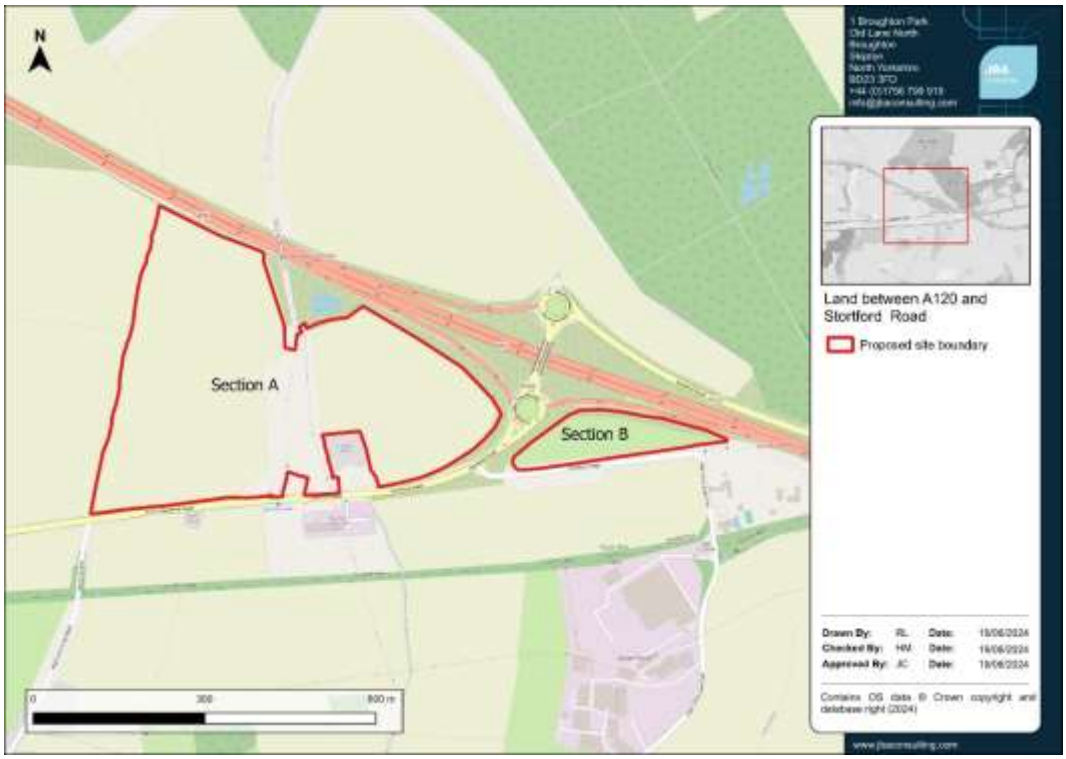
	Uttlesford District Council **Level 2 Strategic Flood Risk Assessment** **Detailed Site Summary Table**
Site details	
Site Code	**E**
Address	Land Between A120 and Stortford Road
Area	23.5 ha
Current land use	Greenfield (Arable Farmland)
Proposed land use	Employment
Flood Risk Vulnerability	Less Vulnerable
Sources of flood risk	
Location of the site within the catchment	The proposed development is located in the northeast of the Upper Roding catchment, which drains an area of 102 km^2. The site lies over an unnamed tributary of the River Roding, which flows parallel north to south. Section A is bound by the A120 to the north, the A120 Dunmow west interchange to the east, the B1256 Stortford Road to the south and fields to the west. Section B lies to the east of Section A. It is bound by the A120 to the north, Stortford Road to the west and High Cross Lane East to the south.
Topography	Section A encompasses a small valley, with an Ordinary Watercourse (a tributary to the River Roding) flowing north to south through the centre of the site. The lowest elevation is located in the central south of the site at 85.3m AOD, and highest in the southeast, at 96.9m AOD. The site is high ground along its western and eastern boundaries. Section B has a maximum elevation of approximately 200.0m AOD along the northern, eastern and southern boundaries of the site. The elevation reduces to approximately 140.0m AOD in the west and centre of the site

	
Existing drainage features	In Section A an Ordinary Watercourse (tributary to the River Roding) flows north to south through the centre of the site, bisecting it. Its source is approximately 0.6km north of the site at the Canfield Spring/ Highwood Quarry. It flows under the A120 and through the site parallel with an access road from the B1256 to the Quarry to Strood Court, which forms part of the site boundary. It enters culvert at the B1256, shifting ~60m east past Blue Gates Industrial Park, before continuing south, then south-west to meet the Roding approximately 1.2km north of Great Canfield. A second Ordinary Watercourse is present outside of the site, joining the other at the A120 culvert north of the site. The source of this watercourse is approximately 750m north-east in High Wood. No ordinary watercourses are present in Section B.
Fluvial	**The proportion of site at risk FMFP:** FZ3 – 0% FZ2 – 0% FZ1 – 100% **Fluvial model outputs:** 3.3% AEP fluvial event – Not Available 1% AEP fluvial event – Not Available 0.1% AEP fluvial event – Not Available **Available data:** The EA Flood Map for Planning Rivers and Sea Flood Zone shows available data for fluvial flood risk of Main Rivers. The Ordinary Watercourses on the site have a catchment area less than 3km^2, and therefore are not covered by hydraulic modelling used to define the Flood Map for Planning. Flood Zones are present for this watercourse approximately 920m downstream of the site, but this is based on 2D generalised modelling (national FMfP). The

	River Roding model is a detailed 1D-2D hydraulic model, which does not include this tributary. In the absence of Flood Zone mapping, the Risk of Flooding from Surface Water (RoFSW) mapping has been used as a proxy for the risk of fluvial flooding from the Ordinary Watercourses. **Flood characteristics:** Using the RoFfSW dataset as a proxy for fluvial flood risk in the absence on any detailed modelling or national Flood Zones, this shows that in Section A the floodplain around the banks of the channel is at flood risk for all modelled return periods. Flood risk should be confined to the north-south course of the ordinary watercourse given the land rises away from the floodplain on both sides, with the greatest flood depths along the channel centre line. Flood depths within the floodplain, outside of the main channel, are expected to reach up to 0.3m depth. There is a small difference between the 3.3% and 1% AEP extents, with a wider extent in the 0.1% AEP event. The RoFfSW extents would likely overestimate risk around the B1256 junction as it does not represent the culvert structure or channel capacity. However, the site is bisected from the Ordinary Watercourse. Section B does not have any main or ordinary watercourses.It is therefore 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.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – 3.1% Max depth – 0.6-0.9m Max velocity – 1-2m/s **1% AEP** – 4.8% Max depth – 0.6-0.9m Max velocity – 1-2m/s **0.1% AEP** – 14.6% Max depth – >1.2m Max velocity – >2m/s **Available data:** The Environment Agency's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment. **Description of surface water flow paths:** RoFSW mapping shows flow paths generated on the site within the 3.3%, 1% and 0.1% AEP events, bisecting the Section A due to the path of the Ordinary Watercourse. <u>Section A</u> For the 3.3% AEP event, the majority of surface water flooding occurs within the confines of the channel floodplain in the centre of the site, with localised sections along the northern and southern perimeter. This flooding has a maximum depth and velocity of 0.9m and 1-2m/s respectively. This corresponds to a hazard level of 'danger for most'. In the 1% AEP event, the extent of flooding within the central channel expands slightly. The localised flooding in the north and south of the site expand but remain minor along the boundaries. The 1% AEP event is

	expected to generate a maximum depth and velocity of 0.9m and 2m/s respectively and corresponds to a maximum hazard level of 'danger for all'. In the 0.1% AEP event, the flood extents widen more significantly. Through the centre of the site, the extents are wider but are still confined to the lower lying floodplain topography. Some isolated patches occur in the central eastern portion of the site, and the two flow paths along the northern and southern boundaries increase significantly to flood the full width of the lower western half of the site and encroaching into the site's northern boundary. The 0.1% AEP event is expected to generate a maximum depth and velocity in excess of 1.2m and 2m/s respectively. The maximum hazard level on site is 'danger for all'. <u>Section B</u> For the 3.3% AEP event, the surface water flooding pools in the centre of the site. This has a maximum depth and velocity of 1.20m and 1,00m/s respectively. In the 1% AEP event, the extent of flooding expands slightly, but the maximum depth and velocity of the flood remains the same. This corresponds to a hazard level of 'danger for all'. For the 0.1% AEP event, the extent increases, covering a larger proportion of the centre of the site. The maximum depth and velocity increases to >1.20m and 2.00m/s respectively with the hazard level remaining at a 'danger for all'.
Reservoir	The site is not expected to be at risk from reservoir flooding in the 'dry day' or 'wet day' scenario.
Groundwater	JBA's Groundwater Emergence Risk Map is provided as 5m resolution grid squares. The entire site is expected to have no risk of groundwater flooding. As a result, this zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
Sewers	Sewer flooding records for Uttlesford district provided by Thames Water showed 11 instances of sewer flood events affecting the CM6 1 postcode. The site is located within the Thames sewer catchment. While Uttlesford district 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 Environment Agency's Historic Flood Map shows no records of flooding on the site.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows that the site is not protected by formal flood defences.
Residual risk	The Ordinary Watercourse in Section A enters several culverts in the vicinity of the site: under the A120, then another short access road along the site's central northern boundary, and then again by Strood Court at the Stortford Road B1256.

	If these culverts were to block in the event of a flood, it could exacerbate localised risk around the northern and southern boundaries. Flood risk would be expected to remain confined to the floodplain given the rising topography east and west away from the channel. The impacts should be investigated in a site-specific FRA using a hydraulic model. There is no residual risk in Section B.
Emergency planning	
Flood warning	The site is not located within a Flood Warning or Flood Alert area.
Access and egress	Vehicular access Section A is possible via a private access road which connects to the B1256 to the south and an access track connected to Loverose Way to the north. In the 3.33% AEP event, a small area of flooding is expected to occur at the access road's junction with the B1256, with flood depths of up to 0.3m and velocities of up to2m/s. While this may potentially restrict vehicular access through a hazard level of 'caution', access to the west of the site through the south is expected to remain largely dry. To the north, while there is only minimal flooding to the access track itself, access may be challenging under this scenario, as flood depths on the connecting Loverose Way are expected to reach 0.9m with velocities in excess of 2m/s. Access and egress to the north is thus expected to be challenging and generates a 'danger for most' hazard rating. In the 1% AEP event, flooding is expected to expand at the access road's junction with the B1256, while maximum flood depths and velocities are expected to remain the same, at 0.3m and 2m/s, respectively. This may further restrict vehicular access, while maintaining a hazard rating of 'caution'. In the 0.1% AEP event, flooding at the access road's junction with the B1256 is expected to reach a maximum depth and velocity of 0.9m and >2m/s, respectively. Access and egress to the site, from either side, is thus expected to be challenging, with a 'danger for most' hazard rating. Consideration is needed with regards to the site being bisected by both fluvial and surface water risk north to south. The access road is west of the watercourse, so how the eastern portion of the site can safely reach this road, or whether access can be gained directly to the B1256 from that half of the site, needs to be investigated and confirmed in a site-specific assessment. The Dunmow West Interchange is free of flood risk, with stretches of risk in all AEP events along the A120 to the north of the site. Away from the site, there are just isolated stretches of risk on both roads where watercourses and surface water flow paths cross roads. Vehicular access to Section B is possible via Stortford Road, which connects to the A120 to the north. In the 3.3% and 1% AEP events the access road to Section B is not flooded, however, Stortford Road and the A120 is flooded to the west of the site with a maximum depth and velocity of 0.90m and 2.00m/s. However, access and egress are still possible from the east of Stortford Road. In the 0.1% AEP event there is more substantial flooding on Stortford Road to the east of Section B, as well as on the A120 to the east and west of Section B, making access and egress more challenging. However, access and egress are still possible via Stortford Road to the south of the site. This road does have localised pooled flooding but this is not at a depth or extent

	that could impede access and egress. The maximum depth and velocity of this flooding is 0.30m and 1.00m/s.
Dry Islands	The site is not located on a dry island.
Climate change	
Implications for the site	**Management Catchment:** Roding, Beam and Ingrebourne **Fluvial:** There is no detailed model coverage to assess the impacts of climate change on fluvial flood risk. The RoFfSW 3.3% AEP and 1% AEP models have been upscaled and run for climate change using the Upper End allowance. This mapping can provide an indication on fluvial flooding with climate change, including for Ordinary Watercourses. However, it is recommended that a detailed hydraulic model of the Ordinary Watercourse on the site is developed, as part of a site-specific FRA, to fully assess the impacts of climate change on the developable land. The 1% AEP RoFSW extent has been used as a proxy for the 3.3% AEP + climate change fluvial event. The RoFSW mapping shows only a minor expansion 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% RoFSW AEP extent has been used as a proxy for the 1% AEP + climate change fluvial event. The increase in flood extent in the RoFSW mapping along ordinary watercourses indicates that climate change may increase the extent of fluvial flooding, especially in the south of the site. **Surface Water:** <u>Section A</u> The 3.3% AEP + climate change event shows that climate change would make the flood extents greater than the 1% AEP event, though increases mainly along the existing channel floodplain running through the centre of the site. Under this scenario, maximum depths of 0.96m and velocities of 1.56m/s are possible within the Ordinary Watercourse and its surrounding banks, while previously dry areas are subject to isolated shallow (<0.15m) surface water flooding along the south and northern border. The 1% AEP + climate change event indicates that the surface water flooding is akin to the 0.1% AEP event extents and hence floods wider in the floodplain of the ordinary watercourse and along the northern and southern boundaries to the west, although the latter flow paths are shallow (<0.25m). Under this scenario, flood depths of 1.17m and velocities of up to 2.02m are expected within the Ordinary Watercourse and its surrounding floodplain, particularly in the northern portion of the site. Apart from a larger area of isolated ponding in the eastern half of the site, the extents overall are similar to the existing surface water flooding AEPs. There are no 'new' flow paths activated. <u>Section B</u> The 3.3% AEP + climate change event shows that climate change will increase the flood extent in the centre of the site, with a similar extent to the

	0.1% AEP event without climate change. Under this scenario the maximum depth and velocity is 0.95m and 0.05m/s. The 1% AEP + climate change event indicates that the extent is slightly larger than the 3.3% AEP + climate change event. The maximum depth and velocity of this flooding is 1.25m and 1.30m/s. 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 site sits on a bedrock of London Clay Formation, consisting of clay, silt and sand. This is overlain by a superficial layer of sedimentary diamicton of the Lowestoft Formation. **Sustainable Drainage Systems (SuDS)** • The site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work. • BGS data indicates that the underlying geology is London Clay Formation, overlain with superficial deposits of mainly Lowestoft Formation Diamicton and is likely to have varying drainage. 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 Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality. • The site is designated in one Nitrate Vulnerable Zones (NVZs) ○ Surface Water - “Surface Water S441 - Roding (Cripsey Brook to Loxford Water) NVZ” • 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 Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths during the 0.1% AEP event. 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 Watercourse which affects the site should be investigated, where suitable, to manage runoff and help mitigate flood events downstream in the wider Roding catchment. • Opportunities for using source control SuDS to manage runoff rates and volumes, contributing to the reduction of flood peaks on the Ordinary Watercourse and the Roding 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 Exception Test is shown to not currently be required for this development as the site is classified as ‘Less Vulnerable’ (Employment and not present in the Flood Zones). However, there is still significant surface water flood risk and fluvial flood risk from the Ordinary Watercourses which needs to be investigated in more detail and confirmed in a FRA, which if detailed modelling shows that parts of the site lie within FZ2/FZ3, the Exception test will need to be applied.

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 and fluvial)
	• 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 scenario modelling should be conducted to assess the residual risk associated with potential blockage of the culverts on the Ordinary Watercourse around the site boundaries.
	• 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 tidal event and surface water events with an appropriate allowance for climate change, using the depth, velocity, and hazard outputs. As access and egress to some sections of the site will not be possible during the 0.1% AEP event, a Flood Warning and evacuation Plan will be required.
- An environmental permit for flood risk activities may be required for work in, under, over or within 8m from a fluvial main river and from any flood defence structure or culvert.
- 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.
    - raise them as much as possible.
    - include extra 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.
    - by 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, and development is steered away from the areas of fluvial and surface water flooding in the central portion of the Section A (north to south) and the central portion of Section B (east to west).
- 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 flooding across the site, including the areas on the northern and southern boundaries of the site.
- Safe access and egress can be demonstrated in the fluvial and surface water plus climate change events. This includes measures to reduce flood risk along these routes such as

raising access, but not displacing floodwater elsewhere. As the site is bisected by fluvial and surface water flood risk, consideration is needed for the eastern half of the site given the current access road is west of the watercourse.

- 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 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).

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 RoFSW 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 RoFSW mapping has been used as a proxy for fluvial flooding using the upscaled 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 RoFSW mapping, in the absence of a detailed fluvial hydraulic model.
Surface Water	The EA RoFSW 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 RoFSW 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. Sewer flooding data was requested from Anglian Water but not received within the study timeframe.
Reservoir	The EA 'Dry Day' and 'Wet Day' Reservoir flood maps have been used in this assessment.