M11 Junction 9a – east
	Type	New settlement
Information	**Main rivers**	None
	Ordinary watercourses	Un-named tributary of River Cam
	Geology/superficial deposits	Chalk overlain on higher ground by Lowestoft Formation Diamicton
	Soils	Loamy and clayey soils with some impeded drainage
	Historic flooding/known problems	None
	Availability of detailed modelling	None
	Flood defences and assets	None
Flood risk	**Fluvial flood risk**	Flood Zone3b, 3a, 3a+CC and 2 affect a small area in the middle of the Area of Search. They are similar in extent and confined to a narrow floodplain by the topography.
	Surface water flood risk	Flow paths defined by topography and existing watercourses. No areas of ponding (UFMfSW).
	Groundwater flood risk	Low risk (<25% chance of emergence) (AStGWF)
	Sewer flood risk	None
	Reservoir flood risk	None
	Effect of climate change	The extent of Flood Zone 3 is not likely to increase significantly with climate change due to the confined topography. However climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	A new settlement has the potential to impact on flows through Great Chesterford and entering the River Cam.
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable here as an integrated part of a large new settlement. Slope and soil permeability will vary locally across the area, with more freely draining soils located in the west of the area.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Sequential design of a new settlement at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and should avoid impacting on surface water flow routes or ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. A drainage strategy must be submitted at an early stage to show how the impact of the development will be reduced through the use of SuDS, following Essex County Council's SuDS Design Guide. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary

Reference	**Area of search number**	2
	Name	M11 Junction 9 – west
	Type	New settlement
Information	**Main rivers**	None
	Ordinary watercourses	Un-named tributary of River Cam
	Geology/superficial deposits	Chalk overlain on higher ground by Lowestoft Formation Diamicton
	Soils	Lime rich Loamy soils
	Historic flooding/known problems	None
	Availability of detailed modelling	None
	Flood defences and assets	None
Flood risk	**Fluvial flood risk**	Flood Zone3b, 3a, 3a+CC and 2 are similar in extent and confined to a narrow floodplain by the topography. Only affects small area in the north of the Area of Search.
	Surface water flood risk	Flow paths defined by topography and existing watercourses. Some areas of ponding are seen in the north east of the area by the M11 (UFMfSW).
	Groundwater flood risk	Low risk (<25% chance of emergence) (AStGWF) to the northeast of the area
	Sewer flood risk	There is 1 property on the Thames Water Sewer Flooding Register in the CB11 4 postcode area which currently covers this area.
	Reservoir flood risk	None
	Effect of climate change	The extent of Flood Zone 3 is not likely to increase significantly with climate change due to the confined topography. However climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	A new settlement has the potential to impact on flows through Great Chesterford and entering the River Cam.
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable here as an integrated part of a large new settlement. Slope and soil permeability will vary locally across the area although it is generally freely draining.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Sequential design of a new settlement at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and should avoid impacting on surface water flow routes or ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. A drainage strategy must be submitted at an early stage to show how the impact of the development will be reduced through the use of SuDS, following Essex County Council's SuDS Design Guide. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary

Reference	**Area of search number**	3
	Name	Elsenham area
	Type	New settlement
Information	**Main rivers**	Stansted Brook
	Ordinary watercourses	Un-named tributary of River Cam
	Geology/superficial deposits	Chalk, Thanet Sand and the London Clay formation overlain on higher ground by Diamicton and sands and gravels
	Soils	Lime-rich loamy and clayey soils
	Historic flooding/known problems	Historic flooding in Elsenham due to the Stanstead Brook. Area affected to the south west of the area. History of flooding on Old Mead Lane, Henham due to an ordinary watercourse.
	Availability of detailed modelling	River Cam & Tributaries Mapping Study (JBA 2014)
	Flood defences and assets	0
Flood risk	**Fluvial flood risk**	Flood Zone 3b, 3a, 3a+CC and 2 affects the south of the area due to the Stansted Brook, and the northwest of the area due to River Cam tributary. Relatively well confined due to the topography.
	Surface water flood risk	Flow paths defined by topography and existing watercourses. Some areas of ponding throughout the area (UFMfSW).
	Groundwater flood risk	Low risk (<25% chance of emergence) in the north and east of the area. Medium risk in the west (25% - 50% chance of emergence) and high risk in the south (50% - 75% chance of emergence) of the area. (AStGWF)
	Sewer flood risk	There is 1 property on the Thames Water Sewer Flooding Register in the Elsenham postcode area (CM22 6)
	Reservoir flood risk	None
	Effect of climate change	The extent of Flood Zone 3 is not likely to increase significantly with climate change due to the confined topography. However climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	A new settlement has the potential to increase flows entering the Stansted Brook and River Stort, and impact on flows through Stansted Mountfitchet and Bishop's Stortford
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable here as an integrated part of a large new settlement. Slope and soil permeability will vary locally across the area, although the soil generally has slightly impeded drainage.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Sequential design of a new settlement at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and should avoid impacting on surface water flow routes or ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. A drainage strategy must be submitted at an early stage to show how the impact of the development will be reduced through the use of SuDS, following Essex County Council's SuDS Design Guide. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary

Reference	**Area of search number**	4
	Name	M11 Junction 8 – north-west
	Type	New settlement
Information	**Main rivers**	River Stort
	Ordinary watercourses	Great Hallingbury Brook
	Geology/superficial deposits	London Clay Formation with some Thanet Sand and Lambeth Group overlain on higher ground by Glacio-fluvial deposits and diamicton
	Soils	Lime-rich loamy and clayey soils
	Historic flooding/known problems	Flood incidents reported in Birchanger in 2001 event.
	Availability of detailed modelling	None
	Flood defences and assets	None
Flood risk	**Fluvial flood risk**	Very small area in the southeast of the area within Flood Zones 3b, 3a, 3a+CC and 2.
	Surface water flood risk	Flow paths are defined by topography and existing watercourses. No areas of ponding (UFMfSW).
	Groundwater flood risk	Low risk (<25% chance of emergence) for most of the area. Medium risk (25% - 50% chance of emergence) in the northwest of the area. (AStGWF)
	Sewer flood risk	There are 8 properties on the Thames Water Sewer Flooding Register in the Bishop's Stortford / Birchanger postcode area (CM23 5).
	Reservoir flood risk	None
	Effect of climate change	The extent of Flood Zone 3 is not likely to increase significantly with climate change due to the confined topography. However climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	A new settlement has the potential to impact on flows through Bishop's Stortford and entering River Stort and Great Hallingbury Brook.
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable here as an integrated part of a large new settlement. Slope and soil permeability will vary locally across the area, although the soil is generally freely draining.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Sequential design of a new settlement at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and should avoid impacting on surface water flow routes or ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. A drainage strategy must be submitted at an early stage to show how the impact of the development will be reduced through the use of SuDS, following Essex County Council's SuDS Design Guide. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary

Reference	**Area of search number**	5
	Name	M11 Junction 8 – south-east
	Type	New settlement
Information	**Main rivers**	None
	Ordinary watercourses	Great Hallingbury Brook
	Geology/superficial deposits	London Clay Formation overlain by glacio-fluvial deposits and diamicton
	Soils	Lime-rich loamy and clayey soils with some areas of rich-acidic loamy soil
	Historic flooding/known problems	None
	Availability of detailed modelling	None
	Flood defences and assets	None
Flood risk	**Fluvial flood risk**	Small area in west within Flood Zones 3b, 3a, 3a+CC and 2.
	Surface water flood risk	Flow paths are defined by topography and existing watercourses. No areas of ponding (UFMfSW).
	Groundwater flood risk	Low risk (<25% chance of emergence) (AStGWF)
	Sewer flood risk	There are 2 properties on the Thames Water Sewer Flooding Register in the Great Hallingbury postcode area (CM22 7).
	Reservoir flood risk	None
	Effect of climate change	The extent of Flood Zone 3 is not likely to increase significantly with climate change due to the confined topography. However climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	A new settlement has the potential to increase flows entering Great Hallingbury Brook and River Stort, and impact on flows through towns downstream (e.g. Sawbridgeworth).
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable here as an integrated part of a large new settlement. Slope and soil permeability will vary locally across the area, although the soil generally has slightly impeded drainage.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Sequential design of a new settlement at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and should avoid impacting on surface water flow routes or ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. A drainage strategy must be submitted at an early stage to show how the impact of the development will be reduced through the use of SuDS, following Essex County Council's SuDS Design Guide. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary

Reference	**Area of search number**	6
	Name	South of A120, North of Hatfield Forest
	Type	New settlement
Information	**Main rivers**	Pincey Brook
	Ordinary watercourses	None
	Geology/superficial deposits	London Clay Formation overlain by diamicton and a small area of alluvium
	Soils	Lime-rich loamy and clayey soils
	Historic flooding/known problems	None
	Availability of detailed modelling	None
	Flood defences and assets	None
Flood risk	**Fluvial flood risk**	Small area in east within Flood Zones 3b, 3a, 3a+CC and 2.
	Surface water flood risk	Flow paths defined by topography and existing watercourses. Some areas of ponding throughout the area (UFMfSW).
	Groundwater flood risk	Low risk (<25% chance of emergence) (AStGWF)
	Sewer flood risk	There is 1 property on the Thames Water Sewer Flooding Register in the Takely Street postcode area (CM22 6).
	Reservoir flood risk	Eastern edge of area at risk from breach of Balancing Pond C.
	Effect of climate change	Flood Zone 3 shows a small increase with climate change although this appears to be associated with modelling of the balancing ponds at London Stansted Airport. Climate change is predicted to result in more frequent and extreme rainfall events, increasing the likelihood and severity of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	A new settlement has the potential to impact on flows entering the Pincey Brook
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable here as an integrated part of a large new settlement. Slope and soil permeability will vary locally across the area, although the soil generally has slightly impeded drainage.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Sequential design of a new settlement at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and should avoid impacting on surface water flow routes or ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. A drainage strategy must be submitted at an early stage to show how the impact of the development will be reduced through the use of SuDS, following Essex County Council's SuDS Design Guide. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary

Reference	**Area of search number**	7
	Name	North of A120, west of Great Dunmow
	Type	New settlement
Information	**Main rivers**	None
	Ordinary watercourses	Strood Hall Brook and Roding
	Geology/superficial deposits	London Clay Formation overlain by diamicton and sands and gravels
	Soils	Lime-rich loamy and clayey soils
	Historic flooding/known problems	One flood incident reported at Molehill Green. River Roding has a history of flooding.
	Availability of detailed modelling	Upper Roding Modelling Study (JBA, ongoing)
	Flood defences and assets	None
Flood risk	**Fluvial flood risk**	Flood Zone 3b, 3a, 3a+CC and 2 runs through the centre of the area but are mostly of similar extent and confined to a narrow floodplain by the topography.
	Surface water flood risk	Flow paths are defined by topography and existing watercourses. There are small areas of ponding (UFMfSW).
	Groundwater flood risk	Low risk (<25% chance of emergence) (AStGWF)
	Sewer flood risk	There is 1 property on the Thames Water Sewer Flooding Register in the Molehill Green postcode area (CM22 6).
	Reservoir flood risk	None
	Effect of climate change	There is an increase in the extent of Flood Zone 3 with climate change just upstream of the A120. Climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	A new settlement has the potential to impact on flows entering River Roding and Strood Hall Brook.
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable here as an integrated part of a large new settlement. Slope and soil permeability will vary locally across the area. The soil within the area generally has slightly impeded drainage, with freely draining soils in the far east.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Sequential design of a new settlement at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and should avoid impacting on surface water flow routes or ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. A drainage strategy must be submitted at an early stage to show how the impact of the development will be reduced through the use of SuDS, following Essex County Council's SuDS Design Guide. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary

Reference	**Area of search number**	8
	Name	South of the A120
	Type	New settlement
Information	**Main rivers**	None
	Ordinary watercourses	Strood Hall Brook and Roding
	Geology/superficial deposits	London Clay Formation overlain by diamicton and alluvium
	Soils	Lime-rich loamy and clayey soils
	Historic flooding/known problems	A small area of historic flooding has taken place in the south of the catchment (around Great Canfield) on the River Roding
	Availability of detailed modelling	Upper Roding Modelling Study (JBA, ongoing)
	Flood defences and assets	None
Flood risk	**Fluvial flood risk**	Flood Zone 3b, 3a, 3a+CC and 2 runs through the centre of the area due to the River Roding and two tributaries. Flood Zones are generally of similar extent and confined to a narrow floodplain by the topography. Very small area of the area in the east within Flood Zones.
	Surface water flood risk	Flow paths are defined by topography and existing watercourses. There are small areas of ponding (UFMfSW).
	Groundwater flood risk	Low risk (<25% chance of emergence) across the majority of the area, with some areas of Medium risk (25% - 50% chance of emergence) (AStGWF)
	Sewer flood risk	None
	Reservoir flood risk	None
	Effect of climate change	The extent of Flood Zone 3 is not likely to increase significantly with climate change due to the confined topography. However climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	A new settlement has the potential to impact on flows entering River Roding and Strood Hall Brook.
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable here as an integrated part of a large new settlement. Slope and soil permeability will vary locally across the area. The soil within the area generally has slightly impeded drainage, with freely draining soils in the east.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Sequential design of a new settlement at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and should avoid impacting on surface water flow routes or ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. A drainage strategy must be submitted at an early stage to show how the impact of the development will be reduced through the use of SuDS, following Essex County Council's SuDS Design Guide. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary

Reference	**Area of search number**	9
	Name	West of Braintree
	Type	New settlement
Information	**Main rivers**	Stebbing Brook
	Ordinary watercourses	None
	Geology/superficial deposits	London Clay Formation overlain by diamicton and sands and gravels
	Soils	Lime-rich loamy and clayey soils with some areas of rich-acidic loamy soil
	Historic flooding/known problems	Recorded incidents of flooding in Stebbing in October 2001 and Januray 2003.
	Availability of detailed modelling	None
	Flood defences and assets	None
Flood risk	**Fluvial flood risk**	Flood Zone 3b, 3a, 3a+CC and 2 runs through the centre of the area and also a small area located in the east of the area. Flood Zones are of similar extent and confined to a narrow floodplain by the topography.
	Surface water flood risk	Flow paths are defined by topography and existing watercourses. There are small areas of ponding (UFMfSW).
	Groundwater flood risk	Low risk (<25% chance of emergence) across the majority of the area, with some vert small areas of Medium risk (25% - 50% chance of emergence) (AStGWF)
	Sewer flood risk	None
	Reservoir flood risk	None
	Effect of climate change	The extent of Flood Zone 3 is not likely to increase significantly with climate change due to the confined topography. However climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	A new settlement has the potential to impact on flows entering Stebbing Brook and River Ter.
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable here as an integrated part of a large new settlement. Slope and soil permeability will vary locally across the area. The soil within the area generally has slightly impeded drainage, with freely draining soils located in the Stebbing Brook valley through the centre of the area.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Sequential design of a new settlement at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and should avoid impacting on surface water flow routes or ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. A drainage strategy must be submitted at an early stage to show how the impact of the development will be reduced through the use of SuDS, following Essex County Council's SuDS Design Guide. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary

Reference	**Area of search number**	10
	Name	Saffron Walden
	Type	Urban extension
Information	**Main rivers**	The Slade
	Ordinary watercourses	None
	Geology/superficial deposits	Chalk overlain by diamicton and alluvium
	Soils	Lime-rich loamy and clayey soils
	Historic flooding/known problems	Long history of severe flooding problems due mostly to The Slade, but also surface water. Particular flood risk issues associated with blockage and poor maintenance of several long culverts.
	Availability of detailed modelling	River Cam Flood Mapping Improvements Phase 2 (Halcrow, 2012); River Cam & Tributaries Mapping Study (JBA 2014); Saffron Walden Culvert Blockage Analysis (Environment Agency 2013)
	Flood defences and assets	Several long culverts within the town. Blockage of the long culvert on the Kings Slade in a 1 in 100 year event produces a similar flood outline to Flood Zone 2.
Flood risk	**Fluvial flood risk**	Flood Zones 3b, 3a, 3a+CC and 2 associated with the Slades run through and affect significant areas of AoS 10a, 10c, 10f and 10g. The Flood Zones are of similar extent due to the topography.
	Surface water flood risk	Saffron Walden is identified as a Tier 2 surface water flood risk area in the LFRMS. Flow paths are defined by topography and existing watercourses. No areas of ponding (UFMfSW).
	Groundwater flood risk	Medium risk (25% - 50% change of emergence) for 10g. Low risk (<25% chance of emergence) for all other areas. (AStGWF)
	Sewer flood risk	There are 2 properties on the Anglian Water Sewer Flooding Register in Saffron Walden (CB10 1).
	Reservoir flood risk	None
	Effect of climate change	The extent of Flood Zone 3 is not likely to increase significantly in the Areas of Search with climate change due to the confined topography. However climate change may have a significant impact in the existing town. Climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	Developing the outskirts of the town has the potential to affect flows entering The Slades, River Cam (or Granta) and their tributaries. If not managed correctly this could increase the already significant risk of flooding and culvert blockages in the centre of Saffron Walden, which is a Tier 2 flood risk area. Increased flows could also impact Great Chesterford.
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable here as an integrated part of a large new development. Slope and soil permeability will vary locally across the area. The areas generally have freely draining soils, with some areas of soils with slightly impeded drainage.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Saffron Walden is identified as a Tier 2 flood risk area under the LFRMS. Close consultation with the LLFA will be required and any future SWMP studies must be taken into account. Sequential design of new developments at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and avoid surface water flow routes and ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. A drainage strategy must be submitted at an early stage to show how the impact of the development will be reduced through SuDS techniques, with surface water run-off rates attenuated according to Essex County Council's SuDS Guidance local design standards. The drainage strategy should demonstrate that existing surface water flow paths will be preserved and that flows will not be increased in Saffron Walden town centre, which is particlarly sensitive to flood risk and culvert blockage. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary.

Reference	**Area of search number**	11
	Name	Edge of Bishop's Stortford
	Type	Urban extension
Information	**Main rivers**	River Stort
	Ordinary watercourses	Elm Road Ditch
	Geology/superficial deposits	London Clay Formation, Thanet Sands and Chalk Formation overlain by diamicton and sands and gravels
	Soils	Lime rich Loamy soils with some areas of rich-acidic loamy soil
	Historic flooding/known problems	A small area to the west of area 11b has historic flooding from River Stort.
	Availability of detailed modelling	None
	Flood defences and assets	None
Flood risk	**Fluvial flood risk**	Flood Zones 3b, 3a, 3a+CC and 2 in the east of area 11b where the floodplain is well confined by the topography. A small area in the west of 11b is within Flood Zone 2.
	Surface water flood risk	Flow paths are defined by topography and existing watercourses. There are small areas of ponding (UFMfSW).
	Groundwater flood risk	Low to Medium Risk (<25%, >=25% <50%) change of emergence for the whole area.
	Sewer flood risk	There are 11 properties on the Anglian Water Sewer Flooding Register in the Bishop's Stortford postcode areas (CM23 2, CM23 3 and CM23 5)
	Reservoir flood risk	None
	Effect of climate change	The extent of Flood Zone 3 is not likely to increase significantly with climate change due to the confined topography. However climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	Developing the town has the potential to impact flows eneterining River Stort and Great Hallingbury Brook. There is potential for flows through Bishop's Stortford and towns downstream on the River Stort to be impacted.
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable here as an integrated part of a large new development. Slope and soil permeability will vary locally across the areas, from freely draining to slightly impeded drainage.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Sequential design of new developments at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and avoid surface water flow routes and ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. A drainage strategy must be submitted at an early stage to show how the impact of the development will be reduced through SuDS techniques, with surface water run-off rates attenuated according to Essex County Council's SuDS Guidance local design standards. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary.

Reference	**Area of search number**	12
	Name	Great Dunmow
	Type	Urban extension
Information	**Main rivers**	Chelmer
	Ordinary watercourses	Hoblong's Brook and other unamed tributaries of the River Chelmer
	Geology/superficial deposits	London Clay Formation overlain with diamicton and alluvium
	Soils	Lime rich Loamy soils with some areas of rich-acidic loamy soil
	Historic flooding/known problems	River Chelmer runs through areas 12b and 12d and there is recorded historic flooding here. Recorded incidents of flooding at Churchend, Great Dunmow.
	Availability of detailed modelling	River Chelmer SFRM Study (Halcrow, 2010)
	Flood defences and assets	None
Flood risk	**Fluvial flood risk**	A large proportion of areas 12b and 12f are within Flood Zones 3b, 3a, 3a+CC and 2. Floodplains relatively extensive. A small area in the east of 12e within Flood Zone 2.
	Surface water flood risk	Great Dunmow is identified as a Tier 3 surface water flood risk area in the LFRMS. Flow paths are defined by topography and existing watercourses. There are small areas of ponding (UFMfSW).
	Groundwater flood risk	12a - low to medium risk, 12b - High to medium risk, 12c - Low to medium risk, 12d - low medium and high, 12e - low medium and high, 12f low
	Sewer flood risk	There are 2 properties on the Anglian Water Sewer Flooding Register in Great Dunmow (CM6 1).
	Reservoir flood risk	Areas 12b and 12d are at risk from breach of Little Easton reservoir.
	Effect of climate change	The extent of Flood Zone 3 is not likely to increase significantly with climate change due to the confined topography. However climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	Developing the town has the potential to impact on flows through Great Dunmow and entering the River Chelmer.
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable here as an integrated part of a large new development. Slope and soil permeability will vary locally across the areas, from freely draining to slightly impeded drainage.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Great Dunmow is identified as a Tier 3 flood risk area under the LFRMS. Close consultation with the LLFA will be required and any future SWMP studies must be taken into account. Sequential design of a new settlement at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and avoid surface water flow routes and ordinary watercourses. This will be a particular issue in Areas of Search 12b and 12d. An FRA should be submitted including and assessment of flood risk from all sources,and hydraulic modelling of the watercourses to define flood extents, water levels and the impact of climate change. A drainage strategy should be submitted at an early stage to show how the impact of the development will be reduced through area design and SuDS techniques, with surface water run-off rates attenuated according to local design standards. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. Improvements in WFD status should be sought as part of the development. Anglian Water should be consulted at an early stage to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary.

Reference	**Area of search number**	13
	Name	Stansted Mountfitchet
	Type	Key village (village extensions/small sites)
Information	**Main rivers**	Stansted Brook
	Ordinary watercourses	Ugley Brook
	Geology/superficial deposits	Chalk and Thanet Sands overlain by diamicton and glacio-fluvial deposits
	Soils	Acidic but rich soils and lime rich loamy and clayey soils
	Historic flooding/known problems	Historic problems at the confluence of the Stansted Brook and Ugley Brook. Particularly, Lower Street (B1351)/Gall End Lane in the east of the area.
	Availability of detailed modelling	Upper & Middle Stort Flood Mapping Model (Halcrow, 2010)
	Flood defences and assets	Proposed Stansted Mountifitched FAS - An initial assessment of combined pluvial and fluvial flooding within Stansted Mountfitchet for the purposes of a flood alleviation sheme is currently ongoing.
Flood risk	**Fluvial flood risk**	Flood Zones 3b, 3a, 3a+CC and 2 run through centre of the village but all are similar in extent and confined to a very narrow floodplain. Floodplain from Stansted Brook in east of village slightly less constrained.
	Surface water flood risk	Stansted Mountfitchet is identified as a Tier 3 surface water flood risk area in the LFRMS. Flow paths are defined by topography and existing watercourses. There are small areas of ponding (UFMfSW).
	Groundwater flood risk	Low risk (<25% chance of emergence) for the majority of the area with medium risk (25% - 50% change of emergence) in the southwest of the village.
	Sewer flood risk	There are 7 properties on the Thames Water Sewer Flooding Register in Stansted Mountfitchet (CM24 8)
	Reservoir flood risk	None
	Effect of climate change	The extent of Flood Zone 3 is likely to increase around the railway to the east of the village with climate change . Climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	Developing the village has the potential to impact flows entering the Stansted Brook and River Stort. There is potential for flows through Stansted Mountfitchet to be impacted.
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable here as an integrated part of a large new development. Slope and soil permeability will vary locally across the area but is generally freely draining. Infiltration, filtration and detention SuDS will be limited close to the Stansted Brook where the groundwater is higher.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Stansted Mountfitchet is identified as a Tier 3 flood risk area under the LFRMS. Close consultation with the LLFA will be required and any future SWMP studies must be taken into account. Sequential design of major developments at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and avoid surface water flow routes and ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. Minor developments that involve a change of use, have known drainage issues or may be at flood risk from local sources will require an FRA. A drainage strategy must be submitted for all sites at an early stage to show how the impact of the development will be reduced through SuDS techniques, with surface water run-off rates attenuated according to Essex County Council's SuDS Guidance local design standards. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary.

Reference	**Area of search number**	13
	Name	Great Chesterford
	Type	Key village (village extensions/small sites)
Information	**Main rivers**	River Cam (or Granta)
	Ordinary watercourses	Un-named tributary of River Cam
	Geology/superficial deposits	Chalk Formation overlain by river terrace deposits
	Soils	Slightly acidic but rich soils
	Historic flooding/known problems	History of flooding in Great Chesterford from River Cam (or Granta) and tributary.
	Availability of detailed modelling	River Cam & Tributaries Mapping Study (JBA 2014)
	Flood defences and assets	None
Flood risk	**Fluvial flood risk**	Flood Zones 3b, 3a, 3a+CC and 2 in the north and south of the village. Floodplain relatively extensive as topography is less steep.
	Surface water flood risk	Flow paths are defined by topography and existing watercourses. There are areas of ponding (UFMfSW).
	Groundwater flood risk	Low risk (<25% chance of emergence) in the east of the area and medium risk (25% - 50% chance of emergence) for the majority of the area.
	Sewer flood risk	There are 2 properties on the Thames Water Sewer Flooding Register in Great Chesterford and surrounding postcode area (CB11 4)
	Reservoir flood risk	None
	Effect of climate change	The extent of Flood Zone 3 is likely to increase just upstream of Walden Road. Climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	Developing the village has the potential to increase flows entering River Cam (or Granta). There is potential for flows through Great Chesterford to be impacted.
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable here as an integrated part of a large new development. Slope and soil permeability will vary locally across the area but is generally freely draining. Infiltration, filtration and detention SuDS will be limited close to River Cam where the groundwater is higher.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Sequential design of major developments at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and avoid surface water flow routes and ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. Minor developments that involve a change of use, have known drainage issues or may be at flood risk from local sources will require an FRA. A drainage strategy must be submitted for all sites at an early stage to show how the impact of the development will be reduced through SuDS techniques, with surface water run-off rates attenuated according to Essex County Council's SuDS Guidance local design standards. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary.

Reference	**Area of search number**	13
	Name	Newport
	Type	Key village (village extensions/small sites)
Information	**Main rivers**	River Cam (or Granta) and Wicken Water
	Ordinary watercourses	Un-named tributary of River Cam
	Geology/superficial deposits	London Clay Formation overlain by allivuim and diamicton
	Soils	Lime rich Loamy soils with some areas of rich-acidic loamy soil
	Historic flooding/known problems	A small area north east of the area adjacent to the River Cam has a history of flooding (Bridge End, Water Lane, Cambridge Road and White Horse Lane)
	Availability of detailed modelling	River Cam & Tributaries Mapping Study (JBA 2014)
	Flood defences and assets	None
Flood risk	**Fluvial flood risk**	A large area in the south, central and east of the area is within Flood Zones 3b, 3a, 3a+CC and 2. In the south the floodplain extents are very similar, whilst in the north the floodplain exents vary.
	Surface water flood risk	Flow paths are defined by topography and existing watercourses. There are small areas of ponding (UFMfSW).
	Groundwater flood risk	Low (<25% chance of emergence) to high risk (50% - 75% change of emergence) for the whole area. Lowest risk in the southwest and highest risk in northeast of the village.
	Sewer flood risk	There is 1 property on the Anglian Water Sewer Flooding Register in Newport (CB11 3).
	Reservoir flood risk	None
	Effect of climate change	The extent of Flood Zone 3 is likely to increase by a small amount in certain locations. Climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	Developing the village has the potential to impact flows entering River Cam (or Granta). There is potential for flows through Newport and Great Chesterford to be impacted.
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable here as an integrated part of a large new development. Slope and soil permeability will vary locally across the area but is generally freely draining.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Sequential design of major developments at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and avoid surface water flow routes and ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. Minor developments that involve a change of use, have known drainage issues or may be at flood risk from local sources will require an FRA. A drainage strategy must be submitted for all sites at an early stage to show how the impact of the development will be reduced through SuDS techniques, with surface water run-off rates attenuated according to Essex County Council's SuDS Guidance local design standards. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary.

Reference	**Area of search number**	13
	Name	Thaxted
	Type	Key village (village extensions/small sites)
Information	**Main rivers**	River Chelmer
	Ordinary watercourses	Unnamed tributary of the River Chelmer
	Geology/superficial deposits	London Clay Formation and Thanet Sands overlain by diamicton and glaciofluvial deposits
	Soils	Lime rich Loamy soils with some areas of rich-acidic loamy soil
	Historic flooding/known problems	Thaxted has experienced flooding on several occasions initiating a flood investigation report. Majority of flooding is to the north (ordinary watercourse) and east (runoff from fields) of the village.
	Availability of detailed modelling	River Chelmer SFRM Study (Halcrow, 2010)
	Flood defences and assets	A local FAS currently being put in place by ECC.
Flood risk	**Fluvial flood risk**	None
	Surface water flood risk	Thaxted is identified as a Tier 3 surface water flood risk area in the LFRMS. Flow paths are defined by topography and existing watercourses. There are areas of ponding within the village (UFMfSW).
	Groundwater flood risk	Low risk (<25% chance of emergence) (AStGWF)
	Sewer flood risk	None
	Reservoir flood risk	None
	Effect of climate change	The extent of Flood Zone 3 is not likely to increase significantly with climate change due to the confined topography. However climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	Developing the village has the potential to impact flows entering River Chelmer, and flowing through Great Dunmow.
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable here as an integrated part of a large new development. Slope and soil permeability will vary locally across the area, from freely draining to slightly impeded drainage.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Thaxted is identified as a Tier 3 flood risk area under the LFRMS. Close consultation with the LLFA will be required and any future SWMP studies must be taken into account. Sequential design of major developments at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and avoid surface water flow routes and ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. Minor developments that involve a change of use, have known drainage issues or may be at flood risk from local sources will require an FRA. A drainage strategy must be submitted for all sites at an early stage to show how the impact of the development will be reduced through SuDS techniques, with surface water run-off rates attenuated according to Essex County Council's SuDS Guidance local design standards. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary.

Reference	**Area of search number**	13
	Name	Elsenham
	Type	Key village (village extensions/small sites)
Information	**Main rivers**	Stansted Brook
	Ordinary watercourses	Unnamed tributary of the River Cam (or Granta)
	Geology/superficial deposits	London Clay Formation and Thanet Sands overlain by Diamicton and sands and gravels
	Soils	Slightly acidic but rich soils
	Historic flooding/known problems	None
	Availability of detailed modelling	None
	Flood defences and assets	Essex County Council provided some detailed asset data for the culvert at Old Mead Lane, Elsenham.
Flood risk	**Fluvial flood risk**	None
	Surface water flood risk	Flow paths are defined by topography. There are areas of ponding within the village (UFMfSW).
	Groundwater flood risk	Majority of the village has a medium risk (25% - 50% chance of emergence). (AStGWF)
	Sewer flood risk	There is 1 property on the Thames Water Sewer Flooding Register in Elsenham and surrounding postcode area (CM22 6)
	Reservoir flood risk	None
	Effect of climate change	The extent of Flood Zone 3 is likely to increase with climate change around Hall Road. However climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	Developing the village has the potential to impact flows entering Stansted Brook, and flowing through Stansted Mountfitchet.
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable here as an integrated part of a large new development. Slope and soil permeability will vary locally across the area but is generally freely draining.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Sequential design of major developments at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and avoid surface water flow routes and ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. Minor developments that involve a change of use, have known drainage issues or may be at flood risk from local sources will require an FRA. A drainage strategy must be submitted for all sites at an early stage to show how the impact of the development will be reduced through SuDS techniques, with surface water run-off rates attenuated according to Essex County Council's SuDS Guidance local design standards. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary.

Reference	**Area of search number**	13
	Name	Takeley
	Type	Key village (village extensions/small sites)
Information	**Main rivers**	Tributary of Pincey Brook
	Ordinary watercourses	Drain
	Geology/superficial deposits	London Clay Formation overlain by diamicton
	Soils	Lime rich Loamy and clayey soils
	Historic flooding/known problems	Flood incidents recorded and Takeley Tier 3 area identified within PFRA.
	Availability of detailed modelling	None
	Flood defences and assets	Proposed FAS at Takeley - Frequent blocking of a culvert is to be remedied by installing a new screen and de-culverting. Essex County Council provided some detailed asset data for Dunmow Road, Takeley and Fleming Road, Little Canfield.
Flood risk	**Fluvial flood risk**	None
	Surface water flood risk	Takeley is identified as a Tier 3 surface water flood risk area in the LFRMS. Flow paths are defined by topography. There are areas of ponding within the village (UFMfSW).
	Groundwater flood risk	Low risk (<25% chance of emergence) (AStGWF)
	Sewer flood risk	There is 1 property on the Thames Water Sewer Flooding Register in Takeley and surrounding postcode area (CM22 6)
	Reservoir flood risk	None
	Effect of climate change	Climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	Developing the village has the potential to impact flows entering Takeley Drain.
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable here as an integrated part of a large new development. Slope and soil permeability will vary locally across the area but generally the soil has slightly impeded drainage.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Takeley is identified as a Tier 3 flood risk area under the LFRMS. Close consultation with the LLFA will be required and any future SWMP studies must be taken into account. Sequential design of new developments at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and avoid surface water flow routes and ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. A drainage strategy must be submitted at an early stage to show how the impact of the development will be reduced through SuDS techniques, with surface water run-off rates attenuated according to Essex County Council's SuDS Guidance local design standards. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary.

Reference	**Area of search number**	13
	Name	Hatfield Heath
	Type	Key village (village extensions/small sites)
Information	**Main rivers**	Pincey Brook
	Ordinary watercourses	None
	Geology/superficial deposits	London Clay Formation overlain with diamiction, gravels, sand, silt and clay
	Soils	Slightly acid loamy and clayey and lime rich loamy soils
	Historic flooding/known problems	Far east of area is within historic flood outline of Pincey Brook. Recorded flood incident in October 2001 event.
	Availability of detailed modelling	None
	Flood defences and assets	Essex County Council provided some detailed asset data for Hatfield Heath.
Flood risk	**Fluvial flood risk**	None
	Surface water flood risk	Flow paths are defined by topography. There are areas of ponding within the village (UFMfSW).
	Groundwater flood risk	Low risk (<25% chance of emergence) in the west and east of the village, medium risk (25% - 50% chance of emergence) in the centre of the village. (AStGWF)
	Sewer flood risk	There are 2 properties on the Thames Water Sewer Flooding Register in Hatfield Heath and surrounding postcode area (CM22 7)
	Reservoir flood risk	None
	Effect of climate change	The extent of Flood Zone 3 on Pincey Brook is likely to increase by a small amount. Climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	Developing the village has the potential to impact flows entering Pincey Brook.
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable here as an integrated part of a large new development. Slope and soil permeability will vary locally across the area but generally the soil has slightly impeded drainage.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Sequential design of major developments at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and avoid surface water flow routes and ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. Minor developments that involve a change of use, have known drainage issues or may be at flood risk from local sources will require an FRA. A drainage strategy must be submitted for all sites at an early stage to show how the impact of the development will be reduced through SuDS techniques, with surface water run-off rates attenuated according to Essex County Council's SuDS Guidance local design standards. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary.

Reference	**Area of search number**	14
	Name	Ashdon, Quendon & Rickling, Chrishall, Debden, Henham (Great Ouse catchment)
	Type	Type A Villages (small sites)
Information	**Main rivers**	None
	Ordinary watercourses	Ashdon - River Bourn; Quendon & Rickling and Debden - tributary of River Cam (or Granta); Henham - tributary of Stansted Brook
	Geology/superficial deposits	London Clay Formation and Chalk Formation overlain by diamicton and glaciofluvial deposits
	Soils	Lime-rich loamy and clayey soils in all of the settlements but Ashdon has slightly acidic soils as well.
	Historic flooding/known problems	Long history of flooding in Ashdon, associated with River Bourn flowing through the centre of the village. There are reports of flood incidents in all of the other villages for the larger events across the District however Debden has a greater number of recorded flood incidents.
	Availability of detailed modelling	None
	Flood defences and assets	Essex County Council provided some detailed asset data for Chrishall.
Flood risk	**Fluvial flood risk**	Only Ashdon located within Flood Zones. Flood Zones 3b, 3a, 3a+CC and 2 runs through the centre of Ashdon. Flood Zones similar in extent and confined to a narrow floodplain by the topography.
	Surface water flood risk	Flow paths are defined by topography. There are surface water flow routes and areas of ponding within the villages (UFMfSW).
	Groundwater flood risk	Low risk (<25% chance of emergence) for all villages. (AStGWF)
	Sewer flood risk	There is 1 property on the Thames Water Sewer Flooding Register in Henham and surrounding postcode area (CM22 6). None in the other villages.
	Reservoir flood risk	None
	Effect of climate change	Climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	Developing Ashdon has the potential to impact flows entering River Bourn, a tributary of River Granta. Developing the other villages has the potential to increase flows into ordinary watercourses which are tributaries of the River Cam (or Granta).
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable at these areas as an integrated part of a development. Slope and soil permeability will vary locally across the areas, from freely draining to slightly impeded drainage.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Sequential design of major developments at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and avoid surface water flow routes and ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. Minor developments that involve a change of use, have known drainage issues or may be at flood risk from local sources will require an FRA. A drainage strategy must be submitted for all sites at an early stage to show how the impact of the development will be reduced through SuDS techniques, with surface water run-off rates attenuated according to Essex County Council's SuDS Guidance local design standards. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary.

Reference	**Area of search number**	14
	Name	Hatfield Broad Oak, Leaden Roding, Birchanger, Manuden, Farnham, Clavering, Little Hallingbury (Thames catchment)
	Type	Type A Villages (small sites)
Information	**Main rivers**	Hatfield Broad Oak - Pincey Brook; Manuden - River Stort; Clavering - River Stort and Sticking Green Brook; Little Hallingbury - Little Hallingbury Brook
	Ordinary watercourses	Hatfield Broad Oak - Mus Brook; Birchanger - tributary of River Stort
	Geology/superficial deposits	London Clay Formation, Thanet sands and Chalk Formation overlain by diamicton and glaciofluvial deposits
	Soils	Lime rich loamy soils - Hatfield Broad Oak, Leaden Roding, Farnhem. Slightly acidic soils - birdchanger, Manuden, Little Hallingbury
	Historic flooding/known problems	Historic flooding in Manuden and Calvering due to River Stort. Historic flooding in Little Hallingbury where Little Hallingbury and Woodside Green Brook confluence. History of surface water flooding on A1060 Lower Road, Little Hallingbury. One groundwater flood incident in Hatfeld Broad Oak. Flood incidents recorded in Birchanger for larger events in the District. No history of flooding in Leaden Roding or Farnham.
	Availability of detailed modelling	Manuden & Clavering - Upper & Middle Stort Flood Mapping Model (Halcrow, 2010)
	Flood defences and assets	Existing flood defence embankments on River Stort at Little Hallingbury, Clavering and Manuden. Proposed new scheme at Clavering and Manuden to improve an undersized culvert which causes the river to surcharge. Proposed solution is to increase culvert capacity or attenuate high flows.
Flood risk	**Fluvial flood risk**	Flood Zones 3b, 3a, 3a+CC and 2 located in Clavering and Manuden. Very small area of Hatfield Broad Oak and Little Hallingbury located within Flood Zones.
	Surface water flood risk	Clavering and Manuden are identified as Tier 3 surface water flood risk areas in the LFRMS. Flow paths are defined by topography. There are areas of ponding within the villages (UFMfSW).
	Groundwater flood risk	Low risk (<25% chance of emergence) for Farnham, Leaden Roding, Clavering, Little Hallingbury and Hatfield Broad Oak. Low and medium risk (25% - 50% chance of emergence) for Birchanger and Manuden. (AStGWF)
	Sewer flood risk	There are 8 properties on the Thames Water Sewer Flooding Register in the Bishop's Stortford / Birchanger postcode area (CM23 5) and 2 in the Hatfield Broad Oak and Little Hallingbury area (CM22 7).
	Reservoir flood risk	None
	Effect of climate change	Climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	Developing Hatfield Broad Oak has the potential to impact flows entering Pincey Brook. Developing Leadon Roding has the potential to impact flows entering River Roding. Developing the other villages has the potential to impact flows entering the River Stort and its tributaries.

Implications for development	**SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)**	Most SuDS techniques should be suitable at these areas as an integrated part of a development. Slope and soil permeability will vary locally across the areas, from freely draining to slightly impeded drainage.
	Considerations for planning and development control	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Clavering and Manuden are identified as Tier 3 flood risk areas under the LFRMS. Close consultation with the LLFA will be required and any future SWMP studies must be taken into account. Sequential design of major developments at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and avoid surface water flow routes and ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. Minor developments that involve a change of use, have known drainage issues or may be at flood risk from local sources will require an FRA. A drainage strategy must be submitted for all sites at an early stage to show how the impact of the development will be reduced through SuDS techniques, with surface water run-off rates attenuated according to Essex County Council's SuDS Guidance local design standards. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary.

Reference	**Area of search number**	14
	Name	Radwinter, Wimbish, Great Sampford, Felstead, Flitch Green, Stebbing, Great Easton (North Essex catchment)
	Type	Type A Villages (small sites)
Information	**Main rivers**	Radwinter - River Pant and Lower House Brook; Wimbish - River Pant; Flitch Green - Stebbing Brook; Stebbing - Stebbing Brook; Great Easton - River Chelmer
	Ordinary watercourses	Radwinter, Wimbish, Great Sampford - unnamed tributary of River Pant; Flitch Green - unnamed tributary of River Chelmer and Stebbing Brook; Stebbing - unnamed tributray of Stebbing Brook; Great Easton - unnamed tributaries of River Chelmer
	Geology/superficial deposits	London Clay Formation, Thanet sands and Chalk Formation overlain by diamicton and sands and gravels
	Soils	Slightly acidic loamy soils - Radwinter, Felstead, Flitch Green Stebbing, Great Easton. Lime-rich loamy and clayey soils - Radwinter, Wimbish, Great Sampford, Felstead.
	Historic flooding/known problems	Small area of historic flooding in Great Easton. Radwinter, Wimbish, Stebbing and Great Sampford all had reported incidents of flooding in 2001 and 2003. No history of flooding in Felstead or Flitch Green.
	Availability of detailed modelling	Flitch Green & Great Easton - River Chelmer SFRM Study (Halcrow, 2010)
	Flood defences and assets	Essex County Council provided some detailed asset data for Radwinter Farm.
Flood risk	**Fluvial flood risk**	Flood Zones 3b, 3a, 3a+CC and 2 located within Radwinter, Wimbish, Stebbing and Great Easton. Only a very small area of Great Sampford and Flitch Green located within the Flood Zones. No Flood Zone within Felstead.
	Surface water flood risk	Radwinter is identified as a Tier 3 surface water flood risk area in the LFRMS. Flow paths are defined by topography. There are areas of ponding within the villages (UFMfSW).
	Groundwater flood risk	Low risk (<25% chance of emerging) for Radwinter, Wimbish and Felstead. Low to medium risk (25% - 50% chance of emergence) for Flitch Green, Stebbing and Great Easton. Low to high (50 - 75% chance of emergence) for Great Sampford. (AStGWF)
	Sewer flood risk	None
	Reservoir flood risk	None
	Effect of climate change	Climate change is predicted to result in more frequent and extreme rainfall events, increasing the frequency and severity (depth/hazard) of flooding from fluvial and surface water sources. In relation to groundwater, the effect of climate change is less certain. Milder wetter winters may increase the frequency of groundwater flooding incidents but warmer drier summers may counteract this effect.
	Downstream impact	Developing Radwinter, Wimbish or Great Sampford has the potential to impact flows entering the River Pant. Developing Flitch Green, Felstead, Stebbing or Great Easton has the potential to impact flows entering the River Chelmer.
	SuDS appraisal (suitability of retention, wetlands, infiltration, filtration, detention, open channels, source control techniques)	Most SuDS techniques should be suitable at these areas as an integrated part of a development. Slope and soil permeability will vary locally across the areas, from freely draining to slightly impeded drainage.

Implications for development	**Considerations for planning and development control**	Early consultation with the EA and LLFA is essential. Any development must pass the Sequential Test. Radwinter is identified as a Tier 3 flood risk area under the LFRMS. Close consultation with the LLFA will be required and any future SWMP studies must be taken into account. Sequential design of major developments at the master planning stage should ensure that built development and access routes are entirely within Flood Zone 1 and avoid surface water flow routes and ordinary watercourses. Opportunities should be exploited at the master planning stage for multiple benefits in terms of integrated sustainable drainage, green infrastructure, amenity, biodiversity and WFD status. All major developments must carry out an FRA including and assessment of flood risk from all sources, and hydraulic modelling of the watercourses to better define the Flood Zones, water levels and the impact of climate change. Minor developments that involve a change of use, have known drainage issues or may be at flood risk from local sources will require an FRA. A drainage strategy must be submitted for all sites at an early stage to show how the impact of the development will be reduced through SuDS techniques, with surface water run-off rates attenuated according to Essex County Council's SuDS Guidance local design standards. The drainage strategy should demonstrate that existing surface water flow paths will be preserved. Anglian Water should be consulted at an early stage for major developments to ensure that there will be sufficient capacity in the wastewater system and any upgrades are carried out where necessary.

Uttlesford
District Council

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