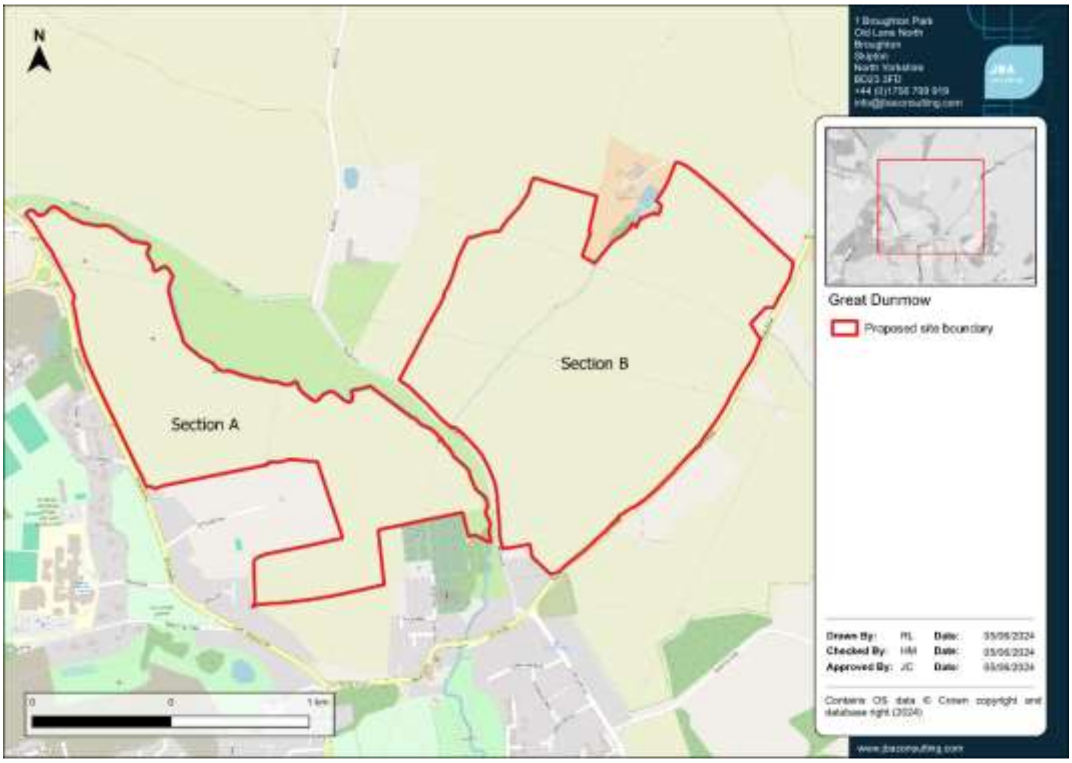
Uttlesford District Council
Level 2 Strategic Flood Risk Assessment
Detailed Site Summary Table

Site details	
Site Code	**Great Dunmow**
Address	Land off The Broadway, Great Dunmow
Area	70.32ha
Current land use	Greenfield
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 northern half of the River Chelmer catchment. The site is located to the north of Great Dunmow. It is bounded by agricultural land to the north, east and southeast. To the southwest and west the site is bounded by a residential area and the B1008. The site has been divided into two land parcels due to the River Chelmer flowing northwest to southeast through the middle of it parallel with Bigods Lane, therefore the land to the west will be referred to as Section A, and the land to the east as Section B. 
Topography	Section A has a maximum elevation of 73m AOD to the west of the site and a minimum elevation of 52m AOD to the east of the site; land slopes downwards in a north-easterly direction towards the floodplain of the Chelmer.

	Section B has a maximum elevation of 82m AOD to the east of the site and a minimum elevation of 55m AOD to the west of the site; land slopes downwards in a south-westerly direction towards the floodplain of the Chelmer.
Existing drainage features	The Environment Agency's Statutory Main River Map indicates that the River Chelmer forms the northern site boundary of Section A. It flows between the two land parcels in a north-westerly to south-easterly direction before turning south to the east of Church End. There are two Ordinary Watercourses within Section B flowing north-east to south-west in parallel through the centre of the site (from approximately the centre of the site at the foot of the raised land). These join the Chelmer the other side of Bigods Lane. An Ordinary Watercourse flows towards Section A from Hoglands Wood, northeast between the leisure centre and Bowyers Road, into culvert at the B1008, and forming the north-easterly site boundary to join the Chelmer at the site's northern tip.
Fluvial	**The proportion of site at risk FMFP:** FZ3 – 9.6% FZ2 – 10.9% FZ1 – 89.1% **Fluvial model outputs:** 3.3% AEP fluvial event – 8.7% 1% AEP fluvial event – 9.6% 0.1% AEP fluvial event – 10.9% **Climate change scenarios:** 3.3% AEP Central – 9.3% 3.3% AEP Higher Central – 10.0% 1% AEP Central – 9.9% 1% AEP Higher Central – 10.2% 0.1% AEP Central – 11.6% 0.1% AEP Higher Central – 12.9% **Available data:** The EA Flood Map for Planning Rivers and Sea Flood Zone shows available data for fluvial flood risk of Main Rivers. The River Chelmer 1D-2D 2020 hydraulic model has been used in this assessment of flood risk and takes precedence over the national FMfP. It includes central and higher climate change scenarios for each of the return periods. There is also modelling available for the Chelmer Tributaries (2020), but the two watercourses included in this model are further south in Great Dunmow and hence are outside of the site boundary and area of influence. The two small Ordinary Watercourses in Section B have a catchment area less than $3km^2$, and therefore 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 (RoFSW) mapping has been used as a proxy for the risk of fluvial flooding from the Ordinary Watercourses.

	Flood characteristics: Overall, the flood extents between FZ3b, FZ3a and FZ2 are quite similar; the extents increase in each event, but the floodplain is wide and well-defined, meaning the floodplain is largely filled in each event with little difference overall. Section A During a 3.3% AEP fluvial flooding event, flooding occurs along the site's border with the River Chelmer, particularly in the northern section where the floodplain is lower, and the flood extent encroaches further into the site. Flood depths along the site's eastern boundary, close to the river's centreline, may reach up to 4.5m flowing at 2m/s. This generates a maximum hazard of 'danger for all'. Out of the main channel, flood depths are greater through the northern central portion of the floodplain, at depths of around 0.7m and velocities of 0.5m/s, corresponding to a hazard of 'danger for most'. On the outer floodplain, flood extents are shallower, with depths and velocity reaching approximately 0.3m and 0.3m/s. Under the Central 3.3% AEP fluvial flooding scenario, maximum depths of 4.6m and velocities of 1.8m/s are present in channel, while across the floodplain, depth and velocities are around 1m and 0.7m/s respectively. In the 3.3% AEP plus Higher Central scenario, maximum depth and velocity reaches 1.5m and 0.7m/s respectively. During a 1% AEP fluvial flooding event, maximum flooding extent is increased slightly, to a maximum depth of 4.6m and velocity of 1.8m/s. The central portion of the floodplain has a depth and velocity of 0.9m and 0.7m/s, respectively. The fringes of this floodplain decrease in depth and velocity, to approximately 0.45m and 0.4m/s respectively. Under the Central 1% AEP fluvial flooding scenario, maximum depths of 4.8m and velocities of 1.8m/s are possible within the channel of the River Chelmer, while in the wider floodplain, depths and velocities reach a maximum of 1.5m and 0.7m/s respectively. In the Higher Central 1% AEP scenario, depths and velocities in channel reaching 4.9m and 1.8m/s;, and depths and velocities across the floodplain reaching 1.6m and 0.8m/s respectively. During a baseline 0.1% AEP fluvial flooding event, maximum flood extent is again increased slightly, with a maximum depth and velocity of 5.1m and 2.1m/s in the channel, respectively. Under this scenario, the central portion of floodplain has a depth of 1.3m and velocity of 0.8m/s, while the outer floodplain areas are up to 0.6m and 0.5m/s. Under the Central 0.1% AEP fluvial flooding scenario, maximum depths and velocities of 5.3m and 2.1m/s are possible in the River Chelmer channel, while across the floodplain, these reach 2.1m and 1.3m/s. For the higher central scenario, depths and velocities increase to 5.6m and 2.1m/s in channel, and 2.4m and 1.3m/s across the floodplain . Section B Section B is expected to be largely unaffected by flood risk from the Chelmer; all AEP events meet the southwestern boundary but are not shown to flow beyond Bigods Road into the site. A 3.3% AEP fluvial flood shows minimal, shallow encroachment onto the site boundary at depths and velocities of 0.4m and 0.4m/s, respectively. Under the Central 3.3% AEP fluvial flooding scenario, depths of 0.53m and

	velocities of 0.6m/s, while under the Higher Central 3.3% AEP scenario, depths of 0.8m and velocities of 1.7m/s may occur. Under the 1% AEP, the flood extent is expected to remain broadly similar, with flood depths on the westernmost border of 0.6m and velocities of 0.7m/s. Under the Central 1% AEP fluvial flooding scenario, depths of 0.5m and velocities of 0.6m/s, while under the Higher Central 1% AEP scenario, depths of 0.8m and velocities of 1.7m/s may occur. Under the 0.1% AEP, the flood extent is expected to remain broadly similar again, with flood depths on the westernmost border of 1m and velocities of 1.7m/s. Under the Central 0.1% AEP fluvial flooding scenario, depths of 0.5m and velocities of 1.7m/s, while under the Higher Central 0.11% AEP scenario, depths of 1.5m and velocities of 1.7m/s may occur. For the two parallel Ordinary Watercourses, the RoFSW mapping was used as a proxy for fluvial flooding. Under a 3.3% AEP event, the channel is expected to experience flood depths of 0.9m and velocities of up to 2m/s. Under a 1% AEP event, flooding is expected to remain within the channel, with a maximum flood depth of 1.2m and velocity of >2m/s along the southern Ordinary Watercourse close to its confluence with the River Chelmer. Under the 0.1% AEP event, flooding is expected to exceed bank capacity, and maximum depths and velocities of >1.2m and >2m/s are possible.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – 3.7% Max depth – 0.60-0.90m Max velocity – 1.00-2.00m/s **1% AEP** – 6.2% Max depth 0.90-1.20m Max velocity – 1.00-2.00m/s **0.1% AEP** – 16.2% Max depth – 0.90-1.20m Max velocity – >2.00m/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:** <u>Section A</u> During the 3.3% surface water AEP event, there are flow paths in the north and southeast of the site, largely in alignment with the Flood Zones and Chelmer floodplain. These have a maximum depth and velocity of 0.90m and 1.00m/s respectively. During the 1% surface water AEP event, the flow paths in the north and southeast of the site increase in extent. The maximum depth and velocity of this flooding increases to 1.20m and 1.00m/s respectively. During the 0.1% surface water AEP event, the entire north of the site and the eastern boundary is inundated more significantly; still contained in the Chelmer floodplain but encroaching further into the northern end of the site than the fluvial Flood Zones due to another flow path joining from the ordinary watercourse to the south-west by Bowyers Road. The maximum

	depth and velocity of this flooding increases to >1.20m and 2.00m/s respectively. <u>Section B</u> During the 3.3% surface water AEP event, there are three flow paths, which converge into two, associated with the topography of the Ordinary Watercourses on the site. These are flowing from the high ground in the northeast around Marks Farm to the lower ground southwest of the site and are tributaries to the River Chelmer. The flooding appears to be largely contained towards the depressed channels. These have a maximum depth and velocity of 0.90m and 2.00m/s respectively. During the 1% surface water AEP event, the flow paths are still largely contained in their depressed channels. Ponding occurs in the centre and southwest of the site. The maximum depth and velocity of this flooding increases to 1.20m and >2.00m/s respectively. During the 0.1% surface water AEP event, the existing flow paths are wider and there are now approximately 5 parallel surface water flow paths flowing towards the Chelmer. A new flow path is established in the south of the site and there is additional ponding in numerous locations across the site. The maximum depth and velocity of the flooding in the channel is >1.20m and >2.00m/s respectively. The maximum depth and velocity of the ponded water is 0.30m and 2.00m/s.
Reservoir	This site is shown to be at risk of reservoir flooding in both the ‘dry day’ and ‘wet day’ scenarios. In the ‘dry day ‘scenario Section A is inundated, in the north and along the eastern border of the site. Section B is not inundated during this ‘dry day’ scenario. In the ‘wet day’ scenario Section A is inundated to a greater extent in the north and along the eastern boundary. There is also a very small extent of flooding in Section B, on the western boundary.
Groundwater	Using JBA’s Groundwater Emergence map, the majority of Section A is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. However, in the southeast of the site 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. In the southeast of the site there is a small area where 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. Section B is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions.
Sewers	According to the Thames Water Flood Data, there are no incidents of 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 was previously flooded in 1947 by the River Chelmer, due to the channel capacity being exceeded. This inundated the western boundary of Section A and the eastern boundary of the Section B. 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 Great Dunmow 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	There are several structures in the vicinity of the site which, in the event of a blockage, could exacerbate risk in the localised area. The River Chelmer flows under the B1008 at the northern tip of Section A; water would likely back up outside of the site and the site is already inundated in this area of low floodplain, but it could increase localised depths and velocities. The Ordinary Watercourse flowing towards this same end of Section A, flows under the B1008 downstream of Bowyers Road. This could cause additional water to flow into the site as shown in the RoFfSW mapping. The Chelmer flows under Church End Road just downstream of the site, and it is unlikely there would be a significant impact to the site here looking at the flood extents and topography, but it may cause localised increases at the site boundaries. The two Ordinary Watercourses in Section B flow under Bigods Lane to meet the Chelmer. If these were to block, localised increases in flood risk could be seen along the boundary, though risk is anticipated to be low as the Chelmer extents are confined. The RoFfSW mapping can be used as an indication of where water could pool. It is recommended that the residual risk to the site due to a blockage of these culverts is assessed using the River Chelmer model, as part of a site-specific FRA.
Emergency planning	
Flood warning	The site is not covered by the Environment Agency's Flood Warning Service. However, the Flood Alert Service does cover the eastern boundary of Section A, and a small proportion of the western boundary of Section B.
Access and egress	Section A Vehicular access of Section A is possible via an access road off the B1008, on the western boundary, and Bigods Lane to the east. During the 3.3% AEP surface water event, although there is ponding on the B1008, this is to a maximum depth and velocity of 0.30m and 0.25m/s respectively and so access and egress to the site is still possible via the west. However, under the same AEP, Bigods Lane is expected to become inundated with up to 0.6m water flowing >2m/s and should be avoided where possible. For a 3.3% AEP fluvial event, this road is at low risk of flooding to the south, while there is a potential for flooding to the north where the road, renamed Dunmow Road/B184, crosses the River Chelmer and depths and velocities of 0.5m and 0.6m/s, respectively, are expected. Flooding on Bigods Lane is

	expected to reach depths of 0.7m flowing at 0.65m/s in places, and thus should be avoided. During the 1% and 0.1% surface water AEP events the flooding is more extensive, blocking the access road connected to the B1008 with maximum depths and velocities of 0.30m and 2.00m/s. The velocity of this water is high which may impede safe access and egress. For the egress route via B1008, all AEP events, the depths and velocities of surface water flooding at the roundabout to the north of the B1008 are high, which may impede safe access and egress via this route. Therefore, access and egress should be in a southerly direction from the site. Access and egress conditions are expected to remain similar in the baseline and climate change scenarios. <u>Section B</u> Vehicular access to Section B is possible via an access road off the B1057 on the northeastern site boundary, and along the southwest via the same section of Bigods Lane as Section A. For the B1057 access route, access and egress are not impacted in any of the surface water AEP events. In all AEP events, the depths and velocities of surface water flooding at the to the northeast of the B1057 may make safe access and egress challenging via this route. Therefore, access and egress should be in a south-westerly direction from the site. As the access and egress to Section B is expected to be along the same section of Bigods Lane, conditions under the different AEPs is expected to also apply to Section B. Access and egress conditions are expected to remain similar in the baseline and climate change scenarios.
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 River Chelmer 2020 1D-2D hydraulic model has been used to assess the impacts of climate change on fluvial risk. The River Chelmer has available climate change outputs for the Central and Higher Central allowances for a 3.33% AEP event, and the Higher Central allowance for a 0.1% AEP event. The FZ3b+CC extent was also available. In the 3.3% fluvial AEP plus Central climate change allowance, there is a very similar extent to the 1% baseline AEP event, with similar flood depths (4.6m for both) and velocities (both 1.8m/s) within the channel. Within the floodplain, water may reach 1m deep and travel at 0.7m/s under the Central climate change simulation, versus 1.3m and 0.7m/s for the baseline 1% AEP. Under the 3.3% fluvial AEP plus Higher Central climate change allowance, there is again a similar extent to the 1% baseline AEP event, albeit with slightly higher maximum flood depths and velocities in the channel of 4.9m and 2.1m/s. Within the floodplain, water may reach 1.5m deep and travel at 0.7m/s under the Higher Central climate change simulation.

	In the 1% fluvial AEP plus Central climate change allowance, there is a very similar extent to the 1% baseline AEP event, with similar flood depths (4.6m for the baseline, 4.8 for the climate change simulation) and velocities (both 1.8m/s) within the channel. Within the floodplain, water may reach 1.5m deep and travel at 0.7m/s under the 1% AEP Central climate change simulation, versus 1.4m and 0.7m/s for the baseline 1% AEP event. Under the 1% fluvial AEP plus Higher Central climate change allowance, there is again a similar extent to the 1% baseline AEP event, albeit with slightly higher maximum flood depths and velocities in the channel of 4.9m while maintaining the same velocity of 1.8m/s. Within the floodplain, water may reach 1.6m deep and travel at 0.8m/s under the Higher Central climate change simulation. In the 0.1% AEP plus Central climate change scenario, the maximum depths and velocities are expected to be similar to those in the baseline 0.1% AEP event, at 5.3m and 2.1m/s, and 5.1m and 2.1m/s, respectively. Under the 0.1% AEP Higher Central scenario, depths of 5.6m in the channel are possible. In the floodplain, flood depths of 1.9m, 2.1m, 2.4m are possible for the baseline, Central and Higher Central 0.1% AEP events respectively. This corresponds to velocities of 1.3m/s for all three simulations. Furthermore, FZ3b+CC shows a similar extent to the baseline. This indicates that the site is relatively insensitive to changes to fluvial flooding as a result of climate change, as the floodplain is well contained within the baseline footprint. For the Ordinary Watercourses on the Section B site, the RoFSW mapping can provide an indication on fluvial flooding with climate change. The RoFSW mapping shows a moderate increase in flood extent between the baseline 3.3% and 3.3%+CC AEP events along the Ordinary Watercourses, suggesting that climate change will have a moderate impact on the extent of flooding from these watercourses during a 3.3% AEP event. The RoFSW mapping shows a large increase in flood extent between the baseline 1% and 1%+CC AEP events along the Ordinary Watercourses, suggesting that climate change will cause greater out-of-channel flooding along these watercourses during a 1% AEP event. **Surface Water:** The RoFfSW 3.3% AEP and 1% AEP models have been upscaled and run for climate change using the Upper End allowance. The 3.3% AEP + climate change event shows that climate change is expected to moderately increase the risk of surface water to the site, with the extent of the flow path in Section B increasing, and additional flow paths and ponding emerging in Section B. The 1% AEP + climate change event shows that climate change is expected to significantly increase the risk of surface water to the site. This mapping indicates that the flow path in the north and along the eastern boundary of Section A greatly increases in extent. In Section B there is a large increase in the extent of flow paths and the formation of numerous new ponding sites during the 1% AEP event, when climate change is taken into account. 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 a mixture of 'Head – clay silt, sand and gravel', 'Alluvium – clay, silt, sand and gravel', 'Kesgrave Catchment Subgroup- sand and gravel', 'Lowestoft Formation – diamicton' and 'River Terrace Deposits, 1 – sand and gravel'.
	  ○ Due to the wide range of superficial deposits the drainage will vary.
	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 a large range of superficial 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 historic landfill site.
	• 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 RoFSW 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 Great Dunmow and the wider Chelmer catchment. • 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, as well as existing surface water flow paths leaving the site.
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 there is significant fluvial flood risk within all Flood Zones at the eastern side of Section A and the development type is 'More Vulnerable'. 'More Vulnerable' development is not permitted within Flood Zone 3b. Development should be steered away from areas of flood risk.

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:
	  ○ Within fluvial Flood Zones 2 and 3
	  ○ Greater than one hectare
	  ○ At risk of other sources of flooding (surface water, groundwater, and reservoir)
	• 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.
	- 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 may need to be conducted using the existing River Chelmer model to assess the residual risk associated with potential blockage of the culverts.
	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 during a 1% surface water event, 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:

- The area of the eastern side of Section A, located in Flood Zone 3 is left undeveloped.
- Development is steered away from the area of fluvial flood risk in the eastern side of the site and the small flow paths/areas of surface water ponding 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 flooding across 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.
- 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 and the River Chelmer 1D-2D hydraulic model for FZ3b. 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	The central and higher central allowances were available for the River Chelmer (2020) hydraulic model to indicate the impacts on fluvial flood risk. 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.
Fluvial depth, velocity and hazard mapping	Depth, velocity, and hazard data was derived from the River Chelmer (2020) hydraulic model for the 3.3%, 1% and 0.1% AEP events.
Surface Water	The EA Risk of Flooding from Surface Water (RoFSW) dataset has been used for this assessment.
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.
Reservoir	The EA 'Dry Day' and 'Wet Day' Reservoir flood maps have been used in this assessment.