Uttlesford District Council
Level 2 Strategic Flood Risk Assessment
Detailed Site Summary Table

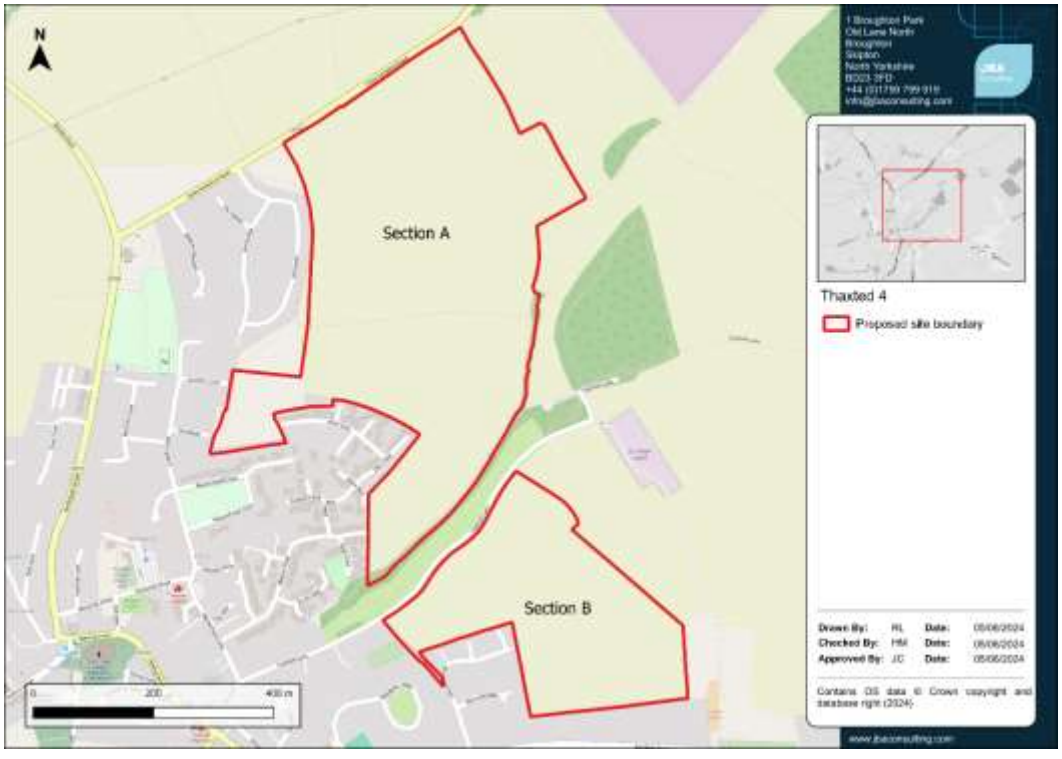
Site details	
Site Code	**Thaxted 4**
Address	Land at Barnards Fields, Thaxted
Area	36.92ha
Current land use	Agricultural Land
Proposed land use	Residential
Flood Risk Vulnerability	More Vulnerable

Sources of flood risk

Location of the site within the catchment

The site is located in the east of the River Chelmer catchment and is located northeast of Thaxted. The site is split into two land parcels. The northern parcel will be referred to as Section A and the southern parcel Section B.

Section A is bounded by the B1051 (Great Sampford Road) on its northern boundary, Copthall Lane on its southern boundary, agricultural land to the east and the residential areas of Moscotts and Holst Lane to the west. Section B is bounded by Copthall Lane on its northern boundary, agricultural land to its east, and the residential area of Barnards Field to its south and west. The River Chelmer is located approximately 650m west of the site.



Topography	For Section A, EA LiDAR 1m DTM indicates that the site slopes southwards, from an elevation of approximately 108m AOD in the northeast of the site, to approximately 88m AOD in the southwest. Transecting the middle of the site from east to west there is a depression with an elevation of approximately 90m AOD, which appears to be a field boundary ditch. For Section B, EA LiDAR 1m DTM indicates that the northwest of the site has an elevation of approximately 195m AOD, reducing to 180m AOD in the south and along the eastern boundary. The majority of both land parcels are situated on high ground, excepting the land close to the boundaries by Copthall Lane.
Existing drainage features	The Environment Agency's Statutory Main River Map indicates that there are no Main Rivers within the site boundary. The nearest main river is the River Chelmer, located approximately 650m to the west of the western boundary. In Section A, an unnamed Ordinary Watercourse flows along the southeastern boundary of the site, and is met by a second Ordinary Watercourse, before flowing in a south-westerly direction along the southern boundary of the site. The watercourse is a tributary of the River Chelmer, which is located approximately 650m west of the site. The unnamed watercourse is culverted for approximately 800m, from Brook View beyond the southwest corner of the site, to the southern edge of Thaxted along Park Lane, where it then flows southwest to meet the Chelmer.
Fluvial	**The proportion of site at risk FMFP:** FZ3 – 0% FZ2 – 0% FZ1 – 100% **Fluvial model outputs:** 3.3% AEP fluvial event – N/A 1% AEP fluvial event – N/A 0.1% AEP fluvial event – N/A **Available data:** The EA Flood Map for Planning Rivers and Sea Flood Zone shows available data for fluvial flood risk of Main Rivers. Ordinary Watercourses which have a catchment area less than 3km^2, are not covered by hydraulic modelling used to define the Flood Map for Planning. In the absence of Flood Zone mapping, the Risk of Flooding from Surface Water (RoFfSW) mapping has been used as a proxy for the risk of fluvial flooding from the Ordinary Watercourses. **Flood characteristics:** The EA Flood Map for Planning indicates that the site is located in Flood Zone 1 and therefore has a very low risk of fluvial flooding from Main Rivers. However, there is unmodelled/ unmapped flood risk associated with the Ordinary Watercourse along the southern boundary of Section A and the northern boundary of Section B. <u>Section A</u> The RoFfSW mapping indicates that out of bank flooding occurs in the 0.1% AEP event, affecting the southeast and southern boundaries of Section A. Flood depths reach up to 0.60m in the southeast of the site, with velocities reaching up to 2.00m/s.

	<u>Section B</u> The RoFfSW mapping indicates that there is limited flood risk along the northern boundary in the 0.1% AEP event. This flooding comes up to the site boundary but does not encroach onto the site. It is recommended that a detailed hydraulic model is developed to assess the risk of fluvial flooding from the ordinary watercourse at the site, as part of a site-specific FRA, in consultation with the EA and the LLFA.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – 0.6% Max depth – 0.0 - >1.20m Max velocity – 0.00 - 2.00m/s **1% AEP** – 0.9% Max depth – 0.0 - >1.20m Max velocity – 0.0 – 2.00m/s **0.1% AEP** – 4.4% Max depth – 0.0 - >1.20m Max velocity – 0.00 - 2.00m/s **Available data:** The Environment Agency's Risk of Flooding from Surface Water (RoFfSW) map has been used within this assessment. **Description of surface water flow paths:** RoFfSW mapping shows flow paths generated on the site within the 3.3%, 1% and 0.1% AEP events. <u>Section A</u> For all AEPs, the majority of mapped surface water flood risk relates to the floodplain of the Ordinary Watercourses at the southern and eastern boundaries of the site. The maximum flood depth of the floodplain is predicted to reach 0.60m with a maximum velocity of 2.00m/s. For the 3.3% AEP, a small surface water flow path forms in the west of the site, which relates to an existing ditch. A flow path is also predicted to form in the southeast of the site and drains into the Ordinary Watercourse at the southern boundary. Flood depths in the flow paths remain shallow (up to 0.15m) and velocities are low (0.00 – 0.50 m/s). For the 1% AEP event, the extent of surface water flooding increases within the existing ditch in the west of the site, and the flow path in the southeast of the site. Flood depths reach up to 0.60 – 0.90m, and velocities reach up to 1.00 – 2.00m/s. The extent of flooding at the southern and eastern boundaries of the site, relating to the Ordinary Watercourses, also increase. For the 0.1% AEP event, additional flow paths form in the centre, south and northeast of the site, and drain into the Ordinary Watercourses at the southeast and south of the site. The flow paths are shallow, with approximate depths of between 0.00 – 0.15m and velocities reach between 0.50 – 2.00m/s. The flow paths in the centre of the site, as well as the northern and northeast boundaries of the site, appear to relate to existing ditches. The areas of surface water flood risk in the west and southeast of the site, which are present in the 3.3% and 1% AEPs cover a larger proportion of the

	site in the 0.1% AEP and also increase in depth, with depths ranging from 0.00 - 1.20m. However, the extent of flooding is predicted to remain within the existing western ditch. The velocity of the ditch flow path in the west of the site ranges between 0.00 – 1.00m/s, whereas the flow path in the southeast of the site has a velocity between 0.50 – 2.00m/s. <u>Section B</u> For the 3.3 and 1% AEP events, there is a very small extent of surface water flooding along the northern boundary. Flood depths in the flow paths remain shallow (up to 0.30m) and velocities are low (0.00 – 0.50 m/s). For the 0.1% AEP event, flow paths emerge along the northern and southern boundary with a narrow strip of ponding in the centre of the site, associated with a topographic depression. The maximum depth and velocity are 0.60m and 2.00m/s giving it a hazard score of 'Danger to All'. There is also surface water flooding along the northwestern boundary, following Coptall Road, although this does not encroach onto the site.
Reservoir	This site is not shown to be at risk of reservoir flooding in either the 'dry day' or 'wet day' scenarios.
Groundwater	Using JBA's Groundwater Emergence map, it shows that the site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. However, this should be confirmed through additional site investigation work within a site-specific FRA.
Sewers	According to the Thames Water Flood Data, there are no incidents of sewer flooding in the CM6 2 postcode area. The site is located within the Thames sewer catchment. While Uttlesford is not identified as a flood priority catchment in Thames Water's Drainage and Wastewater Management Plan (DWMP), developers should consult Thames Water as part of any development proposal to ensure development does not exacerbate existing issues and maximise opportunities for development to deliver benefits to Thames Water's strategic aims.
Flood history	The EA Historic Flooding Map shows that the site has not previously been affected by fluvial flooding from Main Rivers. The nearest EA historic flood extent is located approximately 400m north of the site and relates to flooding from the River Chelmer in 1947. Historic flooding data provided by Essex County Council also showed no historic flood incidents for this site. There are no published Section 19 Flood Investigations for Thaxted and no Parish Flood Risk Survey information.
Flood risk management infrastructure	
Defences	The site is not currently protected by any formal flood defences.
Residual risk	The Ordinary Watercourse on the southern border of Section A appears to enter a culvert at Brook View, beyond the southwest corner of the site. This culvert runs for approximately 800m, to the southern boundary of Thaxted. If this culvert were to become blocked, then water could back up and increase the flood extent in the southwestern corner of Section A. It is recommended that the residual risk to the site of a blockage to this culvert is assessed within a detailed hydraulic model, as part of a site-specific FRA.
Emergency planning	

Flood warning	The site is not covered by any EA Flood Warning Areas, or Flood Alert Areas.
Access and egress	<u>Section A</u> Currently, the only vehicular access to the site is from the B1051, at the northern site boundary (it may be that other access points are proposed in future Master planning). This road is at very low risk of surface water and fluvial flood risk. Additional access routes may be created off Copthall Road, beyond the southern boundary of the site. Copthall Road is at high risk of surface water flooding in a 3.3% AEP and greater rainfall events, and the risk of flooding increases to the southwest, towards Mill End and Park Street. Flood depths on Copthall Road are predicted to reach up to 0.90 to >1.20m during a 0.1% AEP event, with velocities reaching 1.00 – 2.00m/s. It is recommended this route is avoided due to the widespread flood extents down its entire reach in the 0.1% AEP event and the ordinary watercourse flowing along the southern boundary. <u>Section B</u> Currently, the only vehicular access to the site is from Barnards Farm, on the western site boundary (it may be that other access points are proposed in future Masterplanning). Barnards Farm comes off Bardfield Road. These roads are at very low risk of fluvial flooding. In the 3.3% AEP event, surface water flooding on these roads only reaches 0.15m depth; however, it has a velocity of 2.00m/s which could impede access and egress. This increases to a depth and velocity of 0.30m and 2.00m/s respectively in the 1% AEP event and 0.90m >2.00m/s in the 0.1% AEP event. These depths and velocities may be challenging for safe access and egress.
Dry Islands	The site is not located on a dry island.
Climate change	
Implications for the site	**Management Catchment:** Combined Essex Management Catchment **Fluvial:** The site is located in the EA's FMfP Flood Zone 1 and there is no detailed model coverage to assess the impacts of climate change on fluvial risk. However, there are Ordinary Watercourses along the site boundary, and the RoFfSW mapping can provide an indication on fluvial flooding with climate change. It is recommended that a detailed hydraulic model of the Ordinary Watercourses at the site is developed, as part of a site-specific FRA, to assess the impacts of climate change. The 1% AEP RoFfSW extent has been used as a proxy for the 3.3% AEP + climate change fluvial event. The RoFfSW mapping shows very little difference in flood extent between the 3.3% and 1% AEP events, which suggests that climate change is not expected to have a significant impact on the extent of flooding from the Ordinary Watercourse during a 3.3% AEP event. The 0.1% RoFfSW AEP extent has been used as a proxy for the 1% AEP + climate change fluvial event. The increase in flood extent in the RoFfSW mapping indicates that climate change may increase the extent of fluvial flooding in the south and southeastern areas of Section A.

	Surface Water: The RoFfSW 3.3% AEP and 1% AEP models have been upscaled and run for climate change using the Upper End allowance. <u>Section A</u> The 3.3% SW+CC AEP model is similar in extent to the 1% surface water AEP event. However, depths and velocities are much greater than even the 0.1% AEP event, at 3.00m and 4.00m/s respectively, along the southeastern boundary. The 1% SW+CC AEP model is similar in extent to the 0.1% surface water AEP event. However, depths and velocities are much greater than even the 0.1% AEP event, at 3.04m and 4.00m/s respectively, along the southeastern boundary, meaning it is a 'hazard for all'. This shows that the site is very vulnerable to the impacts of climate change. <u>Section B</u> The 3.3% SW+CC AEP model is similar in extent and depth to the 1% AEP event. However, the velocity is greater at 1.40m/s. The 1% SW+CC AEP model is similar in extent to the 0.1% AEP event. However, depths and velocities are much greater than even the 0.1% AEP event, at 0.55m and 1.70m/s respectively, in the northern corner of the site, meaning it is a 'hazard for most'. This shows that the site is very vulnerable to the impacts of climate change. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.
Requirements for surface water drainage and integrated flood risk management	

Broad-scale assessment of potential SuDS	**Geology & Soils**
	• The bedrock geology is 'London Clay Formation – clay, silt and sand'.
	  ○ Relatively impermeable, improved slightly by the presence of sand and flint gravel.
	
	• The superficial deposit is 'Lowestoft Formation – Diamicton' which is composed of sheets of chalky till, with outwash sands and gravels, silts and clays.
	  ○ This mixture of characteristics means that the drainage of the area will vary. Sands, gravel and chalk facilitate water permeation; however, silts and clays make the ground impermeable.
	  ○ The composition of these soils will influence the drainage of the site.
	
	Sustainable Drainage Systems (SuDS)
	• BGS data indicates that the underlying geology is London Clay Formation, overlain with superficial deposits of Lowestoft Formation Diamicton and is likely to be poorly draining. Any proposed use of infiltration should be supported by infiltration testing. Off-site discharge in accordance with the SuDS hierarchy is required to discharge surface water runoff.
	• The site is not located within a historic landfill site.

	• Use of infiltration SuDS not appropriate if the site is located on contaminated ground. • Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques. • The RoFfSW mapping indicates the presence of surface water flow paths on the site during the 3.3%, 1% and 0.1% AEP events. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space. • If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner. • Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. • Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean and improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site. • The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.
Opportunities for wider sustainability benefits and integrated flood risk management	• The use of Natural Flood Resilience (NFM) measures on the Ordinary Watercourses which affect the site should be investigated, where suitable, to manage runoff and help mitigate flood events downstream in Thaxted and the wider River Chelmer catchment. • Opportunities should be taken to open (or 'daylight') the culverted ordinary watercourse beyond the south west boundary of the site, to enhance biodiversity and reduce the risk of blockage to the structure. • Opportunities for using source control SuDS to manage runoff rates and volumes, contributing to the reduction of flood peaks on the Ordinary Watercourses on the site and the River Chelmer downstream, as well as existing surface water flow paths leaving the site. • Waterside areas, or areas along known flow routes, can act as blue green infrastructure, being used for recreation, amenity, and

	environmental purposes, allowing the preservation of flow routes and flood storage, and at the same time providing valuable social and environmental benefits contributing to other sustainability objectives.
NPPF and planning implications	
Exception Test requirements	The Local Authority will need to confirm that the Sequential Test has been carried out, in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies residential development as 'More Vulnerable'. The Exception Test is required for this site because although the site is in Flood Zone 1, the site is at risk of surface water flooding during the 3.3% AEP and greater events. There will still be fluvial flood risk from the Ordinary Watercourse that needs to be modelled and should the site be at risk in Flood Zone 3 and 2, the Exception test will need to be passed. The fluvial flood risk from Ordinary Watercourses at the site is not represented in the EA Flood Zones, and therefore RoFfSW mapping has been used as a proxy. This indicates that the southeast and south of the Section A is also at risk from fluvial flooding. However, the majority of the site remains at low fluvial and surface water risk, and there are opportunities to ensure that the development will be safe for its lifetime and flood risk can be managed through a sequential approach to design.

Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:**
	
	• At the planning application stage, a site-specific FRA will be required, as the proposed development site is:
	  ○ Greater than one hectare
	  ○ At risk from Ordinary Watercourses through the site
	  ○ At risk of other sources of flooding (surface water)
	• All sources of flooding should be considered as part of a site-specific FRA.
	• Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the Environment Agency should be undertaken at an early stage.
	• Any FRA should be carried out in line with the National Planning Policy Framework (NPPF); Flood Risk and Coastal Change Planning Practice Guidance (PPG); Uttlesford District Council's Local Plan Policies and Essex County Council's SuDS Guidance.
	• The development should be designed with mitigation measures in place where required.
	• Detailed modelling will be required to confirm Flood Zone and climate change extents for the Ordinary Watercourses at the site as part of a site-specific FRA, to determine the flood extents, climate change and flood 1 in 1000-year flood level (0.1% AEP) The Environment Agency and LLFA should be consulted at the time of the flood risk assessment. They will advise as to whether existing detailed models are available, and if so, whether they need to be updated.Climate change should be assessed using recommended climate change allowances at the time of the assessment (Flood risk assessments: climate change allowances - GOV.UK (www.gov.uk)) for the type of development and level of risk. The current allowances were published in May 2022 but may be subject to change in the future.
	• Blockage modelling should be conducted to assess the residual risk associated with potential blockage of the culvert on the unnamed Ordinary Watercourse, beyond the southwest boundary of the site.

- Trash screens on culverts downstream of sites can build up with debris and increase flood risk. Additionally, Parish Councils can seek access improvements for trash screens and the ownership of the screen may be unknown.
- If any culverts or flood risk infrastructure are found to be under the required conditions, then the new development must not compromise assets downstream, and if there is scope, then improvements should be sought to bring the assets up to condition.
- Compensatory flood storage should be provided where development is proposed within the 1 in 100-year (1% AEP) flood extent, including an appropriate allowance for climate change. Ideally, proposed developments should have a net gain of floodplain storage to reduce the risk of flooding, on site and elsewhere.

Guidance for site design and making development safe:

- The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG).
- The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to greenfield rates.
- Planning permission is required to surface more than 5 square metres of unpaved ground using a material that cannot absorb water.
- Arrangements for safe access and egress will need to be demonstrated for the 1% AEP surface water event with an appropriate allowance for climate change, using the depth, velocity, and hazard outputs. As safe access and egress may not be possible to the south of the site during a 1% surface water event, if this is the preferred access route for the site, a Flood Warning and Evacuation Plan will be required.
- Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels. These measures should be assessed to make sure that flooding is not increased elsewhere.
    - set finished floor levels to 600mm above the 1% AEP flood level, including an appropriate allowance for climate change
    - include property flood resistance and resilience measures.
- Other examples of flood resistance and resilience measures include:
    - using flood resistant materials that have low permeability to at least 600mm above the estimated flood level
    - making sure any doors, windows or other openings are flood resistant to at least 600mm above the estimated flood level
    - raising all sensitive electrical equipment, wiring and sockets to at least 600mm above the estimated flood level.

Key messages

Development is likely to be able to proceed if:

- Fluvial flood risk is confirmed through hydraulic modelling in a site-specific FRA.
- Development is steered away from the area of predicted fluvial flood risk in the southern and southeastern boundaries of the Section A.
- Existing surface water flow paths on the site are incorporated and considered within the development design.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development steered away from the areas identified to be at risk of surface water and fluvial flooding across the site.
- A site-specific FRA demonstrates that the site is not at an increased risk of flooding in the future and that development of the site does not increase the risk of surface water or fluvial flooding on the site and to neighbouring areas.
- If flood mitigation measures are implemented then they are tested to check that they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).
- Safe access and egress can be demonstrated in the 1% AEP plus climate change events. This includes measures to reduce flood risk along these routes, such as raising access, but not displacing floodwater elsewhere.

Mapping Information	
Flood Zones	Flood Zones 2 and 3 have been taken from the EA Flood Map for Planning mapping. As the risk of fluvial flooding from Ordinary Watercourses on the site is not represented in the Flood Map for Planning, the RoFfSW mapping has been used as a proxy dataset.
Climate change	A detailed fluvial hydraulic model is not available for this site, and therefore the impacts of climate change cannot be assessed in detail. Instead the RoFfSW mapping has been used as a proxy for fluvial and surface water flooding in the 3.3% AEP + climate change and the 1% AEP + climate change events.
Fluvial depth, velocity and hazard mapping	Depth, velocity, and hazard data was derived from the EA RoFfSW mapping, in the absence of a detailed fluvial hydraulic model.
Surface Water	The EA RoFfSW dataset has been used for this assessment. The latest climate change allowances (updated May 2022) have also been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events (considered to be high, medium, and low risk) have been taken from EA RoFfSW mapping.
Groundwater	Groundwater data was derived from JBA's Groundwater Emergence maps.
Sewer	Uttlesford's sewers are managed by both Thames Water (for catchments flowing south) and Anglian Water (for catchments flowing north). Data for sewer flooding was provided by Thames Water.
Reservoir	The EA 'Dry Day' and 'Wet Day' Reservoir flood maps have been used in this assessment.