Uttlesford District Council: Level 1 Strategic Flood Risk Assessment

Final Report

June 2024

Prepared for:
Uttlesford District Council

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Abbreviations

AEP	Annual Exceedance Probability
AStGWF	Areas Susceptible to Groundwater flooding
AW	Anglian Water
CC	Climate Change
CFMP	Catchment Flood Management Plan
CIRIA	Construction Industry Research and Information Association
Defra	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EU	European Union
FAA	Flood Alert Area
FCERM	Flood and Coastal Erosion Risk Management
FRA	Flood Risk Assessment
FRMP	Flood Risk Management Plan
FWA	Flood Warning Area
FWMA	Flood and Water Management Act
FWS	Flood Warning System
GSPZ	Groundwater Source Protection Zone
IDB	Internal Drainage Board
JBA	Jeremy Benn Associates
LFRMS	Local Flood Risk Management Strategy
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
LPU	Local Plan Update
mAOD	metres Above Ordnance Datum
NFM	Natural Flood Management
NPPF	National Planning Policy Framework
NRD	National Receptor Database
NVZs	Nitrate Vulnerable Zones
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
RBD	River Basin District
RBMP	River Basin Management Plan
RMAs	Risk Management Authorities

RoFSW	Risk of Flooding from Surface Water
SFRA	Strategic Flood Risk Assessment
SoP	Standard of Protection
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
TW	Thames Water
UDC	Uttlesford District Council
WFD	Water Framework Directive

Definitions

1D model: one-dimensional hydraulic model

2D model: two-dimensional hydraulic model

Annual Exceedance Probability: the probability (expressed as a percentage) of a flood event occurring in any given year.

Brownfield: previously developed parcel of land

Catchment Flood Management Plan: a high-level planning strategy through which the EA 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.

Climate Change: long term variations in global temperature and weather patterns caused by natural and human actions.

Cumecs: the cumec is a measure of flow rate. One cumec is shorthand for cubic metre per second (m^3/s).

Design flood: This is a flood event of a given annual flood probability, which is generally taken as: fluvial (river) flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year), or tidal flooding with a 0.5% annual probability (1 in 200 chance each year), or surface water flooding likely to occur with a 1% annual probability (a 1 in 100 change each year), plus an appropriate allowance for climate change, against which the suitability of a proposed development is assessed and mitigation measures, if any, are designed.

Exception test: Set out in the NPPF, the exception test is a method used to demonstrate that flood risk to people and property will be managed appropriately, where alternative sites at a lower flood risk are not available. The exception test is applied following the sequential test. As set out in Paragraph 170 of the NPPF (December, 2023), the exception test should demonstrate that: development that has to be in a flood risk area will provide wider benefits to the community that outweigh flood risk; and the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

Flood defence: Infrastructure used to protect an area against floods such as floodwalls and embankments; they are designed to a specific standard of protection (design standard).

Flood Map for Planning: The EA Flood Map for Planning (Rivers and Sea) is an online mapping portal which shows the Flood Zones in England. The Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences and do not account for the possible impacts of climate change.

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 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.

Flood 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 river (main river or ordinary watercourse).

Green Infrastructure: a network of multi-functional green and blue spaces and other natural features, urban and rural, which is capable of delivering a wide range of environmental, economic, health and wellbeing benefits for nature, climate, local and wider communities, and prosperity (NPPF, December 2023).

Greenfield: undeveloped parcel of land

Indicative Flood Risk Area: nationally identified flood risk areas based on the definition of 'significant' flood risk described by Defra and WAG.

Lead Local Flood Authority: the unitary authority for the area or if there is no unitary authority, the county council for the area.

Main river: a watercourse shown as such on the statutory main river map held by the Environment Agency. They are usually the larger rivers and streams. The Environment Agency has permissive powers (not duties) to carry out maintenance and improvement works on main rivers).

Major development: defined in the National Planning Policy Framework (NPPF) as a housing development where 10 or more homes will be provided, or the site has an area of 0.5 hectares or more, or as a non-residential development with additional floorspace of 1,000m² or more, or a site of 1 hectare or more, or as otherwise provided in the Town and Country Planning (Development Management Procedure) (England) Order 2015 available here.

Ordinary watercourse: any river, stream, ditch, drain, cut, dyke, sluice, sewer (other than a public sewer) and passage through which water flows but which does not form part of a main river. The local authority or internal drainage board has permissive powers (not duties) on ordinary watercourses.

Permissive Powers: authorities have the power to undertake flood risk management activities, but not a duty to do so. This will depend on priorities in flood risk management.

Pitt Review: Comprehensive independent review of the 2007 summer floods by Sir Michael Pitt, which provided recommendations to improve flood risk management in England.

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.

Riparian owner: A riparian landowner, in a water context, owns land or property, next to a river, stream or ditch.

Risk Management Authority: the Environment Agency; a lead local flood authority; a district council in an area where there is no unitary authority; an internal drainage board; a water company and a highway authority.

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.

Sequential test: Set out in Paragraph 168 of the NPPF (December 2023), the sequential test is a method used to steer new development to areas with the lowest probability of flooding. The sequential test is a risk-based approach, taking into account all sources of flood risk and climate change.

Sewer flooding: Flooding caused by a blockage or overflowing in a sewer or urban drainage system.

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.

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% AEP (1 in 100 year) standard of protection.

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.

Surface Water Management Plan: The SWMP plan should outline the preferred surface water management strategy and identify the actions, timescales, and responsibilities of each partner. It is the principal output from the SWMP study. There are three key partners who must be involved and engaged in the SWMP study process: the Local Authority, the Environment Agency and the relevant Water and Sewerage Companies.

Sustainable Drainage Systems: SuDS are methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques, such as grates, gullies, and channels.

Water Framework Directive: Under the WFD, all waterbodies have a target to achieve Good Ecological Status (GES) or Good Ecological Potential (GEP) by a set deadline. River Basin Management Plans (RBMPs) set out the ecological objectives for each water body and give deadlines by when objectives need to be met.

Windfall site: a site which becomes available for development unexpectedly and therefore not included as allocated land in a planning authority's local plan.

Executive Summary

This report provides a comprehensive and robust evidence base on flood risk issues to support the review and update of the planning policies for Uttlesford District Council (UDC). The review process is known as the Local Plan Update (LPU). This report uses the best available information, including input from key stakeholders. The SFRA applies the latest national planning policy and guidance, including the National Planning Policy Framework (NPPF), which was revised in July 2021 and further updated in December 2023, the updated Planning Practice Guidance (PPG): Flood Risk and Coastal Change dated August 2022, and the updates to the EA climate change guidance in July 2021 and May 2022.

Introduction

To support the review and update of the Local Plan for UDC, the key objectives of the assessment are:

- To collate and analyse the latest available information and data for current and future (i.e., climate change) flood risk from all sources, and how these may be mitigated for development.
- To inform decisions in the emerging LPU, including informing the sustainability appraisal, the selection of development sites, and planning policies.
- To provide evidence to support the application of the sequential test for the allocation of new development sites, to support UDC in the preparation of the LPU.
- To provide a comprehensive set of maps presenting flood risk from all sources that can be used as evidence base for use in the update to the Local Plan.
- To help decide when a Flood Risk Assessment (FRA) will be required for individual planning applications.
- To provide advice for applicants carrying out site-specific Flood Risk Assessments (FRAs), including those at risk from sources other than river and sea flooding, or at risk of flooding in the future due to climate change, and outline specific measures or objectives that are required to manage flood risk.
- To provide the basis for applying the sequential test on planning applications, including by identifying sources of flooding other than those in 'Flood Zones' and those at risk of flooding in the future.
- To identify opportunities to reduce the causes and impacts of flooding and gather information on the land that is likely to be required for flood risk management structures.

Summary of the study area and flood risk

Uttlesford District is primarily rural. Its main urban centres are located sporadically across the study area, the largest of which are Saffron Walden, Great Dunmow, Stansted Mountfitchet, and Thaxted.

Flood risk from all sources has been assessed in the SFRA in Sections 4 and 5. Parts of the study area are at risk of flooding from the following sources: fluvial, surface water,

groundwater, sewers, reservoir inundation, and overtopping/breach. This study has shown that the most significant sources of flood risk in the study area are fluvial, and surface water. The points below summarise the findings:

- Fluvial: The primary sources of fluvial flood risk in the study area are the River Cam, River Stort, River Roding, and River Chelmer, as well as their associated tributaries. The River Cam flows north through Newport and Saffron Walden, exiting the study area at Great Chesterford. The River Chelmer flows south east through the study area, flowing through Great Dunmow and Flitch Green. The River Stort and Stansted Brook flow south west through Stansted Mountfitchet and out of the study area. Finally, the River Roding flows south, from Molehill Green, through Great Canfield and The Rodings to the southern border of the District. *Fluvial flood risk is discussed in Section 4.3 and Appendix E and flood extents are shown in the GeoPDFs in Appendix A.*
- Surface Water: The Risk of Flooding from Surface Water map shows prominent overland flow routes that largely follow the topography of the River Cam, River Stort, and River Chelmer floodplains. There are some areas where there are additional flow paths and areas of ponding, for example where water is impounded at road or rail embankments and in low-lying areas. While the study area is largely rural, there are also flow routes following the roads through the main urban areas of Saffron Walden, Great Dunmow, and Stansted Mountfitchet, which may affect many properties across these settlements. *Surface water flood risk is discussed in Section 4.4 and Appendix E and the flood extents are shown in the GeoPDFs in Appendix A.*
- Climate Change: Areas at risk of flooding today are likely to become at increased risk in the future and the frequency of flooding will also increase in such areas, due to climate change. Flood extents will increase; in some locations, this may be minimal, but flood depth, velocity and hazard may have more of an impact due to climate change. This SFRA provides an assessment of the impacts of climate change on fluvial, and surface water flood risk. *The approach to climate change is discussed in Section 5 and the flood extents are also shown in the GeoPDFs in Appendix A*. It is recommended that the Council work with other Risk Management Authorities (RMAs) to review the long-term sustainability of existing and new development when developing climate change plans and strategies for the study area.
- Sewer: Thames Water, Anglian Water, and Affinity Water provide water services and sewerage services across the study area and have provided details of historic sewer flooding across the study area. On receipt of detailed site boundaries, water companies will be able to further assess the risk of flooding from the public sewer to a specific site using sewer modelling data. *Sewer flood risk is discussed in Section 4.5.*
- Groundwater: The JBA Groundwater Emergence Map shows the north of the study area, particularly around the course of the River Cam, to have significantly higher groundwater levels. This includes levels at, or very near, the surface along

an unnamed tributary near Royston Road. There are also increased groundwater levels along the course of the River Stort, and its tributaries, but to a lesser extent. Elsewhere in Uttlesford district, groundwater levels are quite low. *Groundwater flood risk is discussed in Section 4.6 and Appendix E, and the AStGWF map and JBA emergence map are shown in the GeoPDFs in Appendix A.*

- Canals: The River Stort Navigation flows along part of the south west border of the study. It runs north to south along the Uttlesford border between Rushy Mead Nature Reserve and Gaston Green and Hallingbury Marina. *Canal flood risk is discussed in Section 4.7.*
- Reservoirs: There are 4 reservoirs located within the study area, and a further 3 located outside the study area where the 'wet day' or 'dry day' scenarios encroach into the study area. There is a potential risk of flooding from reservoirs both within the study area and those outside. The level and standard of inspection and maintenance required under the Reservoirs Act means that the risk of flooding from reservoirs is relatively low. However, there is a residual risk of a reservoir breach, and this risk should be considered in any site-specific FRAs (where relevant) in accordance with the updated PPG. *Reservoir flood risk is discussed in Section 4.8 and Appendix E. The 'Dry Day' and 'Wet Day' flood extents are shown in the GeoPDFs in Appendix A.*

Defences

The EA Asset Information Management System (AIMS) dataset provides information on flood defence assets across the study area. The main defence type across the study area is 'Natural High Ground', primarily located along the along the left and right banks of the River Chelmer, River Stort, River Cam, and many of the smaller watercourses in the south of the study area. Engineered defences include 3 embankments, 1 wall, and a section of engineered high ground. *Further information on defences across the study area is available in Section 6.4 and shown in the GeoPDFs in Appendix A.*

Development and flood risk

The sequential and exception test procedures for both Local Plans and FRAs have been documented, along with guidance for planners and developers. Links have been provided for relevant guidance documents and policies published by other Flood RMAs such as the Lead Local Flood Authorities (LLFAs) and the Environment Agency (EA).

The risk of flooding should be reviewed as early as possible in the development process to ensure that opportunities are taken to reduce the risk of flooding on and off the site. Where necessary, development and redevelopment within the study area will require an FRA appropriate to the scale of the development and to the scope as agreed with the LLFA and/or EA. FRAs should consider flood risk from all sources including residual risk, along with promotion of Sustainable Drainage Systems (SuDS) to create a conceptual drainage strategy and safe access/egress at the development in the event of a flood. Latest climate change guidance (last updated in May 2022) should also be taken into account, for the

lifetime of developments. Planners and developers must check that modelling in line with the most up to date EA climate change guidance has been run.

How to use this report

Planners

The SFRA provides recommendations regarding all sources of flood risk across the study area, which can be used to inform policy on flood risk within the emerging LPU. This includes how the cumulative impact of development should be considered.

It provides the latest flood risk data and guidance to inform the sequential test, for both allocations and individual planning applications, and provides guidance on how to apply the exception test. UDC can use this information to apply the sequential test to strategic allocations and identify where the exception test will also be needed.

The SFRA provides guidance for the development industry and development management officers to establish when an FRA is required and to assess whether site-specific FRAs meet the required quality standard. It can be used to help identify which locations and development may require emergency planning provision.

Developers

For sites that are not strategic allocations, developers will need to use this SFRA to help apply the sequential test. For both strategic allocations and windfall sites, developers will need to apply the exception test in the following cases:

- Highly vulnerable development in Flood Zone 2
- Essential infrastructure in Flood Zone 3a or 3b
- More vulnerable development in Flood Zone 3a
- Proposed development in locations affected by surface water flood risk
- A site-specific FRA should be used to inform the exception test at the planning application stage.

This SFRA is a strategic assessment and **does not** replace the need for site-specific FRAs where a development is either within Flood Zones 2 or 3 or greater than a hectare in Flood Zone 1, is less than a hectare and located in an area affected by sources of flooding other than rivers and the sea, or is in an area within Flood Zone 1 which has critical drainage problems as notified by the EA. In addition, a sustainable surface water drainage strategy will be needed for development requiring an FRA, or in any other case for major category development, to satisfy Essex County Council as LLFA. Further assessments may also be required at this stage to manage the risk from sewer flooding to a site, and developers should contact United Utilities for further advice.

Developers can use the information in this SFRA, alongside site-specific research to help scope out what additional work will be needed in a detailed FRA. To do this, they should refer to Section 4, Appendix A (Interactive GeoPDF mapping), and Appendix B (Data sources used in the SFRA). At the planning application stage, developers may need to undertake more detailed hydrological and hydraulic modelling assessments of the watercourses to verify flood extent (including latest climate change allowances, last

updated in May 2022), inform master-planning, and demonstrate, if required, that the exception test is satisfied. As part of the EA's updated guidance on climate change, which must be considered for all new developments and planning applications, developers will need to undertake a detailed assessment of the impact of climate change on flood risk to the site as part of the planning application process when preparing FRAs. Additionally, at planning application stage, flood risk from other sources should be assessed if identified at the development site.

Developers need to check and ensure that new development does not increase surface water runoff rates and volumes from a site or contribute to cumulative effects at sensitive locations, see Section 7 and Appendix F: Cumulative Impact Assessment (CIA). Section 9 provides information on the surface water drainage requirements of the LLFAs. SuDS should be considered at the earliest stages that a site is planned to be developed which will help to minimise costs and overcome any site-specific constraints.

Site-specific FRAs will need to identify how flood risk will be mitigated so development is safe from flooding for its lifetime and does not have an adverse effect on third parties or other areas. The FRA will also need to consider emergency arrangements, including how there will be safe access and egress from the site.

Any developments located within an area protected by flood defences and where the Standard of Protection (SoP) is not of the required standard (either now or in the future) should be identified and the use of developer contributions considered to fund improvements to the defences.

Neighbourhood Plans

Neighbourhood planning groups can use the information in this SFRA to assess the risk of flooding to sites within their community, using Section 4, the sources of flooding across the study area and the interactive flood mapping in Appendix A. The SFRA will also be helpful for developing community level flood risk policies in high flood risk areas. Similarly, all known available recorded historical flood events across the study area are listed in Section 4.1. This can be used to supplement local knowledge regarding areas worst hit by flooding. Ongoing and proposed flood alleviation schemes planned within the study area are outlined in Section 6 and Section 8.3 discusses mitigations, resistance and resilience measures which can be applied to alleviate flood risk to an area.

Mapping

The SFRA mapping highlights on a strategic scale flood risk from fluvial, surface water and reservoirs sources, and where groundwater emergence may occur; as well as where the effects of climate change are most likely. The maps are useful to provide a community level view of flood risk but may not identify if an individual property is at risk of flooding or depict small scale changes in flood risk. Local knowledge of flood mechanisms will need to be included to complement this mapping. Similarly, all known available recorded historical flood events across the study area are listed in Section 4.1. This can be used to supplement local knowledge regarding areas worst hit by flooding. Ongoing and proposed flood alleviation schemes planned by the UDC are outlined in Section 6.5, and Section

8.3**Error! Reference source not found.** discusses mitigations, resistance and resilience measures which can be applied to alleviate flood risk to an area. The mapping data should always be supplemented by direct consultation with the relevant wastewater company to ascertain if there is any site-specific risk from a public sewer. This is because sewer flood risk information is not publicly available and would need to be considered on a site-specific basis.

Cumulative Impact Assessment (CIA)

Under the NPPF, strategic policies and their supporting SFRAs, are required to 'consider cumulative impacts in, or affecting, local areas susceptible to flooding' (Paragraph 166). A Cumulative Impact Assessment (CIA) has identified which catchments in the study area are more sensitive to the cumulative impact of development and where more stringent policy regarding flood risk is recommended. Any development in these areas should seek to contribute to work that reduces wider flood risk in those catchments.

1 Introduction

1.1 Purpose of the Strategic Flood Risk Assessment (SFRA)

“Strategic policies should be informed by a strategic flood risk assessment and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the EA and other relevant flood RMAs, such as lead local flood authorities and internal drainage boards.”.
(NPPF, Paragraph 166).

The data available for SFRAs and the relevant legislation is continually changing; therefore, an SFRA should be updated to reflect changes where applicable and reasonably practicable. Under any changes in guidance or legislation, the implications on the SFRA should be considered and a review undertaken where this is deemed reasonably necessary.

Since the previously published L1 SFRA in December 2021, and following Regulation 18 Consultation in late 2023, Uttlesford District Council (UDC) commissioned an updated Level 1 SFRA update to reflect the latest legislation and guidance, and to inform the updates to their Local Plan as a comprehensive and robust evidence base. This SFRA replaces the previous 2021 L1 SFRA report.

This 2024 L1 SFRA will be used to inform decisions on the location of future development and the preparation of land use planning policies for the long-term management of flood risk, reflecting the implications of the August 2022 changes to the PPG.

1.2 Levels of SFRA

The PPG identifies the following two levels of SFRA:

- All LPAs are required to undertake a Level 1 assessment. Where potential site allocations are not at major flood risk and where development pressures are low a Level 1 assessment is likely to be sufficient, without the LPA progressing to a Level 2 assessment. The Level 1 assessment should be of sufficient detail to enable application of the sequential test, to inform the allocation of development to areas of lower flood risk.
- A Level 2 assessment is required where land outside flood risk areas cannot appropriately accommodate all necessary development, creating the need to apply the NPPF’s exception test, or if an LPA believe they may receive high numbers of applications in flood risk areas on sites not identified in the local plan. In these circumstances the assessment should consider the detailed nature of the flood characteristics within a Flood Zone and assessment of other sources of flooding.

This is a Level 1 SFRA assessment. If all the development proposed is not located outside areas of Flood Risk, a Level 2 assessment may be required to inform the exception test. The PPG can be accessed on the Government's website here.

1.3 SFRA Outputs

This SFRA aims to provide the following outputs:

- Identification of existing national and local policy and technical updates.
- Identification of any strategic flooding issues or cumulative effects which may have cross boundary implications.
- Appraisal of all potential sources of flooding, including main river, ordinary watercourse, surface water, sewers, groundwater, and reservoirs.
- Review of historic flooding incidents.
- Reporting on the SoP provided by existing flood risk management infrastructure.
- Mapping showing distribution of flood risk across all Flood Zones from all sources of flooding including climate change allowances.
- Mapping defining the extent of Flood Zone 3b (the functional floodplain).
- Assessment of the potential increase in flood risk due to climate change to identify areas at risk of flooding in the future.
- FRA guidance for developers.
- Identification of the requirements for developers to consider emergency planning arrangements.
- Assessment of strategic surface water management issues, how these can be addressed through development management policies and the application of SuDS.
- Recommendations of the criteria that should be used to assess future development proposals and the development of a sequential test and sequential approach to flood risk.
- Assessment of strategic flood risk solutions that can be implemented to reduce risks.
- Information to assist identifying land that is likely to be needed for flood risk management infrastructure.

1.4 SFRA Study Area

Uttlesford in located in Essex, in the south east of England. The main urban areas in the study area are the towns of Saffron Walden and Great Dunmow, and the villages of Stansted Mountfitchet, Takeley, Elsenham, Thaxted, and Newport.

The Lead Local Flood Authority (LLFA) for Uttlesford is Essex County Council (ECC), as shown in Figure 1-1.

The study area is bounded by six other authorities:

- South Cambridgeshire District
- Braintree District

- Chelmsford District
- Epping Forest District
- East Hertfordshire District
- North Hertfordshire District

An overview of the study area showing the neighbouring authorities is presented in Figure 1-2.

The water service provider for Uttlesford is Affinity Water. Anglian Water and Thames Water are also responsible for managing sewerage, as shown in Figure 1-3. Some developments within the study area may be supplied by New Appointment and Variations (NAV) suppliers; locations where these companies supply can be found on the UK Parliament website, here.

The main watercourses which run through the study area are shown in Figure 1-4, and are as follows:

- River Chelmer: Flows north to south from north of Thaxted, through Great Dunmow, to the southern border of the District.
- River Roding: Flows north to south through Great Canfield to the southern border of the District.
- River Cam: Flows from south to north, from Elsenham to the northern border of the District.
- River Stort: Flows north to south, in the far west of the site, through Clavering and Manuden to the western border of the site.
- River Pant: Flows west to east through Radwinter and Great Sampford to the eastern border of the District.
- Stebbing Brook: A tributary of the River Chelmer flowing north to south to its confluence near Flitch Green.
- Pincey Brook: A tributary of the River Stort, flowing north to south west from London Stansted Airport to the south western border of the site.
- Stansted Brook: Flows east to west through Stansted Mountfitchet to the western border of the site.

Uttlesford lies across both the Thames and Anglian River Basin Districts, as shown in Figure 1-5.

1.5 Consultation

SFRAs should be prepared in consultation with other Risk Management Authorities (RMAs). In addition to the LPAs the following parties have been consulted during the preparation of this version of the SFRA through data requests and draft report reviews:

- Essex County Council (ECC) as LLFA
- Environment Agency (EA)
- Anglian Water (AW)
- Thames Water (TW)

- Internal Council departments, including the drainage and engineering teams, emergency planners, and technical services.

In addition, the following parties were consulted through data requests during the preparation of this SFRA:

- Neighbouring LPAs to provide data on cross-boundary development implications:
  - South Cambridgeshire District Council
  - Braintree District
  - Chelmsford City Council
  - Epping Forest District Council
  - East Hertfordshire Council
  - North Hertfordshire Council
- Canal and River Trust

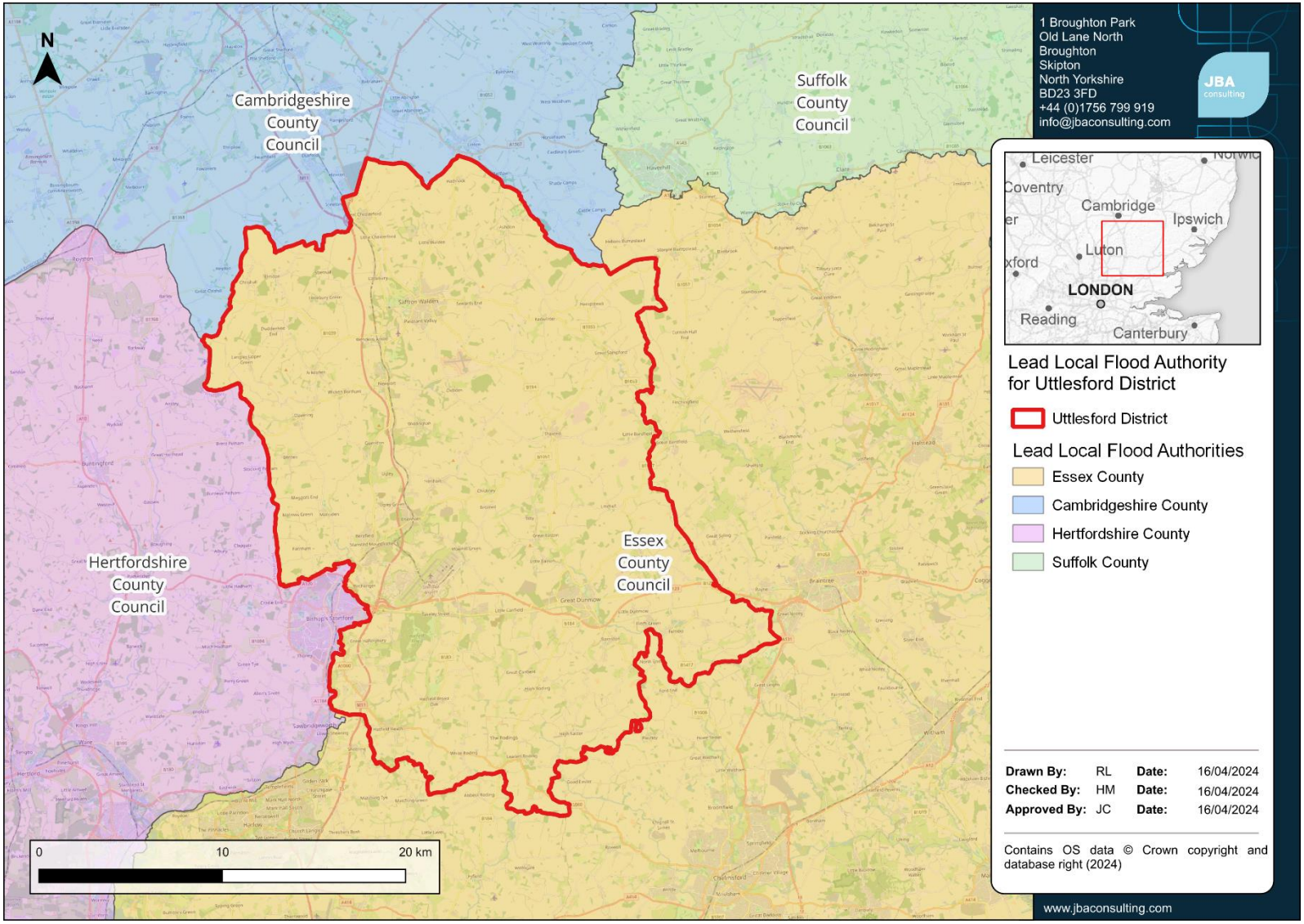


Figure 1-1: Lead Local Flood Authorities (LLFAs) in Uttlesford District

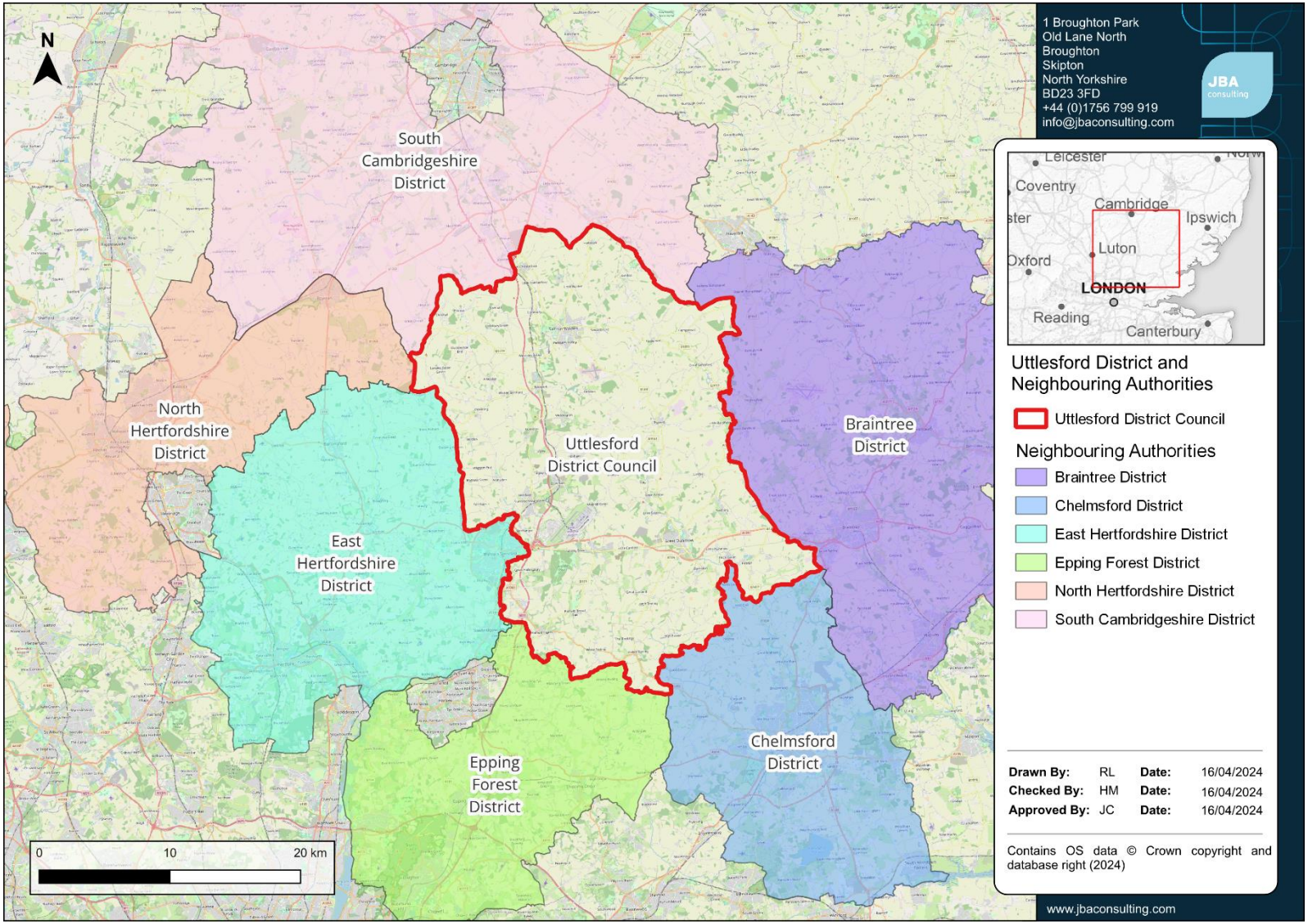


Figure 1-2: Neighbouring authorities to Uttlesford District Council

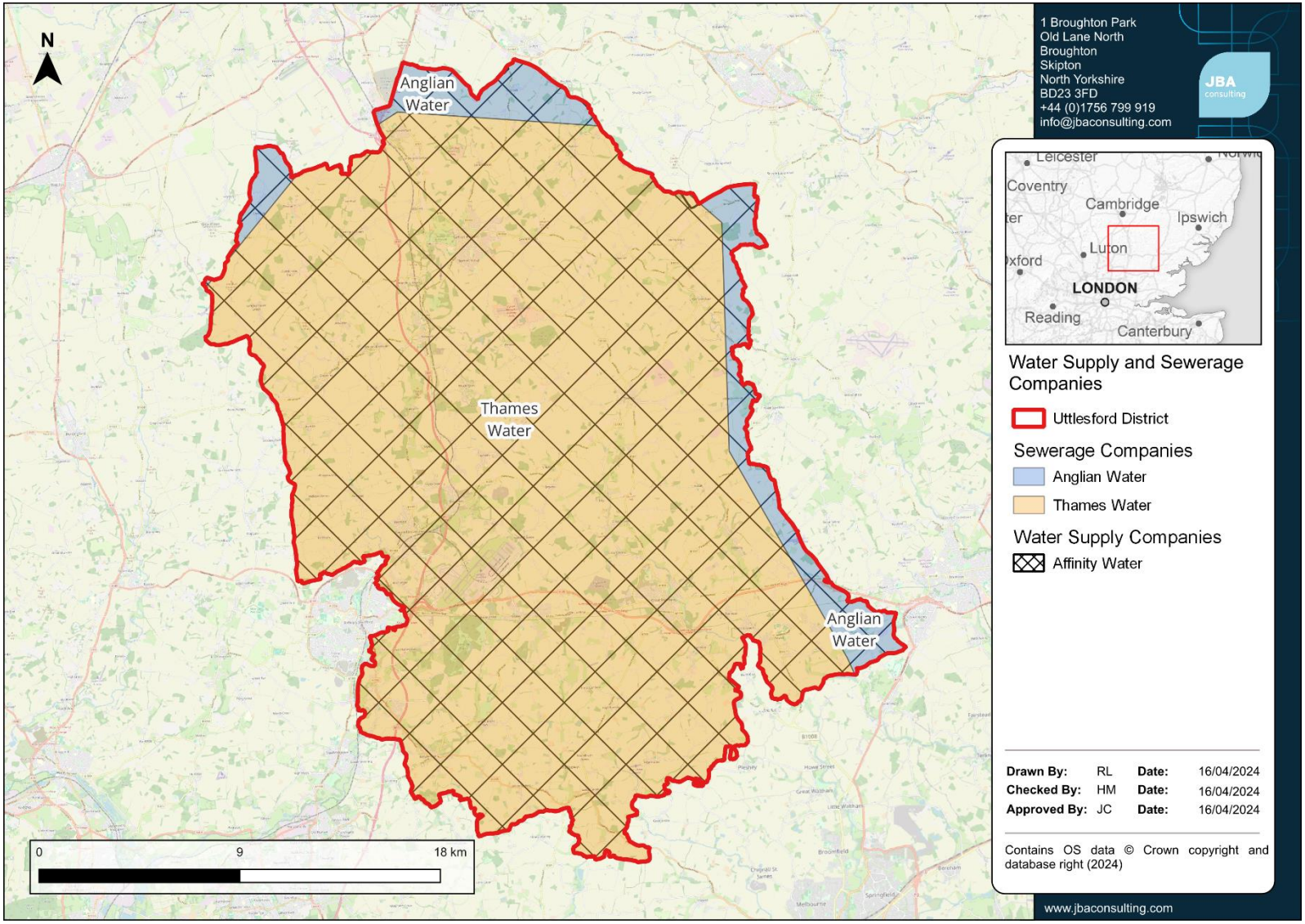


Figure 1-3: Water supply and sewerage companies in Uttlesford District

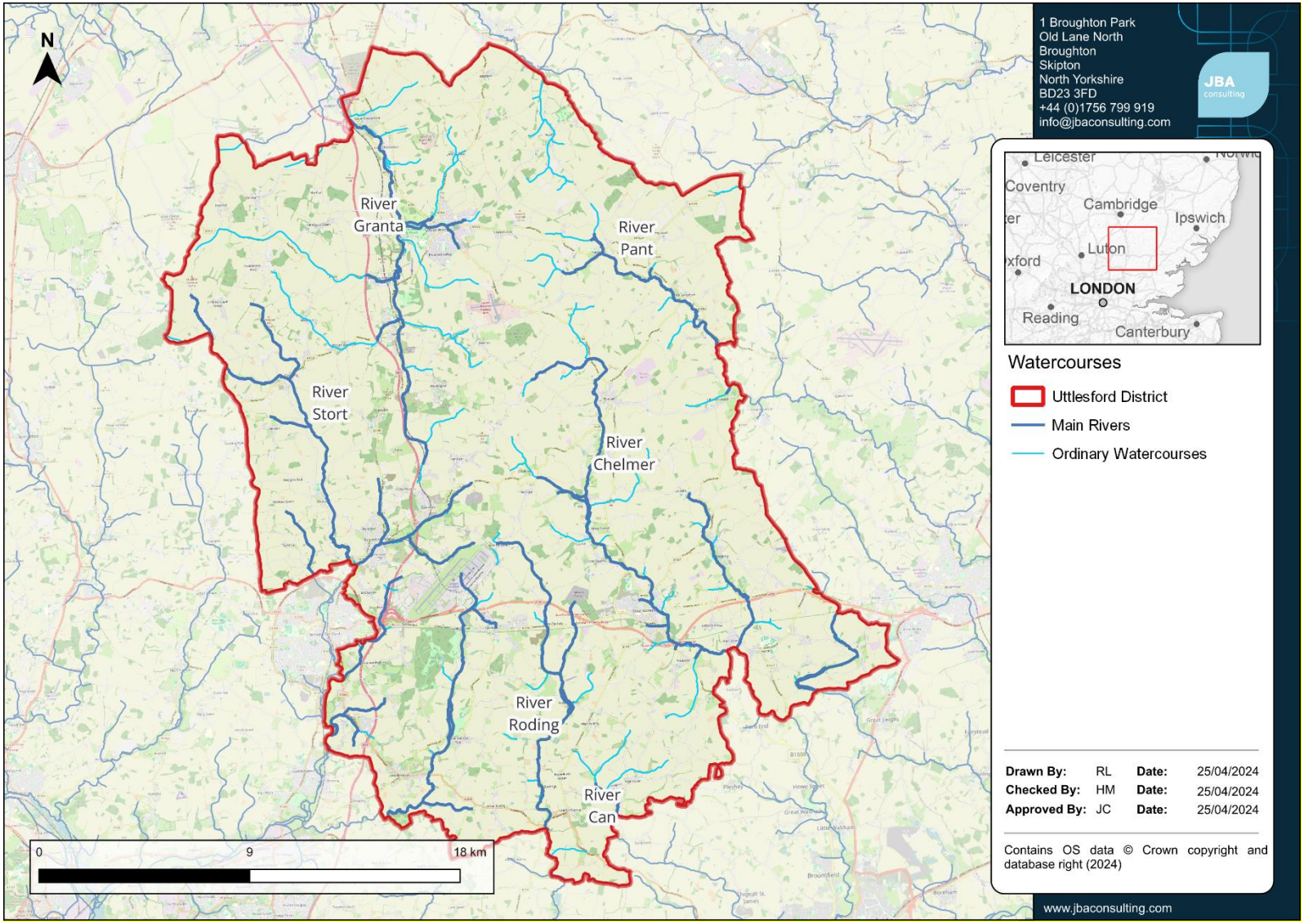


Figure 1-4: Watercourses within Uttlesford District

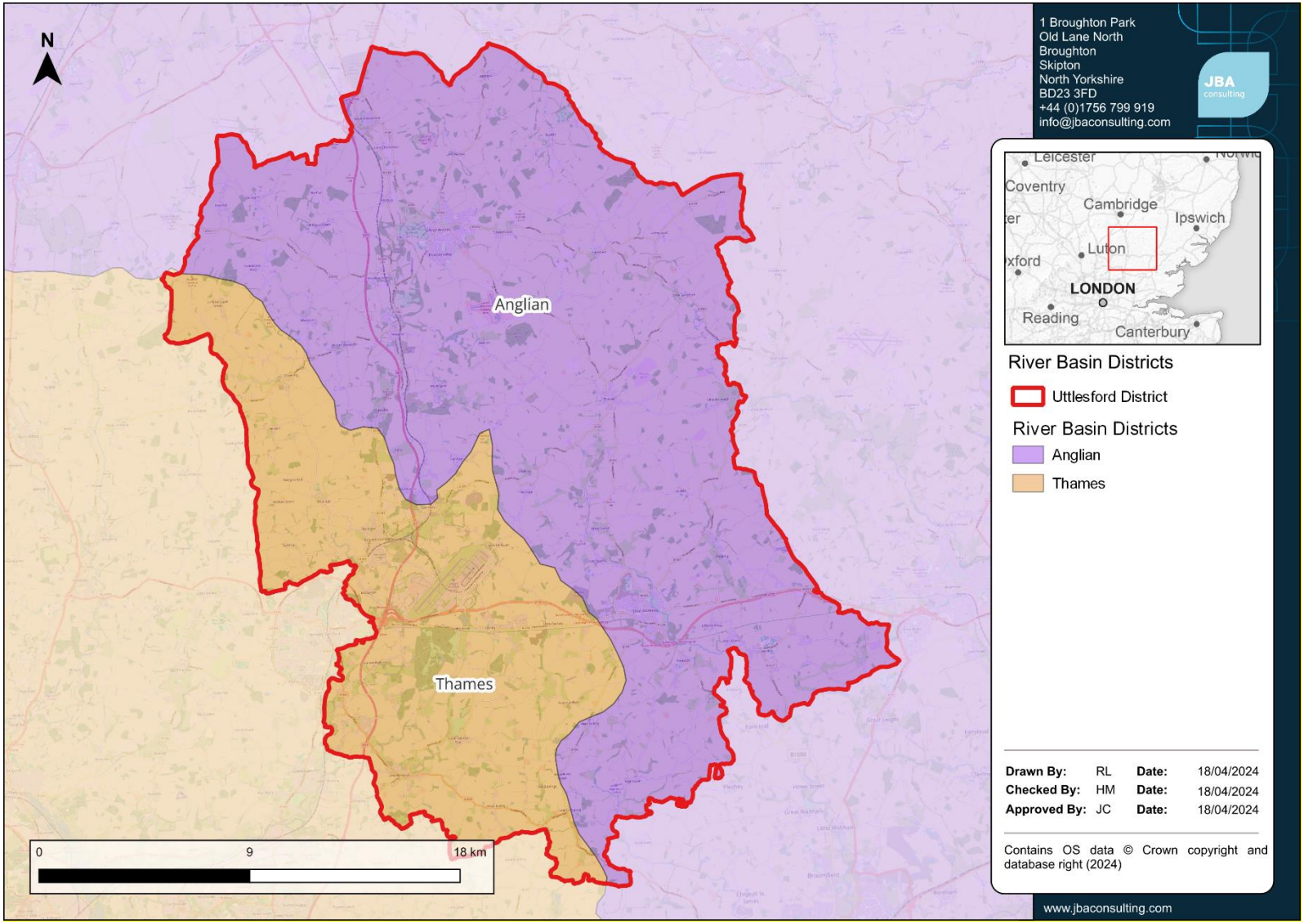


Figure 1-5: Water Framework Directive River Basin Districts

1.6 Use of SFRA data

Level 1 SFRAs are high-level strategic documents and do not go into detail on an individual site-specific basis. The primary purpose is to provide an evidence base to inform the preparation of Local Plans and any future flood risk policies.

Developers will still need to undertake site-specific FRAs where required to support Planning Applications. Developers will be able to use the information in the SFRA to scope out the sources of flood risk that will need to be explored in more detail at site-specific level.

Appendix C presents a SFRA User Guide, further explaining how this SFRA data should be used, including reference to relevant sections of the SFRA, how to consider different sources of flood risk and recommendations and advice for sequential and exception tests.

As per the date of this report, this SFRA contains the latest available flood risk information. Over time, new information will become available to inform planning decisions, such as updated hydraulic models (which then update the Flood Map for Planning), updated information on other sources of flood risk or evidence showing future flood risks, new flood event information, new defence schemes and updates to policy, legislation, and guidance. The EA are currently producing new national flood risk mapping (NaFRA2) which is due to go live in August 2024, although these timescales are subject to change due to the complexities of the project. Developers should check the online Flood Map for Planning in the first instance to identify any major changes to the Flood Zones and the long-term flood risk mapping portal for any changes to flood risk from surface water or inundation from reservoirs.

1.7 Structure of this report

Table 1-1 sets out the contents of each section of the report, and guidance on how to use each section. Appendices included as part of this SFRA are also included. For further information on this document, please contact the UDC.

Table 1-1: Sets out the contents of the report and how to use each section.

Section	Contents	How to use
Executive summary	This section focuses on how the SFRA can be used by planners, developers, and neighbourhood planners.	Users should refer to this section for a summary of the Level 1 findings and recommendations.

Section	Contents	How to use
1. Introduction	This section provides a background to the study, the Local Plan stage the SFRA informs, the study area, the roles and responsibilities for the organisations involved in flood management and how they were involved in the SFRA. It also provides a short introduction to how flood risk is assessed and the importance of considering all sources.	Users should refer to this section for general information and context.
2. Flood risk policy and strategy	This section sets out the relevant legislation, policy, and strategy for flood risk management at a national, regional, and local level.	Users should refer to this section for any relevant policy which may underpin strategic or site-specific assessments.
3. Planning policy for flood risk management	This section provides an overview of both national and existing Local Plan policy on flood risk management. This includes the Flood Zones, application of the Sequential Approach and sequential/exception test process. It provides guidance for Councils and developers on the application of the sequential and exception test for both allocations and windfall sites, at allocation and planning application stages.	Users should use this section to understand and follow the steps required for the sequential and exception tests.
4. Understanding flood risk in the study area	This section provides an overview of the characteristics of flooding affecting the study area and key risks including historical flooding incidents, flood risk from all sources and flood warning arrangements.	This section should be used to understand all sources of flood risk across the study area including where has flooded historically. This section may also help identify any data gaps, in conjunction with Appendix B.

Section	Contents	How to use
5. Impact of climate change	This section outlines the latest climate change guidance published by the EA and how this was applied to the SFRA. It also sets out how developers should apply the guidance to inform site-specific FRAs.	This section should be used to understand the climate change allowances for a range of epochs and conditions, linked to the vulnerability of a development.
6. Flood alleviation schemes and assets	This section provides a summary of current flood defences and asset management and future planned schemes. It also introduces actual and residual flood risk.	This section should be used to understand if there are any defences or flood schemes in a particular area, for further detailed assessment at site specific stage.
7. Cumulative impact of development and strategic solutions	This section introduces the Cumulative Impact Assessment (CIA), which is included as Appendix F.	Planners should use this section to help develop policy recommendations for the cumulative impact of development, in conjunction with Appendix F.
8. Flood risk management for developers	This section contains guidance for developers on FRAs, considering flood risk from all sources.	Developers should use this section to understand requirements for FRAs and what conditions/guidance documents should be followed, as well as mitigation options.
9. Surface water management and Sustainable Drainage Systems	This section provides an overview of SuDS, Guidance for developers on Surface Water Drainage Strategies, considering any specific local standards and guidance for SuDS from the LLFA.	Developers should use this section to understand what national, regional, and local SuDS standards are applicable. Hyperlinks are provided.
10. Summary and recommendations	This section summarises sources of flood risk in the study area and outlines planning policy recommendations. It also sets out the next steps.	Developers and planners should use this as a summary of the SFRA. Developers should refer to the Level 1 SFRA recommendations when

Section	Contents	How to use
		considering site specific assessments.
Appendices	Appendix A: GeoPDFs and User Guide Appendix B: Data sources used in the SFRA Appendix C: SFRA User Guide Appendix D: Flood Alert and Flood Warning Areas Appendix E: Summary of flood risk across the study area Appendix F: Cumulative Impact Assessment (CIA)	Planners should use these appendices to understand what data has been used in the SFRA, to inform the application of the sequential and exception tests, as relevant, and to use these maps and tabulated summaries of flood risk to understand the nature and location of flood risk.

1.8 Understanding flood risk

The following content provides useful background information on how flooding arises and how flood risk is determined.

1.8.1 Sources of flooding

Flooding is a natural process and can happen at any time in a wide variety of locations. It constitutes a temporary covering of land not normally covered by water and presents a risk when people and human or environmental assets are present in the area that floods. Assets at risk from flooding can include housing, transport and public service infrastructure, commercial and industrial enterprises, agricultural land, and environmental and cultural heritage. Flooding can occur from many different and combined sources and in many ways. Major sources of flooding include:

- Fluvial (rivers) - inundation of floodplains from rivers and watercourses; inundation of areas outside the floodplain due to influence of bridges, embankments and other features that artificially raise water levels; overtopping or breaching of defences; blockages of culverts; blockages of flood channels/corridors.
- Surface water - direct run-off from adjacent land.
- Sewer flooding - surcharging of piped drainage systems, including public sewers.
- Groundwater - water table rising after prolonged rainfall to emerge above ground level remote from a watercourse; most likely to occur in low-lying areas underlain by permeable rock (aquifers); groundwater recovery after pumping for mining or industry has ceased.

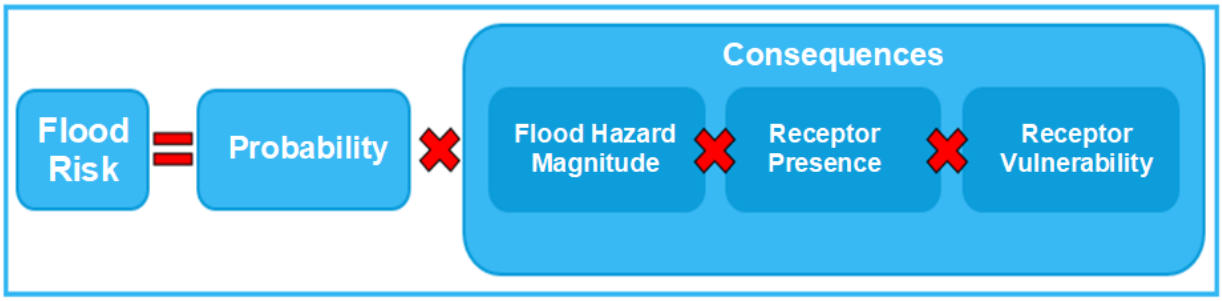
- Infrastructure failure - reservoirs; industrial processes; burst water mains; blocked sewers or failed pumping stations.
- Other sources of flooding including breaching of flood defences, overwhelmed canals, lakes, and other artificial sources.

Different types and forms of flooding present a range of different risks and the flood hazards of speed of inundation, depth, and duration of flooding, can vary greatly. With climate change, the frequency, pattern, and severity of flooding are expected to change and become more damaging.

1.8.2 Defining flood risk

Section 3 (subsection 1) of the Flood and Water Management Act 2010 (FWMA) defines the risk of a potentially harmful event (such as flooding) as 'a risk in respect of an occurrence is assessed and expressed (as for insurance and scientific purposes) as a combination of the probability of the occurrence with its potential consequences.'

Thus, it is possible to summarise flood risk as:



1.8.2.1 Source-Pathway-Receptor model.

Flood risk can be assessed using the Source-Pathway-Receptor model where:

- The source is the origin of the floodwater, principally rainfall.
- A pathway is a route or means by which a receptor can be affected by flooding, which includes rivers, sea, drains, sewers, and overland flow.
- A receptor is something that can be adversely affected by flooding, which includes people, their property, and the environment.

This is a standard environmental risk model common to many hazards and should be the starting point of any assessment of flood risk. All these elements must be present for flood risk to arise. Having applied the Source-Pathway-Receptor model it is possible to mitigate the flood risk by addressing the source (often very difficult), blocking, or altering the pathway, or removing the receptor, e.g., steer development away.

The planning process is primarily concerned with the location of receptors, taking appropriate account of potential sources and pathways that might put those receptors at risk. It is therefore important to define the components of flood risk to apply this guidance in a consistent manner.

1.8.2.2 Probability

The probability of flooding is expressed as a percentage based on the average frequency measured or extrapolated from records over many years. A 1% probability indicates the flood level that is expected to be reached on average once in a hundred years, i.e., it has a 1% chance of occurring in any one year, not that it will occur at least once every hundred years.

Considered over the lifetime of development, such an apparently low frequency or rare flood has a significant probability of occurring. For example:

- A 1% flood has a 26% (1 in 4) chance of occurring at least once in a 30-year period - the period of a typical residential mortgage.
- And a 49% (1 in 2) chance of occurring in a 70-year period - a typical human lifetime.

1.8.2.3 Consequences

The consequences of flooding include fatalities, property damage, disruption to lives and businesses, with severe implications for people (e.g., financial loss, emotional distress, health problems). Consequences of flooding depend on the hazards caused by flooding (depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality), the receptors that are present and the vulnerability of these receptors (type of development, nature, e.g., age-structure, of the population, presence, and reliability of mitigation measures etc).

2 Flood risk policy and strategy

This section sets out the flood risk management roles and responsibilities for different organisations and relevant legislation, policy, and strategy.

2.1 Roles and responsibilities for Flood Risk Management across the study area

There are different organisations in and around the study area that have responsibilities for flood risk management, known as RMAs. These are listed in Table 2-1 with a summary of their responsibilities.

The Local Government Association also provide further information on the roles and responsibilities for managing flood risk on their website here.

Table 2-1: Roles and responsibilities for RMAs.

Risk Management Authority	Strategic Level	Operational Level	Planning role
EA	Strategic overview for all sources of flooding, National Strategy, and general supervision	Main River (e.g., the River Chelmer) and reservoirs (Flood Risk Activity Permits (FRAPs), enforcement, and works)	Statutory consultee for certain development in Flood Zones 2 and 3 and all works within 20 metres of a main river. Advice on when to consult the EA is available on the Government website here.
ECC as LLFA	Coordination of Local Flood Risk Management and maintaining a Local Flood Risk Management Strategy (LFRMS)	Surface water, groundwater, and ordinary watercourses (consenting, enforcement, and works)	Statutory consultee for major developments
Affinity Water, AW, and TW	Asset Management Plans, supported by Periodic Reviews (business cases), develop drainage and wastewater management plans	Public sewers and some reservoirs	Non-statutory consultee

Risk Management Authority	Strategic Level	Operational Level	Planning role
Highways Authorities (National Highways for motorways and trunk roads and UDC for non-trunk roads)	Highway drainage policy and planning	Highway drainage	Statutory consultee regarding highways design standards and adoptions

2.1.1 Riparian ownership

Land and property owners are responsible for the maintenance of watercourses either on or next to their properties, called Riparian Owners. Riparian Owners are also responsible for the protection of their properties from flooding as well as other management activities, for example by maintaining riverbeds/ banks, controlling invasive species, and allowing the flow of water to pass without obstruction. More information can be found on the Government website in the EA publication 'Owning a watercourse' (2018), available from the Government website here.

When it comes to undertaking works to reduce flood risk, the EA, ECC as LLFA do have permissive powers, but limited resources must be prioritised and targeted to where they can have the greatest effect. Permissive powers mean that RMAs are permitted to undertake works on watercourses but are not obliged.

2.1.2 Partnership working

There are several groups and partnerships set up across the study area, involving representatives from the RMAs mentioned above, as well as additional stakeholders with interest in flood risk management. These organisations help with coordination and engagement in flood risk management across the study area.

2.2 Relevant legislation

The following legislation is relevant to development and flood risk in the study area. Hyperlinks are provided to external documents:

- Town and Country Planning Act (1990), Water Industry Act (1991), Land Drainage Act (1991), Environment Act (1995), which set out the regulations for development on land in England and Wales.
- Flood and Water Management Act (2010) – as amended and implemented via secondary legislation. These set out the roles and responsibilities for organisations that have a role in Flood Risk Management.

- The Land Drainage Act (1991, as amended) and Environmental Permitting Regulations (2018) also set out where developers will need to apply for additional permission (as well as planning permission) to undertake works to an ordinary watercourse or main river.
- The Water Environment Regulations (2017) – these transpose the European Water Framework Directive (WFD) (2000) into law and require the EA to produce River Basin Management Plans (RBMPs). These aim to improve/maintain the water quality of aquatic ecosystems, riparian ecosystems, and wetlands so that they reach 'good' status.
- The Environment Act 2021 requires developers to provide Biodiversity Net Gain (BNG) and for LPAs to develop Local Nature Recovery Strategies (LNRS). Strategic site allocations in Local Plans which present opportunities for BNG or areas for habitat improvement/creation identified by the LNRS could have parallel opportunities to contribute to reduced flood risk from a range of sources.
- Other environmental legislation such as the Habitats Directive (1992), Environmental Impact Assessment Directive (2014), and Strategic Environmental Assessment Directive (2001) also apply as appropriate to strategic and site-specific developments to guard against environmental damage.
- Flood Risk Regulations (2009) - these transpose the European Floods Directive (2000) into law and require the EA and LLFAs to produce PFRAs and identify nationally significant Flood Risk Areas (FRAs).
- The Planning and Compulsory Purchase Act (2004) Section 19(1A) requires local planning authorities to include in their Local Plans 'policies designed to secure that the development and use of land in the local planning authority's area contribute to the mitigation of, and adaptation to, climate change.'

2.3 Key national, regional, and local policy documents and strategies

Table 2-2 summarises relevant national, regional, and local flood risk policy and strategy documents and how these apply to development and flood risk. Hyperlinks are provided to external documents. These documents may:

- Provide useful and specific local information to inform FRAs within the local area.
- Set the strategic policy and direction for flood risk management and drainage – they may contain policies and action plans that set out what future flood mitigation and climate change adaptation plans may affect a development site. A developer should seek to contribute in all instances to the strategic vision for flood risk management and drainage in the study area.
- Provide guidance and/or standards that inform how a developer should assess flood risk and/or design flood mitigation and SuDS.

The following sections provide further details on some of these documents and strategies.

Please note that the links to these documents may change over time and any requests for these documents should be directed toward the author.

Table 2-2: National, regional, and local flood risk policy and strategy documents.

Policy level	Document, lead author and date	Contextual information	Policy and measures	Development design requirements	Next update due
National	National Planning Policy Framework updated in December 2023	Yes	Yes	Yes	-
National	Planning Practice Guidance (PPG) updated in August 2022	Yes	Yes	Yes	-
National	How to prepare a strategic flood risk assessment	Yes	No	No	-
National	Building Regulations Part H (MHCLG) 2010	Yes	No	Yes	-
Regional	Thames Catchment Flood Management Plan (EA) 2009	No	Yes	No	-
Regional	Thames river basin district river basin management plan (EA) 2022	No	Yes	No	2027
Regional	Thames river basin district flood risk management plan (EA) 2022	No	Yes	No	2027
Regional	Anglian river basin district river basin management plan (EA) 2022	No	Yes	No	-
Regional	Anglian river basin district flood risk management plan (EA) 2022	No	Yes	No	2027
Regional	Affinity Water Water Resources Management Plan, 2023 *	Yes	No	No	-
Regional	Anglian Water Drainage and Wastewater Management Plan, 2023	Yes	Yes	No	-

Policy level	Document, lead author and date	Contextual information	Policy and measures	Development design requirements	Next update due
Regional	Thames Water Drainage and Wastewater Management Plan, 2023	Yes	Yes	No	2028
Local	Essex County Council Preliminary Flood Risk Assessment 2017	Yes	No	No	-
Local	Essex County Council Local Flood Risk Management Strategy, 2018	Yes	Yes	No	-

* Please note that at the time of writing, Affinity Water have just concluded the public consultation stage of their WRMP, with the view to publish it in 2024, after it is approved by DEFRA. Further information of WRMPs can be found in Section 2.3.10.

2.3.1 Flood Risk Regulations (2009)

The Flood Risk Regulations (FRRs) 2009 translate the European Union (EU) Floods Directive into UK law, which is at the time of writing retained in UK law post-Brexit, and can be accessed on the Government website. The EU requires Member States to complete an assessment of flood risk, known in England as a Preliminary Flood Risk Assessment (PFRA) and then use this information to identify areas where there is a significant risk of flooding. For these Flood Risk Areas, States must then undertake Flood Risk and Hazard Mapping and produce Flood Risk Management Plans (FRMPs). This cycle is repeated on a six-yearly basis.

The FRRs direct the EA to do this work for river, sea, and reservoir flooding. LLFAs must do this work for surface water, ordinary watercourse, and groundwater flooding.

The first cycle of planning ran from 2009 until 2015. Within this time LLFAs published their first PFRAs. The first FRMPs were also published.

The second cycle of planning commenced in 2016. Within this cycle, LLFAs published addendums to their existing PFRAs, the EA published their PFRA, and the second cycle FRMPs were published in December 2022, with actions to manage flood risk across England for the period 2021 to 2027.

The EA PFRA (2018) for river, sea and reservoir flooding identifies nationally significant Flood Risk Areas for these sources. This PFRA identified 25 flood risk areas in the Thames RBD and 8 in the Anglian RBD.

The Essex County Council PFRA was published in 2011 with an addendum in 2017 with updated flood risk data and information. This greater understanding of flood risk from the LLFA has been updated to include all significant flood events since 2011.

Although there is no specific reference to Uttlesford in this documentation, key outputs of the 2011 PFRA include:

- Overall flood risk is expected to increase as a result of climate change, particularly relating to winter storms (12% increase in winter precipitation from 2011 to 2050). Peak flows are also expected to increase between 8 and 14%.
- No past floods with significant consequences were identified, although this is likely due to a lack of robust evidence.

More information on district and national scale measures is available on the EA's online interactive mapping.

It is also recognised that there are areas at flood risk outside of these FRAs. The plan has therefore been expanded to show what is happening across the RBD and in locally important areas referred to as 'Strategic Areas' which were put forward by the EA providing they were not already designated FRAs.

As of 1 January 2024, the Retained EU Law (Reform and Revocation) Bill automatically repealed any retained EU law (REUL) not otherwise preserved or replaced in UK law before the end of 2023, including the Flood Risk Regulations 2009 which transposed the EU

Floods Directive into legislation. This is because much of the FRRs is duplicated in existing domestic legislation, namely the Flood and Water Management Act 2010. The EA and LLFAs in England will therefore no longer be required to comply with the third cycle of planning, however the government expects to see continued implementation of the FRMPs 2021-2027.

2.3.2 Flood and Water Management Act (2010)

The FWMA was passed in April 2010 following the recommendations made within the Pitt Review (2009) following the flooding in 2007. It aims to improve both flood risk management and the way water resources are managed.

The FWMA (2010) has created clearer roles and responsibilities and helped to define a more risk-based approach to dealing with flooding. This included the creation of a lead role for Local Authorities, as LLFAs, designed to manage local flood risk (from surface water, ground water and ordinary watercourses) and to provide a strategic overview role of all flood risk for the EA. Schedule 3 of the FWMA 2010 is expected to be implemented by the government in the short term, following periods of consultation, making SuDS mandatory for new developments in England. Further information on Schedule 3 is provided in Section 9.1.

The content and implications of the FWMA (2010) provide considerable opportunities for improved and integrated land use planning and flood risk management by Local Authorities and other key partners. The integration and synergy of strategies and plans at national, regional, and local scales is increasingly important to protect vulnerable communities and deliver sustainable regeneration and growth.

2.3.3 The Water Framework Directive and Water Environment Regulations and River Basin Management Plans

The purpose of the WFD, which was transposed into English Law by the Water Environment Regulations (2003), is to deliver improvements across Europe in the management of water quality and water resources through a series of plans called RBMPs.

The WFD requires the production of RBMPs for each RBD. RBMPs support the government's framework for the 25-year environment plan and allow local communities to find more cost-effective ways to further improve our water environments. Water quality and flood risk can go hand in hand in that flood risk management activities can help to deliver habitat restoration techniques.

The EA manages the RBMPs and must review and update them every six years. The first cycle of RBMPs were published in 2009 and were most recently updated in 2022.

Uttlesford District lies within both the Anglian River Basin District and Thames River Basin District. The updated Anglian and Thames RBMPs for 2022 can be found here and here respectively.

2.3.4 Updated Strategic Flood Risk Assessment guidance

There was an update to the 'How to prepare a Strategic Flood Risk Assessment guidance' in March 2022, which requires further adjustment to the approaches to both Level 1 and Level 2 assessments. This Level 1 assessment is undertaken in accordance with the latest guidance. The latest guidance can be accessed on the Government website.

2.3.5 Catchment Flood Management Plans

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

The study area lies within both the Thames CFMP and Anglian CFMP regions, which set out the policies relating to flooding from rivers, surface water, and groundwater within their respective catchment areas.

2.3.6 Essex Local Flood Risk Management Strategy (LFRMS) (2018)

ECC are responsible for developing, maintaining, applying, and monitoring the LFRMS. The most recent strategy was published in 2018 and is available here. It is used as a means by which the LLFA co-ordinated Flood Risk Management on a daily basis.

The Essex LFRMS aims to set out how flood risk will be reduced and managed in the study area, using 7 measures:

1. Investigating Floods
2. Mapping local routes for water
3. Looking after our watercourses
4. Planning for future floods
5. Influencing new development and drainage
6. Building new flood defences
7. Involving the community

2.3.7 Local policy and guidance for SuDS

The 2023 NPPF states that: 'Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate' (Paragraph 175) and 'development should only be allowed in areas at risk of flooding where… it can be demonstrated that… c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate' (Paragraph 173). When considering major planning applications, local planning authorities (LPAs) should consult the relevant LLFA on the management of surface water to satisfy that:

- The proposed minimum standards of operation are appropriate.
- Using planning conditions or planning obligations there are clear arrangements for on-going maintenance over the development's lifetime.

At the time of writing this SFRA, the following documents and policies are relevant to SuDS and surface water in the study area. Hyperlinks are provided to external documents:

- SuDS Manual (C753), published in 2007 and updated in 2015.
- Defra Non-statutory technical standards for sustainable drainage systems, 2015
- Defra National Standards for sustainable drainage systems Designing, constructing (including LASOO best practice guidance), operating and maintaining drainage for surface runoff, 2011
- Building Regulations Part H (MHCLG), 2010
- Essex County Council Sustainable Drainage Systems Design Guide, 2020

The 2023 NPPF states that flood risk should be managed “using opportunities provided by new development and improvements in blue green and other infrastructure to reduce the causes and impacts of flooding" (Paragraph 167). Alongside flood risk management, SuDS can provide amenity, biodiversity, recreation, community, and water resources benefits. Where possible, priority should be given to SuDS that can deliver multiple benefits.

2.3.8 Water Cycle Studies

Water Cycle Studies assist local authorities to select and develop growth proposals that minimise impacts on the environment, water quality, water resources, infrastructure, and flood risk and help to identify ways of mitigating such impacts. The existing Water Cycle Study for Uttlesford was completed in 2019 and can be accessed here; however, UDC commissioned an updated Water Cycle and Management Study in 2021 prior to the update of the Uttlesford District Local Plan, which is ongoing at the time of writing.

2.3.9 Surface Water Management Plans

Surface Water Management Plans (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. ECC has developed 10 SWMP, all covering different parts of the county. Only the Lower Sheering SWMP, last updated in 2022, intersects the Uttlesford study area to the east of Hatfield Heath.

2.3.10 Water Resources Management Plans (WRMPs)

Under the duties set out in sections 37A to 37D of the Water Industry Act 1991, all water companies across England and Wales must prepare and maintain a WRMP. This must be prepared at least every five years and reviewed annually.

WRMPs should set out how a water company intends to achieve a secure supply of water for their customers and a protected and enhanced environment.

Thames Water published their revised Draft WRMP 24, in August 2023, after public consultation. It defines their strategy to undertake sustainable plans for water supplies and sets out the actions and investments they will make to ensure a resilient and sustainable water supply for the next 50 years. Anglian Water also published their revised Draft WRMP24 in August 2023, taking into account feedback received from the public consultation, and setting out how they plan to maintain a sustainable and secure supply of drinking water for their customers over the period of 2025 to 2050. At the time of writing, Affinity Water have recently concluded the public consultation stage of their final WRMP, with the view to publish it in 2024. Their WRMP aims to address a significant future shortfall in water resources in their supply area between 2025-2075.

2.3.11 Drainage and Wastewater Management Plans (DWMPs)

The aim of the Drainage Water Management Plans (DWMPs) is to identify future catchment risks to drainage and wastewater treatment systems and develop sustainable, efficient solutions to ensure that systems remain robust and resilient to future pressures. This assessment then informs a long-term strategic plan, setting out how wastewater systems (and the drainage systems that impact them) will be maintained, improved, and extended over the next 25 years.

Water companies are required to publish DWMPs for river basin catchments across England as part of the Environment Act. Uttlesford District is served by two water companies, Anglian Water and Thames Water. Both companies have recently published their DWMPs.

The DWMPs provide a wider geographical extent of information on sewer flood risk than has previously been available. In doing this, the DWMPs include risk assessment and mapping which could potentially be used in the proposed land use planning prioritisation process and could potentially be perceived as being appropriate for consideration in the Sequential and Exception Tests.

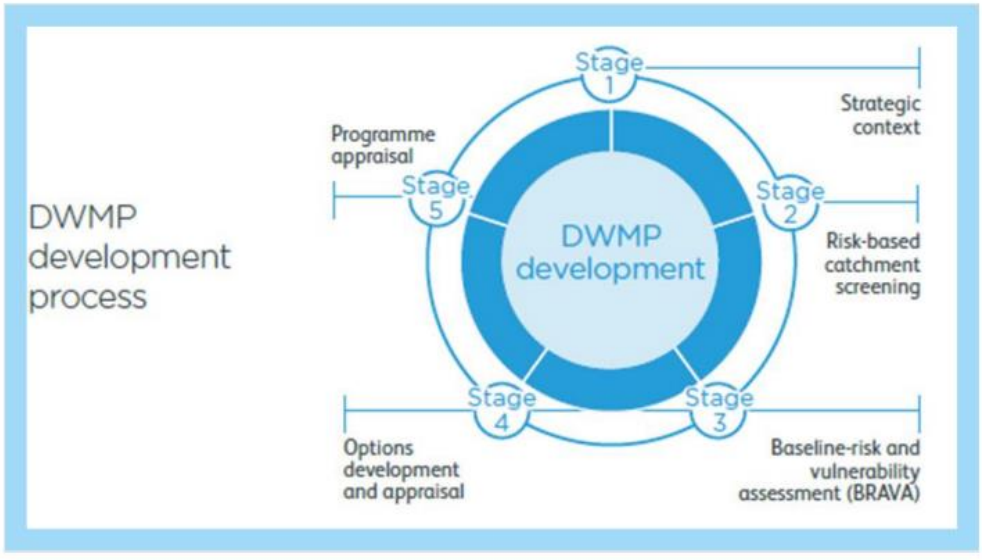


Figure 2-1: DWMP development process (Thames Water, 2023)

The planning objectives of the Thames Water and Anglian Water DWMPs are as follows:

Anglian Water

- Adaptive plan to meet the challenges faced over the next 25 years.
- A strategic direction for the approach to minimise the risks the region faces.
- Takes a catchment-based approach to these risks and challenges the region faces.
- Promotes the use of nature based solutions, especially when it comes to surface water removal.
- Protects the environment through improvements to discharges.
- Demonstrates how a growing population will be served over the next 25 years.
- Shows what is needed to protect assets and customers from the impacts of heavy rainfall caused by climate change.
- Identifies opportunities for partnership working to release benefits and resolve risks through matched funding.
- Aligns with other strategic plans, such as the Long Term Delivery Strategy (LTDS), Water Resources Management Plan (WRMP), Water Resources East (WRE) Regional Plan, Flood Risk Management Plans (FRMPs), River Basin Management Plans (RBMP) and Local Plans.
- Includes all water recycling customers, regardless of who serves their water.
- Excludes upstream water supply and downstream resources, which will be reviewed separately through the business plan.

Thames Water

- Flooding
  - Stop property flooding internally (within the home or business) and externally (outside the home or business) from sewers where possible, up to a 1 in 50-ear storm event,
- Storm overflows
  - Limit environmental impact by discharging on average, no more than 10 times per year, per storm overflow, and no more than three in designated bathing waters, by 2045.
- Sewage Treatment Works (STWs)
  - Enhance the ability of sewage treatment works to recover from difficulties, without impacting service or the environment.
- Carbon
  - Support the carbon neutrality goals of stakeholders.
- Wellbeing
  - Enhance the wellbeing in communities by increasing access to green space.

Uttlesford District Council published a Level 1 Addendum in 2023 detailing the development of both the Thames and Anglian Water DWMPs. It provides and overview of the risk-based

catchment screening process, baseline risk and vulnerability assessment, and highlights any implications for the sequential test.

It is recommended that the DWMP information and mapping is not used to assess sewer flooding in the sequential test alongside river and surface water flooding on the basis that the available information is not of appropriate resolution or format. This understanding should be addressed with Anglian Water and Thames Water and formal confirmation obtained as necessary to support the Local Plan and Examination, to clarify the necessity and extent to which identified DWMP sewer flood risk should be addressed at sites where this is potentially an influential matter. This can then inform the necessity to include content on sewer flood risk in a Level 2 SFRA and where possible, the DWMP information should be used to inform the scope of site-specific Flood Risk Assessments.

Further information on the DWMPs can be found in the Level 1 Addendum here.

3 Planning policy for flood risk management

This section summarises national planning policy for development and flood risk.

3.1 National Planning Policy Framework and Guidance

The revised NPPF was published in July 2021, and was most recently updated in December 2023. The NPPF sets out Government's planning policies for England and is available on the Government website. It must be considered in the preparation of local plans and is a material consideration in planning decisions. The NPPF advises on how flood risk should be considered to guide the location of future development and FRA requirements. The NPPF states that:

"Strategic policies should be informed by a strategic flood risk assessment and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards" (Paragraph 166). The PPG on flood risk and coastal change was published in March 2014 and sets out how the policy should be implemented. Diagram 1 in the PPG sets out how flood risk should be considered in the preparation of Local Plans. It was updated on the 25 August 2022. The most up-to-date guidance is available on the Government website.

3.2 The risk-based approach

The NPPF takes a risk-based approach to development in flood risk areas. Since July 2021 the approach has adjusted the requirement for the sequential test (as defined in Paragraph 167 of the NPPF) so that all sources of flood risk are to be included in the consideration. The requirement for the revised sequential test has been addressed by adopting the following approach:

- The test will no longer be purely based on the use of the Flood Zones describing river and sea flood risk, and instead be based on whether development can be located in the lowest risk areas (high-medium-low) of flood risk both now and in the future. The test now applies to all sources of flood risk – whereas previously the test was only performed for present day flood risk for the "Flood Zones" i.e., river and sea flood risk.
- Understanding flood risk to sites based on their vulnerability and incompatibility as opposed to whether development is appropriate.
- In addition to the flood risk mapping describing river and sea flood risk, there is mapping available to describe surface water flood risk. Although, this is not conceptually similar to the flood risk mapping for rivers and sea due to the differing nature of flooding.
- As there is no available competent risk mapping for other sources of risk it is not considered appropriate to use such mapping in a strict process that involves

comparison of differing levels of flood risk. Reservoir, groundwater, and sewer flood risk are addressed through the SFRA using a variety of datasets to analyse and describe the risk to areas across the study area.

- A more formal assessment of these sources is undertaken in a Level 2 SFRA and involves a more detailed assessment at site level of the implications of reservoir, sewer, and groundwater flood risk to establish that more appropriate locations at lower risk are not available. Consultation with the sewerage undertaker is necessary to take in to account any hydraulic incidents and the latest available modelling information on sewer flood risk.
- Consideration is given to all sources of flood risk using the available data to complete the sequential test so decisions on the selection of preferred sites for allocation address the potential implications of groundwater, reservoir, and sewer flooding. Also, where necessary it identifies sites where consideration should be given to satisfying the requirements of the exception test.

3.2.1 Flood Zones - fluvial risk

The definition of the Flood Zones is provided below. The Flood Zones do not consider defences, except when considering the functional floodplain. This is important for planning long term developments as long-term policy and funding for maintaining flood defences over the lifetime of a development may change over time.

The Flood Zones are:

- Flood Zone 1: Low risk: less than a 0.1% chance of river and sea flooding in any given year.
- Flood Zone 2: Medium risk: between a 1% and 0.1% chance of river flooding and between a 0.5% and 0.1% of flooding from the sea in any given year.
- Flood Zone 3a: High risk: between a 3.3% and 1% chance of river flooding and between a 3.3% and 0.5% chance of flooding from the sea in any given year.
- Flood Zone 3b: Functional Floodplain: land where water has to flow or be stored in times of flood (greater than 3.3% AEP). SFRAs identify this Flood Zone in discussion with the LPA and the EA. The identification of functional floodplain takes account of local circumstances. Only water compatible and essential infrastructure are permitted in this zone and should be designed to remain operational in times of flood, resulting in no loss of floodplain or blocking of water flow routes. Information on flood risk vulnerability classification is available online in Annex 3 of the NPPF, here. It may be required to consider climate change on the functional floodplain; this would need hydraulic modelling to confirm extents and therefore it is recommended that this is considered in an FRA and a suitable approach is agreed with the EA.
    - Flood Zone 3b is based on the best available modelled data:
        - 3.3% Annual Exceedance Probability (AEP) where available
        - 2% or 1.3% AEP where the 3.3% is not available.

- Where model data is not available, Flood Zone 3a is used as a conservative proxy.

Flood Zones 2 and 3a consider undefended fluvial risk whilst Flood Zone 3b considers defended fluvial risk. The Flood Zones do not risk mapping for surface water, sewer, groundwater flooding or the impacts of reservoir failure or climate change. Hence, there could still be a risk of flooding from other sources and that the level of flood risk will change over the lifetime of a development. In addition to the Flood Zones, areas at future flood risk need to be considered within the sequential test. The approach to consideration of climate change within this SFRA and the available data are set out in Section 5 and Appendix C: User Guide details the approach for assessing future flood risk within the SFRA.

Important note on Flood Zone information in this SFRA

Flood Zones 2 and 3a, as shown in Appendix A: GeoPDFs, show the same extent as the online EA's Flood Map for Planning (which incorporates latest modelled data).

The EA Flood Zones do not cover all catchments or ordinary watercourses with areas <3km². As a result, whilst the EA Flood Zones may show an area is in Flood Zone 1, there may be a flood risk from a smaller watercourse(s) not shown in the Flood Zones.

Functional floodplain (Flood Zone 3b) is identified as land which would flood with an annual probability of 3.3% AEP (1 in 30 years). Flood defences should be considered when delineating the functional floodplain. The 3.3% AEP defended modelled flood extents have been used to represent Flood Zone 3b, where available from the EA.

The 3.3% AEP modelled flood extents have been used to represent Flood Zone 3b, where available. 3.3% AEP extents were available for the following models:

- Chelmer
- Roding
- Blackwater
- Stort Tributaries (Stickling Green Brook)
- Chelmer Tributaries (Olives Wood and Godfrey Way in Great Dunmow)

For areas covered by detailed models, but with no 3.3% AEP output available, the 2% AEP (1 in 50 years) outputs were used as a worst-case proxy. This was the case for the following models:

- Cam Rural (including the Slade)
- Stansted Mountfitchet
- For the Upper and Middle Stort model, only the 5% or 1% AEP events were available, therefore Flood Zone 3a has been used as a conservative proxy.

For areas outside of the detailed model coverage, Flood Zone 3a has been used as a conservative indication for Flood Zone 3b. Further work should be undertaken as part of a detailed site-specific FRA to define and refine the extent of Flood Zone 3b where no detailed modelling exists. Caution should also be applied where the conservative Flood Zone 3b extent encompasses existing urban areas which would not otherwise be "designed to flood".

3.2.2 Flood Zones - surface water risk

To address the requirement that flood risk from all sources is included in the sequential test in addition to the fluvial Flood Zones, a further set of surface water zones have also been defined.

The surface water zones define locations at either lower or higher risk of surface water flooding based on the extent of the 1% AEP plus 40% climate change allowance surface water event. This is the upper end allowance for the 2070s epoch which the EA climate change guidance recommends is assessed within SFRAs.

- Zone A – lower risk of surface water flooding (lies outside the 1% AEP plus 40% climate change surface water extent)
- Zone B – higher risk of surface water flooding (lies within the 1% AEP plus 40% climate change surface water extent)

Surface water mapping does not strictly describe the same conceptual risk zone as is defined for river and sea flooding (even though it is notionally associated with the same probability) as the mapping is based on different assumptions. However, it does create a product that can accommodate sequential testing, as it can facilitate strategic decisions that direct development to land in a “lower risk surface water flood zone”.

Surface water flood risk can be of much shallower depth and is not normally experienced for such extensive durations as river flooding. However, the safety implications of placing proposed development at locations where there is surface water flood risk together with the potential effects on third parties is a material consideration and thus if it is proposed to place development in a Zone of high surface water flood risk then consideration should be given to the demonstrating that part “b” of the Exception Test (outlined in section 3.2.5) can be satisfied (with the presumption that part “a” was satisfied if the land was allocated in the Local Plan).

3.2.3 Flood Zones - other sources of flooding

Other sources of flooding also need to be considered as part of the sequential test. This includes reservoir, groundwater, and sewer flooding.

While all sources of flood risk should inform the sequential test, the national data available for use in this SFRA for other sources of flooding are not sufficient 'risk-based' datasets to inform the sequential test in the same way as the available data for fluvial and surface water risk, and therefore a more detailed assessment will be required in a Level 2 assessment.

A reservoir's primary function is to provide water storage; however, they can be a source of flooding. The latest available mapping now shows “wet day” and “dry day” reservoir inundation extents. The “wet day” being a reservoir breach at the same time as a 0.1% AEP river flood (as this is a likely time when a reservoir might fail) and the "dry day" shows the failure just from the water retained by the dam. However, neither set of mapping describes a risk-based scenario, as they do not indicate the relative risk to land based on the probability of dam failure but are intended to show a “worst credible case”.

By comparing the extent of Fluvial Flood Zone 2 with the Reservoir Flood Map Wet Day Extent, two zones can be defined:

- Where reservoir flooding is predicted to make fluvial flooding worse.
- Where reservoir flooding is not predicted to make fluvial flooding worse.

The mapping could be used to direct proposed new development away from locations that could potentially be affected by reservoir flood risk. However, it is different to the risk pertaining to river and sea flooding and further assessment would be required to understand the magnitude of the potential hazard. This mapping will also identify locations where proposed development could result in a change to the risk designation of a reservoir. If proposed sites are located in a zone at reservoir risk, it will be necessary to include a more detailed assessment in a Level 2 SFRA.

With regards to sewer and groundwater flood risk, for the purposes of this SFRA it is not possible to prepare zone maps as the appropriate analyses and data are not available nationally. Sewer flooding is presented as postcode point locations, and groundwater mapping data shows susceptibility of risk and likelihood of emergence. The latter could be viewed in conjunction with the surface water mapping to ascertain where emerging overland flows may travel above ground. The existing datasets on sewer flooding and groundwater are therefore used to inform the sequential approach to development at a site in accordance with Paragraph 167 of the NPPF (which could in some instances result in alternative sites being considered).

It is recommended that the DWMP information and mapping is not used to assess sewer flooding in the Sequential Test alongside river and surface water flooding on the basis that the available information is not of appropriate resolution or format. This understanding should be addressed with Anglian Water and Thames Water and formal confirmation obtained as necessary to support the Local Plan and Examination and clarify the necessity and extent to which identified DWMP sewer flood risk should be addressed at sites where this is potentially an influential matter. Where possible, the DWMP information should be used to inform the scope of site-specific FRAs and inform the necessity to include content on sewer flood risk in a Level 2 SFRA.

Direct consultation with Anglian Water and Thames Water on any sewer flood risks will be necessary once site-specific details are known.

3.2.4 The sequential test

Firstly, land at the lowest risk of flooding from all sources should be considered for development. A test is applied called the ‘sequential test’ to do this.

The LPA are required to undertake the sequential test in the preparation of their local plan, and the process is set out within this section. Developers are also required to follow a sequential approach to development, for both local plan allocations and windfall sites.

This section sets out the sequential test for the local plan process. The sequential test for developers is outlined in Section 3.3.

Figure 3-1 summarises the sequential test.

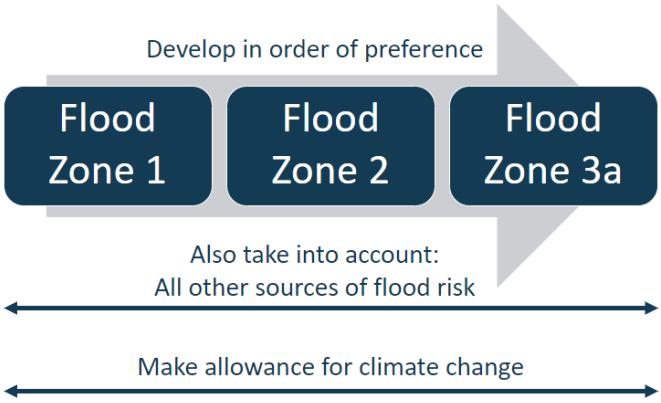


Figure 3-1: A summary of the sequential test.

The sequential approach steers development away from areas of flood risk and where the sequential and exception test have been applied (where required) and have not been met, development should not be permitted. It is advised that this approach should be considered early in the design process. This SFRA provides mapping of the flood risk from fluvial sources in 'Flood Zones', surface water, groundwater, and reservoirs, alongside the future flood risk from fluvial sources.

The sequential test should be applied to all relevant planning applications, as set out below. Developers must supply evidence to the LPA, with a planning application, that the development has passed the test.

A sequential test should be carried out if the development is:

- Within Flood Zones 2, 3a, or 3b
- Within Flood Zone 1 where:
    - This SFRA shows it to be at risk of flooding from rivers or sea in the future; or
    - It is at risk of flooding from other sources
        - Surface water (identified as Zone B in this SFRA)
        - Groundwater, reservoirs, and sewer (see Section 3.2.3 which refers to the limitations with data currently available to assess flood risk these sources)

Mapping of these sources of flooding are available in the GeoPDF mapping in Appendix A.

Exceptions to this requirement are for changes of use (except for changes of use to a caravan, camping or chalet site, or to a mobile home or park site, where the sequential and exception tests should be applied as appropriate), householder development, and non-residential extensions with a footprint less than 250 square metres.

The LPA should define a suitable search area for the consideration of alternative sites in the sequential test. 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 / Employment Land Availability Assessments.

Whether any further work is needed to decide if the land is suitable for development will depend on both the vulnerability of the development and the Flood Zone it is proposed for. Annex 3 of the NPPF sets out the flood risk vulnerability classifications for different development types. Table 2 of the PPG defines the flood risk vulnerability and flood zone 'incompatibility' of different development types to flooding which can be found on the Government website here.

Figure 3-2 illustrates the sequential and exception tests for local plan preparation as a process flow diagram (Diagram 2 of the PPG) using the information contained in this SFRA to assess potential development sites against the EA's Flood Map for Planning Flood Zones and development vulnerability compatibilities.

This is a stepwise process, but a complex one, as several of the criteria used are qualitative and based on experienced judgement. The process must be documented, and evidence used to support decisions recorded. In addition, the risk of flooding from other sources and the impact of climate change must be considered when considering which sites are suitable to allocate. The SFRA User Guide in Appendix C shows where the sequential and exception test may be required for the datasets assessed in the SFRA, and how to interpret different sources of flood risk, including recommending what proposed development sites should be assessed at Level 2. The application of both the sequential test and exception test is also outlined in diagrams 2 and 3 in the PPG here.

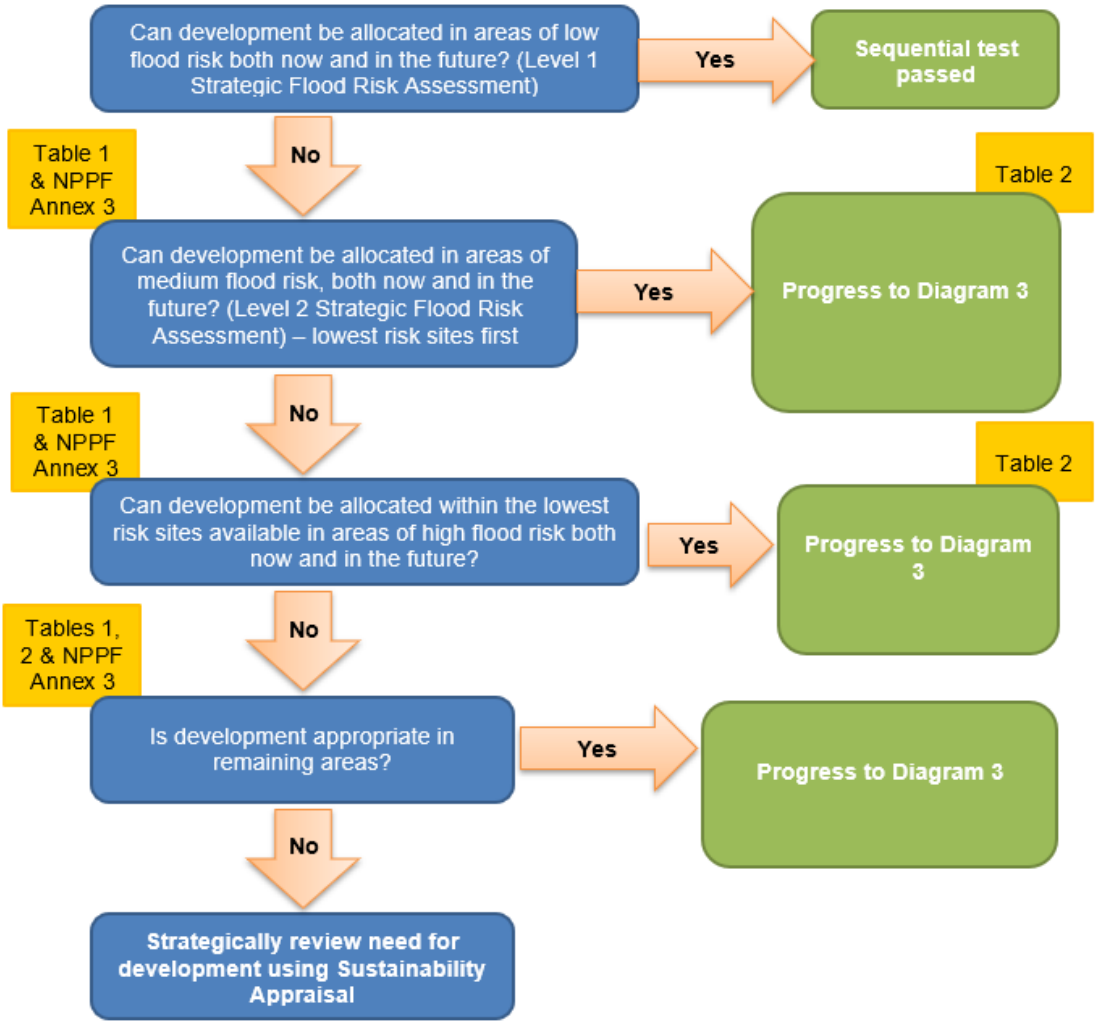


Figure 3-2: Local Plan sequential approach to site allocation.

3.2.5 The Exception Test

It will not always be possible for all new development to be located on land that is not at risk from flooding. To further inform whether land should be allocated, or Planning Permission granted, a greater understanding of the scale and nature of the flood risks is required. In these instances, the exception test will be required.

The exception test should only be applied following the application of the sequential test. It applies in the following instances:

- 'More vulnerable' development in Flood Zone 3a
- 'Essential infrastructure' in Flood Zone 3a or 3b
- 'Highly vulnerable' development in Flood Zone 2
- Any development where a higher risk of surface water has been identified (surface water Zone B) and the site does not clearly show that development can be achieved away from the flood risk.

'Highly vulnerable' development should not be permitted within Flood Zone 3a or Flood Zone 3b. 'More vulnerable' and 'Less vulnerable' development should not be permitted within Flood Zone 3b.

While current guidance in Table 2 of the PPG only applies to the EA's Flood Map for Planning, which displays risk of flooding from rivers and the sea, the updated PPG (August 2022) now requires all sources of flood risk to be assessed within the sequential test and therefore it follows that, where sufficient datasets are available, the exception test is recommended to take into account all sources of flood risk.

Figure 3-3 summarises the exception test. For sites proposed for allocation within the Local Plan, the LPA should use the information in this SFRA to inform the exception test. At the planning application stage, the developer must design the site such that it is appropriately flood resistant and resilient in line with the recommendations in national and local planning policy and supporting guidance and those set out in this SFRA. This should demonstrate that the site will still pass the flood risk element of the exception test based on the detailed site level analysis.

For developments that have not been allocated in the Local Plan or where the sequential test was not applied at the development plan stage and new information becomes available that identifies a flood risk, developers must undertake the sequential and exception tests and present this information to the LPA for approval. The Level 1 SFRA can be used to scope the flooding issues that a site-specific FRA should investigate in more detail to inform the exception test for windfall sites.

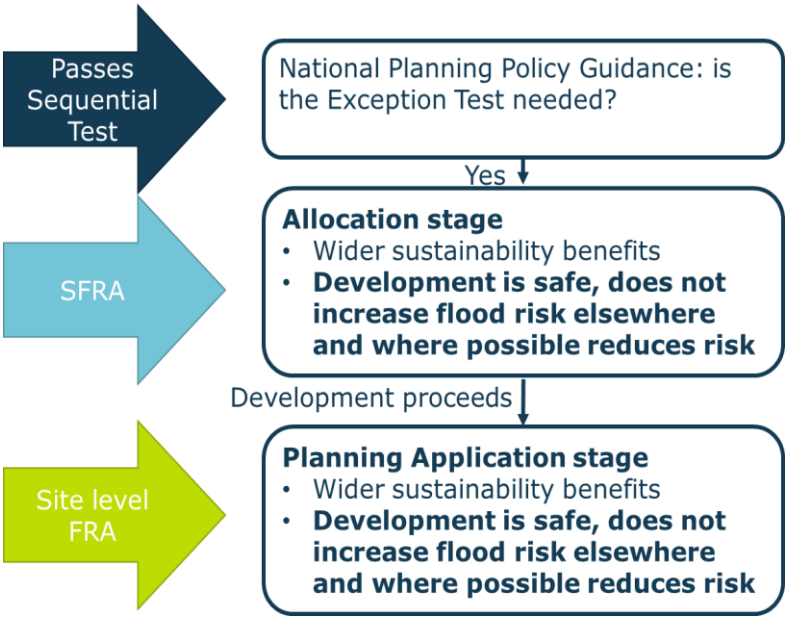


Figure 3-3: The exception test.

There are two parts to demonstrating a development passes the exception test:

1. Demonstrating that the development would provide wider sustainability benefits to the community that outweigh the flood risk.

LPAs will need to set out the criteria used to assess the exception test and provide clear advice to developers on the information required. If this information is not provided, the LPA should consider whether the use of planning conditions and / or planning obligations could allow it to pass the exception test. If this is not possible, this part of the exception test has failed, and planning permission should be refused.

At the stage of allocating development sites, LPAs should consider wider sustainability objectives, such as those set out in Local Plan Sustainability Appraisals. These generally consider matters such as biodiversity, blue green infrastructure, housing, historic environment, climate change adaptation, flood risk, green energy, pollution, health, transport etc.

The LPA should consider the sustainability issues the development will address and how far doing so will outweigh the flood risk concerns for the site, e.g., by facilitating wider regeneration of an area, providing community facilities, infrastructure that benefits the wider area etc.

2. Demonstrating 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.

In circumstances where the potential effects of proposed development are material a Level 2 SFRA is likely to be needed to inform the exception test for strategic allocations to provide evidence that the principle of development can be supported. At the planning application stage, a site-specific FRA will be needed. Both will need to consider the actual and residual risk and how this will be managed over the lifetime of the development.

3.2.6 Making a site safe from flood risk over its lifetime

LPAs will need to consider the actual and residual risk of flooding and how this will be managed over the lifetime of the development:

- Actual risk is the risk to the site considering existing flood mitigation measures.
- The PPG refers to the 'design flood' against which the suitability of a proposed development should be assessed and mitigation measures, if any, are designed.
- The 'design flood' is defined as the 1% AEP fluvial event or 1% AEP surface water event, plus an appropriate allowance for climate change. Allowances for climate change can be found on the EA website here.
- Safe access and egress should be available during the design flood event. Firstly, the design of the development should seek to avoid areas of a site at flood risk. If that is not possible then access routes should be located above the design flood event levels. Where that is not possible, access through shallow and slow flowing water that poses a low flood hazard may be acceptable.
- Residual risk is the risk that remains after the effects of flood defences have been taken into account and/ or from a more severe flood event than the design event. The residual risk can be:

- The effects of an extreme 0.1% annual probability flood event. This could lead to the overtopping of flood defences, which may lead to erosion and/or failure, and/ or
- Structural failure of any flood defences, such as breaches in embankments or walls.

- Flood resistance and resilience measures should be considered to manage any residual flood risk by keeping water out of properties and seeking to reduce the damage caused, should water enter a property. Emergency plans should also account for residual risk, e.g., through the provision of flood warnings and a flood evacuation plans where appropriate.

In line with the NPPF, the impacts of climate change over the lifetime of the development should be taken into account when considering actual and residual flood risk.

3.3 Applying the sequential test and exception test to individual planning applications

3.3.1 Applying the sequential test

Councils, with advice from the EA, are responsible for considering the extent to which sequential test considerations have been satisfied.

Developers are required to apply the sequential test to all development sites, unless the site is:

- A strategic allocation and the test have already been carried out by the LPA as part of preparing the local plan, or
- A change of use (except to a caravan, camping or chalet site, or to a mobile home or park home site), or
- A minor development (householder development, small non-residential extensions with a footprint of less than 250m²), or
- A development in fluvial Flood Zone 1 unless there are other flooding issues in the area of the development (i.e. surface water, ground water, sewer flooding).

The SFRA contains information on all sources of flooding and takes into account the impact of climate change. This should be considered when a developer undertakes the sequential test, including the consideration of reasonably available sites at lower flood risk.

Local circumstances must be used to define geographical scope of the sequential test (within which it is appropriate to identify reasonably available alternatives). To determine the appropriate search area criteria, include the catchment area for the type of development being proposed. For some sites this may be clear, e.g. school catchments, in other cases it may be identified by other Local Plan policies. For some sites, e.g. regional distribution sites, it may be suitable to widen the search area beyond LPA administrative boundaries.

The sources of information on reasonably available sites may include but is not restricted to:

- Site allocations in Local Plans

- Sites with Planning Permission but not yet built out
- Strategic Housing and Economic Land Availability Assessments (SHELAAs)/ five-year land supply/ annual monitoring reports
- Locally listed sites for sale

It may be that a number of smaller sites or part of a larger site at lower flood risk form a suitable alternative to a development site at high flood risk.

Ownership or landowner agreement in itself is not acceptable as a reason not to consider alternatives.

3.3.2 Applying the 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 (as set out in Table 2 of the PPG).

Where a development proposal is in accordance with an allocation made in a Local Plan following the application of the sequential and exception tests, the exception test will only be required to be repeated if:

- Elements of the development that were key to it satisfying the exception test at the plan-making stage (such as wider sustainability benefits to the community or measures to reduce flood risk overall) have changed or are not included in the proposed development; or
- The understanding of current or future flood risk has changed significantly.

The applicant will need to provide information that the application can pass both parts of the exception test:

1. Demonstrating that the development would provide wider sustainability benefits to the community that outweigh the flood risk.
    - Applicants should refer to wider sustainability objectives in Local Plan Sustainability Appraisals. These often consider matters such as biodiversity, blue green infrastructure, housing, historic environment, climate change adaptation, flood risk, green energy, pollution, health, transport etc.
    - Applicants should assess the suitability issues the development will address and how doing it will outweigh the flood risk concerns for the site, e.g. by facilitating wider regeneration of an area, providing community facilities, infrastructure that benefits the wider area etc.
2. Demonstrating 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.
    - The site-specific FRA should demonstrate that the site will be safe, and the residents/occupiers will not be exposed to hazardous flooding from any source. The FRA should consider actual and residual risk and how this will be managed over the lifetime of the development, including:
    - the design of any flood defence infrastructure,

- access and egress,
- operation and maintenance,
- design of the development to manage and reduce flood risk wherever possible,
- resident awareness,
- flood warning and evacuation procedures, including whether the developer would increase the pressure on emergency services to rescue people during a flood event, and
- any funding arrangements required for implementing measures.
- Further guidance on FRAs for new developments can be downloaded from the government website here.

4 Understanding flood risk across the study area

This section explores the key sources of flooding in the study area and the factors that affect flooding including topography, soils, and geology. The main sources of flooding affecting the study area are from watercourses, surface water, and sewers, as detailed in information provided by the Council, ECC, the EA, and Thames/ Anglian Water.

This is a strategic summary of the risk in the study area. Developers should use this section to scope out the flood risk issues they need to consider in greater detail in a site-specific FRA to support a Planning Application.

Appendix B contains a list of the sources of data used in the SFRA and the approach to using hydraulic model data to inform the mapping.

4.1 Historical flooding

4.1.1 Historical flood records

Table 4-1 and Figure 4-1 detail the flood events shown within the EA Recorded Flood Outlines dataset. ECC provided locations of a further 6 incidences in postcode areas CM6, CM22, and CB11; but the dates of these are unknown.

Table 4-1: Historic flooding incidents shown in the EA Recorded Flood Outlines dataset.

Flood date	Flood source	Flood cause	Areas affected
March 1947	Fluvial - Various	Channel capacity exceedance	River Cam around Little Chesterford. River Pant through Radwinter, Great Sampford, and Little Sampford. River Chelmer through Thaxted, Great Easton, and Great Dunmow. Stebbing Brook through Stebbing and Plitch Green. River Stort through Clavering and Manuden Stansted Brook through Elsenham and Stansted Mountfitchet Pincey Brook from Little Barrington Hall Farm to Downhall Wood Unnamed watercourses east of White Roding.
November 1974	Fluvial - River Stort	Channel capacity exceedance	River Roding through Great Canfield, Rythorpe Roding, and The Rodings. River Stort Navigation
May 1978	Fluvial -	Channel	Pincey Brook from Little Barrington Hall

Flood date	Flood source	Flood cause	Areas affected
	Various	capacity exceedance	Farm to Downhall Wood River Stort Navigation River Roding through Great Canfield, Rythorpe Roding, and The Rodings.
May 1987	Fluvial - River Stort	Unknown	River Stort in Manuden
October 1993	Fluvial - Various	Channel capacity exceedance	River Roding through Great Canfield, Rythorpe Roding, and The Rodings. River Stort Navigation at Gaston Green River Stort in Clavering and Manuden
December 2000	Fluvial/ Canal	Unknown	River Stort Navigation at Gaston Green
February 2001	Fluvial - River Stort	Channel capacity exceedance	River Stort Navigation at Gaston Green River Stort through Clavering and Manuden
October 2001	Fluvial - Various	Unknown	River Cam north of Little Chesterford, east of Littlebury, and west of Audley End Estate. River Bourn through Ashdon River Chelmer at select locations within Great Dunmow.
February 2009	Fluvial/ Canal	Unknown	River Stort Navigation at Gaston Green
February 2014	Fluvial/ Canal	Unknown	River Stort Navigation at Gaston Green

In addition, the EA's Historic Flood Map (HFM) shows areas of land that have been previously subject to flooding in the area. This includes flooding from rivers, the sea and groundwater springs but excludes surface water. The HFM outlines for the study area are shown in Figure 4-1, alongside the Recorded Flood Outlines (RFO) which also show records of historic flooding from surface water and are included in Appendix A: GeoPDFs. Across Uttlesford, the HFM and RFO detail the same flood events aside from a small area to the north west on the River Pant. Please note some of the historic extents may refer to older historic flood events, prior to flood defence improvements.

Information on sewer flooding across the study area is included in Section 4.5 and a list of historic flooding incidences provided by the Water Companies is available in Table 4-2.

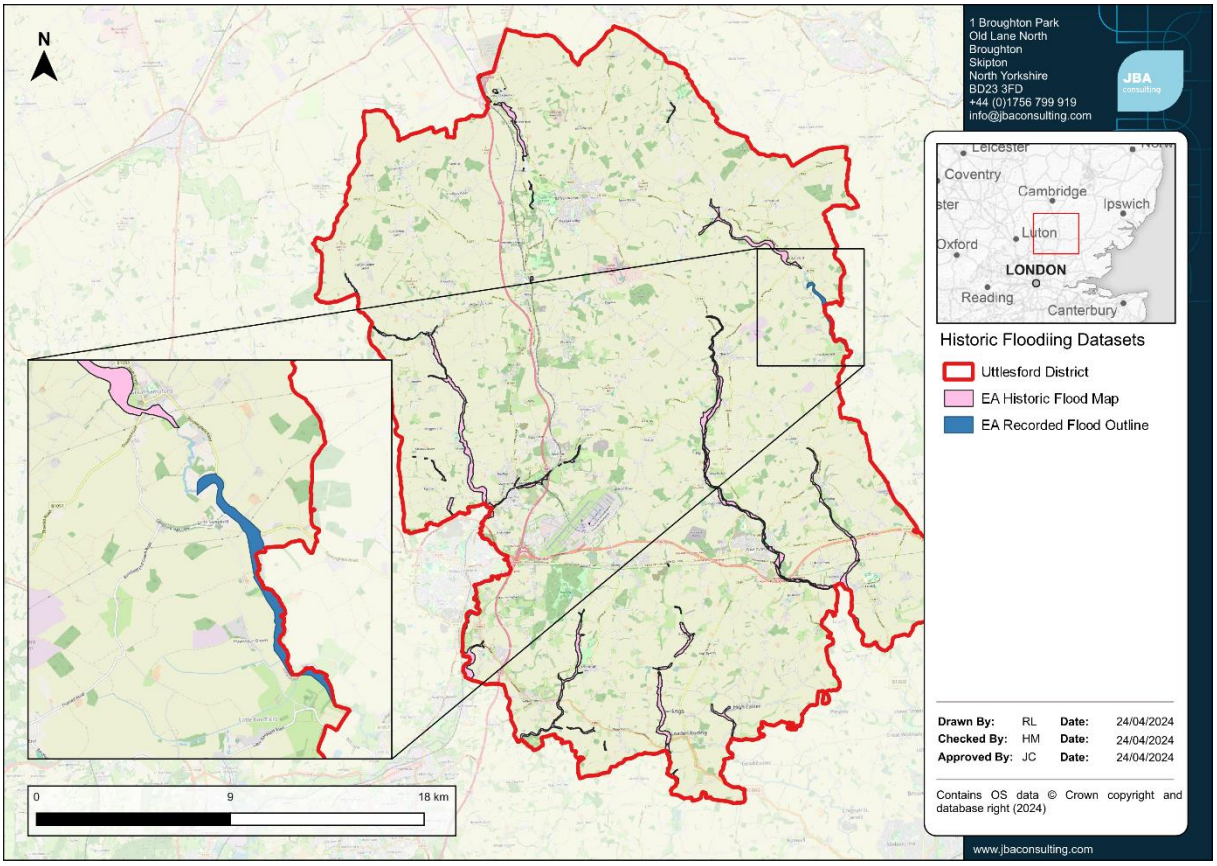


Figure 4-1: Historic Flood Map and Recorded Flood Outlines for Uttlesford

4.1.2 Section 19 Flood Investigations

Under the Flood and Water Management Act (2010), the LLFA has a duty to investigate flood incidences, where considered necessary or appropriate and produce a report. Section 19 Flood Investigation reports are available for specific events and locations on request from ECC here, this includes the following events:

- Essex Countywide Flooding (2011)
- Little Hallingbury (June 2012)
- Essex Countywide Flooding (June 2016)
- Saffron Walden (July 2017)

4.2 Topography, geology, soils, and hydrology

The topography, geology and soil are all important in influencing the way the catchment responds to a rainfall event. The degree to which a material allows water to percolate through it, the permeability, affects the extent of overland flow and therefore the amount of run-off reaching the watercourse. Steep slopes or clay rich (low permeability) soils will promote rapid surface runoff, whereas more permeable rock such as limestone and sandstone may result in a more subdued response.

4.2.1 Topography

Figure 4-2 highlights the changes in topography across Uttlesford. The northwestern corner of the study area, Crishall Common, lies at the highest elevation, approximately 146m AOD. This slopes steeply downwards towards the east and the River Cam, which lies at approximately 33m AOD where it flows out of the district.

The centre of the study area is a peak of 123m AOD - 128m AOD (Lovecotes Hill), sloping downwards on each side towards the Uttlesford District boundary. To the north, topography slopes with the River Cam, detailed above. To the southeast, the topography slopes with the River Chelmer and Stebbing Brook, which converge immediately south of Flitch Green at approximately 42m AOD. The southwest of the study area slopes down following a series of tributaries of the River Roding and River Lea, with the lowest point of the south west border lying at approximately 47m AOD.

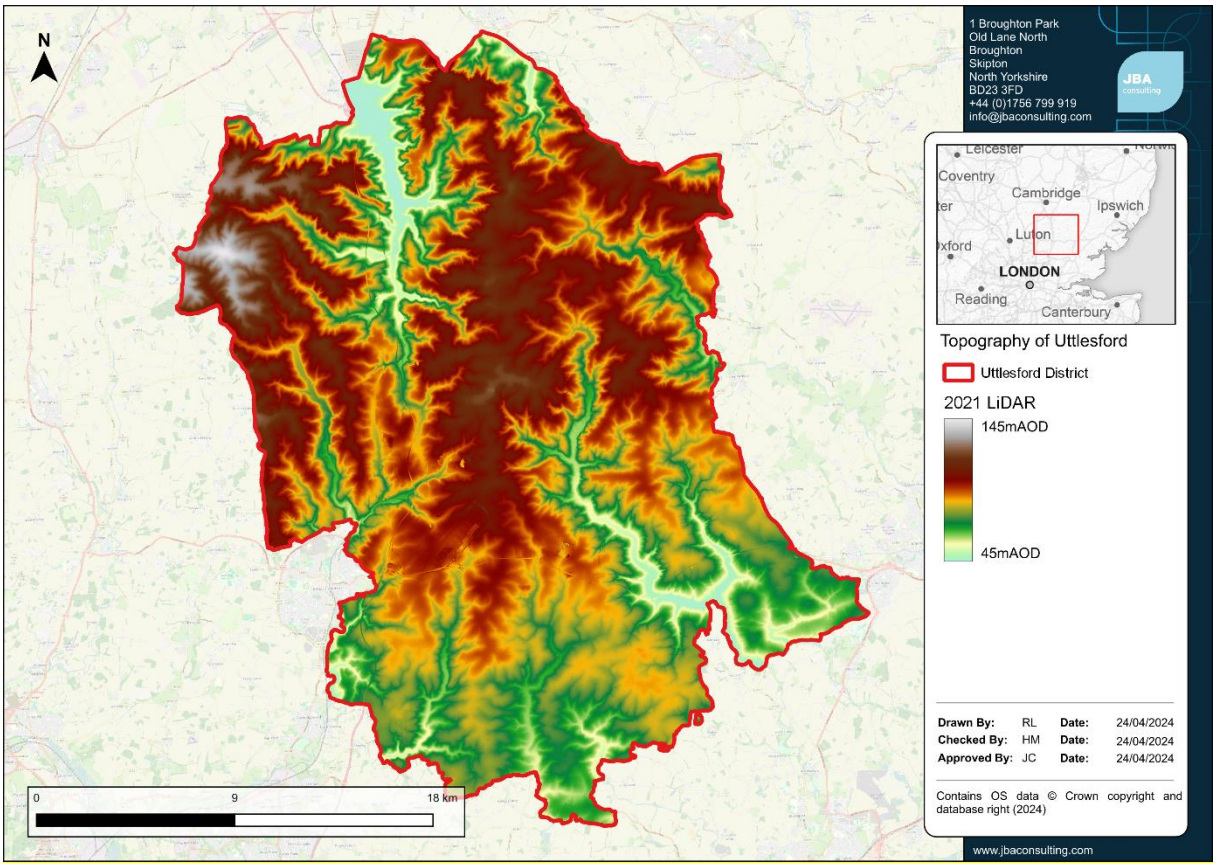


Figure 4-2: Topography of Uttlesford District

4.2.2 Geology

Information on the bedrock and superficial geology in the study area can be viewed online in the British Geology Society Geology Viewer.

The study area largely consists of London Clay Formation bedrock geology, which is a combination of clay, sand, and silt. Towards the north, near Safford Walden this bedrock geology changes to Lewes Nodular and Seaford Chalk Formations. Superficial geology is primarily the Lowestoft Fomation and river terrace deposits.

The EA also provides mapping of different types of aquifers, the underground layers of water-bearing permeable rock from which groundwater can be extracted. Aquifers are designated as either principal or secondary aquifers. Principal aquifers are designated by the EA as strategically important rock units that have high permeability and water storage capacity.

The north of Uttlesford District 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.

4.2.3 Soils

Much of the soils in the study area are lime rich, loamy, and clayey. This means there is slightly impeded drainage. Along many of the watercourses, soils become freely draining slightly and acid, but base-rich.

Soils data across the study area is available from the British Geological Survey website

4.3 Fluvial flood risk

The major watercourses flowing through the study area are:

- River Cam
- River Chelmer
- River Roding
- River Stort
- Stebbing Brook
- Pincey Brook
- Stansted Brook

Tributaries of these watercourses include smaller ordinary watercourses and numerous unnamed drains. There are also several ponds and lakes within the study area. A map of the key watercourses is included in Figure 1-4 and in Appendix A: GeoPDFs.

The primary fluvial flood risk in the study area is from rivers running through developed areas such as the River Cam, River Chelmer, and Stansted Brook.

The Flood Zone maps for the study area are provided in Appendix A: GeoPDFs, split into Flood Zones 2, 3a, and 3b. Section 3.2.1 describes how the fluvial Flood Zones have been derived for this SFRA. The flood risk associated with the major locations in the study area are detailed in Appendix E.

4.4 Surface water flooding

Surface water runoff is most likely to be caused by intense downpours e.g. thunderstorms. At times the amount of water falling can completely overwhelm the drainage network, which is not designed to cope with extreme storms. The flooding can also be complicated by blockages to drainage networks, sewers being at capacity and/ or high-water levels in watercourses that cause local drainage networks to back up.

The EA Risk of Flooding from Surface Water mapping (RoFSW) highlights several communities in the study area at risk from surface water flooding. Surface water flow paths generally follow the topography of existing watercourses, although there are some areas at risk from isolated ponding. Additionally, surface water flow routes are also established on roads in the more urban areas within the study area, highlighting risk to transport networks while posing a risk to buildings which water can be routed to. The RoFSW mapping for the study area can be found in Appendix A: GeoPDFs.

The impacts of climate change on surface water flooding are discussed in Section 0.

4.5 Sewer flooding

Sewer flooding occurs when intense rainfall/river flooding overloads sewer capacity (surface water, foul or combined), and/or when sewers cannot discharge to watercourses due to high water levels.

Sewer flooding can also be caused by blockages, collapses, equipment failure or groundwater leaking into sewer pipes.

Since 1980, the Sewers for Adoption guidelines mean that new surface water sewers have been designed to have capacity for a 3.3% AEP rainfall event, although until recently this did not apply to smaller private systems. This means that sewers can be overwhelmed in larger rainfall and flood events.

New developments should not cause additional pressures on existing sewers due to the requirements to maintain greenfield runoff rates. However, increases in rainfall as a result of climate change can lead to existing sewers becoming overloaded, although this can be reduced through the use of well-designed SuDS to reduce surface water runoff.

The management of drainage networks across the study area is the responsibility of either AW or TW, depending on location. Records of flood incidents relating to public foul, combined or surface water sewers between 2021 and 2023 have been provided by Thames Water. Table 4-2 below displays this data using truncated postcodes to avoid identifying specific streets or properties.

Data from Anglian Water was not received for the 2024 study; however, the table below details data received as part of the 2021 SFRA.

Table 4-2: Sewer flooding incidents recorded by Thames Water (2009 - 2023) and Anglian Water (2016 - 2021)

Postcode	Number of recorded incidents pre 2021	Number of recorded incidents 2021	Number of recorded incidents 2022	Number of recorded incidents 2023	Total flooding incidents between 2021 and 2023
CB1 1	9	1	0	0	10
CB1 2	14	1	0	0	15
CB1 3	22	7	0	0	29

Postcode	Number of recorded incidents pre 2021	Number of recorded incidents 2021	Number of recorded incidents 2022	Number of recorded incidents 2023	Total flooding incidents between 2021 and 2023
CB1 7	1	0	0	0	1
CB1 8	8	0	0	0	8
CB1 9	5	0	0	0	5
CB10 2	37	4	0	0	41
CB11 3	16	4	0	0	20
CB11 4	9	8	1	1	19
CM22 6	0	1	1	1	3
CM22 7	0	3	3	0	6
CM23 5	0	0	2	1	3
CM24 8	0	8	2	3	13
CM6 1	0	10	1	0	11

4.6 Groundwater flooding

In general, less is known about groundwater flooding than other sources and availability of data is limited. Groundwater flooding can be caused by:

- High water tables, influenced by the type of bedrock and superficial geology.
- Seasonal flows in dry valleys, which are particularly common in areas of chalk geology.
- Rebounding groundwater levels, where these have been historically lowered for industrial or mining purposes.
- Where there are long culverts that prevent water easily getting into watercourses.
- Perched aquifers underlain by impermeable geology, particularly in low lying areas.

Groundwater flooding is different to other types of flooding. It can last for days, weeks, or even months and is much harder to predict and warn for. Monitoring does occur in certain areas, for example where there are major aquifers or when mining stops.

Two datasets were used to identify potential areas that are likely to be at higher risk of groundwater flooding:

- The EA's Areas Susceptible to Groundwater Flooding (AStGWF) dataset, showing the degree to which areas are susceptible to groundwater flooding based on geological and hydrogeological conditions. It does not show the likelihood of groundwater flooding occurring, i.e., it is a hazard, not risk, based dataset.

- The JBA Groundwater Emergence map, showing the risk of groundwater flooding to both surface and subsurface assets, based on predicted groundwater levels. This divides groundwater emergence into five categories:
    - Groundwater levels are either at or very near (within 0.025m of) the ground surface. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
    - Groundwater levels are between 0.025m and 0.5m below the ground surface. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
    - Groundwater levels are between 0.5m and 5m below the ground surface. There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
    - Groundwater levels are at least 5m below the ground surface. Flooding from groundwater is not likely.
    - No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.

The areas at most risk of groundwater emergence is discussed in Appendix E. It should be noted that these datasets only identify areas likely to be at risk of groundwater emergence and do not allow prediction of the likelihood of groundwater flooding or quantification of the volumes of groundwater that might be expected to emerge in a given area.

The JBA Groundwater Emergence map and the EA AStGWF dataset for the study area are provided in Appendix A. In high-risk areas, a site-specific risk assessment for groundwater flooding may be required to fully inform the likelihood of flooding.

4.7 Flooding from canals

Canals are regulated waterbodies and are unlikely to flood unless there is a sudden failure of an embankment or a sudden ingress of water from a river in areas where they interact closely. Embankment failure can be caused by:

- Culvert collapse
- Overtopping
- Animal burrowing
- Subsidence/ sudden failure e.g., collapse of former mine workings
- Utility or development works close or encroaching onto the footings of a canal embankment.

Flooding from a breach of a canal embankment is largely dictated by canal and ground levels, canal embankment construction, breach characteristics and the volume of water within the canal that can discharge into the lower lying areas behind the embankment. The volume of water released during a breach is dependent on the pound length (i.e. the distance between locks) and how quickly the operating authorities can react to prevent

further water loss, for example by the fitting of stop boards to restrict the length of the canal that can empty through the breach, or repair of the breach. The Canal and River Trust monitor embankments at the highest risk of failure.

Although there are no canals within the study area, the River Stort Navigation flows along part of the south west border of the study area, as shown in Figure 4-4, and could therefore pose risk. The canal runs north to south along the Uttlesford border between Rushy Mead Nature Reserve and Gaston Green and Hallingbury Marina. The residual risk from canal flooding should be assessed as part of a site-specific FRA.

The canals have the potential to interact with other watercourses in the study area, including the River Stort and other smaller watercourses. These have the potential to become flow paths if these canals were overtopped or breached. Any development proposed adjacent to a canal should include a detailed assessment of how a canal breach would impact the site, as part of a site-specific Flood Risk Assessment. Guidance on development near canals is available from the Canal and River Trust website.

4.8 Flooding from reservoirs

Reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoirs Act 1975, available on the Government website here, and are on a register held by the EA. The level and standard of inspection and maintenance required by a Supervising Panel of Engineers under the Act means that the risk of flooding from reservoirs is very low. Some reservoirs are designated as high risk by the EA, where an uncontrolled release of water could put people's lives at risk and are subject to increased inspection and maintenance requirements. However, this designation does not mean they are at a high risk of flooding.

Flooding from reservoirs occurs following partial or complete failure of the control structure designed to retain water in the artificial storage area. Reservoir flooding is very different from other forms of flooding; it may happen with little, or no warning and evacuation will need to happen immediately. The likelihood of such flooding is difficult to estimate but is extremely low compared to flooding from other sources. It may not be possible to seek refuge upstairs from floodwater as buildings could be unsafe or unstable due to the force of water from the reservoir breach or failure.

The EA hold mapping showing what might happen if reservoirs fail. Developers and planners should check the Long-Term Risk of Flooding website before using the reservoir data shown in this SFRA to make sure they are using the most up to date mapping. The EA provide two flooding scenarios for the reservoir flood maps: a ‘dry-day’ and a ‘wet-day’. The ‘dry day’ scenario shows the predicted flooding which would occur if the dam or reservoir fails when rivers are at normal levels. The ‘wet day’ scenario shows the predicted worsening of the flooding which would be expected if a river is already experiencing an extreme natural flood. It should be noted that these datasets give no indication of the likelihood or probability of reservoir flooding.

The current mapping shows that there are four reservoirs located within the study area with flood extents impacting the study area, detailed in Table 4-3, with their locations shown in Figure 4-3. There is a further three reservoirs are located outside the study area but whose flood extents lie within the study area, also detailed on Table 4-5. Section 8.4.3 provides further considerations for developing in the vicinity of reservoirs. The reservoir flood mapping for both the 'dry day' and 'wet day' scenarios in the study area has been provided in and in in Appendix A: GeoPDFs. The EA 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.

Table 4-3: Reservoirs with flood extents that impact the study area.

Reservoir	Easting and Northing	Reservoir owner	Risk Category	Within Uttlesford Boundary	Local Authority
Balancing Pond C	554999, 221632	Stansted Airport Ltd	High-risk	Yes	Essex
Hatfield Forest Lake	554092, 219900	The National Trust	Not high-risk	Yes	Essex
Little Easton Reservoir	560198, 224146	Mr C J Trembath	High-risk	Yes	Essex
Shrubbs Farm Reservoir	551873, 213589	Liddell	Not high-risk	Yes	Essex
Lancaster Lake	54656, 218420	MJ & SC Collins	High risk	No	Hertfordshire
Bomb Pond	546563, 218430	MJ & SC Collins	High-risk	No	Hertfordshire
Berners Hall Farm	558997, 209737	Essex Farm	High-risk	No	Essex

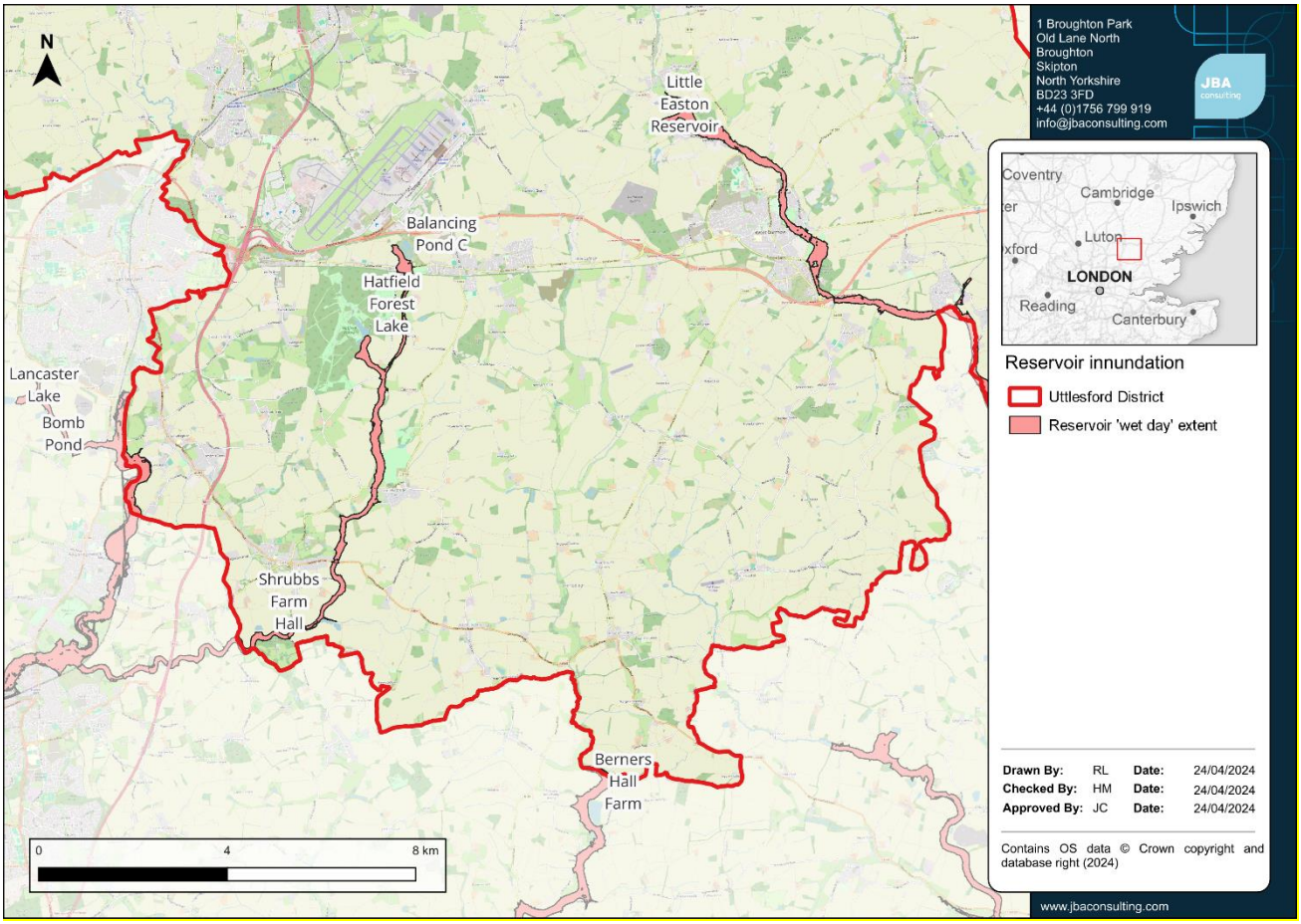


Figure 4-3: Reservoir 'wet day' scenario

As above, the risk of reservoir flooding is extremely low. However, there remains a residual risk to development from reservoirs which developers should consider during the planning stage.

- Developers should seek to contact the reservoir owner to obtain information which may include:
  - Reservoir characteristics: type, dam height at outlet, area/volume, overflow location.
  - Operation: discharge rates/maximum discharge.
  - Discharge during emergency drawdown.
  - Inspection/maintenance regime.
- Developers should apply the sequential approach to locating development within the site.
- Consult with relevant authorities regarding emergency plans in case of reservoir breach.
- The reservoir owners are contacted to confirm the Reservoir Risk Designation (if determined) and the inspection and maintenance regime of the reservoir.
- Consider the impact of a breach and overtopping, particularly for sites proposed to be located immediately downstream of a reservoir. This should consider whether there is sufficient time to respond.

- It should also be understood that the “risk category” of a reservoir is set by the potential damage and loss of life in circumstances where there is a breach or an extreme flood event. Accordingly, it is possible that allocation of new development downstream of an existing reservoir could potentially change the risk category and result in a legal requirement (under the Reservoirs Act 1975) to improve the structural and hydraulic capacity of the dam. As the cost of implementing such works can be substantial consideration should be given to considering the implications and whether it would be more appropriate to place development in alternative locations not associated with such risk.
- The EA online Reservoir Flood Maps contain information on the extents following a reservoir breach (note: flood extents are not included for smaller reservoirs or for reservoirs commissioned after the reservoir modelling programme began in October 2016). For proposed sites located within the extents, consideration should be given to the extents shown in these online maps.
- In addition to the risk of inundation, those considering development in areas affected by breach events should also assess the potential hydraulic forces imposed by the rapid flood event and check that that the proposed infrastructure fabric can withstand the loads imposed on the structures by a breach event.

4.9 Flood alerts and flood warnings

The EA is the lead organisation for providing warnings of river flooding. Flood Warnings are supplied via the Flood Warning System (FWS) service, to homes and business within Flood Zones 2 and 3. Further information on how to sign up for these warnings is available on the EA website.

There are currently 10 Flood Alert Areas (FAA) and 28 Flood Warning Areas (FWAs) covering the study area, as detailed in Appendix D.

Flood Alerts are issued when there is water out of bank for the first time anywhere in the catchment, signalling that ‘flooding is possible’, and therefore FAAs usually cover the majority of main river reaches.

Flood Warnings are issued to designated FWAs (i.e., properties within the extreme flood extent which are at risk of flooding), when the river level hits a certain threshold; this is correlated between the FWA and the gauge, with a lead time to warn that ‘flooding is expected’.

The FAAs and FWAs are listed in Appendix D and included in Appendix A: GeoPDFs.

4.10 Combined sources of flood risk

The sections above set out the various sources of flooding, which all individually present a flood risk within the study area. However, it is important to note that there is also the likelihood of increased or altered flood risk as a result of different sources of flooding interacting within the study area. The combined influence of fluvial and surface water

flooding for example could differ from what the datasets show separately, and this should be considered further by developers within a site-specific FRA, where appropriate.

4.11 Summary of flood risk in the study area

A table summarising all sources of flood risk to key settlements in the study area can be found in Appendix E. For this summary, the study area has been delineated into three sub-areas which are detailed below and shown in Figure 4.4:

- Sub-area 1 covers the north of the study area and includes the urban centres of Saffron Walden and Newport.
- Sub-area 2 is located to the east of the District and includes the urban centres of Great Dunmow and Thaxted.
- Sub-area 3 is in the west of the study area and includes the urban centres of Stansted Mountfitchet and Elsenham.

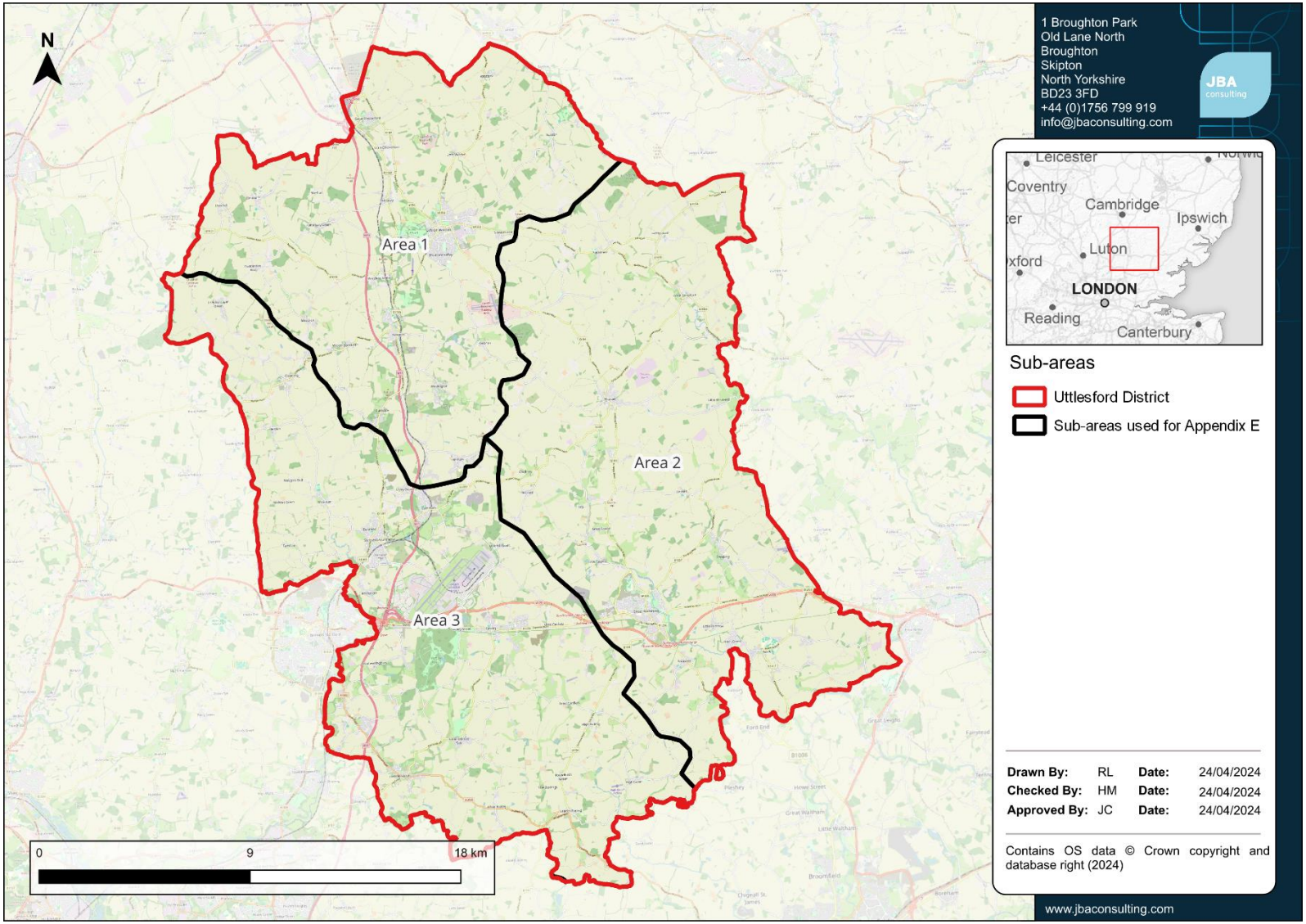


Figure 4-4: Uttlesford sub-areas for Appendix E

5 Impact of Climate Change

Climate change projections show an increased chance of warmer, wetter winters and hotter, drier summers with a higher likelihood of more frequent and intense rainfall. This is likely to make severe flooding happen more often.

The NPPF sets out that flood risk should be managed over the lifetime of a development, taking climate change into account. This section sets out how the impact of climate change should be considered.

5.1 Revised climate change guidance

The Climate Change Act 2008 creates a legal requirement for the UK to put in place measures to adapt to climate change and to reduce carbon emissions by at least 80% below 1990 levels by 2050. This was updated in June 2019 under the Climate Change Act 2008 (2050 Target Amendment) Order to a 100% reduction (or net zero) by 2050. The full Act is available on the Government website here and the amendment order is available on the Government website here.

In 2018, the government published new UK Climate Projections (UKCP18). The EA used these projections to update their climate change guidance for new developments with regards to updated fluvial and rainfall allowances. The EA published updated climate change guidance for fluvial risk in July 2021 on how allowances for climate change should be included in both strategic and site-specific FRAs. The guidance adopts a risk-based approach considering the vulnerability of the development and considers risk allowances on a management catchment level, rather than a river basin level. The guidance was further updated in May 2022 to address the changes to the requirements for peak rainfall allowances.

Before undertaking a detailed FRA, developers should check the government website for the latest guidance.

5.1.1 Applying the Climate Change Guidance

To apply the appropriate climate change guidance to a site, the following information is required:

- The vulnerability of the development – see Annex 3 in the NPPF.
- The likely lifetime of the development – in general 75 years is used for commercial development and 100 for residential, but this needs to be confirmed in an FRA. For development that will have an anticipated lifetime significantly beyond 100 years a higher allowance is required.
- The Management Catchment (assigned by the EA) that the site is located in (as shown in Figure 5-1. The study area lies across four Management Catchments:

- The north of the study area lies within the Cam and Ely Ouse Management Catchment.
- The east and centre of the study area lies within the Combined Essex Management Catchment.
- The south of the study area lies within the Roding, Beam, and Ingrebourne Management Catchment.
- The west of the study area lies within the Upper Lee Management Catchment.

Developers should consider the following when deciding which allowances to use to address flood risk for a development or local plan allocation:

- Likely depth, speed, and extent of flooding for each allowance of climate change over time considering the allowances for the relevant epoch (2020s, 2050s and 2080s).
- The 'built in' resilience measures used, for example, raised floor levels.
- The capacity or space in the development to include additional resilience measures in the future, using a 'managed adaptive' approach.

Developers should refer to the EA guidance when considering which climate change allowances to use, available on the government website here.

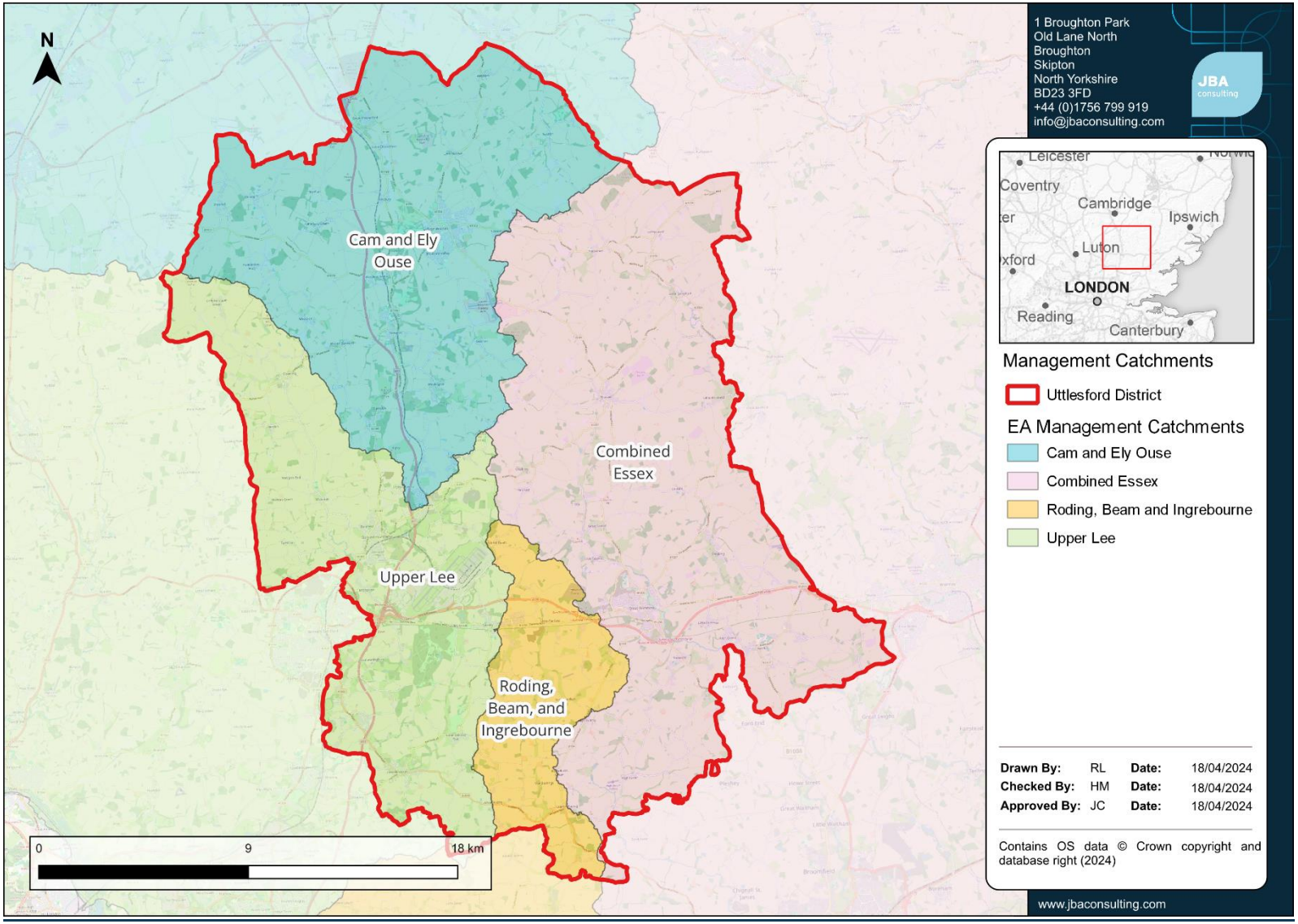


Figure 5-1: EA Management catchments for Uttlesford

5.2 Relevant allowances for the study area

Table 5-1 shows the updated peak river flow allowances that apply across the study area for fluvial flood risk for the Cam and Ely Ouse; Combined Essex; Roding, Beam, and Ingrebourne; and Upper Lee Management Catchments. These allowances supersede the previous allowances by River Basin District.

The range of allowances are based on percentiles which describe the proportion of possible scenarios that fall below an allowance level:

- The central allowance is based on the 50th percentile (exceeded by 50% of the projections in the range).
- The higher central allowance is based on the 70th percentile (exceeded by 30% of the projections in the range).
- The upper end allowance is based on the 95th percentile (exceeded by 5% of the projections in the range).

Table 5-1: Peak river flow allowances for the Management Catchments which cover the study area.

Management Catchment	Allowance category	Total potential change anticipated for '2020s' (2015 to 2039)	Total potential change anticipated for '2050s' (2040 to 2069)	Total potential change anticipated for '2080s' (2070 to 2115)
Cam and Ely Ouse	Upper end	21%	22%	45%
Cam and Ely Ouse	Higher central	7%	5%	19%
Cam and Ely Ouse	Central	2%	-2%	9%
Combined Essex	Upper end	27%	37%	72%
Combined Essex	Higher central	13%	16%	38%
Combined Essex	Central	7%	9%	25%
Roding, Beam, and Ingrebourne	Upper end	31%	38%	64%
Roding, Beam, and Ingrebourne	Higher central	20%	21%	36%
Roding, Beam, and Ingrebourne	Central	15%	14%	26%
Upper Lee	Upper end	23%	27%	59%
Upper Lee	Higher central	9%	7%	22%
Upper Lee	Central	3%	-1%	10%

Table 5-2 shows the updated rainfall intensity allowances that apply across the study area for surface water flood risk for the different Management Catchments. These allowances supersede the previous country wide allowances. These allowances should be used for site-scale applications and for surface water flood mapping in small catchments (less than 5km²) and urbanised drainage catchments.

Table 5-2: Peak rainfall intensity allowances for small and urban catchments for the Management Catchments which cover the study area.

Management Catchment	Allowance category	Total potential change anticipated for '2050s' (2022 to 2060) 3.3% AEP	Total potential change anticipated for '2050s' (2022 to 2060) 1% AEP	Total potential change anticipated for '2070s' (2061 to 2125) 3.3% AEP	Total potential change anticipated for '2070s' (2061 to 2125) 1% AEP
Cam and Ely Ouse	Upper end	35%	40%	35%	40%
Cam and Ely Ouse	Central	20%	20%	20%	25%
Combined Essex	Upper end	35%	45%	35%	40%
Combined Essex	Central	20%	20%	20%	25%
Roding, Beam, and Ingrebourne	Upper end	35%	40%	35%	40%
Roding, Beam, and Ingrebourne	Central	20%	20%	20%	25%
Upper Lee	Upper end	35%	40%	35%	40%
Upper Lee	Central	20%	20%	20%	25%

Section 5.3 details the methodology applied to represent climate change within this Level 1 SFRA. Further details on the models used can be found in Appendix B.

5.3 Representing climate change in the Level 1 SFRA

Representation of climate change within the SFRA was discussed and agreed with the EA via an online meeting and agreement of a scoping methodology on 24th April 2024. This discussed the model data received, available data in the models, the latest climate change allowances, the approach adopted in the 2021 SFRA and the proposed approach for this updated 2024 SFRA.

The models requested and received are shown below, along with the available data for each model and the latest climate change allowances:

Table 5-3: Available modelling for the study

Model	Year	Catchment basin	Existing data	Pre-2021 allowances: Central, Higher Central & Upper End (2080s)	2021 allowances: Central, Higher Central & Upper End (2080s)
Upper Roding	2016	Roding, Beam & Ingrebourne	1% AEP +CC (20%)	25%, 35%, 70%	26%, 36%,64%
Upper Middle Stort	2010	Upper Lee	1% AEP +CC (20%)	25%, 35%, 70%	10%, 22%,59%
Stort Tribs (Stickling Green Brook)	2015	Upper Lee	1% AEP +CC (20%)	25%, 35%, 70%	10%, 22%,59%
Stansted Mountfitchet	2015	Upper Lee	1% AEP +CC (20%)	25%, 35%, 70%	10%, 22%,59%
Chelmer - Upper Chelmer Tribs	2020	Combined Essex	2016 allowances (25%, 35%, 65%)	25%, 35%, 65%	25%, 38%,72%
Upper Blackwater	2016	Combined Essex	1% AEP +CC and 0.1% (20%)	25%, 35%, 65%	25%, 38%,72%
Cam	2012	Cam and Ely Ouse	1% AEP +CC (20%)	25%, 35%, 65%	9%, 19%, 45%
Cam Rural Model (Phase 2 Slades 2012)	2014	Cam and Ely Ouse	1% AEP +CC (20%)	25%, 35%, 65%	9%, 19%, 45%

Green denotes a lowering in climate change allowances.

Red denotes an increase in climate change allowances.

Black denotes the same/ low difference in climate change allowances.

A pragmatic approach to climate change was proposed to the EA for the Uttlesford L1 SFRA in 2021. As the centre of the authority area forms a catchment boundary for three major basins, this means the watercourses are in their headwaters where the topography is very confined, meaning generally narrow floodplains with little difference seen between FZ2 and FZ3 extents (climate change usually sits between these events).
It was proposed to the EA that no new climate change modelling would be carried out for the L1 SFRA based on the following justifications:

- For all EA models provided, there is at least one existing climate change model output, and for one model there are the three 2080s pre-July 2021 allowances.
- The majority of updated 2021 catchment climate change allowances are lowered (the only increase is Chelmer and Blackwater Upper End, though the focus for FRAs is now on the Central allowance in the new guidance).

- There is a minor difference on the whole between FZ3 and FZ2 extents. Modelling climate change would show minimal difference as the extents would fall between these scenarios – all watercourses are in their headwaters with confined topography, and therefore negligible difference would be seen in the mapping. This approach was agreed in the previous L1 SFRA, and allowances have since decreased further, meaning FZ2 is a conservative indication.
- Climate change flows in the 2016 L1 SFRA (quote below) were compared and were contained within the 1,000-year event (FZ2) and now the flows are lower again with latest guidance:
    - *"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 1,000-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. 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. 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."*
- The focus in the latest guidance for the vulnerability of developments is on Central allowance. The previous 1% AEP +20% climate change event covers the majority of the models' Central allowances conservatively.

It was agreed in April 2024, that this approach is still acceptable for the Upper Middle Stort, Stort Tribs, Stansted Mountfitchet, Chelmer and Cam models. However, for the Blackwater model, concerns were raised in 2021 as to whether the existing climate change runs were sufficient for the updated uplifts. Checks were undertaken on comparative flows to see whether the allowances were covered by the 0.1% AEP or 0.1% AEP + climate change event. Following checks, the 1% AEP +25%, +38% and +72% climate change uplifts were run and mapped for the Blackwater model in 2021. For the River Roding, where the Central allowance is +36% (i.e. above an accepted 'tolerance' for the +20%), Flood Zone 2 will be used as a proxy which is more conservative.

At the time of this L1 SFRA update, the sites requiring L2 assessment were also known, and only 1 site was located within detailed model coverage: the Chelmer, where detailed outputs were already present. Therefore, it was agreed than any modelling efforts required, should be focussed on the L2 SFRA and subsequent site-specific FRAs.

More detailed modelling of different climate change scenarios may need to be undertaken in future SFRA updates as hydraulic models become older, and if and when a Level 2 assessment is required or during a site-specific Flood Risk Assessment.

The Council should note that if new large settlements/ significant urban extensions or essential infrastructure are proposed in flood risk areas, the Upper End allowance would be required to be modelled as part of a Level 2 SFRA or a Flood Risk Assessment proposal.

The sections below detail the approaches taken to consider climate change for fluvial and surface water flooding.

5.3.1 Fluvial climate change

5.3.1.1 3.3% AEP (Functional floodplain - Flood Zone 3b)

Where model data is present for the 3.3% AEP event with climate change scenario (e.g. the River Chelmer), this has been used in preference (named "Modelled 3.3% AEP Central (River Chelmer only) in the mapping).

Where there is no available 3.3% AEP event with climate change, a pragmatic proxy approach has been used in agreement with the EA. Where model data was available, this involved looking at the model inflows, and aligning a 3.3% AEP + CC (Central) event with the nearest representative return period output, to act as a more accurate proxy, rather than defaulting to FZ3a which may be more conservative. As the table shows below, in some cases this better aligned with a 2% or 1.3% AEP event. The flood extents of the chosen return period events were merged to form a composite proxy (named "Indicative 3.3% AEP Central (modelled proxy)" in the mapping).

Where there was no modelling present, the proxy defaults to Flood Zone 3a of the EA's FMfP, and for Ordinary Watercourses where there is no national mapping available, the 1% RoFfSW dataset has been used as a proxy to infer risk.

It should be noted that at site-specific Flood Risk Assessment stage, detailed hydraulic modelling may be needed to confirm the effects of climate change on the functional floodplain, but this is deemed a pragmatic approach for the strategic assessment of sites.

Table 5-4: Flood Zone 3b + CC Proxy Investigation

Model	FZ3b representation	Central 2080s allowance	Peak flows comparison - FZ3b + Central CC	FZ3b+CC Proxy
Roding	3.3% AEP	26%	Between 1.3% and 1% AEP	**1% AEP**
Stort Tribs (Stickling Green Brook)	3.3% AEP	10%	2% AEP	**2% AEP**

Model	FZ3b representation	Central 2080s allowance	Peak flows comparison - FZ3b + Central CC	FZ3b+CC Proxy
Upper and Middle Stort (2010)	FZ3a proxy (only 5% or 1% available)	10%	n/a	**FZ3a proxy**
Blackwater	3.3% AEP	25%	Similar to 1%	**1% AEP**
Cam rural	2% AEP	9%	Granta = 1.3% Cam = 1%	**1% AEP**
Slade	2% AEP	9%	1.3%	**1.3% AEP**
Stansted Mountfitchet	2% AEP	10%	Mostly like 1.3% AEP but some flows between 1.3%-1% AEP	**1.3% AEP**
Chelmer Tribs (Godfrey Way/ Olives Wood)	3.3% AEP	25%	Both between 1.3% and 1% AEP, but nearer 1% AEP	**1% AEP**
Chelmer	3.3% AEP	25%	n/a	**n/a (modelled)**

5.3.1.2 1% AEP (Flood Zone 3a)

Where model data is present for the 1% AEP event with climate change scenario, this has been used in preference. Table 5-4 below shows a summary of which event has been used for each model. For some models where only the +20% allowance was available, this was replicated for both the Central and Higher Central allowance. This means for the Central allowance, the +20% allowance is conservative for some models and more closely represents the Higher Central allowance. The Chelmer, Chelmer Tributaries and Blackwater have more representative allowances already run. For the Roding model, as the Central allowance (+26%) was above an acceptable tolerance to use the existing +20% output, the EA requested that Flood Zone 2 was used to represent climate change.

These outputs have been merged to form composite extents for the 1% Central and Higher Central climate change events (named "Indicative 1% AEP Central/ Higher Central (modelled proxy)" in the mapping).

In the absence of detailed hydraulic modelling, but where the EA's national Flood Map for Planning is available, Flood Zone 2 has been used as a proxy (named "Indicative 1% AEP (FZ2)" in the mapping). This is appropriate given the Higher Central/ Upper End climate change extents are often similar to the Flood Zone 2 (0.1% AEP) extents.

For Ordinary Watercourses where there is no national mapping available, the 0.1% RoFfSW dataset has been used as a proxy to infer risk.

A site-specific Flood Risk Assessment will need to model Flood Zone 3a+CC at a site if this data is not already available.

Table 5-5: Climate change allowances for various locations within the study area

Model	Existing data/ Proxy for Central CC	Central (2080s) Uplift	Existing data/ Proxy for Higher Central CC	Higher Central (2080s) Uplift
Upper Roding	Flood Zone 2 (0.1% AEP)	26%	Flood Zone 2 (0.1% AEP)	36%
Upper Middle Stort	1% AEP +20%	10%	1% AEP +20%	22%
Stort Tribs (Stickling Green Brook)	1% AEP +20%	10%	1% AEP +20%	22%
Stansted Mountfitchet	1% AEP +20%	10%	1% AEP +20%	22%
Chelmer - Upper Chelmer	1% AEP +25%	25%	1% AEP +35%	38%
Chelmer Tribs (Godfrey Way Olives Wood)	1% AEP +25%	25%	1% AEP +35%	38%
Upper Blackwater	1% AEP +25%	25%	1% AEP +38%	38%
Cam Rural	1% AEP +20%	9%	1% AEP +20%	19%
Cam Rural (Slades 2012)	1% AEP +20%	9%	1% AEP +20%	19%

5.3.1.3 0.1% AEP (Flood Zone 2)

Where model data is present for the 0.1% AEP event with climate change scenario (e.g. the River Chelmer - Central allowance +25%), this has been used in preference. Where there is no available 0.1% AEP event with climate change, the EA's FMfP Flood Zone 2 can be used to represent this.

For Ordinary Watercourses where there is no national mapping available, the 0.1% RoFfSW dataset has been used as a proxy to infer risk.

Most hydraulic models are not built to run events of this magnitude, and often present instabilities and an inability to run. Given that generally across the district the floodplain

topography is confined, climate change allowances have lowered, and the Upper End climate change extents are often similar to the Flood Zone 2 extents, it is not expected that there would be significant differences from the 0.1% AEP event.

This may need to be considered further at a Level 2 assessment or for a site-specific Flood Risk Assessment.

5.3.2 Surface water climate change

Modelled Climate Change uplifts for the 3.3% and 1% AEP events for the Upper End scenario were included as part of this SFRA and are presented in Appendix A: GeoPDFs. The study area is covered by four management catchments (Cam and Ely Ouse, Combined Essex, Upper Lee and Roding, Beam and Ingrebourne), and the following uplifts have been provided:

- 3.3% AEP with +35% uplift (Upper End)
- 1% AEP with +40% uplift (Upper End)

The 0.1% AEP surface water extent can be used as an indication of surface water risk, and the risk from smaller watercourses, which are too small to be covered by the EA's Flood Map for Planning.

5.3.3 Developers

Developers may need to undertake a more detailed assessment of climate change as part of the planning application process when preparing FRAs, using the percentage increases which relate to the proposed lifetime and the vulnerability classification of the development. In areas where no modelling is present, this may require development of a 'detailed' hydraulic model, using channel topographic survey. Developers should consult the EA to provide further advice on how best to apply the new climate change guidance.

Where the peak river flow allowance is particularly high or the upper end is used, there should be an allowance for encroachment out of Flood Zone 2 and development in these areas should be avoided until proven at a site-specific FRA stage.

When undertaking a site-specific FRA, developers should:

- Confirm which national guidance on climate change and new development applies by visiting the Government website here.
- Apply this guidance when deciding the allowances to be made for climate change, having considered the potential sources of flood risk to the site (using this SFRA), the vulnerability of the development to flooding and the proposed lifetime of the development. If the site is just outside the indicative climate change extents in this SFRA, the impact of climate change should still be considered because the site may be affected should the more extreme climate change scenarios materialise.
- Refer to Section 8 which provides further details on climate change for developers, as part of the FRA guidance, and the SFRA User Guide in Appendix C.

5.4 Impacts of climate change across the study area

This section explores which areas of the study area are most sensitive to increases in flood risk due to climate change. It should be noted that areas that are already at high risk will also become at increasing risk in future and the frequency of flooding will increase in such areas.

It is recommended that the Council works with other RMAs to review the long-term sustainability of existing and new development in these areas when developing climate change plans and strategies for the study area.

5.4.1 Impact of climate change on fluvial flood risk

The sensitivity of an area to climate change can be analysed through comparison between design flood event extents and design flood events extents with modelled climate change uplifts applied. Due to the presence of formal flood defences across large parts of the study area, the defended climate change model flood extents have been compared with the defended 1% AEP flood extent. It should be noted that there is a residual risk should the defences breach or overtop. Further details on defences within the study area and residual risk can be found in Section 6.

Areas in the study area identified as most sensitive to fluvial impacts of climate change from defended modelled outputs are:

- The River Blackwater around Great Sampford
- The River Cam around Broom Wood, Saffron Walden, and Great Chesterford.
- The River Stort around Stansted Mountfitchet

Where no detailed modelling exists, the 1% AEP flood extent (Flood Zone 3a) can be compared against the 0.1% AEP flood extent (Flood Zone 2), for an indication of areas most sensitive to climate change.

5.4.2 Impacts of climate change on surface water flood risk

The 1% AEP surface water event with a 40% climate change uplift can be compared to the present day 1% AEP extent for an indication of areas most sensitive to climate change.

While across the study area, a significant difference in surface water flood extents is observed, areas in the study area most sensitive to changes in surface water flood risk are typically in low lying, urban locations such as Great Sampford, Saffron Walden, and Stansted Mountfitchet.

5.4.3 Impacts of climate change on groundwater flood risk

There is no technical modelling data available to assess climate change impacts on groundwater. It would depend on the flooding mechanism, historic evidence of known flooding and geological characteristics, for example prolonged rainfall in a chalk catchment. Flood risk could increase when groundwater is already high or emerged, causing additional overland flow paths or areas of still ponding.

A high likelihood of groundwater flooding may mean infiltration SuDS are not appropriate and groundwater monitoring may be recommended.

5.4.4 Adapting to climate change

The PPG Climate Change guidance contains information and guidance for how to identify suitable mitigation and adaptation measures in the planning process to address the impacts of climate change. Examples of adapting to climate change include:

- Considering future climate risks when allocating development sites so that the risks are understood over the development's lifetime.
- Considering the impact of and promoting design responses to flood risk for the lifetime of the development.
- Considering availability of water and water infrastructure for the lifetime of the development and design responses to promote water efficiency and protect water quality.
- Promoting adaptation approaches in design policies for developments and the public realm, for example by building in flexibility to allow future adaptation if needed, such as setting new development back from watercourses.
- Identifying no or low-cost responses to climate risks that also deliver other benefits, such as blue green infrastructure that improves adaptation, biodiversity, and amenity, for example by leaving areas shown to be at risk of flooding as public open space.
- Considering the Standard of Protection (SoP) of defences and sites for future development, in relation to sensitivity to climate change. The authorities and developers will need to work with RMAs and use the SFRA datasets to understand whether development is affordable or deliverable. Locating development in such areas of risk may not be a sustainable long-term option, such as at the defence locations mentioned in Section 6; and
- It is recommended that the differences in flood extents from climate change are compared by the authorities when allocating sites, to understand how much additional risk there could be, where this risk is in the site, whether the increase is marginal or activates new flow paths, whether it affects access/ egress and how much land could still be developable overall. Recommendations for development are made for the levels of risk in the SFRA User Guide in Appendix C.

6 Flood alleviation schemes and assets

This section provides a summary of existing flood alleviation schemes and assets in the study area. Planners should note the areas that are protected by defences where further work to understand the actual and residual flood risk through a Level 2 SFRA may be beneficial. Developers should consider the benefit they provide over the lifetime of a development in a site-specific FRA.

6.1 Asset management

RMAs hold databases of flood risk management and drainage assets according to their jurisdiction as follows:

- The EA holds a national database that is updated by local teams.
- The LLFA holds a database of significant local flood risk assets, required under Section 21 of the FWMA (2010).
- Highways Authorities hold databases of highways drainage assets, such as gullies and connecting pipes.
- Water Companies hold records of public surface water, foul and combined sewers, the records may also include information on culverted watercourses.
- The databases include assets RMAs directly maintain and third-party assets. The drainage network is extensive and will have been modified over time. It is unlikely that any RMA contains full information on the location, condition, and ownership of all the assets in their area. They take a prioritised approach to collecting asset information, which will continue to refine the understanding of flood risk over time.

Developers should collect the available asset information and undertake further survey as necessary to present an understanding of current flood risk and the existing drainage network in a site-specific FRA.

6.2 Standards of Protection

Flood defences are designed to give a specific Standard of Protection (SoP), reducing the risk of flooding to people and property in flood prone areas. For example, a flood defence with a 1% AEP SoP means that the flood risk in the defended area is reduced to at least a 1% chance of flooding in any given year.

Over time the actual SoP provided by the defence may decrease, for example due to deterioration in condition or increases in flood risk due to climate change. The understanding of SoP may also change over time as RMAs undertake more detailed surveys and flood modelling studies.

It should be noted that the EA's on-going hydraulic modelling programme may revise flood risk datasets and, therefore, the SoP offered by flood defences in the area may differ from those discussed in this report.

Developers should consider the SoP provided by defences and residual risk as part of a detailed FRA.

6.3 Maintenance

Different authorities have responsibilities relating to maintenance of flood risk assets.

- The EA and local authorities have permissive powers to maintain and improve main rivers and ordinary watercourses, respectively. The ultimate responsibility for maintaining watercourses rests with the landowner.
- Highways authorities have a duty to maintain public roads, making sure they are safe, passable, and the impacts of severe weather have been considered. They are also responsible for maintaining sections of watercourses where they are crossed by highways.
- Water companies have a duty to effectually drain their area. What this means in practise is that assets are maintained to common standards and improvements are prioritised for the parts of the network that do not meet this standard e.g., where there is frequent sewer flooding.
- ECC as the LLFA have permissive powers and limited resources are prioritised and targeted to where they can have the greatest effect.

There is potential for the risk of flooding to increase in areas where flood alleviation measures are not maintained regularly. Breaches in raised flood defences are most likely to occur where the condition of a flood defence has degraded over time. Drainage networks in urban areas can also frequently become blocked with debris and this can lead to blockages at culverts or bridges.

It is important that the authorities work in partnership to maintain flood risk assets and manage flood risk across the study area.

Developers should not assume that any defence, asset, or watercourse is being or will continue to be maintained throughout the lifetime of a development.

They should contact the relevant RMA about current and likely future maintenance arrangements and make future users of the development aware of their obligations to maintain watercourses.

Formal structural defences are given a rating based on a grading system for their condition. A summary of the grading system used by the EA for condition is provided in Table 6-1.

Table 6-1: Grading system used by the EA to assess flood defence condition.

Grade	Rating	Description
1	Very good	Cosmetic defects that will have no effect on performance.
2	Good	Minor defects that will not reduce the overall performance of the asset.
3	Fair	Defects that could reduce the performance of the asset.

Grade	Rating	Description
4	Poor	Defects that would significantly reduce the performance of the asset. Further investigation required.
5	Very poor	Severe defects resulting in complete performance failure.

Source: Condition Assessment Manual – EA 2006

6.4 Major flood risk management assets in the study area

The EA retired the Flood Map for Planning 'Areas Benefiting from Defences' (ABD) dataset in December 2022. This dataset will no longer be available on online mapping. Instead, a developer can enter an address on the EA website here to get information about their specific site and request flood risk assessment data for planning (also known as Product 4).

The EA now provide a dataset called the 'Reduction in risk of flooding from rivers and sea' which provides areas that are offered some level of reduced flood risk from defences, but with no defined SoP.

In the study area, a number of areas are shown to have reduced flood risk due to defences. Often these are small, isolated, pockets of land including along the River Roding, River Stort, and River Cam. Additional areas to the east of Stansted Mountfitchet, around Stansted Park, are also shown as having reduced flood risk due to defences.

Aside from a few sections of embankment, primarily along the River Stort Navigation Canal, the most common form of flood defence within Uttlesford is natural high ground. It is present on the banks of most major watercourses in the study area.

The EA 'AIMS' (Asset Information Management System) flood defence dataset gives further information on flood defence assets within the study area.

Table 6-2 details the locations which benefit from flood defences within the 'AIMS' dataset. In addition to the information shown in Table 6-2, there is considerable natural high ground across the study area, which provides a level of protection against fluvial flood risk. Most high ground lies along the left and right banks of the River Chelmer, River Stort, and River Cam. For further details of specific defences, developers should refer to the dataset, available to download from the EA website here. Additionally, the AIMS dataset can be viewed in Appendix A: GeoPDF Mapping.

If flood defences are proposed in the future (excluding property flood resilience measures which protect only residential properties, but not their curtilage e.g. flood doors), there is a requirement for the developer/ landowner to demonstrate through modelling that the risk is not increased elsewhere as a result, therefore the building of a defence alone without supporting modelling is not a reason to alter Flood Zones.

Table 6-2: Locations shown in the EA 'AIMS' data set (also shown in Appendix A: GeoPDF Mapping).

Watercourse	Location	Type	Design SoP (AEP)	Condition Rating (1-5)	Ownership
River Stort	Along the western bank of the river near Manuden.	Embankment	5%	Unknown	Private individual, company, or charity
River Stort	Along the eastern bank of the river, south of the B1038 at the confluence with The Bourne.	Embankment	1%	Unknown	Local Authority
River Stort	Along the northern bank between the river and Lower Road in Clavering	Wall	20%	Unknown	Private individual, company, or charity
River Stort Navigation Canal	Along the eastern bank of the canal near Thorley Wash Nature Reserve	Embankment	10%	Unknown	Private individual, company, or charity
River Roding	Engineered high ground along the northern bank of a connecting channel between two branches river	Engineered high ground	Unknown	Unknown	Private individual, company, or charity

6.5 Existing and future flood alleviation schemes

Below are the current and potential future schemes led by the EA and other local groups in the area.

6.5.1 Fluvial flood alleviation schemes

The following flood alleviation schemes (FAS) have been confirmed within Uttlesford District:

- Functional Floodplain and Flood Alleviation Scheme at Elms Farm, Stansted Mountfitchet - This included the realignment of Stansted Brook, floodplain compensation upstream to increase the functional floodplain area and storage to ensure no loss in flood storage. More information is available here.
- The FCRM Capital Programme for the Great Ouse catchment shows one Flood Alleviation Scheme within this area, which is a culvert repair and upgrade to trash screens on The Slades in Saffron Walden to reduce flood risk. This project is supported by the Environment Agency for capital investment next financial year (2024/25). This is led by Essex County Council.
    - The project also includes a Phase 2 involving the repair of culverted sections of the watercourse.
- Essex County Council have delivered a leaky dam scheme in Thaxted and are working with UDC to upgrade the trash screens here.
- Lower High Street in Stansted Mountfitchet - Essex County Council have supported the installation of Property Flood Resilience (PFR) measures in the known fluvial and surface water hotspot.
- Various small scale works to prevent culvert blockage in Clavering, Manuden, and Takeley.

The Environment Agency also confirm that their Partnership & Strategic Overview team covering Norfolk, Suffolk, and Essex do not currently have any planned Natural Flood Management or Flood Alleviation Schemes within Uttlesford District.

6.6 Actual and residual flood risk

A Level 2 SFRA (for strategic allocations) or developer site-specific FRA will need to consider the actual and residual flood risk due to the presence of flood and drainage assets in greater detail (although it should be noted that Zone 3b is based on the actual flood risk).

6.6.1 Actual flood risk

This is the risk to the site considering existing flood mitigation measures and any planned to be provided through new development. Note that it is not likely to be acceptable to allocate developments in existing undefended areas on the basis that they will be protected by developer works, unless it can be demonstrated there is a wider community benefit.

The assessment of the actual risk should consider that:

- The level of protection afforded by existing defences might be less than the appropriate standards and hence may need to be improved if further growth is contemplated.
- The flood risk management policy for the defences will provide information on the level of future commitment to maintain existing standards of protection. If there is a conflict between the proposed level of commitment and the future needs to support growth, then it will be a priority for this to be reviewed.
- The standard of safety must be maintained for the intended lifetime of the development. Over time the effects of climate change will erode the present-day SoP afforded by defences and so commitment is needed to invest in the maintenance and upgrade of defences if the present-day levels of protection are to be maintained and where necessary, land secured and safe-guarded that is required for affordable future flood risk management measures.
- By understanding the depth, velocity, speed of onset and rate of rise of floodwater it is possible to assess the level of hazard posed by flood events from the respective sources.
- Consider what the SMP Policy is for the defences on the coastline, where relevant, and if it is intended to Hold the Line (HTL), what evidence is available for securing HTL.

6.6.2 Residual risk

Residual risk is the risk that remains after the effects of flood risk infrastructure have been considered. It is important that these risks are quantified to confirm that the consequences can be safely managed. The residual risk can be:

- The effects of a larger flood than defences were designed to alleviate (the 'design flood'). This can cause overtopping of flood banks, failure of flood gates to cope with the level of flow or failure of pumping systems to cope with the incoming amount of water.
- Failure of the defences or flood risk management measures, such as breaches in embankments or walls, failure of flood gates to open or close or failure of pumping stations.
- It is the responsibility of the developer to fully assess flood risk, propose measures to mitigate it and demonstrate that any residual risks can be safely managed.

This SFRA does not assess the probability of failure other than noting that such events are very rare. However, in accordance with NPPF, all sources of flooding need to be considered. If a breach or overtopping event were to occur, then the consequences to people and property could be high. Developers should be aware that any site that is at or below defence level, may be subject to flooding if an event occurs that exceeds the design capacity of the defences, or the defences fail, and this should be considered in a detailed FRA.

The assessment of residual risk should consider:

- The flood hazard, depth and velocity that would result from overtopping or breach of defences. Flood gate or pumping station failure and/ or culvert blockage (as appropriate). The EA can provide advice at site-specific development level for advice on breach/ overtopping parameters for flood models.
- The design of the development to take account of the highest risk parts of the site e.g., allowing for flood storage on parts of the site and considering the design of the development to keep people safe e.g., sleeping accommodation above the flood level.
- A system of warning and a safe means of access and egress from the site in the event of a flood for users of the site and emergency services.
- Climate change and/ or policy-dependent residual risks (such as those that may be created, if necessary, future defence improvements are required, or those associated with any managed adaptive strategies).

6.6.3 Overtopping

The risk from overtopping of defences is based on the relative heights of property or defence, the distance from the defence level and the height of water above the crest level of the defence. The Defra and EA Flood Risks to People guidance document, available from the Government website here, provides standard flood hazard ratings based on the distance from the defence and the level of overtopping.

Any sites located next to defences or perched ponds/ reservoirs, may need overtopping assessments at the site-specific FRA stage, and climate change should be considered.

6.6.4 Defence breach

A breach of a defence occurs when there is a failure in the structure and a subsequent ingress of flood water. Where defences are present, risk of breach events should be considered as part of the site-specific FRA. Flood flows from breach events can be associated with significant depths and flow velocities in the immediate vicinity of the breach location and so FRAs must include assessment of the hazards that might be present so that the safety of people and structural stability of properties and infrastructure can be appropriately considered. Whilst the area in the immediate vicinity of a breach can be subject to high flows, the whole flood risk area associated with a breach must also be considered as there may be areas remote from the breach that might, due to topography, involve increased depth hazards.

Considerations include the location of a breach, when it would occur and for how long, the depth of the breach (toe level), the loadings on the defence and the potential for multiple breaches. There are currently no national standards for breach assessments and there are various ways of assessing breaches using hydraulic modelling. Work is currently being undertaken by the EA to collate and standardise these methodologies. It is recommended that the EA are consulted if a development site is located near to a flood defence, to understand the level of assessment required and to agree the approach for the breach assessment.

7 Cumulative impact of development and strategic solutions

7.1 Cumulative Impact Assessment

Under the NPPF, strategic policies and their supporting SFRAs, are required to 'consider cumulative impacts in, or affecting, local areas susceptible to flooding' (Paragraph 166), rather than just to or from individual development sites.

When allocating land for development, consideration should be given to the potential cumulative impact of the loss of floodplain storage volume from any source, as well as the impact of increased flows on flood risk downstream. Whilst the loss of storage for individual developments may only have a minimal impact on flood risk, the cumulative effect of multiple developments may be more severe. Similarly, the effect of the loss of surface water flow paths / exceedance paths from sewers, surface water ponding and infiltration can also give rise to cumulative effects and potentially exacerbate flood risk.

All developments are required to comply with the NPPF and demonstrate they will not increase flood risk elsewhere. Therefore, providing developments comply with the latest guidance and legislation relating to flood risk and sustainable drainage, and appropriate consideration is given to flow paths and storage proposals should normally not increase flood risk downstream.

Local planning policies can also be used to identify areas where the potential for development to increase flood risk is highest and identify opportunities for such new development to positively contribute to decreases in flood risk downstream.

Catchments within the study area that are most sensitive to future increases in fluvial and surface water flood risk were identified. This provides a relative assessment of the catchments within the study area and are not comparable across other boroughs/districts. The following catchments were identified to be most sensitive:

- Chelmer (Great Easton - River Can)
- Stort and Navigation, Bishop's Stortford to Harlow
- Cam
- Stort and Bourne Brook
- Slade
- Stort (at Clavering)

The availability of development data varied across the authorities and therefore was not included within the quantitative ranking assessment, however, a qualitative assessment of the potential cumulative impact of development has been undertaken for each authority area.

The Cumulative Impact Assessment can be found in Appendix F.

7.2 Natural Flood Management (NFM)

NFM is used to protect, restore, and re-naturalise the function of catchments and rivers to reduce flood risk. A wide range of techniques can be used that aim to reduce flooding by working with natural features and processes in order to store or slow down flood waters before they can damage flood risk receptors (e.g., people, property, infrastructure, etc.). Techniques and measures, which could be applied in the study area include:

- Creation of Offline Storage Areas
- Re-meandering streams (creation of new meandering courses or reconnecting cut-off meanders to slow the flow of the river)
- Targeted woodland planting
- Reconnection and restoration of functional floodplains
- Restoration of rivers and removal of redundant structures, i.e. weirs and sluices no longer used or needed
- Installation or retainment of large woody material in river channels
- Improvements in management of soil and land use
- Creation of rural and urban SuDS

To maximise the benefits of NFM, it is important that land which is likely to be needed for NFM is protected by safeguarding land for future flood risk management infrastructure. This is particularly important for infrastructure that reduces the risk of flooding to large amounts of existing development, or where options for managing risk in other ways are limited to achieve multiple benefits for flood risk and the environment.

It is important to recognise the value of maintenance or restoration of natural riparian zones, such as grasslands, which protect the soils from erosion and ‘natural’ meadows which can tolerate flood inundation. The use of blue and green infrastructure throughout river corridors can also play a vital role in enhancing the river environment as well as safeguarding land from future development, protecting people and buildings from flooding and reducing flood risk downstream.

In 2017, the EA published an online evidence base to support the implementation of NFM and maps showing locations with the potential for NFM measures. These maps are intended to be used alongside the evidence directory to help practitioners think about the types of measure that may work in a catchment and the best places in which to locate them. The EA evidence directory can be found on the Government website here.

7.2.1 Opportunities and projects in and/or affecting Uttlesford District

The Catchment Based Approach (CaBA) was introduced by the Government to establish catchment partnerships throughout England to jointly deliver improved water quality and reduce flood risk, directly supporting achievement of many of the targets set out within the Government's 25-year Environment Plan. CaBA partnerships are actively working in all 100+ river catchments across England and cross-border with Wales. Further details are available on the CaBA website.

Roding, Beam and Ingrebourne (RBI) Catchment Partnership:

The RBI Catchment Partnership is co-hosted by Thames21 and the Thames Chase Trust. It is a collaboration between relevant partners to deliver projects that will improve the health of the area's rivers and wetland environments. It consists of three separate tributary catchments to the River Thames; the River Roding, River Beam and, the most relevant to Uttlesford District, the River Ingrebourne.

Their key objectives are:

- To improve opportunities for recreation across the catchment and in turn raise awareness for a more sustainable use of this resource and ensure it is valued and appreciated.
- To manage flood risk and sustainable drainage; improve connectivity, manage Invasive Non-Native Species (INNS) and litter.
- To improve the way in which water is captured and managed; and to reduce nutrients in our watercourses.
- To work with land managers to improve habitats, and the way in which people can access their rivers and associated green spaces.
- To work with land managers; businesses and funding bodies to create inward investment opportunities for the Roding, Beam and Ingrebourne Catchment.

The partnership has created an interactive map that details of a range of project data that is being collated and opportunities for improvements across the catchment, including de-culverting and weir removals, NFM studies and pollution control schemes.

Upper Roding Farm Engagement

The Upper Roding Catchment Farm Cluster, comprising of local farmers and landowners, and representatives from Thames21 and the Roding, Beam, and Ingrebourne Catchment Partnership is an EA funded project to encourage the improvement of environmental health and biodiversity in the area.

Since its inception in 2023, the Cluster have provided over 100 farmers and landowners a space to develop a shared ambition to improve water quality, soil health, and biodiversity on their land whilst maintaining sustainable farm businesses. Projects have included tree planting, natural fertiliser use, pond creation, hedge laying, turtle dove conservation, and deer management.

River Lea Catchment Partnership:

The River Lea Catchment Partnership is co-hosted by Thames21, the Herts & Middlesex Wildlife Trust, and Groundwork. It is a collaboration between relevant partners to deliver projects that will improve the health of the area's rivers and wetland environments. The Partnership covers the River Lea catchment and its tributaries, of which the River Ash and River Stort are the most relevant to Uttlesford District.

The partnership has created interactive maps for each tributary/ catchment (Ash, Stort) that details a range of project data that is being collated and opportunities for improvements including water quality improvements, weir removals, NFM studies and community engagement.

Cam & Ely Ouse (CamEO) Catchment Partnership:

The CamEO Catchment Partnership is co-hosted by The Rivers Trust and Anglian Water. Its scope covers five river catchments: the River Lark, Little Ouse and Thet, Wisey, South Level and, the most relevant to Uttlesford District, Cam.

Their key objectives are:

- To encourage community-led management of river catchments by empowering local decision making.
- To ensure farming and land use sectors contribute to, and benefit from, healthy ecosystems.
- To maintain and restore healthy-functioning, biodiverse and resilient ecosystems, and increase 'natural capital' understanding.
- To mitigate the impact of Invasive Non-Native Species (INNS).
- To improve strategic co-operation at the catchment scale in order to maximise resources and facilitate more effective delivery.
- To ensure there is enough water of sufficient quality to support the needs of the environment and wider society.

Combined Essex Catchment Partnership:

The Combined Essex Catchment Partnership is co-hosted by the Essex Rivers Hub (which is in-turn hosted by the Essex Wildlife Trust) and the Environment Agency. It is a collaboration between relevant partners to deliver projects that will improve water quality and availability, reduce agricultural pollution, improve navigation and community engagement, biodiversity and land use. The Partnership covers the combined areas of previous catchment partnerships, as well as other catchments relevant to Uttlesford District, such as the River Can, River Chelmer, River Pant and River Ter.

The Essex Forest Initiative:

The Essex Forest Initiative launched in November 2019 with a five-year commitment to plant 375,000 trees across Essex. The scheme is part of wider efforts by Essex County Council to tackle climate change, reduce carbon, promote environmentally friendly infrastructure, and protect green spaces.

Uttlesford Nature Recovery Network:

The Uttlesford Nature Recovery Network is collating local knowledge of environmental project work, environmental volunteering, and general local environmental knowledge across the district. This is due to be used as an evidence base for the review of Uttlesford Districts' natural habitats within the upcoming Local Plan.

Local nature reserves:

The following nature reserves, which are owned by Essex Wildlife Trust, contain some of the country's rarest species. NFM techniques could be encouraged here to aid flood storage and slow surface water flows:

- Aubrey Buxton nature reserve - located in the Stansted Brook catchment near Stansted Mountfitchet. Contains Common Spotted-Orchids, Black Poplar, Adder's Tongue Fern, Lesser Lady's Mantle and Great Crested Newts.
- Rushy Mead nature reserve - located in the Great Hallingbury Brook catchment near Bishop's Stortford. Contains Water Voles.
- Shadwell Wood nature reserve - located in the Granta catchment close to the River Bourn near Ashdon and Saffron Waldon. Contains Oxlip, Wood Violets, Wood Anemones, Early Purple Orchids, Common Spotted Orchids, Meadowsweet and Sanicle.

Hatfield Forest

Hatfield Forest is owned by the National Trust is located in the Pincey Brook catchment near Takeley. This forest is a designated National Nature Reserve and Site of Special Scientific Interest (SSSI) for butterflies, beetles and dragonflies, as well as being home to over 4000 species of wildlife including mammals such as Fallow Deer and Muntjac, insects, birds, over 650 species of fungi and over 320 wildflower species. Large scale NFM techniques could be encouraged here to aid flood storage as well as increase instream habitats.

8 Flood risk management requirements for developers

This section provides guidance on site-specific FRAs. These are carried out by (or on behalf of) developers to assess flood risk to and from a site. They are submitted with Planning Applications and should demonstrate how flood risk will be managed over the development's lifetime, considering climate change and vulnerability of users.

The report provides a strategic assessment of flood risk within the study area. Prior to any construction or development, site-specific assessments will need to be undertaken so all forms of flood risk and the actual and residual risk and SoP and safety at a site are considered in more detail. Developers should, where required, undertake more detailed hydrological and hydraulic assessments of watercourses to verify flood extents (including latest climate change allowances), to inform the sequential approach within the site and prove, if required, whether the exception test can be satisfied.

A detailed FRA may show that a site, windfall or other, is not appropriate for development of a particular vulnerability or even at all. The sequential and exception tests in the NPPF apply to all developments and an FRA should not be seen as an alternative to proving these tests have been met.

8.1 Principles for new development

8.1.1 Apply the sequential and exception tests.

Developers should refer to Section 3 for more information on how to consider the sequential and exception tests. For allocated sites, UDC should use the information in this SFRA to apply the Sequential test. For windfall sites a developer must undertake the Sequential test, which includes considering reasonable alternative sites at lower flood risk. Only if it passes the sequential test should the exception test then be applied if required.

Where planning applications come forward on sites allocated in the development plan through the sequential test, applicants need not apply the sequential test again. However, the exception test will need to be applied as proposals at the application stage will need to demonstrate flood risk is not increased elsewhere and is safe.

Developers should also apply the sequential approach to locating development within the site. The following questions should be considered:

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

8.1.2 Consult with statutory and non-statutory consultees at an early stage to understand their requirements.

Developers should consult with the EA, ECC as LLFA, and the relevant water companies at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling and foul and surface water drainage assessment and design. It should be noted that some of these consultees may need to charge for advice requested by developers or landowners.

8.1.3 Consider the risk from all sources of flooding and that they are using the most up to date flood risk data and guidance.

The SFRA can be used by developers to scope out what further detailed work is likely to be needed to inform a site-specific FRA. At a site level, developers will need to check before commencing on a more detailed FRA that they are using the latest available datasets. Developers should apply the most up-to-date climate change guidance (last updated in May 2022) and consider climate change adaptation measures. Site-specific consultation with United Utilities will be critical to identify any risk of flooding from the public sewer (especially when a sewer passes through a site) and if the site is located in a reservoir flood zone.

8.1.4 Confirm that the development does not increase flood risk elsewhere.

Section 9 sets out these requirements for taking a sustainable approach to surface water management. Developers should also confirm that mitigation measures do not increase flood risk elsewhere and that floodplain compensation is provided where necessary.

8.1.5 Make the development safe for future users.

Consideration should first be given to minimising risk by planning sequentially across a site. Once risk has been minimised as far as possible, only then should mitigation measures be considered. Developers should consider both the actual and residual risk of flooding to the site, as discussed in Section 6.6.

Further flood mitigation measures may be needed for any developments in an area protected by flood defences, where the condition of those defences is ‘fair’ or ‘poor’, and where the SoP is not of the required standard.

8.1.6 Enhance the natural river corridor and floodplain environment through new development.

Developments should demonstrate opportunities to create, enhance, and link green assets. This can provide multiple benefits across several disciplines including flood risk and biodiversity/ecology and may provide opportunities to use the land for an amenity and recreational purposes. Development that may adversely affect blue green infrastructure assets should not be permitted. Where possible, developers should identify and work with partners to explore all avenues for improving the wider river corridor environment. Developers should open up existing culverts and should not construct new culverts on site except for short lengths to allow essential infrastructure crossings.

8.1.7 Consider and contribute to wider flood mitigation strategy and measures in the area and apply the relevant local planning policy.

Wherever possible, developments should seek to help reduce flood risk in the wider area, e.g., by contributing to a wider community scheme or strategy for strategic measures, such as defences or NFM or by contributing in-kind by mitigating wider flood risk on a development site. Developers must demonstrate in an FRA how they are contributing towards this vision. Further information and guidance on surface water management and SuDS is presented in Section 9.

8.2 Requirements for site-specific Flood Risk Assessments

8.2.1 When is an FRA required?

Site-specific FRAs are required in the following circumstances:

- Proposals on sites of one hectare or greater in Flood Zone 1.
- Proposals for new development (including minor development such as non-residential extensions, alterations which do not increase the size of the building or householder developments and change of use) in Flood Zones 2 and 3.
- Proposals for new development (including minor development and change of use) in an area within Flood Zone 1 which has critical drainage problems (as notified to the LPA by the EA) (see Section 9.4.4 for more information on critical drainage problems).
- Land identified in this SFRA as being at increased flood risk in the future.
- Where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding (high risk surface water flooding Zone B, groundwater, or reservoirs).

8.2.2 Objectives of a site-specific FRA

Site-specific FRAs should be proportionate to the degree of flood risk and the scale, nature, and location of the development.

Site-specific FRAs should establish:

- Whether a proposed development is likely to be affected by current or future flooding from any source.
- Whether a proposed development will increase flood risk elsewhere.
- Whether the measures proposed to deal with the effects and risks are appropriate.
- The evidence, if necessary, for the LPA to apply the sequential test; and
- Whether, if applicable, the development will be safe and pass the exception test.

FRAs should follow the approach recommended by the NPPF (and associated guidance) and guidance provided by the EA and ECC. Guidance and advice for developers on the preparation of site-specific FRAs is available from the following websites with hyperlinks provided:

- Standing Advice on Flood Risk (EA)
- Flood Risk Assessment for Planning Applications (EA); and
- Site-specific Flood Risk Assessment: Checklist (NPPF PPG, Defra)

Guidance for LPAs for reviewing FRAs submitted as part of planning applications has been published by Defra in 2015 and is available on the Government website here.

Guidance should be sought from the EA and ECC at the earliest possible stage, and opportunities should be taken to incorporate environmental enhancements and reduce flooding from all sources both to and from the site through development proposals. Developers should seek to go beyond managing the flood risk and support reduction of wider flood risk, whilst enhancing and conserving the natural environment. Further advice can be found at: Flood risk and coastal change - GOV.UK (www.gov.uk).

8.2.3 Site layout and design

Flood risk should be considered at an early stage in deciding the layout and design of a site to provide an opportunity to reduce flood risk within the development. It is recommended that there is early engagement with the EA, ECC and also the appropriate water company.

The NPPF states that a sequential, risk-based approach should be applied to try to locate more vulnerable land uses away from Flood Zones to higher ground and lower flood risk areas, while more flood-compatible development (e.g., vehicular parking, recreational space) can be located in higher risk areas. Higher risk areas can also be retained and enhanced as natural green space. Whether parking in floodplains is appropriate will be based on the likely flood depths and hazard, evacuation procedures and availability of flood warning.

Waterside areas, or areas along known flow routes, can act as blue green infrastructure, being 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 provide safe access to higher ground from these areas and avoid the creation of isolated islands as water levels rise.

When designing sites, developers should consider the Hierarchy of Drainage, as stated in the PPG, aiming to discharge surface water runoff as high up the drainage hierarchy as reasonably practicable:

- into the ground (infiltration)
- to a surface water body
- to a surface water sewer, highway drain, or another drainage system
- to a combined sewer

8.2.4 Modification of ground levels

Any proposal for modification of ground levels will need to be assessed as part of a detailed FRA.

Modifying ground levels to raise the land above the required flood level is an effective way of reducing flood risk to a particular site in circumstances where the land does not act as conveyance for flood waters. However, care must be taken as raising land above the floodplain could reduce conveyance or flood storage in the floodplain and could adversely impact flood risk downstream or on neighbouring land. Raising ground levels can also deflect flood flows, so analyses should be performed to demonstrate that there are no adverse effects on third party land or property.

Compensatory flood storage should be provided where development is proposed within the 1 in 100-year (1% AEP) flood extent, including an appropriate allowance for climate change, and would normally be on a level for level, volume for volume basis on land that does not currently flood but is adjacent to the floodplain (for it to fill and drain). It should be in the vicinity of the site and within the red line of the planning application boundary (unless the site is strategically allocated). Ideally, proposed developments should have a net gain of floodplain storage to reduce the risk of flooding, on site and elsewhere. Guidance on how to address floodplain compensation is provided in Appendix A3 of the CIRIA Publication C624, available to download from the CIRIA website here.

Where proposed development results in a change in building footprint, the developer should confirm that it does not impact upon the ability of the floodplain to store or convey water and seek opportunities to provide floodplain betterment.

Raising levels can also create areas where surface water might pond during significant rainfall events. Any proposals to raise ground levels should be tested to check that it would not cause increased ponding or build-up of surface runoff on third party land. Consideration should be given to the impact of raising ground levels on adjacent properties, particularly the impact of raising ground levels on surface water runoff from a site, with potential to increase surface water flood risk.

Applicants should note that changes to manhole cover levels on public sewers may increase / displace flood risk which will therefore require careful consideration with United Utilities. Applicants should not assume that any alteration to a public sewer, including diversion, will be acceptable as this could have adverse flood risk consequences.

For all developments regardless of any identified sewer flood risk that is identified on or near to the site, it is good practice for the finished floor levels and manhole cover levels (including those that serve private drainage runs) to be higher than the manhole cover level at the point of connection to the receiving sewer. Where the ground level of the site is below the ground level at the point where the drainage connects to the public sewer, care must be taken to ensure that the proposed development is not at increased risk of sewer surcharge.

8.2.5 Raised floor levels

If raised floor levels are proposed, these should be agreed with UDC and the EA. The minimum Finished Floor Level (FFL) may change dependent upon the vulnerability and flood risk to the development.

The EA advises that minimum FFL for 'More Vulnerable' development such as residential properties should be set 600mm above the 1% AEP fluvial plus climate change peak flood level, where the appropriate new climate change allowances have been used (see Section 5.2 for the climate change allowances). Where development is categorised as 'Less Vulnerable' or 'Water Compatible Development', FFL can be a minimum of 300mm above the 1 in 100-year plus climate change level and seek to maximize mitigation measures such as property resilience. An additional allowance may be required because of risks relating to blockages to the channel, culvert or bridge and should be considered as part of an FRA. Lowering existing FFLs below the existing levels within the 1% AEP plus climate change floodplain would not be acceptable and should be discouraged. New development offers opportunities to improve the resilience of buildings.

Allocating the ground floor of a building for less vulnerable, non-residential, use is an effective way of raising living space above flood levels. Single storey buildings such as ground floor flats or bungalows are especially vulnerable to rapid rise of water (such as that experienced during a breach). This risk can be reduced by use of multiple storey construction and raised areas that provide an escape route.

Similarly, the use of basements should be avoided. Habitable uses of basements within Flood Zone 3 and areas at risk of surface water flooding in the surface water flood zone B should not be permitted, whilst basement dwellings in Flood Zone 2 will be required to pass the exception test. Access should be situated 300mm above the design flood level and waterproof construction techniques used.

Where the ground level of a site is below the ground level at the point where the drainage connects to the public sewer, care must be taken to ensure that the proposed development is not at an increased risk of sewer surcharge. It is good practice for the finished floor levels and manhole cover levels (including those that serve private drainage runs) to be higher than the manhole cover level at the point of connection to the receiving sewer. Alternatively, mitigation measures may need to be incorporated into the proposals to protect against sewer surcharge.

8.2.6 Development and raised defences

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

Where development is located behind, or in an area benefitting from defences, the residual risk of flooding must be considered.

8.2.7 Developer contributions

In some cases, and following the application of the sequential test, it may be appropriate for the developer to contribute to the improvement of flood defence provision that would benefit both proposed new development and the existing local community. Developer contributions can also be made to maintenance and provision of flood risk management assets, flood

warning and the reduction of surface water flooding (i.e., SuDS). This relates to the Community Infrastructure Levy, a charge that can be levied by local authorities on new development in their area to help them deliver the infrastructure needed to support development in their area, and planning obligations including Section 106. The government website provides further information on the Community Infrastructure Levy and planning obligations. ECC have also developed The Sustainable Drainage Systems Design Guide for Essex, 2020.

8.2.8 Buffer strips

The provision of a buffer strip to 'make space for water', allows additional capacity to accommodate climate change and means access to the watercourse, structures including bridges and culverts, and flood defences are retained for future maintenance purposes. It also enables the avoidance of disturbing riverbanks, adversely impacting ecology, and having to construct engineered riverbank protection. Any watercourse crossings should ensure that flood risk is not impacted. A buffer strip of 8m is required from any main river. Where flood defences are present, these distances should be taken from the toe of the defence.

Building adjacent to riverbanks can cause problems to the structural integrity of the riverbanks and the building itself, making future maintenance of the river much more difficult. Any development in these areas will likely require Flood Risk Activity Permits from the EA alongside any permission. There should be no built development within these distances from main rivers / flood defences / culverts (where present). Further advice and guidance on Flood Risk Activity Permits is available on the government website here.

8.2.9 Making space for water

The PPG sets out a clear aim in Flood Zone 3 to create space for flooding by restoring functional floodplain. Generally, development should be directed away from these areas.

All new development close to rivers should consider the opportunity to improve and enhance the river environment. Developments should look at opportunities for river restoration and enhancement as part of the development. Options include de-culverting, backwater creation, de-silting, in-channel habitat enhancement, fish passage creation, and removal of structures. Opportunities such as these should be pursued, as 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.

8.3 Resistance and resilience measures

The consideration of resistance and resilience measures should not be used to justify development in inappropriate locations. However, having applied planning policy there may be some instances where development (such as essential infrastructure) is permitted in high flood risk areas.

In these cases, the above measures should be considered before resistance and resilience measures are relied on. The effectiveness of these forms of measures are often dependant on the availability of a reliable forecasting and warning system and the use of back up pumping to evacuate water from a property as quickly as possible. The proposals must include details of how the temporary measures will be erected and decommissioned, responsibility for maintenance and the cost of replacement when they deteriorate. Available resistance and resilience measures include:

- Permanent barriers which can include built up doorsteps, rendered brick walls and toughened glass barriers.
- Temporary barriers which consist of moveable flood defences which can be fitted into doorways and/or windows. The permanent fixings required to install these temporary defences should be discrete and keep architectural impact to a minimum. On a smaller scale, temporary snap on covers for airbricks and air vents can also be fitted to prevent the entrance of flood water.
- Community resistance measures which include demountable defences that can be deployed by local communities to reduce the risk of water ingress to several properties. The methods require the deployment of inflatable (usually with water) or temporary quick assembly barriers in conjunction with pumps to collect water that seeps through the systems during a flood.
- Flood resilience measures which aim to limit any permanent damage, prevent the structural integrity of the building being compromised and make the clean up after the flood is easier. Interior design measures to reduce damage caused by flooding can include electrical circuitry installed at a higher level and water-resistant materials for floors, walls, and fixtures.

Guidance on flood resilient and flood resistant construction techniques is available on the government website, here.

There are also opportunities for 'change of use' developments to be used to improve the flood resistance and resilience of existing development, which may not have been informed by a site-specific flood risk assessment when it was first constructed.

8.4 Reducing flood risk from other sources

8.4.1 Groundwater

Groundwater flooding has a very different flood mechanism to any other and so many conventional flood mitigation methods are not suitable. The only way to fully reduce flood risk would be through building design (development form), ensuring floor levels are raised above the water levels caused by a 1% AEP plus climate change event. Site design would also need to preserve any flow routes followed by the groundwater overland so that flood risk is not increased downstream.

Infiltration SuDS can cause increased groundwater levels and subsequently may increase flood risk on or off a site. Developers should provide evidence that this will not be a significant risk. Other underground works, such as basements, may also need to be

assessed as part of a site-specific FRA in certain prone areas susceptible to groundwater issues.

8.4.2 Surface water and sewer flooding

Developers should discuss public sewerage capacity with the water utility company at the earliest possible stage. It is important that a Surface Water Drainage Strategy (often undertaken as part of an FRA) shows that this will not increase flood risk elsewhere, and that the drainage requirements regarding runoff volumes and rates and SuDS for new development are met.

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

When redeveloping existing buildings, the installation of some permanent or temporary floodproofing and resilience measures could protect against both surface water and sewer flooding. Non-return valves prevent water entering the property from drains and sewers. Non-return valves can be installed within gravity sewers or drains within a property's private sewer upstream of the public sewerage system. These need to be carefully installed and must be regularly maintained.

Consideration must also be given to attenuation and flow ensuring that flows during the 1% AEP plus climate change storm event are retained within the site if any flap valves shut. This should be demonstrated with suitable modelling techniques. As noted above, early consultation with United Utilities will be critical to understand sewer flood risk especially when a sewer passes through a site. Where an existing sewer flood risk affects a site, applicants will need to carefully consider how this can be managed with United Utilities. Sewer flood risk could affect the developable area and the detailed design of the site.

8.4.3 Reservoirs

As discussed in Section 5.8, the risk of reservoir flooding is extremely low. However, there remains a residual risk to development from reservoirs which developers should consider during the planning stage:

- Developers should contact the reservoir owner for information on:
  - the Reservoir Risk Designation
  - reservoir characteristics: type, dam height at outlet, area/volume, overflow location
  - operation: discharge rates / maximum discharge
  - discharge during emergency drawdown; and
  - inspection / maintenance regime.
- The EA online Reservoir Flood Maps contain information on the predicted extents following a reservoir breach both when rivers are at normal levels and in conjunction with rivers in flood conditions (note: only for those reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the

Reservoir Act 1975). Consideration should be given to the extents shown in these online maps. Depths and velocities were also prepared as part of this study but have not been made publicly available.

- The GOV.UK website on Reservoirs: owner and operator requirements provides information on how to register reservoirs, appoint a panel engineer, produce a flood plan, and report an incident.

Developers should use the above information to:

- Apply the sequential approach to locating development within the site.
- Consider the impact of a breach and overtopping, particularly for sites proposed to be located immediately downstream of a reservoir. This should consider whether there is sufficient time to respond, and whether in fact it is appropriate to place development immediately on the downstream side of a reservoir.
- Assess the potential hydraulic forces imposed by sudden reservoir failure event and check that that the proposed infrastructure fabric could withstand the structural loads.
- Develop site-specific Emergency Plans and/ or Off-site Plans if necessary and make the future users of the development aware of these plans. This may need to consider emergency drawdown and the movement of people beforehand.

The potential implications of proposed development on the risk designation of the reservoir should also be considered, as it is a requirement that in particular circumstances where there could be a danger to life, that a commitment is made to the hydraulic capacity and safety of the reservoir embankment and spillway. The implications of such an obligation should be identified and understood before new development is permitted, to ensure it can be achieved.

8.5 Emergency planning

The Civil Contingencies Act 2004 lists Local Authorities, the Environment Agency and emergency services as Category 1 responders. Category 1 responders are responsible for reducing, controlling, and mitigating the effects of emergencies in both response and recovery phases.

The National Planning Policy takes this into account by seeking to avoid inappropriate development in areas of flood risk and considering the vulnerability of new developments to flooding.

The 2023 NPPF (Paragraph 173) requires site level FRAs to demonstrate that “any residual risk can be safely managed; and safe access and escape routes are included where appropriate, as part of an agreed emergency plan.”

In accordance with the NPPF, SFRAs, PFRAs and SWMPs can be used in the preparation and execution of a flood emergency plan as they can indicate areas that may be at risk of flooding. These can be provided as part of an FRA or as a separate document. Decisions regarding whether an Emergency Plan is required sits with the LPA, with advice from their Emergency Planning Teams, the EA and LLFA.

According to the PPG, an emergency plan is needed wherever emergency flood response is an important component of making a development safe; this includes the free movement of people during a 'design flood' and potential evacuation during an extreme flood.

Emergency plans are essential for any site with transient occupancy in areas at risk of flooding, such as holiday accommodation, hotels, caravan, and camping sites (PPG Paragraph 043).

Emergency Plans should consider:

- The type of flood risk present, and the extent to which advance warning can be given in a flood event.
- The number of people that would require evacuation from the area at risk.
- The vulnerability of site occupants.
- The impact of the flooding on essential services e.g., electricity, gas, telecommunications, water supply and sewerage.
- Safe access and egress for users and emergency services.

Further information is available from the following documents / websites with hyperlinks provided:

- The National Planning Policy Guidance
- 2004 Civil Contingencies Act
- Defra (2014) National Flood Emergency Framework for England
- FloodRe
- The EA and Defra's Standing Advice for FRAs
- Essex County Council's Flood and Water Management webpage
- Uttlesford District Council's Flooding webpage
- EA's 'How to plan ahead for flooding'
- Sign up for Flood Warnings with the EA
- The National Flood Forum
- GOV.UK 'Prepare for flooding' page
- ADEPT Flood Risk Plans for new development

8.5.1 Flood forums and community resilience

The Essex Resilience Forum provide emergency planning information and alerts about large-scale emergencies in the community. It is a multi-agency partnership, made up of local councils, emergency services, health providers, and the voluntary sector; working together to plan and prepare for a multi-agency response to major emergency. This includes warn of hazardous conditions, such as flooding, snow, drought, and extreme weather events, power failure, and National Emergency Alerts etc. Information is available on their website here.

Although Uttlesford District does not have its own resilience forum, Uttlesford District Council have prepared a page targeted at community resilience and emergency planning that can found here.

9 Surface water management and SuDS

This section provides guidance and advice on managing surface water runoff and flooding.

9.1 Roles of the Lead Local Flood Authority and Local Planning Authority in surface water management

Essex County Council as the LLFA is a statutory planning consultee. They provide technical advice on surface water drainage strategies and designs put forward for major development proposals, to confirm that onsite drainage systems are designed in accordance with the current legislation and guidance.

When considering planning applications, the drainage/flood risk engineering team will provide advice to the Planning Department on the management of surface water. The LPA should satisfy themselves that the development's proposed minimum standards of operation are appropriate and, using planning conditions or planning obligations, that there are clear arrangements for on-going maintenance over the lifetime of the development.

It is essential that developers consider sustainable drainage at an early stage of the development process – ideally at the pre-application or master-planning stage. To further inform development proposals at the master-planning stage, pre-application submissions are accepted by the Council. This will assist with the delivery of well designed, appropriate, and effective SuDS. Applicants are also encouraged to engage with the appropriate water provider (Affinity Water) to discuss their surface water proposals, especially where adoption is proposed.

Currently the implementation of SuDS is driven through planning policy. However, Schedule 3 of the FWMA 2010 is expected to be implemented in 2024 following a government review making SuDS mandatory for new developments in England. Schedule 3 will provide a framework for the approval and adoption of drainage systems, a SuDS Approving Body (SAB) within unitary and county councils, and national standards on the design, construction, operation, and maintenance of SuDS for the lifetime of the development.

9.2 Sustainable Drainage Systems (SuDS)

SuDS are designed to maximise the opportunities and benefits that can be secured from surface water management practices.

SuDS provide a means of dealing with the quantity and quality of surface water and can also provide amenity and biodiversity benefits. Given the flexible nature of SuDS they can be used in most situations within new developments as well as being retrofitted into existing developments. SuDS can also be designed to fit into most spaces. For example, permeable paving could be used in parking spaces or rainwater gardens as part of traffic calming measures. A wide range of small SuDS features such as retention and conveyance features should be incorporated in the proposed development in the early design stages -

ideally at the pre-application or master-planning stage, to maximise effectiveness. Large, deep, featureless infiltration and detention basins should be avoided where possible.

It is a requirement for all new major development proposals that SuDS for management of runoff are put in place, unless there is clear evidence that this would be inappropriate (NPPF Paragraph 175). Where possible, SuDS that offer multiple benefits should be given priority. Use of infiltration SuDS are not appropriate on contaminated land.

It is important that SuDS are maintained for the lifetime for the development so that features can function as designed. Consideration should be given to enhancing SuDS to achieve biodiversity net gain.

9.3 Sources of SuDS guidance

9.3.1 C753 CIRIA SuDS Manual (2015)

The C753 CIRIA SuDS Manual (2015) provides guidance on planning, design, construction, and maintenance of SuDS. The manual is divided into five sections ranging from a high-level overview of SuDS, progressing to more detailed guidance with progression through the document. The manual can be downloaded from the CIRIA website here.

9.3.2 Non-Statutory Technical Guidance, Defra (March 2015)

Non-Statutory Technical guidance provides non-statutory standards on the design and performance of SuDS. It outlines peak flow control, volume control, structural integrity, flood risk management and maintenance and construction considerations. This guidance can be accessed on the Government website here.

9.3.3 Non-statutory Technical Guidance for Sustainable Drainage Practice Guidance, LASOO (2016)

The Local Authority SuDS Officer Organisation (LASOO) produced their practice guidance in 2016 to give further detail to the Non-Statutory technical guidance. This guidance is available on the SUS Drain website here.

9.3.4 Water Industry Design and Construction Guidance

The Design and Construction Guidance (DCG), part of a new Codes for Adoption covering the adoption of new water and wastewater infrastructure by water companies, contains details of the water sector's approach to the adoption of SuDS and can be accessed here.

9.3.5 Local Authority SuDS Guidance

The 2023 NPPF states that flood risk should be managed "using opportunities provided by new development and improvements in blue green and other infrastructure to reduce the causes and impacts of flooding" (NPPF Paragraph 167).

As the time of writing, UDC do not have any specific SUDS guidance; however, ECC produced The Sustainable Drainage Systems Design Guide for Essex (2020). This

guidance includes current storage, discharge locations, and rates, planning advice, water quality advice, and maintenance guidance. More information can be found here.

In addition, all SUDS construction should be undertaken in line with the CIRIA SuDS Manual C753 and C768 and the DEFRA Technical Standards for SuDS to meet the adoption criteria for United Utilities.

9.4 Other surface water considerations

9.4.1 Groundwater Vulnerability Zones

The EA published new groundwater vulnerability maps in 2015. These maps provide a separate assessment of the vulnerability of groundwater in overlying superficial rocks and those that comprise of the underlying bedrock. The map shows the vulnerability of groundwater at a location based on the hydrological, hydro-ecological, and soil properties within a one-kilometre grid square.

The groundwater vulnerability maps should be considered when designing SuDS. Depending on the height of the water table at the location of the proposed development site, restrictions may be placed on the types of SuDS appropriate to certain areas. Groundwater vulnerability maps can be found on Defra's interactive mapping.

9.4.2 Groundwater Source Protection Zones (GSPZ)

The EA also defines Groundwater Source Protection Zones (GSPZs) near groundwater abstraction points. These protect areas of groundwater used for drinking water. The GSPZ requires attenuated storage of runoff to prevent infiltration and contamination. GSPZs can be viewed on Defra's interactive mapping. Three main zones are defined as follows:

- Inner protection zone (Zone 1) - areas from where pollution can travel to the groundwater source within 50 days or is at least a 50m radius.
- Outer protection zone (Zone 2) - areas from where pollution can travel to the groundwater source within 400 days or lies within the nearest 25% of the total catchment area (whichever is largest).
- Total catchment (Zone 3) - the total area needed to support removal/discharge of water from the groundwater source.

Online mapping shows there are currently 25 GSPZs which lie partially or wholly within the study area, as shown in Figure 9-1. Where a site is located in a GSPZ used for public water supply, applicants should engage with United Utilities to understand any concerns and any necessary mitigating measures to manage the risk of development to public water supply.

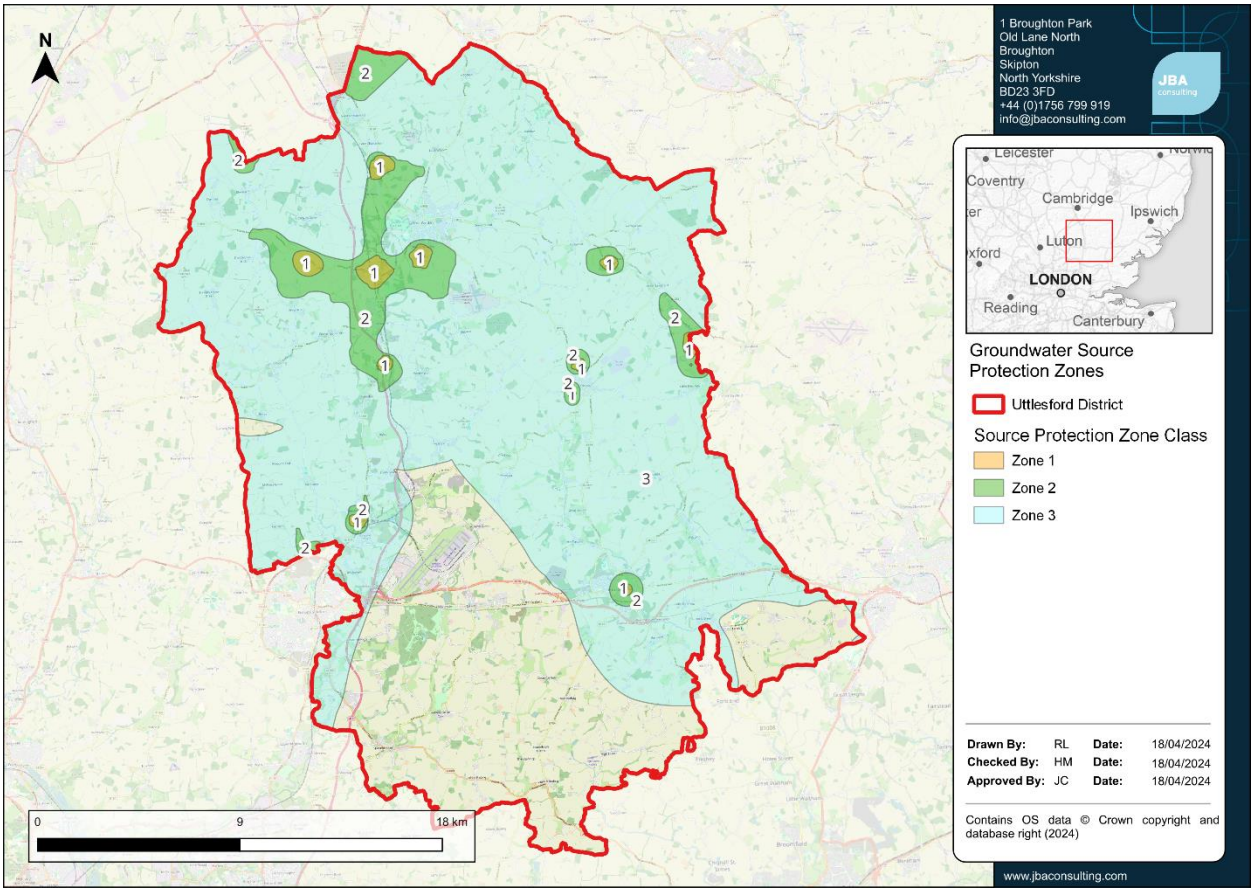


Figure 9-1: Groundwater Source Protection Zones within Uttlesford District

9.4.3 Nitrate Vulnerable Zones

Nitrate Vulnerable Zones (NVZs) are areas designated as being at risk from agricultural nitrate pollution. Nitrate levels in waterbodies are affected by surface water runoff from surrounding agricultural land entering receiving waterbodies. The level of nitrate contamination will potentially influence the choice of SuDS and should be assessed as part of the design process.

NVZs can be viewed on the EA's website here. There are 11 NVZ 2021 to 2024 areas affecting the study area, as shown below.

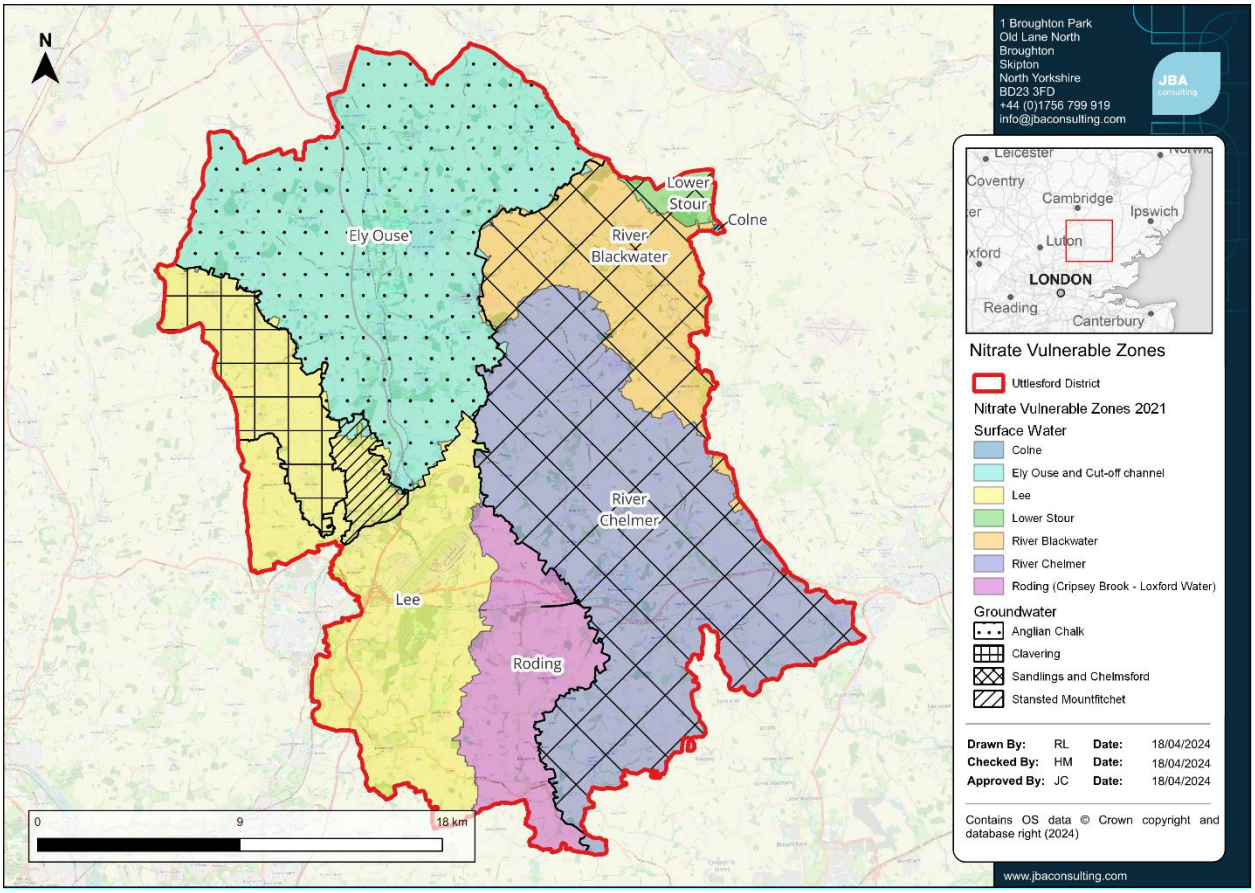


Figure 9-2: Surface water and groundwater nitrate vulnerable zones.

Currently, information on the 2021 to 2024 NVZs post-appeal is unavailable. Landowners can appeal an NVZ designation once notified if their land (or part of it):

- Does not drain into water that has been identified as polluted.
- Drains into water that should not be identified as polluted.

9.4.4 Critical Drainage Areas

Areas with Critical Drainage Problems (ACDPs) is land formally notified to the LPA by the EA as having critical drainage problems. Within ACDPs, proposed development may present increased risks of flooding both on and off site if the surface water runoff is not effectively managed. A dataset containing ACDPs is available to download from the EA website here. There are currently no ACDPs identified within the study area.

Local Authorities can also choose to designate Critical Drainage Areas (CDAs). Any development within these CDAs will need demonstrate an adequate surface water drainage system which is maintainable for the lifetime of the development within a site-specific FRA. Developers will need to provide details of the long term maintenance of the surface water drainage system.

10 Summary and recommendations

10.1 Summary of flood risk

Parts of the study area are at risk of flooding from the following sources: fluvial, surface water, groundwater, sewers, reservoir inundation, and overtopping/ breaches. This study has shown that the most significant sources of flood risk in the study area are fluvial, and surface water.

Fluvial: The primary sources of fluvial flood risk in the study area are the River Cam, River Stort, and River Chelmer, as well as their associated tributaries. The River Cam flows north through Newport and Saffron Walden, exiting the study area at Great Chesterford. The River Chelmer flows south east through the study area, flowing through Great Dunmow and Flitch Green. The River Stort and Stansted Brook flow south west through Stansted Mountfitchet and out of the study area. Finally, the River Roding flows south, from Molehill Green, through Great Canfield and The Rodings to the southern border of the District. *Fluvial flood risk is discussed in Section 4.3 and Appendix E and flood extents are shown in the GeoPDFs in Appendix A.*

Surface Water: The Risk of Flooding from Surface Water map shows prominent overland flow routes that largely follow the topography of the River Cam, River Stort, and River Chelmer floodplains. There are some areas where there are additional flow paths and areas of ponding, for example where water is impounded at road or rail embankments and in low-lying areas. While the study area is largely rural, there are also flow routes following the roads through the main urban areas of Saffron Walden, Great Dunmow, and Stansted Mountfitchet, which may affect many properties across these settlements. *Surface water flood risk is discussed in Section 4.4 and Appendix E and the flood extents are shown in the GeoPDFs in Appendix A.*

Climate Change Areas at risk of flooding today are likely to become at increased risk in the future and the frequency of flooding will also increase in such areas, due to climate change. Flood extents will increase; in some locations, this may be minimal, but flood depth, velocity and hazard may have more of an impact due to climate change. This SFRA provides an assessment of the impacts of climate change on fluvial, and surface water flood risk. *The approach to climate change is discussed in Section 5 and the flood extents are also shown in the GeoPDFs in Appendix A.* It is recommended that the Council work with other Risk Management Authorities (RMAs) to review the long-term sustainability of existing and new development when developing climate change plans and strategies for the study area.

Sewer: Thames Water, Anglian Water, and Affinity Water provide water services and sewerage services across the study area and have provided details of historic sewer flooding across the study area. On receipt of detailed site boundaries, water companies will be able to further assess the risk of flooding from the public sewer to a specific site using sewer modelling data. *Sewer flood risk is discussed in Section 4.5.*

Groundwater: The JBA Groundwater Emergence Map shows the north of the study area, particularly around the course of the River Cam, to have significantly higher groundwater

levels. This includes levels at, or very near, the surface along an unnamed tributary near Royston Road. There are also increased groundwater levels along the course of the River Stort, and its tributaries, but to a lesser extent. Elsewhere in Uttlesford, groundwater levels are quite low. *Groundwater flood risk is discussed in Section 4.6 and Appendix E, and the AStGWF map and JBA emergence map are shown in the GeoPDFs in Appendix A.*

Canals: The River Stort Navigation flows along part of the south west border of the study. It runs north to south along the Uttlesford border between Rushy Mead Nature Reserve and Gaston Green and Hallingbury Marina. *Canal flood risk is discussed in Section 4.7.*

Reservoirs: There are 4 reservoirs located within the study area, and a further 3 located outside the study area where the 'wet day' or 'dry day' scenarios encroach into the study area. There is a potential risk of flooding from reservoirs both within the study area and those outside. The level and standard of inspection and maintenance required under the Reservoirs Act means that the risk of flooding from reservoirs is relatively low. However, there is a residual risk of a reservoir breach, and this risk should be considered in any site-specific FRAs (where relevant) in accordance with the updated PPG. *Reservoir flood risk is discussed in Section 4.8 and Appendix E. The 'Dry Day' and 'Wet Day' flood extents are shown in the GeoPDFs in Appendix A.*

10.2 Recommendations

10.2.1 Sequential approach to development

The NPPF supports a risk-based and sequential approach to development and flood risk in England, so that development is located in the lowest flood risk areas where possible; it is recommended that this approach is adopted for all future developments within the study area.

New development and re-development of land should wherever possible seek opportunities to reduce overall level of flood risk at the site, for example by:

- Reducing volume and rate of runoff through the use of SuDS.
- Relocating development to areas with lower flood risk.
- Creating space for flooding.
- Blue Green Infrastructure should be considered within the mitigation measures for surface water runoff from potential development and consider using areas at risk of flooding as public open space.
- Consideration must be given to the potential cumulative impact of development on flood risk.

10.2.2 Site-specific Flood Risk Assessments

Site-specific FRAs are required to be produced by developers to provide a greater level of detail on flood risk and any protection provided by defences and, where necessary, demonstrate the development passes Part B of the Exception Test.

Developers should, where required, undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood extent (including latest climate change allowances), inform development zoning within the site and prove, if required, whether the Exception Test can be passed. The assessment should also identify the risk of existing flooding to adjacent land and properties to establish whether there is a requirement to secure land to implement strategic flood risk management measures to alleviate existing and future flood risk. Any flood risk management measures should be consistent with the wider catchment policies set out in the CFMP, FRMPs and LFRMS.

Developers should consult with the Council, ECC as LLFA, the EA, and the appropriate water companies at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling, and drainage assessment and design.

10.2.3 Sequential and Exception tests

The SFRA has identified that parts of the study area are at high risk of flooding. Therefore, it is expected that several proposed development sites will be required to pass the Sequential Test and, where necessary, Exception Test in accordance with the NPPF.

The Council should use the information in this SFRA when deciding which development sites to take forward in their LPU. It is the Council's responsibility to determine whether the Sequential Test has been satisfied.

10.2.4 Council review of planning applications

The Council should consult the EA's 'Flood Risk Assessment: Local Planning Authorities', last updated February 2022, when reviewing planning applications for proposed developments at risk of flooding.

The Council will consult the relevant statutory consultees as part of the planning application assessment and they may, in some cases, also contact non-statutory consultees that have an interest in the planning application.

10.2.5 Drainage strategies and SuDS

Planners should be aware of the conditions set by the LLFAs for surface water management. The enactment of Schedule 3 of the FWMA means that there will be mandatory standards for delivery and adoption of SuDS in new developments.

SuDS design should demonstrate how constraints have been considered and how the design provides multiple benefits e.g. landscape enhancement, biodiversity, recreation, amenity, leisure, and the enhancement of historical features.

Planning applications for phased developments should be accompanied by a drainage strategy, which takes a strategic approach to drainage provision across the entire site and incorporates adequate provision for SuDS within each phase. Applicants will need to demonstrate a holistic and co-ordinated approach to both foul and surface water drainage and the management of flood risk.

Use of the SuDS management train to prevent and control pollutants to prevent the 'first flush' polluting the receiving waterbody.

SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.

10.2.6 Residual risk

Residual risk is the risk that remains after mitigation measures are considered. The residual risk includes the consideration of flood events that exceed the design thresholds of the flood defences or circumstances where there is a failure of the defences, e.g. flood bank collapse. Residual risks should be considered as part of site-specific FRAs.

Further, any developments located within an area protected by flood risk management measures, where the condition of those defences is 'fair' or 'poor', where the standard of protection is not of the required standard or where the failure of the intended level of service gives rise to unsafe conditions should be identified.

The risk to development from reservoirs is residual but developers should consider reservoir flooding during the planning stage. They should seek to contact the reservoir owner to obtain information and should apply the sequential approach to locating development within the site. Developers should also consult with relevant authorities regarding emergency plans in case of reservoir breach.

Consideration should be given to the potential for safe access and egress in the event of rapid inundation of water due to a breach with little warning.

10.2.7 Reduction of flood risk through site allocations and appropriate site design:

- To locate new development in areas of lowest risk, in line with the sequential test, by steering sites to Flood Zone 1 from the Flood Map for Planning and avoiding where possible areas with a higher risk of surface water flooding and by avoiding any other sources of flooding. If a sequential test is undertaken and a site at flood risk is identified as the only appropriate site for the development, the exception test shall be undertaken. If development can't be avoided in the higher risk surface water Zone (Zone B), then part "b" of the exception test should be satisfied.
- After application of the exception test, a sequential approach to site design will be used to reduce risk. Any re-development within areas of flood risk which provide other wider sustainability benefits will provide flood risk betterment and made resilient to flooding.
- Identification of long-term opportunities to remove development from the floodplain and to make space for water.
- Ordinary watercourses not currently afforded flood maps should be modelled to an appropriate level of detail to enable a sequential approach to the layout of the development.

- Identify opportunities for brownfield sites in functional floodplain to reduce risk and provide flood risk betterment.
- Identify opportunities to help fund future flood risk management through developer contributions to reduce risk for surrounding areas.
- Seek opportunities to make space for water to accommodate climate change.

10.2.8 Safe access and egress

According to the Government's guidance on 'Preparing a flood risk assessment: standing advice' minimum FFLs for vulnerable development in Flood Zone 2 should normally be a minimum of whichever is higher of the following:

- 300mm above average ground level of the site.
- 300mm above the adjacent road level to the building.
- 300mm above estimated river or sea flood level.

The estimated river or sea flood level is the 1% AEP fluvial flood level with an appropriate allowance for climate change.

For development in Flood Zone 3, as the risk of flooding is greater, the standard of mitigation sought will be higher. While the minimum FFLs outlined above are applicable to development in Flood Zone 2, they are not necessarily applicable to development in Flood Zone 3, where they EA would typically expect FFLs to be at least 600mm above the estimated river or sea flood level.

Safe access and egress will need to be demonstrated at all development sites. Emergency vehicular access should be possible during times of flood. If at risk, then an assessment should be made to detail the flood duration, depth, velocity, and flood hazard rating in the 1% AEP plus climate change flood event, in line with FD2320.

Where detailed hydraulic modelling of a watercourse is not already available, modelling will need to be undertaken as part of a site-specific FRA to estimate the 1 in 1,000-year (0.1% AEP) flood level, including an appropriate allowance for climate change. Where development is located behind, or in an area benefitting from, defences, consideration should be given to the potential safety of the development, FFLs and for safe access and egress in the event of rapid inundation of water due to a defence breach with little warning.

10.2.9 Promote SuDS to mimic natural drainage routes to improve water quality

- SuDS design should demonstrate how constraints have been considered and how the design provides multiple benefits e.g. landscape enhancement, biodiversity, recreation, amenity, leisure, and the enhancement of historical features.
- Planning applications for phased developments should be accompanied by a drainage strategy, which takes a strategic approach to drainage provision across the entire site and incorporates adequate provision for SuDS within each phase.
- Use of the SuDS management train to prevent and control pollutants to prevent the 'first flush' polluting the receiving waterbody.

- SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.

10.2.10 Reduce surface water runoff from new developments and agricultural land

- Space should be provided for the inclusion of SuDS on all allocated sites, outline proposals and full planning applications.
- Promote biodiversity, habitat improvements and Countryside Stewardship schemes help prevent soil loss and to reduce runoff from agricultural land.
- Identify opportunities to maintain and enhance permeable surfaces and greenspaces to help reduce surface water runoff whilst promoting other benefits, including biodiversity and wellbeing.

10.2.11 Enhance and restore river corridors and habitat

- Assess condition of existing assets and upgrade, if required, to confirm that the infrastructure can accommodate pressures/flows for the lifetime of the development.
- Natural drainage features should be maintained.
- Identify opportunities for river restoration/enhancement to make space for water.
- A presumption against culverting of open watercourses except where essential to allow highways and/or other infrastructure to cross, in line with CIRIA's Culvert design and operation guide, (C689) and to restrict development over culverts.
- There should be no built development within 8m from the top of a watercourse or main river for the preservation of the watercourse corridor, wildlife habitat, flood flow conveyance and future watercourse maintenance or improvement.

10.2.12 Mitigate against risk, improved emergency planning and flood awareness

- Work with emergency planning colleagues and stakeholders to identify areas at highest risk and locate most vulnerable receptors.
- Exceedance flows, both within and outside of the site, should be appropriately designed to minimise risks to both people and property.
- For a partial or completely pumped drainage system, an assessment should be undertaken to assess the risk of flooding due to any failure of the pumps to be assessed. The design flood level should be determined if the pumps were to fail; if the attenuation storage was full, and if a design storm occurred.
- An emergency overflow should be provided for piped and storage features above the predicted water level arising from a 1% AEP rainfall event, inclusive of climate change and urban creep.
- Consideration and incorporation of flood resilience measures up to the 0.1% AEP event.
- Produce and implement robust emergency (evacuation) plans for major developments.

- Increase awareness and promote sign-up to the EA Flood Warnings within the study area.

10.3 Requirements for Level 2 SFRA

Following the application of the sequential test, where sites cannot be appropriately accommodated in low-risk areas, the Council will apply the NPPF's exception test. In these circumstances, a Level 2 SFRA may be required, to assess in more detail the nature and implications of the flood characteristics.

As part of this Level 1 SFRA, an initial site screening exercise has been undertaken for Uttlesford District Council to help inform the application of the sequential test and subsequent potential requirement for a Level 2 SFRA. This used sites submitted as part of recent call for sites. These sites had been submitted as potential future development sites.

10.4 Technical recommendations

10.4.1 Updates to SFRA

SFRAs are high level strategic documents and, as such, do not go into detail on an individual site-specific basis. This SFRA has been developed using the best available information, supplied at the time of preparation.

The EA regularly reviews its hydrology, hydraulic modelling, and flood risk mapping, and it is important that they are approached to determine whether updated (more accurate) information is available prior to commencing a site-specific FRA. When using the SFRA to prepare FRAs it is important to check that the most up to date information is used, as is described in amendments to the flood mapping prepared and issued by the EA at regular intervals.

Other datasets used to inform this SFRA may also be updated periodically and following the publication of this SFRA, new information on flood risk may be provided by RMAs.

10.4.2 Modelling updates

Limited modelling updates were undertaken as part of this SFRA, due to the age, scale, and suitability of the available modelling across the study area. Where development is planned in an area where detailed hydraulic modelling is not available, or where the latest climate change uplifts and functional floodplain outputs are not available, further detailed modelling is likely to be required either as part of a Level 2 SFRA or within a site-specific FRA.

11 Appendices

A GeoPDF Mapping and User Guide

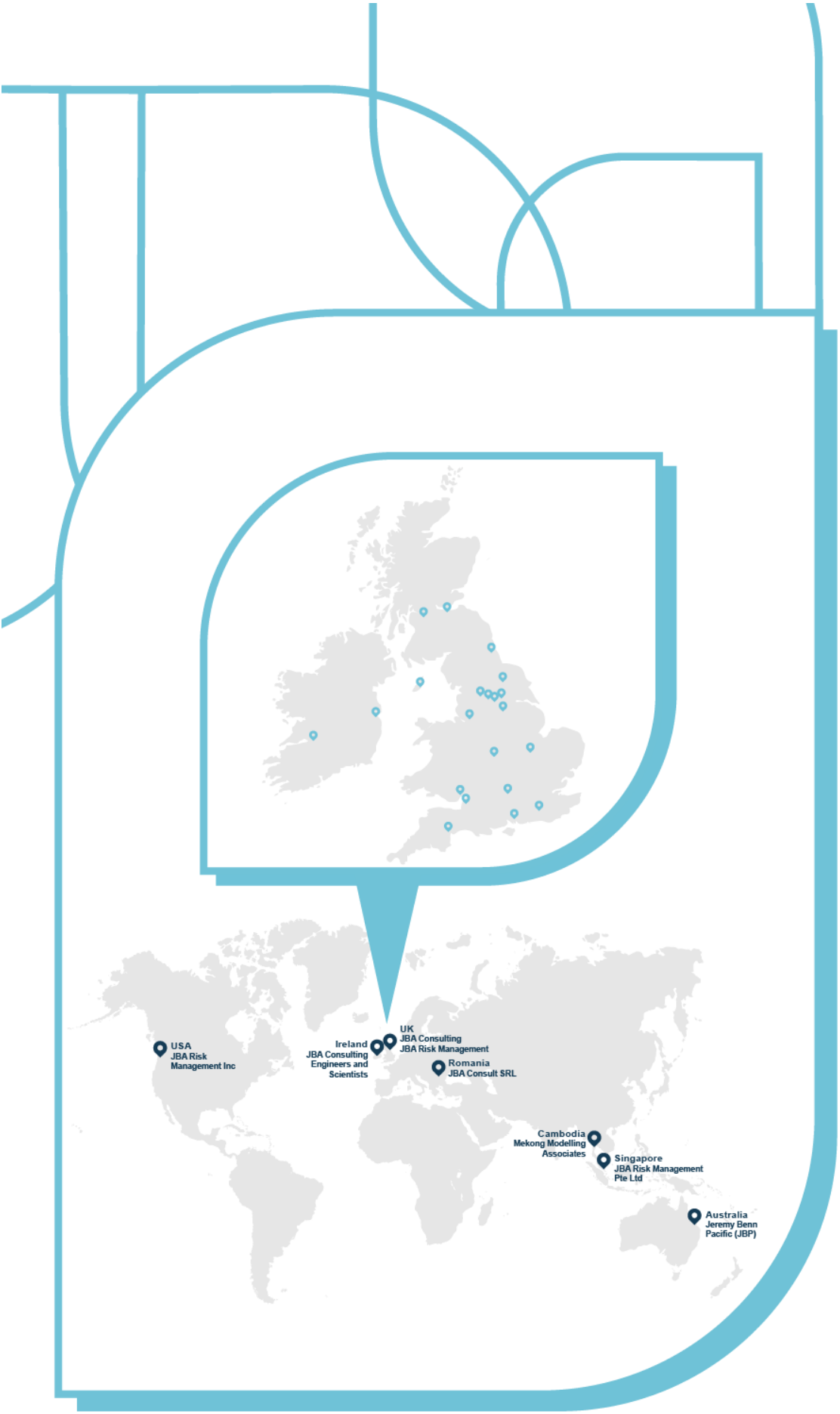
B Data Sources used in this SFRA

C SFRA User Guide

D Flood Alerts and Flood Warnings

E Summary of flood risk in Uttlesford District

F Cumulative Impact Assessment (CIA)



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