Uttlesford District Council: Level 2 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
RoFfSW	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.

Dry island: Land which may not be at risk of flooding itself but is surrounded by flood risk and therefore may become cut off during a flood event.

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 Risk Regulations: Transposition of the EU Floods Directive into UK law. The EU Floods Directive is a piece of European Community (EC) legislation to specifically address flood risk by prescribing a common framework for its measurement and management.

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.

Pluvial flooding: see surface water flooding.

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 Level 2 Strategic Flood Risk Assessment (SFRA) document was created with the purpose of supporting the review and update of the Uttlesford Local Plan. In this SFRA, 15 proposed development sites were screened, with 10 identified as requiring a Level 2 assessment. These sites have been assessed using site summary tables and interactive mapping. This SFRA incorporates recent changes to national and local planning policy and considers the cumulative impacts of development across the district. This report should be read in conjunction with the Level 1 SFRA, which provides additional background information.

Introduction

The aim of the Level 2 assessment is to build on identified risks from the Level 1 SFRA for proposed development sites, to provide a greater understanding of fluvial, surface water, groundwater, and reservoir related flooding risks to the site. The Level 2 assessment also helps Uttlesford District Council answer Part B of the Exception Test to ensure the development is safe for its lifetime. From this, the Council and Developers can make more informed decisions and pursue development in an effective and efficient manner. The Level 2 assessment also identifies sites for further risk analysis at the site-specific Flood Risk Assessment (FRA) stage.

The Level 2 assessment includes detailed assessments of the proposed site options. These include:

- Providing an up-to-date Strategic Flood Risk Assessment, taking into account the most recent policy and legislation in the National Planning Policy Framework (2021).
- An assessment of all sources of flooding including fluvial flooding, tidal flooding, surface water flooding, groundwater flooding and the potential increase in fluvial, surface water and tidal flood risk due to climate change, and how these may be mitigated.
- An assessment of existing flood warning and emergency planning procedures, including an assessment of safe access and egress during an extreme event.
- Advice and recommendations on the likely applicability of sustainable drainage systems for managing surface water runoff.
- To provide a comprehensive set of maps presenting flood risk from all sources that can be used as evidence base for use in the emerging Local Plan.
- Advice on whether the sites are likely to pass the second part of the Exception Test and the Sequential Test with regards to flood risk and on the requirements for a site-specific FRA and outline specific measures or objectives that are required to manage flood risk.

As part of the Level 2 SFRA, detailed site summary tables have been produced for the proposed sites, covering the above. To accompany the site summary tables, there are Geo-PDF maps, with all the mapped flood risk outputs.

The site summary tables produced detail the flood risk to each site, the NPPF requirements, and guidance for site-specific FRAs. A broadscale assessment of suitable SuDS options have been provided, giving an indication where there may be constraints to certain types of SuDS techniques. Each site has a GeoPDF map with the respective flood risk outputs.

Summary of flood risk to the sites

Uttlesford District Council provided 12 sites for assessment, following an amendment from 15 sites. 10 sites were carried forward for Level 2 assessment. The following points summarise the Level 2 assessment:

- **Fluvial Flooding** - some areas of Uttlesford district are at greater risk than others. The main watercourses associated with fluvial risk in the L2 assessment are the:
  - River Chelmer
  - Ugley Brook
  - A number of unnamed Ordinary Watercourses

  The sites that are affected the most within the study area are: Land off the Broadway, Great Dunmow and Land east of High Lane, Stansted Mountfitchet. Most sites assessed are also affected by Ordinary Watercourses, though risk tends to be more localised given the size of channel and topography.
- **Surface Water** - surface water flood risk is widespread across Uttlesford district. Water predominantly flows into and along topographically low-lying areas and is channelled into watercourses such as the River Cam, River Chelmer, Stansted Brook and The Slades. Most of the sites with a detailed Level 2 summary table are at surface water flood risk. The degree of flood risk varies, with some sites being only marginally affected, and other sites being more significantly affected. The sites at most significant surface water risk are: Land Between A120 and Stortford Road; Land off the Broadway, Great Dunmow; Land east of High Lane, Stansted Mountfitchet; and North Takeley Street.
- **Access and Egress** - Whilst not at significant flood risk within the site boundary, several sites with detailed Level 2 summary tables have potential access and egress issues as a result of fluvial and surface water flooding on the surrounding roads. These sites are: Chesterford Research Park; Land Between A120 and Stortford Road; Land off the Broadway, Great Dunmow; Land east of Shire Hill; Land behind Knights Park; Land east of High Lane, Stansted Mountfitchet, Land at Warrens Farm; and North Takeley Street. Consideration should be made to these sites as to how safe access and egress can be provided during flood events, both to people and emergency vehicles. Also, consideration should be given to the nature of the risk, for example whether the flooding forms a flow path or bisects the site where access from one side to another may be compromised.
- **Effects of Climate Change** - fluvial and surface water climate change mapping indicates that flood extents are generally predicted to increase. As a result, the flood depths, velocities, and hazard of flooding may also increase. The

significance of the increase tends to be dependent on the topography of the site and the climate change percentage allowance used.

  - Surface water: The 3.3% AEP +35% and the 1% AEP +40% climate change surface water events have been derived from the RoFfSW as an indication of climate change to surface water flood risk. The RoFfSW 1% AEP plus 40% climate change surface water events are approximately the same size as their respective present day 0.1% AEP events, showing Uttlesford district to be relatively sensitive to increases in surface water flooding due to climate change.
  - Fluvial: Climate change allowances for the 3.3% and 0.1% AEP events have been derived from hydraulic modelling of the River Chelmer and Stansted Brook model (Ugley Brook). They show the 1% AEP plus Central climate change allowance to be predominantly larger than the modelled present day 1% AEP fluvial events but smaller than the modelled present day 0.1% AEP fluvial events. For sites with unmodelled fluvial risk, appropriate proxies have been used to infer risk at this strategic scale.
  - Sites that are the most sensitive to changes in surface water and fluvial flood risk due to climate change include: Land off the Broadway, Great Dunmow and Land east of High Lane, Stansted Mountfitchet.
  - Site-specific FRAs and site drainage and management plans should confirm the impact of climate change using the latest guidance. It is recommended that Uttlesford District Council work with other Risk Management Authorities (RMAs) to review the long-term sustainability of existing and new developments in these areas when developing climate change plans and strategies for the District.

- **Historic Flooding** - historic data provided by Uttlesford District Council/ the LLFA showed 39 instances of recorded flooding within the study area since 2021. The worst affected areas are in the east of the District, around Stansted Mountfitchet.
- **Groundwater** - groundwater emergence mapping indicates the majority of the south and east of Uttlesford district is at negligible risk from groundwater emergence due to the nature of the local geological deposits. There are sections in the north and northwest of Uttlesford that are at moderate to high risk; there is a risk to subsurface assets in these areas, and surface manifestation of groundwater is likely. The areas where emergence is likely are around the River Cam, Stansted Brook, The Slade, the River Stort and the low-lying surrounding floodplain areas. The areas include: Saffron Walden, Wendens Ambo, Little and Great Chesterford and Stansted Mountfitchet.
- **Canals** - The River Stort Navigation flows along part of the southwest border of the study. It runs north to south along the Uttlesford border between Rushy Mead Nature Reserve and Gaston Green and Hallingbury Marina. This has the potential to interact with other watercourses and become flow paths during flood events or in a breach scenario.

- **Reservoirs** - There is a potential risk of flooding in Uttlesford district that is posed by reservoirs within and outside of this study area. 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 Flood Risk Assessments (where relevant).

Requirements for Developers

- Any sites located where there is a Main River (including culverted reaches of Main River) will require an easement of 8m either side of the watercourse from the top of the bank. Developers will be required to apply for appropriate permits so the activity being carried out over easements does not increase flood risk.
- A strategic assessment was conducted of SuDS options using regional datasets. A detailed site-specific assessment of suitable SuDS techniques would need to be undertaken at site-specific level to understand which SuDS option would be best.
- At the planning application stage, developers will need to undertake more detailed hydrological and hydraulic assessments of the watercourses where required, for example at the site located on the Ugley Brook and particularly where there are no detailed hydraulic models present. The modelling should verify flood extents with the latest climate change allowances.
- For sites allocated within the Local Plan, the Local Planning Authority should use the information in this SFRA to inform the Exception Test.
- For developments that have not been allocated in the Local Plan, developers must undertake the Sequential Test followed by the Exception Test (if required) and present this information to the Local Planning Authority for approval. The Exception Test should be applied where there is development which is classed as:
    - More vulnerable in Flood Zone 3a
    - Highly vulnerable in Flood Zone 2 (this is NOT permitted in Flood Zone 3a)
    - Essential infrastructure in Flood Zone 3a or 3b
    - Any development with significant* risk in the surface water 1% AEP event plus 40% climate change allowance flood extent.

**Flood risk issues are not always black and white - the significance of issues requires professional judgement, based on the location, topography and nature (including depth, velocity and hazard) of flooding, rather than simply whether part of a site is within a given flood extent. This would be determined as part of a Level 2 assessment.*

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.

It is recommended that as part of the early discussions relating to development proposals, developers discuss requirements relating to site-specific FRA and drainage strategies with both the Local Planning Authority and the Lead Local Flood Authority (LLFA), to identify any potential issues that may arise from the development proposals.

1 Introduction

1.1 Purpose of the Strategic Flood Risk Assessment

“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 160).

The Planning Practice Guidance (PPG) (2022) advocates a staged approach to risk assessment and identifies two levels of SFRA:

- Level 1 SFRA (L1): where flooding is not a major issue and where development pressures are low. The assessment should be sufficiently detailed to allow application of the Sequential Test. Level 1 is completed first to understand whether a Level 2 assessment is required.
- Level 2 SFRA (L2): where land outside the EA’s Flood Zones 2 and 3 (and land outside areas affected by other sources of flooding as per the Exception Test requirements) cannot accommodate all the necessary development creating the need to apply the NPPF’s Exception Test. In these circumstances, the assessment should consider the detailed nature of the flood characteristics within a Flood Zone and assessment of other sources of flooding.

This SFRA report fulfils the requirements for a Level 2 assessment of strategic sites identified for potential allocation within Uttlesford District and has been prepared in accordance with the NPPF (2021) and PPG (2022).

This report should be read alongside the Uttlesford District Level 1 SFRA (2024) and builds upon the information presented in the Level 1 SFRA.

1.2 SFRA objectives

The objectives of this Level 2 SFRA are:

- Provide individual flood risk analysis for site options using the latest available flood risk data, thereby assisting UDC in applying the exception test to their proposed site options through the emerging LPU.
- Use available data to provide information and a comprehensive set of maps presenting flood risk from all sources for each site option.
- Where the exception test is required, provide recommendations for making the site safe throughout its lifetime.
- Take into account the most recent policy and legislation in the NPPF, PPG, and LLFA SuDS guidance.
- Update the catchments that are most sensitive to new development in flood risk terms and further review policy and recommendations for these catchments.

1.3 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.

1.4 How to use this report

Table 1-1 below outlines the contents of this report and details how different users can apply this information.

Table 1-1: Outline of the contents of each section of this report

Section	Contents	How to use
1. Introduction	Outlines the purpose and objectives of the Level 2 SFRA	For general information and context.
2. The Planning Framework and Flood Risk Policy	Includes information on the implications of recent changes to planning and flood risk policies and legislation, as well as documents relevant to the study. For more detail, please refer to Sections 2 and 3 of the Level 1 SFRA.	Users should refer to this section and the relevant sections of the Level 1 SFRA for any relevant policy which may underpin strategic or site-specific assessments.
3. Sources of information used in preparing the Level 2 SFRA	Summarises the data used in the Level 2 assessment and GeoPDF mapping.	Users should refer to this section in conjunction with the site summary tables and GeoPDF mapping to understand the data presented. Developers should refer to this section when understanding the requirements for a site-specific FRA.
4. Impact of Climate Change	Outlines the latest climate change guidance published by the EA and how this was applied to the SFRA. Sets out how developers should apply the guidance to inform site-specific FRAs.	This section should be used alongside the relevant sections of the Level 1 SFRA to understand the climate change allowances for a range of epochs and conditions, linked to the vulnerability of a development.
5. Level 2	Summarises the sites taken	This section should be used in

Section	Contents	How to use
Assessment Methodology	forward to a Level 2 assessment and the outputs produced for each of these sites.	conjunction with the site summary tables and GeoPDF mapping to understand the data presented.
6. Flood Risk Management Requirements for Developers	Identifies the scope of the assessments that must be submitted in FRAs supporting applications for new development. Refers to relevant sections in the L1 SFRA for mitigation guidance.	Developers should use this section alongside the relevant sections of the L1 SFRA to understand requirements for FRAs, what conditions/ guidance documents should be followed, and information on flood mitigation options.
7. Surface water management and SuDS	Refers to relevant sections in the L1 SFRA for information on SuDS and surface water management.	Developers should use this section to understand the suitability of SuDS across the study area and refer to the L1 SFRA for further information on types of SuDS, the hierarchy and management trains information.
8. Summary of Level 2 assessment and recommendations	Summarises the results and conclusions of the Level 2 assessment, and signposts to the L1 SFRA for planning policy recommendations.	Developers and planners should use this section to see a summary of the Level 2 assessment and understand the key messages from the site summary tables. Developers should refer to the Level 1 SFRA recommendations when considering requirements for site-specific assessments.
Appendix A: Site Summary Tables	Provides a detailed summary of flood risk for sites requiring a more detailed assessment, which considers flood risk, emergency planning, climate change, broadscale assessment of possible SuDS, exception test requirements and requirements for site-specific FRAs.	Planners should use this section to inform the application of the sequential and exception tests, as relevant. Developers should use these tables to understand flood risk, access and egress requirements, climate change, SuDS, and FRA requirements for site-specific assessments.

Section	Contents	How to use
Appendix B: GeoPDF mapping and User Guide	Provides Geo-PDF mapping for each Level 2 assessed site displaying flood risk at and around the site. The associated User Guide providing details of the layers used within the interactive PDF mapping.	Planners and developers should use these maps in conjunction with the site summary tables to understand the nature and location of flood risk. See the User Guide within Appendix B: GeoPDF Mapping and User Guide.

Hyperlinks to external guidance documents/websites are provided in blue through the SFRA.

1.5 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 LLFA for Uttlesford is Essex County Council (ECC).

The study area is bounded by six other authorities:

- South Cambridgeshire District
- Baintree District
- Chelmsford District
- Epping Forest District
- East Hertfordshire District
- North Hertfordshire District

The water service provider for Uttlesford is Affinity Water. Anglian Water and Thames Water are responsible for managing sewerage. 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.

Uttlesford District lies across both the Thames and Anglian River Basin Districts. The main watercourses which run through the study area 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.

Figure 1-1 to Figure 1-5 of the Level 1 report detail the study area, LLFA, neighbouring authorities, water supply and sewage companies, and river basin districts within Uttlesford District.

2 The Planning Framework and Flood Risk Policy

This section of the Level 2 SFRA provides an overview of the planning framework, flood risk policy, and flood risk responsibilities. In preparing the subsequent sections of this SFRA, appropriate planning and policy amendments have been acknowledged and considered.

2.1 Roles and responsibilities for Flood Risk Management

RMAs are comprised of different organisations that have responsibilities for flood risk management. The RMAs in and around Uttlesford District and their responsibilities are detailed in Section 2.1 of the Level 1 SFRA report.

2.2 Relevant legislation

The following legislation is relevant to development and flood risk in Uttlesford District. Hyperlinks are provided to external documents:

- 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. At the time of writing this SFRA it is understood that the UK Government intends to scrap the Flood Risk Regulations 2009 as part of a review into retained EU legislation.
    - There is a proposition to scrap the Flood Risk Regulations as part of the revoking and reforming of retained EU laws, post-Brexit, as the Flood Risk Regulations duplicate existing domestic legislation. However, it is unclear when this is likely to occur. The Government maintains the ability to update retained EU laws until June 2026.
- Town and Country Planning Act (1990), Water Industry Act (1991), Land Drainage Act (1991), Environment Act (1995), and Flood and Water Management Act (2010) – as amended and implanted 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. Note that this secondary UK legislation, which implements EU Directives, is subject to repeal/ amendment following the UK exit

from the EU. At the time of publishing this report the references here were correct.

- 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.

2.3 Relevant flood risk policy and strategy documents

This section highlights policies and other relevant documents for the UDC area. Hyperlinks are provided to external documents.

- Thames Catchment Flood Management Plan (2009) - the EA's overview of flood risk across the Thames river catchment and recommended ways of managing it.
- Thames River Basin District (RBD) RBMP (2022) - the EA's most recent review and update of the RBMPs took place in December 2022. RBMPs enable local communities to find more cost-effective ways to further improve water environments.
- Anglian RBD RBMP (2022) - the EA's most recent review and update of the RBMPs took place in December 2022. RBMPs enable local communities to find more cost-effective ways to further improve water environments.
- Thames RBD Flood Risk Management Plan (FRMP) (2022) - the FRMP is a plan to manage significant flood risks within Thames RBD.
- Anglian RBD FRMP (2022) - the FRMP is a plan to manage significant flood risks within Thames RBD.
- Thames Water Drainage and Wastewater Management Plan (DWMP) (2023) a 25 year plan that sets out how Thames Water will manage wastewater now and, in the future, to meet the challenges of a changing climate and growing population.
- Anglian Water DWMP (2023) - a 25 year plan that sets out how Anglian Water will manage wastewater now and, in the future, to meet the challenges of a changing climate and growing population.
- Affinity Water Water Resource Management Plan (WRMP) (2023) - a 5 year plan that sets out how Affinity Water will address the balance between water supply and demand.
- Climate change guidance for flood risk assessment (2022) - the EA's guidance was last updated in 2022. New UK Climate Projections (UKCP18) were used to update peak river flow allowances, and these are now based on management catchments rather than RBDs. There has also been a change in how peak river flow allowances should be applied, with a greater focus placed on the 'central' allowance. In May 2022 peak rainfall allowances were updated and are now based on management catchments rather than the previous flat rates for the whole country.

- The Essex County Council Preliminary Flood Risk Assessment (PFRA) (2017) - a high-level screening exercise which provides an assessment of past flood risk based on historical data from UDC, the EA, water companies, local Parish Councils, Town Councils, and Residents Associations.
- The Essex County Council Local Flood Risk Management Strategy (LFRMS) (2018) - explains local flood risk sources in Uttlesford and how the council manage flood risk in an integrated and effective way.

Further details relating to these policies and any other relevant documentation can be found in Section 2.3 of the Level 1 SFRA report. This includes:

- Flood Risk Regulations, 2009
- Flood and Water Management Act, 2010
- The Water Framework Directive and Water Environment Regulations and River Basin Management Plans
- Catchment Flood Management Plans
- Essex LFRMS, 2018
- Local SuDS policy and guidance
- Water cycle studies
- Surface Water Management Plans
- Water Resource Management Plans
- Drainage Wastewater Management Plans

2.4 National Planning Policy Framework and Guidance

The Revised National Planning Policy Framework (NPPF) was updated in December 2023. The NPPF sets out Government's planning policies for England and how these are expected to be applied. The Framework is based on core principles of sustainability and forms the national policy framework in England, also accompanied by a number of Planning Practice Guidance (PPG) notes. It must be taken into account in the preparation of local plans and is a material consideration in planning decisions.

2.4.1 Planning Practice and Guidance

An updated version of the PPG: Flood risk and coastal change was published in August 2022. This advises on ‘how to take account of and address the risks associated with flooding and coastal change in the planning process’. The guidance outlines the steps required when preparing strategic policies. Further details regarding the PPG can be found in the Level 1 SFRA.

2.4.2 The Sequential Test

The Sequential Test aims to ensure that areas of little or no flood risk are prioritised for development over areas at a higher risk of flooding. This means areas at a medium or high risk of flooding from any source, now or on the future should be avoided for development where possible.

2.4.3 The Exception Test

It may not always be possible for all new development to be allocated 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, where it is not possible for development to be located in areas with a lower risk of flooding:

- More vulnerable in Flood Zone 3a
- Highly vulnerable in Flood Zone 2 (this is NOT permitted in Flood Zone 3a or 3b)
- Essential infrastructure in Flood Zone 3a or 3b
- Any development with significant* risk in the surface water 1% Annual Exceedance Probability (AEP) event plus 40% climate change allowance flood extent.

**Flood risk issues are not always black and white - the significance of issues requires professional judgement, based on the location, topography and nature (including depth, velocity and hazard) of flooding, rather than simply whether part of a site is within a given flood extent. This would be determined as part of a Level 2 assessment. This is ultimately decided by the RMAs just as the LPA and EA, which are informed by site-specific FRAs and the SFRAs.*

3 Sources of information used in preparing the Level 2 SFRA

This section outlines the datasets used in assessing the sites in the Level 2 SFRA.

3.1 Data used to inform the SFRA

Table 3-1 provides an overview of the supplied data used to inform the appraisal of flood risk for UDC.

Table 3-1: Overview of supplied data for UDC Level 2 SFRA

Source of flood risk	Data used	Data source
Historic (all sources)	Historic Flood Map and Recorded Flood Outlines datasets	EA
Historic (all sources)	Historic flooding incident reports	ECC
Fluvial	Flood Map for Planning	EA
Fluvial (including climate change)	River Chelmer (2020) 1D-2D ISIS/TUFLOW model - Updated climate change allowances for the 3.3% AEP and 0.1% AEP were modelled as part of this SFRA. Stansted Mountfitchet (2015) 1D-2D ISIS-TUFLOW model - Ugley Brook	EA
Surface Water (including climate change)	Risk of Flooding from Surface Water dataset (3.3% AEP +35% and 1% AEP +40% climate change uplifts run by JBA)	EA and JBA
Sewers	Internal and external historic drainage records	Thames Water
Groundwater	Areas Susceptible to Groundwater Flooding dataset	EA
Groundwater	JBA Groundwater emergence map	JBA
Reservoirs	National Inundation Reservoir Mapping (Long term flood risk map)	EA
Flood defences	AIMS Spatial Flood Defences dataset	EA
Other datasets	Source Protection Zones Aquifer Designation maps (Bedrock Geology and Superficial Deposits) Detailed River Network Flood Alert and Flood Warning Areas	EA (via UDC)

Source of flood risk	Data used	Data source
	Groundwater Vulnerability Risk of Flooding from Rivers and Sea National Receptor Dataset	

3.2 Topography, Geology, Soils and Watercourses

Topography, geology, soils, and watercourses data were obtained from the following sources:

- Topography data was obtained from the Environment Agency's 1m LiDAR Composite Digital Terrain Model (DTM) 2022.
- Bedrock Geology and Superficial Deposits data was procured from the British Geological Society's (BGS) 50K mapping dataset.
- Soils data was sourced from Cranfield University Soilscapes mapping.
- Watercourses data – main rivers were mapped using the Environment Agency's Statutory Main River Map dataset, and ordinary watercourses from the Environment Agency's (Partner Only) Detailed River Network (DRN) dataset. Caution should be taken when using these layers to identify culverted watercourses which may appear as straight lines but in reality, are not.

3.3 Historic flooding

Historic flooding was assessed using the EA's Historic Flood Map and Recorded Flood Outlines mapping and a shapefile of historic flooding incidences provided by UDC/ the LLFA. Section 4.1 of the Level 1 report details the recorded flood incidences in Uttlesford district.

It is important to note that the absence of historic flood records does not mean than an area has never flooded, only that records are not held. For previously undeveloped sites, it is likely that historic flooding incidents may have gone unreported due to a lack of site use or interest. In addition, it is also possible that flooding mechanisms have changed since the date of a recorded flooding incident, making it more or less likely for flooding to occur on site.

3.4 Fluvial Flood Zones

3.4.1 Flood Zones 2 and 3a

Flood Zones 2 and 3a show the same extent as the Flood Map for Planning (FMfP) (which incorporates latest modelled data).

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 4 and Appendix C: User Guide details the approach for assessing future flood risk within the SFRA.

The following provides additional information on the FMfP:

- Where flood outlines are not informed by detailed hydraulic modelling, the FMfP is based on generalised modelling to provide an indication of flood risk. Whilst the generalised modelling is generally accurate on a large scale, they are not provided for specific sites or for land where the catchment of the watercourse falls below 3km².
- For watercourses with smaller catchments, the EA's Risk of Flooding from Surface Water (RoFfSW) map provides an indication of the floodplain of small watercourses and ditches. It is more accurate in upper to mid river valley

locations than lower valley locations near the coast. This is because it does not represent the floodplain for small watercourses as well in largely flat areas.

- Even where more detailed models of Main Rivers have been used by the EA to inform the FMfP, they will be largely based on remotely detected ground model data and not topographic survey. In this area, FMfP does not include all modelled outputs, hence the Level 2 SFRA has derived its own Flood Zones based on latest available data.
- For this reason, the FMfP is not of a resolution to be used as application evidence to provide the details of possible flooding for individual properties or sites and for any sites with watercourses on, or adjacent to the site. Accordingly, for site-specific assessments it will be necessary to perform more detailed studies in circumstances where flood risk is an issue.

3.4.2 Flood Zone 3b

Functional floodplain (Flood Zone 3b) is identified as land which would flood with an annual probability of 3.3% AEP (1 in 30 years), where detailed hydraulic modelling exists. 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.

3.5 Climate change

This is considered in detail in Chapter 4.

3.6 Surface water

Mapping of surface water flood risk in Uttlesford has been taken from the EA's RoFfSW mapping. Surface water flood risk is subdivided into the following four categories:

- **High:** An area has a chance of flooding greater than 3.3% AEP (1 in 30) each year.
- **Medium:** An area has a chance of flooding between 1% AEP (1 in 100) and 3.3% AEP (1 in 30) each year.

- **Low:** An area has a chance of flooding between 0.1% AEP (1 in 1,000) and 1% AEP (1 in 100) each year.
- **Very Low:** An area has a chance of flooding of less than 0.1% AEP (1 in 1,000) each year.

The results should be used for high-level assessments such as SFRAs for local authorities. If a particular site is indicated in the EA mapping to be at risk from surface water flooding, a more detailed assessment may be required to illustrate the flood risk more accurately at a site-specific scale. Such an assessment should use the RoFfSW in partnership with other sources of local flooding information to confirm the presence of a surface water risk at that particular location.

Detailed modelling using site survey will be necessary where there is a significant risk of surface water flooding. It is the intention that the EA will prepare updated and improved surface water mapping in the course of updating the National Flood Risk Assessment (NaFRA2). It is anticipated that this data will be available in 2024 and at that time it is recommended that the surface water risk assessment is reviewed. It is not anticipated that the updated mapping will fundamentally change the locations identified to be at risk from surface water flooding, but the improved analysis techniques will reduce some of the uncertainties associated with the assessment.

3.6.1 Critical Drainage Areas

A critical drainage area (CDA) is defined as “a discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer and/or river) often cause flooding in a Flood Risk Area during severe weather thereby affecting people, property or local infrastructure.” These can cover wide areas within both rural and urban environments and are typically where manmade drainage infrastructure has been identified as at critical risk of failure, resulting in flooding. An absence of CDAs does not mean there are no areas with potential drainage problems.

There are no critical drainage areas identified within the Uttlesford District Council boundary.

3.7 Groundwater

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.

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 assess potential areas that are likely to be at higher risk of groundwater flooding:

- The EA's 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.

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 results of this assessment for each site are summarised in Appendix A. It should be noted that this assessment only identifies areas likely to be at risk of groundwater emergence and where this water might flow. It does not predict the likelihood of groundwater emerging or attempt to quantify the volumes of groundwater that might be expected to emerge in a given area. In high-risk areas, a site-specific risk assessment for groundwater flooding may be required to fully inform the likelihood of flooding.

3.8 Flood warning

Flood Warning Areas and Flood Alert Areas are represented by the EA's relevant GIS datasets. The sites affected by Flood Warning and Flood Alert Areas are detailed in the site summary tables in Appendix A.

3.9 Reservoirs

The risk of inundation as a result of a breach or failure of a number of reservoirs within the area has been identified from the Environment Agency's Risk of Flooding from Reservoirs dataset.

This dataset displays a prediction of the credible worst-case scenario. The dataset gives no indication of the likelihood or probability of reservoir flooding. The Reservoir Flood Maps do not describe the risk of flooding (simply a credible worst case) and data includes layers for:

- 'Dry day' – Individual flood extents for all large, raised reservoirs in the event that they were to fail and release the water held on a "dry day" when local rivers are at normal levels.
- 'Wet day' – Individual flood extents for all large, raised reservoirs in the event that they were to fail and release the water held on a "wet day". A wet day is assumed to be a failure at the same time as experiencing a river flood with a 1 in 1000 chance of occurring in any year.

The extents should be taken into consideration as part of the site-specific Flood Risk Assessment.

3.10 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 rainfall event with a 1 in 30 chance of occurring in any given year, although until recently this did not apply to smaller private systems. This means that sewers will be overwhelmed in larger rainfall and flood events. Existing sewers can also become overloaded as new development adds to the surface water discharge to their catchment, or due to incremental increases in roofed and paved surfaces at the individual property scale (urban creep). Sewer flooding is therefore a problem that could occur in many locations across the study area.

Anglian Water and Thames Water are the water companies responsible for the management of the sewer drainage networks across Uttlesford District Council's Administrative Area. Historical incidents of flooding are detailed by Thames Water and Anglian Water through their Hydraulic Sewer Flooding Risk Registers. The sewer flooding

register records incidents of flooding relating to public foul, combined or surface water sewers, and identifies where properties have suffered flooding.

Data was received by Thames Water but not by Anglian Water during the study programme.

3.11 Flood defences

Flood defences are represented by the EA's Asset Information Management System (AIMS) Spatial Defences dataset. Their current condition and Standard of Protection (SoP) are based on those recorded in the tabulated shapefile data. None of the sites being assessed are protected by formal flood defences but there is 'Natural high ground'; along both banks of the major watercourses and along some of the small drainage channels which will offer some protection from these watercourses. Section 6.4 of the Level 1 report lists the location and type of flood risk management assets in Uttlesford.

3.12 Residual risk

Residual risk is the risk that remains after the effects of flood risk infrastructure have been taken into account. 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 take into account:

- 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 Environment Agency 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).

3.13 Depth, velocity, and hazard to people

The Level 2 assessment seeks to map the probable depth and velocity of flooding as well as the hazard to people and use this within the site summary tables.

Where detailed model outputs were available, depth, velocity and hazard data has been used to represent the 3.3% AEP, 3.3% AEP + climate change, 1% AEP and 1% AEP + climate change events. This is the case for the site covered by the River Chelmer in Great Dunmow. The existing River Chelmer model results are formed of 2 storm durations: 'SD20' for the upper catchment and 'SD40' for the lower catchment. In the original modelling study, these were merged to form a 'SDMAX' (maximum) result for existing extents and grids. This method has been replicated for the 3.3% AEP+CC and 0.1% AEP+CC flood extents, depth, velocity, and hazard grids.

The site located on the Ugley Brook only has detailed model representation at the very downstream end of the site, but only water level grids are available (no depth, velocity, hazard or raw model outputs are available), therefore only flood extents have been used in this assessment. Detailed modelling must be undertaken at this site as part of a site-specific Flood Risk Assessment.

In the absence of detailed hydraulic models, flood depth, velocity, and hazard are not available as part of the FMfP dataset so have not been included as part of this Level 2 SFRA and may need to be considered further during a site-specific FRA.

The depth, hazard, and velocity of the 1% AEP plus climate change surface water flood event, produced by uplifting the EA RoFfSW map, has been mapped and considered in this assessment.

Hazard to people has been calculated using the below formula as suggested in Defra's FD2321/TR2 "Flood Risk to People". The different hazard categories are shown in Table 3-2. Developers should also test the impact of climate change depths, velocities, and hazard on the site, at FRA stage.

Table 3-2: Defra's FD2321/TR2 "Flood Risks to People" classifications

Description of Flood Hazard Rating	Flood Hazard Rating	Classification Explanation
Very Low Hazard/ Caution	<0.75	"Flood zone with shallow flowing water or deep standing water"
Danger For Some (i.e. children)	0.75 - 1.25	"Danger: flood zone with deep or fast flowing water"
Danger For Most	1.25 - 2.00	"Danger: flood zone with deep fast flowing water"
Danger For All	>2.00	"Extreme danger: flood zone with deep fast flowing water"

As part of a site-specific FRA, developers will need to undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood depth, velocity and hazard based on the relevant 1% AEP plus climate change event, using the relevant climate change allowance based on the type of development and its associated vulnerability classification. Not all this information is known at the strategic scale and the level of resolution may not be appropriate to enable site scale assessment of proposed development schemes.

3.14 Note on SuDS suitability

The hydraulic and geological characteristics of each site were assessed to determine the factors that potentially constrain schemes for surface water management. This assessment is designed to inform the early-stage site planning process and is not intended to replace site-specific detailed drainage assessments.

The assessment is based on catchment characteristics and additional datasets such as JBA's Groundwater Emergence Mapping and British Geological Survey (BGS) Soil maps of England and Wales which allow for a basic assessment of the soil characteristics on a site-by-site basis. LiDAR data was used as a basis for determining the topography and average slope across each development site. Other datasets used include:

- Historic landfill sites
- Groundwater Source Protection Zones
- Detailed River Network
- Flood Zones derived as part of this Level 2 SFRA.

This data was then collated to provide an indication of particular groups of SuDS systems which might be suitable at a site. SuDS techniques were categorised into five main groups, as shown in Table 3-3. This assessment should not be used as a definitive guide as to which SuDS would be suitable but used as an indicative guide of general suitability. Further site-specific investigation should be conducted to determine what SuDS techniques could be used on a particular development, informed by detailed ground investigations.

Table 3-3: Summary of SuDS categories

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

The suitability of each SuDS type for the site options has been described in the summary tables, where applicable. The assessment of suitability is broadscale and indicative only; more detailed assessments should be carried out during the site planning stage to confirm the feasibility of different types of SuDS.

4 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.

4.1 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.

4.2 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 (for more information see Section 5 of the Level 1 Report).
    - Cam and Ely Ouse
    - Combined Essex

- Roding, Beam, and Ingrebourne
- Upper Lee

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.

4.3 Representing climate change in the L2 SFRA

Section 5.2 of the Level 1 SFRA Report details the relevant allowances for each of the four management catchments. This includes peak river and peak rainfall allowances.

Section 5.3 of the Level 1 SFRA Report details what model data is available and how fluvial climate change has been represented, as agreed with the EA in April 2024.

The sections below describe how this has been applied to the Flood Zones.

4.3.1 Fluvial climate change

4.3.1.1 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.

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.

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 4-1: 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**
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)**

4.3.1.2 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.

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. 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 4-2: 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%

4.3.1.3 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.

4.3.2 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 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 risk to smaller watercourses, which are too small to be covered by the Environment Agency's Flood Map for Planning.

4.4 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.

4.5 Climate change on sewer flood risk

Surface water and fluvial flooding with climate change have the potential to impact on the sewerage system, so careful management of these is needed for development. Due to differing ages of settlements, there will be drainage systems consisting of different types of sewers. Increasing pressures from climate change, urban creep and infill development could impact on the performance of the sewerage system.

4.6 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 and coastal change 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 SoP of defences and sites for future development, in relation to sensitivity to climate change. UDC 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.
- It is recommended that the differences in flood extents from climate change are compared by UDC when proposing to allocate sites, to understand how much additional risk there could be, where this risk is within 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.
- Include the use of Natural Flood Management (NFM) techniques where possible to assist in the adaptation to climate change.

4.7 Developers

It is important to note that although the flood extent may not increase noticeably on some watercourses, the flood depth, velocity, and hazard may increase compared to the 1 in 100 current-day event.

Developers will 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 GOV.uk.
- 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 these may get affected should the more extreme climate change scenarios materialise.

5 Level 2 Assessment Methodology

This section outlines how sites were screened against flood risk datasets to determine which sites required a Level 2 assessment. It also identifies other sites at lower risk with general recommendations for developers.

5.1 Site screening

Uttlesford District Council originally provided 15 sites to take forward to the Level 2 screening assessment, before revising these down to 12, rejecting certain sites due to other planning related criteria. All sites were screened against available flood risk information and spatial data to provide a summary of risk to each site, including:

- The proportion of the site in each Flood Zone derived from the EA's Flood Map for Planning, which includes modelling information where available.
- The proportion of the site affected by climate change within the central allowance for the 3.3% AEP and 1% AEP events, where available.
- Whether the site is shown to be at risk from surface water flooding in the RoFfSW mapping for the 3.3%, 1%, and 0.1% AEP events, and the 1% AEP event plus climate change event.
- Whether the site is within, or partially within, the reservoir 'Dry Day' or 'Wet Day' flood extents.
- Whether the site is within, or partially within, the Environment Agency (EA) Historic Flood Map dataset.
- Whether the AStGWF and JBA's 5m Groundwater Emergence mapping shows the site to be susceptible to groundwater flooding.
- Other considerations such as safe access and egress to or from a site that affect the viability of development.

The screening was undertaken using JBA in-house software called “FRISM”. FRISM is an internal JBA GIS package that computes a range of flood risk metrics based on flood and receptor datasets.

The results of the screening provide a quick and efficient way of identifying sites that are likely to require a Level 2 Assessment, assisting UDC with sequential test decision-making so that flood risk is taken into account when considering allocation options.

The screening also provides an opportunity to identify sites which may show to be 100% in Flood Zone 1, but upon visual inspection in GIS, have an ordinary watercourse flowing through or adjacent to them but for which no Flood Zone information is currently available. Although there are no Flood Zone maps available for these watercourses, it does not mean the watercourse does not pose a risk, it just means no modelling has yet been undertaken to identify the risk.

The Flood Zones are not provided for specific sites or land where the catchment of the watercourse falls below 3km^2. For this reason, the Flood Zones are not of a resolution to be

used as application evidence to provide the details of possible flooding for individual properties or sites and for any sites with watercourses on, or adjacent to the site. The RoFfSW has been used in these cases because this provides a reasonable representation of the floodplain of such watercourses to use for a strategic assessment; however, detailed modelling would be required as part of any site-specific Flood Risk Assessment to support a planning application and site design.

5.2 Sites taken forward to a Level 2 assessment

All 12 sites provided by UDC were screened against fluvial, surface water, groundwater, reservoir datasets using available data. A Red-Amber-Green (RAG) system was applied to the sites on the basis, that:

- Red sites needed a Level 2 assessment and have significant obstacles or challenges for development which will need consideration going forward for development. These sites will need the Exception Test to show that the site can be developed safely from a flood risk perspective.
- Amber sites did not need a Level 2 assessment but are flagged in this report for developer considerations (recommendations provided in Section 5.3), but these are likely to be able to be addressed at the planning application stage. These sites are included within this report as they may have some surface water issues relative to access and egress to the site.
- Green sites that had no significant obstacles for development. However, it is noted sites may need an FRA and drainage strategy depending on the location of the site.

Groundwater flood risk should be considered as part of the site-specific assessments, but there is no equivalent national mapping or datasets to directly compare with fluvial/pluvial risk for allocation purposes. Rather, once sites have been assessed for other sources, a groundwater assessment should be undertaken. The same also applies to reservoir flooding.

It is noted that there are some sites that may be upgraded or downgraded in this assessment. For example, a site may show as Amber, but if there was an area of deep ponding, a prominent flow route bisecting a site, immediate constraints to site access at the boundary, potential for highly vulnerable types of development to occupy a site, it may be moved up to the Red category. In order to assess whether a site was deemed to have significant risk, professional judgment was used based on the extent and location of the flooding issues relative to the topography and site and access and egress.

For other sites with less significant but still noteworthy surface water issues, these have been highlighted below and the LLFA expect the developer to take these into account at an early stage when planning the form and layout of the site, the surface water drainage system and any surface water mitigation measures that may be necessary.

Table 5-1:Site screening to determine a L2 assessment

Site name	% of site in FMfP FZ2	% of site in FMfP FZ3	% of site in RoFfSW 3.3% AEP extent	% of site in RoFfSW 1% AEP extent	% of site in RoFfSW 0.1% AEP extent	% of site in 'Dry Day' reservoir extent	% of site in 'Wet Day' reservoir extent	JBA Groundwater Risk Emergence mapping	Justification for Level 2 Assessment
North Takeley Street	0.00	0.00	2.90	4.60	11.70	0.00	0.00	Not Susceptible	At risk from surface water flooding
Chesterford Research Park	0.00	0.00	0.13	0.14	6.80	0.00	0.00	Not Susceptible	At risk from surface water flooding
Land Between A120 and Stortford Road	0.00	0.00	3.10	4.80	14.6	0.00	0.00	Not Susceptible	At risk from surface water flooding
Land off the Broadway, Great Dunmow	10.90	9.60	3.70	6.20	16.20	5.43	10.88	Low	At risk from surface water, fluvial and reservoir flooding
Land east of Shire Hill Farm and south of Radwinter Road	0.00	0.00	4.60	7.80	17.00	0.00	0.00	Medium	At risk from surface water and groundwater flooding

Site name	% of site in FMfP FZ2	% of site in FMfP FZ3	% of site in RoFfSW 3.3% AEP extent	% of site in RoFfSW 1% AEP extent	% of site in RoFfSW 0.1% AEP extent	% of site in 'Dry Day' reservoir extent	% of site in 'Wet Day' reservoir extent	JBA Groundwater Risk Emergence mapping	Justification for Level 2 Assessment
Land Behind Knights Park	0.00	0.00	0.00	0.00	6.62	0.00	0.00	Medium	At risk from surface water and groundwater flooding
Land east of High Lane, Stansted Mountfitchet	7.90	6.90	4.60	7.80	17.00	0.00	0.00	Medium	At risk from surface water, fluvial and groundwater flooding
Land behind Weston Homes Office Park	0.00	0.00	0.30	0.50	2.00	0.00	0.00	Not Susceptible	At risk from surface water flooding
Land at Warrens Farm, Little Canfield	0.00	0.00	1.10	1.80	5.80	0.00	0.00	Low	At risk from surface water flooding
Land at Barnards Fields, Thaxted	0.00	0.00	0.60	0.90	4.40	0.00	0.00	Not Susceptible	At risk from surface water flooding

The Flood Zone values quoted show the percentage of the site at flood risk from that Flood Zone/event but also include the percentage of the site at flood risk at a higher risk zone. For example, if 50% of a site is in the Flood Zones, taking each Flood Zone individually, 50% would be in Flood Zone 2 but say only 30% might be in Flood Zone 3a and only 10% in Flood Zone 3b. Flood Zone 1 is the remaining area of the site outside of Flood Zone 2, so Flood Zone 2 + Flood Zone 1 will equal 100%.

Upon visual inspection of the above sites, there are also Ordinary Watercourses present at most sites. These are unmodelled but still pose risk, and therefore this has been discussed accordingly in the site tables (fluvial risk section).

5.3 Recommendations for Sites Not Taken Forward to a Level 2 Assessment

The sites not requiring a Level 2 assessment, are shown in Table 5.2 below. The risk posed to these sites is from surface water flooding (or an ordinary watercourse that does not present in the EA's Flood Zones due to catchment size). These sites also have some reservoir flooding and groundwater flooding.

Table 5 2: Sites not taken forward for a L2 assessment

Site name	% of site in FMfP FZ2	% of site in FMfP FZ3	% of site in RoFfSW 3.3% AEP extent	% of site in RoFfSW 1% AEP extent	% of site in RoFfSW 0.1% AEP extent	% of site in 'Dry Day' reservoir extent	% of site in 'Wet Day' reservoir extent	JBA Groundwater Risk Emergence mapping
Elsenham	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low
Gaunts End	**0.00**	**0.00**	**0.10**	**0.60**	**2.70**	**0.00**	**0.00**	Not susceptible

The Elsenham site was not taken forward to a Level 2 assessment because it is not at fluvial, surface water or reservoir risk, and low groundwater susceptibility. The west of the site is at a medium risk of groundwater flooding with groundwater levels being between 0.5 and 5m below the ground surface. However, the east of the site is not susceptible to groundwater flooding. The site was marked as 'green' in the RAG discussed in Section 5.2.

The Gaunts End site is not at risk from fluvial, reservoir or groundwater flooding. It has a very small extent of surface water flooding, predominantly along the boundary, with some encroachment across the western portion of the site in the 0.1% AEP event. Two ordinary watercourses start near the southern/ western site boundary, but the land slopes away and so the watercourse is flowing away from the site. The LIDAR is not well incised and surface water mapping reflects this with barely any risk shown until further downstream. Therefore, it is unlikely that fluvial flooding from these watercourses would reach the site due to the topography. Due to these reasons, this site was not taken forward for a Level 2 assessment. The site was marked as 'amber' in the RAG discussed in Section 5.2

5.4 Site summary tables

As part of the Level 2 SFRA, detailed site summary tables have been produced for the sites listed above in Table 5-1. The summary tables can be found in Appendix A. Each summary table sets out the following information:

- Basic site information
- Location of the site in the catchment
- Area, type of site, current land use (greenfield/ brownfield), proposed site use
- Sources of flood risk
- Topography - Description of topography across the site
- Existing drainage features
- Fluvial – proportion of site at risk including description from mapping/modelling, utilising depth, hazard, and velocity information from detailed hydraulic models where available
- Surface Water – proportion of site at risk including description from RoFfSW mapping using available depth, hazard, and velocity information
- Reservoir flood risk in both the 'Dry Day' and 'Wet Day' scenarios
- Groundwater - the degrees to which areas are susceptible to groundwater flooding based on geological and hydrogeological conditions on a 1km square grid.
- Sewers - records of flood incidents relating to public foul, combined or surface water sewers
- Flood history - historic incidents on or surrounding the site from the EA Recorded Flood Outline and Historic Flood Map datasets and historic incidences provided by ECC.
- Flood risk management infrastructure
  - Defences
  - Description of residual risk
- Emergency Planning
  - Flood Warning and Alert Areas
- Access and egress
- Dry islands
- Fluvial climate change - summary of available climate change allowances and increase in flood extent compared to the 1% AEP event (Flood Zone 3a)
- Surface water climate change - summary of available climate change allowances and increase in flood extent compared to the 1% AEP event
- Requirements for drainage control and impact mitigation
  - Broadscale assessment of possible SuDS to provide indicative surface water drainage advice for each site assessed for the Level 2 SFRA.
  - Opportunities for wider sustainability benefits and integrated flood risk management
  - Groundwater Source Protection Zones

- Historic landfill sites
- NPPF Planning implications
  - Exception test requirements
- Requirements and guidance for site-specific FRA (including consideration of opportunities for strategic flood risk solutions to reduce flood risk)
- Key messages – summarising considerations for the exception test to be passed (where required)
- Mapping information – description of data sources for the mapped outputs used within the assessment

5.4.1 Geo-PDF mapping

To accompany the site summary tables, there are Geo-PDF maps, with all the mapped flood risk outputs per site.

Flood risk information in the Geo-PDF maps include:

- Site boundary and Council boundary
- Title bar showing site name, name of mapped dataset and legend
- Each legend contains:
  - Site boundary
  - All Watercourses
  - 8m watercourse buffer
- Mapped datasets:
  - EA's Flood Warning and Flood Alert Area
  - JBA Groundwater Emergence Mapping
  - EA's Recorded Flood Outlines and Historic Flood Maps
  - EA's Risk of Flooding from Rivers and Sea
  - EA's Flood Map for Planning (Flood Zone 2 and 3)
  - Modelled Flood Zone 3b (3.3% AEP)
  - Indicative Flood Zone 3b (composite of 2%, 1.3% AEP) and FZ3a elsewhere
  - Climate Change - Indicative 3.3% AEP + CC (composite of best model proxy, e.g. 2%, 1.3% or 1% AEP), Indicative 1% CC Central (modelled composite proxy), Indicative 1% Higher Central (modelled composite proxy), Indicative 1% CC (Flood Zone 2 where no modelled extents present)
  - Fluvial modelling – River Chelmer - 3.3%, 1%, 0.1% AEPs, including 3.3%, 1% and 0.1% AEPs with Central and Higher Central climate change - with extent, depth, velocity and hazard
  - EA's RoFfSW with extent, depth, velocity, and hazard (for the 3.3% AEP, 1% AEP, and 0.1% AEP events)
  - EA's RoFfSW with climate change uplifts for the 3.3% and 1% AEP Upper End, with extent, depth, velocity, and hazard
  - EA's Reservoir Inundation Mapping – 'wet day' and 'dry day'

- Flood Defences with standardised attributes, detailing bridge abutments, embankments, engineered high ground, natural high ground, flood gates, spillways, and flood walls.
- Reduction in flood risk from rivers and sea

6 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 the vulnerability of users.

This report alongside the Level 1 SFRA provides a strategic assessment of flood risk in Uttlesford district. Prior to any construction or development, site-specific assessments will need to be undertaken so all forms of flood risk, and any defences at a site, are considered in more detail. Developers should, where required, undertake more detailed hydrological and hydraulic assessments of the watercourse 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 undertaken for a windfall site may find that the site is entirely inappropriate for development of a particular vulnerability, or even at all.

The EA advise that large development sites and associated new infrastructure may be able to deliver ways to reduce the risk of flooding (from all sources) on the site and also off the site where a stand-alone flood alleviation scheme is not viable. On these sites, early engagement with the EA is recommended. The EA also request that any development close to the edge of the floodplain is set back as much as possible leaving a development buffer, as a precautionary approach.

6.1 Requirements for Site-Specific Flood Risk Assessments

6.1.1 When is an FRA Required

Site-specific FRAs are required in the following circumstances:

- Proposals of 1 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 Environment Agency).
- Where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding.

An FRA may also be required for some specific situations:

- If the site may be at risk from the breach of a local defence (even if the site is actually in Flood Zone 1); the Environment Agency should be contacted to agree the breach assessment approach.
- Where evidence of historical or recent flood events have been passed to the LPA.
- In an area where surface water flood risk is a material consideration.
- Land identified in an SFRA as being at increased risk in the future.

6.1.2 Objectives of site-specific FRAs

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

- whether a proposed development will be at risk of flooding, from all sources, both now and in the future, taking into account climate change
- 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 local planning authority 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 Environment Agency and Uttlesford District Council (as listed in Section 2 in the Level 1 SFRA report). Guidance and advice for developers on the preparation of site-specific FRAs include:

- Standing Advice on Flood Risk (Environment Agency);
- Flood Risk Assessment for Planning Applications (Environment Agency);
- FRA Guidance Note (Environment Agency SHWG area);
- Site-specific Flood Risk Assessment: CHECKLIST (NPPF PPG, Defra).

Guidance for local planning authorities for reviewing Flood Risk Assessments submitted as part of planning applications has been published by Defra in 2015 – Flood Risk Assessment: Local Planning Authorities.

Developers should refer to the following sections of the Level 1 SFRA report for further information on the requirements for development.

- Section 8.1 - Principles for new developments
  - This section provides guidance for developers on applying the sequential and exception tests, consulting with statutory consultees, considering the risk from all sources of flooding, ensuring development seeks to reduce flooding and is safe for future users, enhancing the natural river environment and floodplain, and contributing to wider flood mitigation strategy within Uttlesford.
- Section 8.2 - Requirements for site-specific Flood Risk Assessments
  - Site layout and design (8.2.3)

- Modification of ground levels (8.2.4)
- Raised floor levels (8.2.5)
- Development and raised defences (8.2.6)
- Developer contributions (8.2.7)
- Buffer strips (8.2.8)
- Making space for water (8.2.9)

6.2 Flood warning and emergency planning

Appendix C of the Level 1 SFRA details the EA Flood Warning's and Flood Alert's available within Uttlesford at the time of writing. This Level 2 assessment has identified a few proposed sites located within existing EA FWAs. For proposed development within existing EA FWAs, developers should consult the EA to ensure that adequate flood warning procedures and evacuation processes are in place and that RMAs are not put under any additional burden.

Section 8.5 of the Level 1 SFRA report discusses NPPF requirements and what an emergency plan will need to consider and other relevant information on emergency planning.

6.3 Reservoirs

This Level 2 SFRA identified one site assessed within the site summary tables that is shown to be at risk of reservoir flooding during a 'Dry Day' scenario and one site in a 'Wet Day' scenario. The level and standard of inspection and maintenance required under the Reservoirs Act means that the risk of flooding from reservoirs is very low. However, there is a residual risk of a reservoir breach, and this risk should be considered in any site-specific FRA (where relevant).

Section 8.4.3 of the Level 1 SFRA report details considerations that developers should follow when allocating development downstream of a reservoir.

6.4 Duration and onset of flooding

The duration and onset of flooding affecting a site depends on several factors:

- The position of the site within a river catchment, with those at the top of a catchment likely to flood sooner than those lower down. The duration of flooding tends to be longer for areas lower in river catchments.
- Reservoirs in upper catchments will provide some online flood storage that reduces the flood risk downstream and delays the onset of flooding. At the confluence of the larger watercourses and smaller tributaries, there may be different timings of peak flows, for example smaller tributaries would peak much earlier than watercourses with larger catchments.
- The principal source of flooding: where this is surface water, depending on the intensity and location of the rainfall, flooding could be experienced within 30 minutes of the heavy rainfall event e.g., a thunderstorm. Typically, the duration of

flooding for areas at risk of surface water flooding, or from flash flooding from small watercourses, is short (hours rather than days).

- The preceding weather conditions prior to the flooding: wet weather lasting several weeks will lead to saturated ground. Rivers respond much quicker to rainfall in these conditions.
- Whether a site is defended, noting that if the defences were to fail, a site could be affected by very fast flowing and hazardous water within 15 minutes of a breach developing (depending on the size of the breach and the location of the site in relation to the breach), causing danger to life.
- Catchment geology: the permeability of a catchment affects its response time, for example chalk catchments take longer to respond than clay catchments.

Table 6-1 provides guidelines on the typical response time that may be expected for fluvial and surface water flooding. However, these are only broad guidelines, and it is recommended that a site-specific FRA refines this information based on more detailed modelling work where necessary.

Table 6-1: Guidelines on the duration of and onset of flooding

Principal source of flooding	Duration	Onset
Surface water	Up to 4 hours	Within 30 minutes
Fluvial	Between 4 and 24* hours	Within 2 to 8 hours

*Depending on where in the catchment a site is located, flooding could be rapid and flashy in the upper catchment (e.g. small tributaries), and slower responding and longer in duration in the lower catchment.

7 Surface Water Management and SuDS

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

The Level 1 SFRA summarises guidance and advice on managing surface water runoff and flooding in Section 9. Below is a guide to what is included in sections not expanded on here, for reference alongside this Level 2 SFRA:

- Section 9.1 - Role of the LLFA and LPA in surface water management
- Section 9.2 - Sustainable Drainage Systems (SuDS)
- Section 9.3 - Sources of SuDS guidance
- Section 9.4 - Other surface water considerations covering Groundwater Vulnerability Zones, Groundwater Source Protection Zones, Nitrate Vulnerable Zones (NVZs) and Critical Drainage Areas

7.1 SuDS suitability across the study area

The permeability of the underlying soils can determine the infiltration capacity and percolation capacities. As such, a review of the soil characteristics has been undertaken using Soilscapes online soil maps of England and Wales which allow for a basic assessment of the soil characteristics and infiltration capacity. Soilscapes is not intended as a means for supporting detailed assessments, specific site investigations should be undertaken to determine the soil types across the study area. A high-level assessment of the suitability of SuDS is included in the site tables in Appendix A.

This strategic assessment should not be used as a definitive site guide as to which SuDS would be suitable but rather as an indicative guide of general suitability based solely on soil type. Several other factors can determine the suitability of SuDS techniques including land contamination, the depth and fluctuation of the water table, the gradient of local topography and primary source of runoff etc. When considering NVZs and if areas have pollutants, infiltration may only be suitable where treatment measures are provided, prior to any discharge to surface or groundwaters.

Further site-specific investigation should be conducted to determine what SuDS techniques could be utilised at a particular development. The result of this assessment does not remove the requirements for geotechnical investigation or detailed infiltration testing and does not substitute the results of site-specific assessments and investigations. The LLFA should be consulted at an early stage to ensure SuDS are implemented and designed in response to site characteristics and policy factors. ECC as LLFA have set out their requirements for developers in the ECC SuDS Strategy (2017) which is available here.

8 Summary of Level 2 Assessment and Recommendations

8.1 Assessment Methods

The summary tables set out the flood risk to each site, including Flood Zone coverage, maps of extent, depth, and velocity of flooding as well as hazard mapping for the 1% AEP plus an allowance for climate change. Climate change mapping has also been produced to indicate the impact which different climate change allowances may have on the sites (where models are available) or using Flood Zone 2 as an indication of climate change. Each table also sets out the NPPF requirements for the site as well as guidance for site-specific FRAs.

A broadscale assessment of suitable SuDS options has been provided giving an indication where there may be constraints to certain sets of SuDS techniques. This assessment is indicative and more detailed assessments should be carried out during the site planning stage to confirm the feasibility of different types of SuDS. It may be possible that those SuDS techniques highlighted as possibly not being suitable can be designed to overcome identified constraints.

Consideration has also been given to the safety implications for development with respect to surface water flood risk. This reflects the requirement to consider the application of the Exception Test in circumstances where flood risk cannot be avoided.

8.2 Summary of Key Site Issues

Uttlesford District Council provided 12 sites for assessment. 10 sites were carried forward for Level 2 assessment. Detailed site summary tables that set out the flood risk to each site, NPPF requirements for the site, and guidance for site specific FRAs have been produced. A broadscale assessment of suitable SuDS options has been provided, giving an indication where there may be constraints to certain types of SuDS techniques.

The following points summarise the Level 2 Assessment:

- **Fluvial Flooding** - some areas of Uttlesford district are at greater risk than others. The main watercourses associated with fluvial risk in the L2 assessment are the:
    - River Chelmer
    - Ugley Brook
    - A number of unnamed Ordinary Watercourses
    - The sites that are affected the most within the study area are: Land off the Broadway, Great Dunmow and Land east of High Lane, Stansted Mountfitchet. Most sites assessed are also affected by Ordinary Watercourses, though risk tends to be more localised given the size of channel and topography.

- **Surface Water** - surface water flood risk is widespread across Uttlesford district. Water predominantly flows into and along topographically low-lying areas and is channelled into watercourses such as the River Cam, River Chelmer, Stansted Brook and The Slades. Most of the sites with a detailed Level 2 summary table are at surface water flood risk. The degree of flood risk varies, with some sites being only marginally affected, and other sites being more significantly affected. The sites at most significant surface water risk are: Land Between A120 and Stortford Road; Land off the Broadway, Great Dunmow; Land east of High Lane, Stansted Mountfitchet; and North Takeley Street.
- **Access and Egress** - Whilst not at significant flood risk within the site boundary, several sites with detailed Level 2 summary tables have potential access and egress issues as a result of fluvial and surface water flooding on the surrounding roads. These sites are: Chesterfield Research Park; Land Between A120 and Stortford Road; Land off the Broadway, Great Dunmow; Land east of Shire Hill; Land behind Knights Park; Land east of High Lane, Stansted Mountfitchet, Land at Warrens Farm; and North Takeley Street. Consideration should be made to these sites as to how safe access and egress can be provided during flood events, both to people and emergency vehicles. Also, consideration should be given to the nature of the risk, for example whether the flooding forms a flow path or bisects the site where access from one side to another may be compromised.
- **Effects of Climate Change** - fluvial and surface water climate change mapping indicates that flood extents are generally predicted to increase. As a result, the flood depths, velocities, and hazard of flooding may also increase. The significance of the increase tends to be dependent on the topography of the site and the climate change percentage allowance used.
    - Surface water: The 3.3% AEP +35% and the 1% AEP +40% climate change surface water events have been derived from the RoFfSW as an indication of climate change to surface water flood risk. The RoFfSW 1% AEP plus 40% climate change surface water events are approximately the same size as their respective present day 0.1% AEP events, showing Uttlesford district to be relatively sensitive to increases in surface water flooding due to climate change.
    - Fluvial: Climate change allowances for the 3.3% and 0.1% AEP events have been derived from hydraulic modelling of the River Chelmer and Stansted Brook model (Ugley Brook). They show the 1% AEP plus Central climate change allowance to be predominantly larger than the modelled present day 1% AEP fluvial events but smaller than the modelled present day 0.1% AEP fluvial events. For sites with unmodelled fluvial risk, appropriate proxies have been used to infer risk at this strategic scale.
    - Sites that are the most sensitive to changes in surface water and fluvial flood risk due to climate change include: Land off the Broadway, Great Dunmow and Land east of High Lane, Stansted Mountfitchet.

- Site-specific FRAs and site drainage and management plans should confirm the impact of climate change using the latest guidance. It is recommended that Uttlesford District Council work with other Risk Management Authorities (RMAs) to review the long-term sustainability of existing and new developments in these areas when developing climate change plans and strategies for the District.

- **Historic Flooding** - historic data provided by Uttlesford District Council/ the LLFA showed 39 instances of recorded flooding within the study area since 2021. The worst affected areas are in the east of the District, around Stansted Mountfitchet.
- **Groundwater** - groundwater emergence mapping indicates the majority of the south and east of Uttlesford district is at negligible risk from groundwater emergence due to the nature of the local geological deposits. There are sections in the north and northwest of Uttlesford that are at moderate to high risk; there is a risk to subsurface assets in these areas, and surface manifestation of groundwater is likely. The areas where emergence is likely are around the River Cam, Stansted Brook, The Slade, the River Stort and the low-lying surrounding floodplain areas. The areas include: Saffron Walden, Wendens Ambo, Little and Great Chesterford and Stansted Mountfitchet.
- **Canals** - The River Stort Navigation flows along part of the southwest border of the study. It runs north to south along the Uttlesford border between Rushy Mead Nature Reserve and Gaston Green and Hallingbury Marina. This has the potential to interact with other watercourses and become flow paths during flood events or in a breach scenario.
- **Reservoirs** - There is a potential risk of flooding in Uttlesford district that is posed by reservoirs within and outside of this study area. 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 Flood Risk Assessments (where relevant).

Requirements for Developers

- Any sites located where there is a Main River (including culverted reaches of Main River) will require an easement of 8m either side of the watercourse from the top of the bank. Developers will be required to apply for appropriate permits so the activity being carried out over easements does not increase flood risk.
- A strategic assessment was conducted of SuDS options using regional datasets. A detailed site-specific assessment of suitable SuDS techniques would need to be undertaken at site-specific level to understand which SuDS option would be best.
- At the planning application stage, developers will need to undertake more detailed hydrological and hydraulic assessments of the watercourses where required, for example at the site located on the Ugley Brook and particularly

where there are no detailed hydraulic models present. The modelling should verify flood extents with the latest climate change allowances.

- For sites allocated within the Local Plan, the Local Planning Authority should use the information in this SFRA to inform the Exception Test.
- For developments that have not been allocated in the Local Plan, developers must undertake the Sequential Test followed by the Exception Test (if required) and present this information to the Local Planning Authority for approval. The Exception Test should be applied where there is development which is classed as:
    - More vulnerable in Flood Zone 3a
    - Highly vulnerable in Flood Zone 2 (this is NOT permitted in Flood Zone 3a)
    - Essential infrastructure in Flood Zone 3a or 3b
    - Any development with significant* risk in the surface water 1% AEP event plus 40% climate change allowance flood extent.

**Flood risk issues are not always black and white - the significance of issues requires professional judgement, based on the location, topography and nature (including depth, velocity and hazard) of flooding, rather than simply whether part of a site is within a given flood extent. This would be determined as part of a Level 2 assessment.*

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.

It is recommended that as part of the early discussions relating to development proposals, developers discuss requirements relating to site-specific FRA and drainage strategies with both the Local Planning Authority and the Lead Local Flood Authority (LLFA), to identify any potential issues that may arise from the development proposals.

8.3 Planning Policy Recommendations

The planning policy recommendations in Section 10 of the Level 1 SFRA still stand for the site allocations and any windfall development that come forward. Recommendations in the L2 SFRA are as follows:

- Developers should consider flood resilience measures for new developments.
- Finished floor levels should be a minimum of either 600mm or 300mm above the 1% AEP plus climate change peak flood level, depending on the development vulnerability classification.
- Combine infiltration (e.g. permeable surfaces) and attenuation (e.g. balancing ponds and flood storage reservoirs) SuDS techniques to overcome constraints to the area of a site set aside for infiltration systems caused by development pressures.
- Where appropriate, opportunities for betterment should be sought where surface water flooding issues are present, which could be implemented through Supplementary Planning documents for individual settlements.

- Encourage the use of permeable surfacing in gardens and use measures to optimise drainage and reduce runoff.
- Consider opportunities for water conservation through rainwater harvesting and water butts where appropriate for new and existing development.
- Promote land management practices where appropriate to attenuate runoff and alleviate potential issues downstream.

8.4 Guidance for Windfall Sites and Sites Not Assessed in the L2 SFRA

- For sites not covered by the Environment Agency's Flood Zones, or where Flood Zones do exist, but no detailed hydraulic modelling is present, it is recommended that developers construct detailed hydraulic models at these sites as part of a site-specific FRA using channel, structure, and topographic survey, to confirm flood risk. Site-specific flood modelling will probably need to be developed in locations where it is necessary to understand the effects of proposed development schemes on the existing flood flow paths and flood volume storage.
- If a site's extents either include or borders with a Main River (including a culverted reach of Main River), an easement of 8m is required from either bank for access or maintenance. Any future development will require a flood risk permit from any activity within 8m of a Main River.
- If an ordinary watercourse is within or immediately adjacent to the site area, consultation with the Lead Local Flood Authority should be undertaken. If alterations or discharges are proposed to the watercourse, a land drainage consent will be required.
- Where necessary, blockages of nearby culverts may need to be simulated in a hydraulic model to confirm residual risk to the site.
- Surface water risk should be considered in terms of the proportion of the site at risk in the 3.3% AEP (30-year), 1% AEP (100-year) or 0.1% AEP (1,000-year) events, whether the risk is due to isolated minor ponding or deeper pooling of water, or whether the risk is due to a wider overland flow route.
- Surface water risk and mitigation should be considered as part of a detailed site-specific Flood Risk Assessment and Surface Water Drainage Strategy.
- Access and egress should be considered at the site, but also in the vicinity of the site, for example, a site may have low surface water risk, but in the immediate locality, access/ egress to and from the site could be restricted for vehicles and/ or people.
- Sites where there is a canal within or immediately adjacent to the site area, developers should consult the Canals and Rivers Trust. Any proposed alterations to the canal or discharges must be agreed with the Canals and Rivers Trust.
- If a site is located within 250m of a landfill site, there could be amenity, dirt, and contamination issues. Sites could be sensitive from the perspective of controlled waters and therefore any redevelopment must ensure there is no pollution risk to the water environment.

8.5 Use of SFRA Data and Future Updates

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

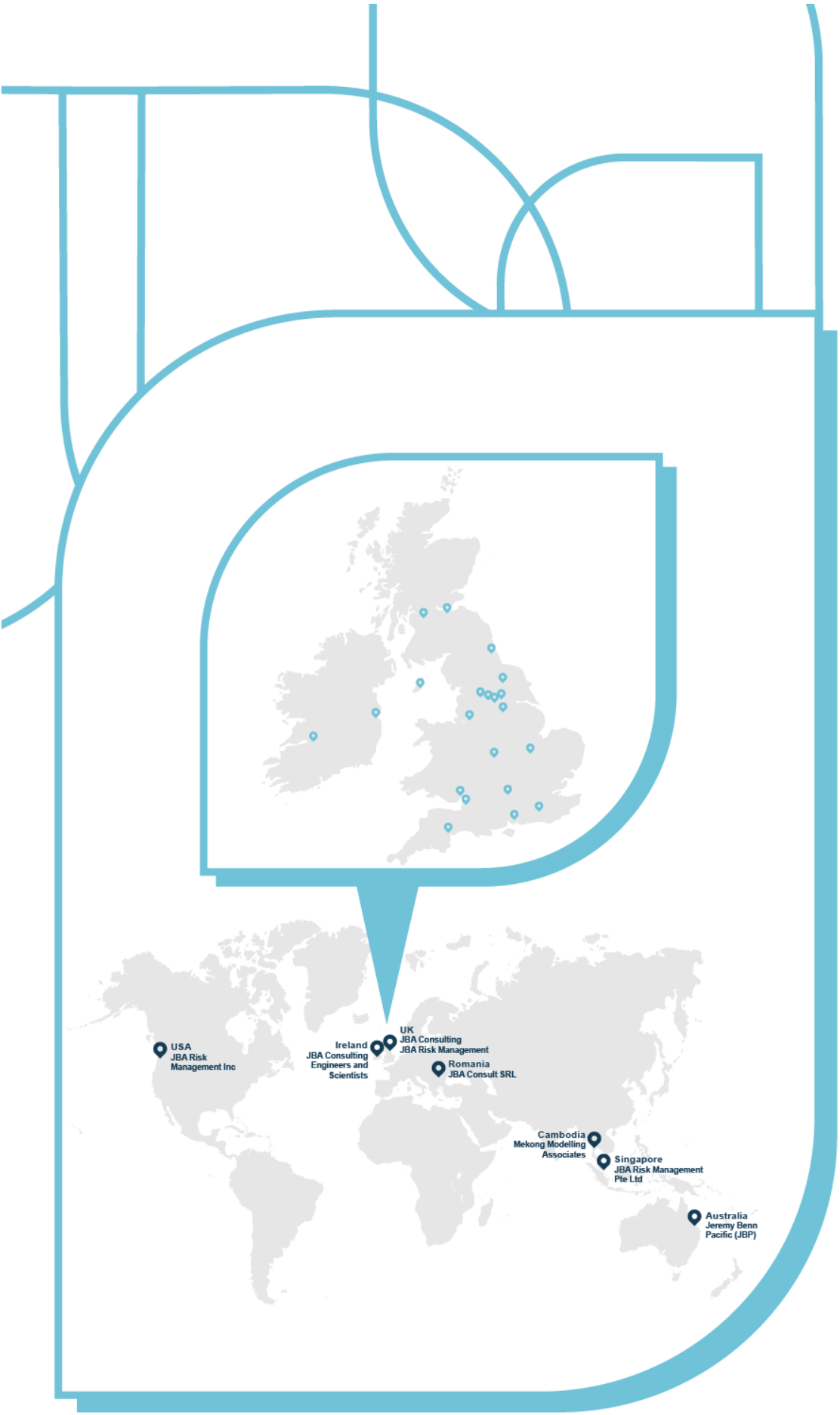
The SFRA should be a 'living document', and as a result should be updated when new information on flood risk, flood warning or new planning guidance or legislation becomes available. New information on flood risk may be provided by Uttlesford District Council, the Highways Authority, Essex County Council, Thames and Anglian Water, and the Environment Agency. Such information may be in the form of:

- New hydraulic modelling results
- Flood event information following a future flood event
- Policy/legislation updates
- Environment Agency flood map updates
- New flood defence or alleviation schemes.

The Environment Agency regularly reviews their flood risk mapping, and it is important that they are approached to determine whether updated (more accurate) information is available prior to commencing a detailed Flood Risk Assessment. It is recommended that the SFRA is reviewed when there are significant updates to the Environment Agency's Flood Zone mapping. This will ensure the latest data is still represented in the SFRA, allowing a cycle of review and a review of any updated data by checking with the above bodies for any new information.

A Site Summary Tables

B GeoPDFs and GeoPDF User Guide



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