	Uttlesford District Council **Level 2 Strategic Flood Risk Assessment** **Detailed Site Summary Table**
Site details	
Site Code	**7**
Address	Land at Warrens farm, Little Canfield
Area	121.41ha
Current land use	Fields
Proposed land use	Residential
Flood Risk Vulnerability	More Vulnerable
Sources of flood risk	
Location of the site within the catchment	The site consists of several land parcels and is located in between the Pincey Brook and River Roding catchments, in the northerly end of their catchments, to the north of Takeley. The site is comprised of three main land parcels named hereafter as Section A: to the west of Smiths Green Lane (Pincey Brook catchment), Section B: to the east of Smiths Green Lane and Section C: to the south of Section B to Stortford Road(B1256) (Sections B and C lie in the Roding catchment). The site as a whole is bounded by A120 to the north, Bambers Green Road to the east, a residential area of Takeley and the B1256 (Stortford Road) to the south and a residential area and fields around Prior's Wood to the west. The eastern boundary is located 280m from the River Roding and the western boundary is located 77m from Pincey Brook.
Topography	Section A has a maximum elevation of 104.5m AOD in the south of the site and a minimum elevation of 95.6m AOD in the north of the site, sloping south to north. Section B has a maximum elevation of 103.9m AOD in the west of the site and a minimum elevation of 87.9m AOD in the east of the site, sloping west to east. Section C has a maximum elevation of 96.3m AOD in the west of the site and a minimum elevation of 87.8m AOD in the east of the site, sloping west to east.
Existing drainage features	There are a number of depressed channels in the ground elevation data running from west to east through the site, which are small drains or ordinary watercourses following field boundaries and hedgerows. These are around Parker's Farm to the southern boundary of Section B and north to south along a portion of the eastern boundary. All these small drains lead to the Roding close to Maynards. Section A appears to have a very short reach of the source of an Ordinary Watercourse which appears to go into culvert beneath the A120 at the

	northern boundary, leading into the Pincey Brook catchment around the airport carpark.
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. The Ordinary Watercourses on the site have a catchment area less than 3km2, 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 (ROFfSW) mapping has been used as a proxy to infer 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, as the Flood Zone maps only identify fluvial flood risk from Main Rivers with catchments >3km2, and therefore do not represent the risk of flooding from the Ordinary Watercourses on the site, the ROFfSW mapping has been used as a proxy to infer the risk of fluvial flooding of this watercourse. The ROFfSW mapping indicates that the majority of the flood risk is contained in the drains themselves; however, some out of bank flooding occurs in the 0.1% AEP event, affecting the north of Section A. The north and eastern boundary as well as the area surrounding the Ordinary Watercourses of Section B is also more widely inundated. Surface water flood depths reach up to >1.20m in the area surrounding the ordinary watercourse of Section B, with velocities reaching > 2.00m/s. This may be different to fluvial risk but offers an indication of where out of bank flows may have the biggest impact. Whilst the risk is anticipated to be low given the topography and alignment along field boundaries, the risk posed by the Ordinary Watercourses should be investigated in a site-specific Flood Risk Assessment which may require detailed hydraulic modelling.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – 1.1% Max depth – 0.90-1.20m Max velocity – 1.00-2.00m/s **1% AEP** – 1.8% Max depth – >1.20m Max velocity – 1.00-2.00m/s **0.1% AEP** – 5.8% Max depth – >1.20m

Max velocity – >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 in the 3.3%, 1% and 0.1% AEP events. Overall, risk in the 3.3% and 1% AEP events is low. The 0.1% AEP event widens in extent but the majority of the risk is in the same locations as the lower order events

Section A

For the 3.3% and 1% AEP events there is surface water ponding in several locations across the site, but this is largely contained in topographic ditches. The only exception is to the north of the site, along the boundary where surface water flooding is ponding against the A120, associated with the source of an Ordinary Watercourse which appears to go into culvert beneath the A120. This has a maximum depth and velocity of 0.90m and 1.00m/s respectively.

In the 0.1% AEP event, the extent of surface water flooding increases slightly with additional ponding appearing in numerous locations across the site, the most extensive being in the northwestern corner of the site. A flow path also appears in the centre of the site, flowing from south to north. This has a maximum depth and velocity of 1.20m and 2.00m/s respectively.

Section B

For the 3.3% and 1% AEP events there is surface water ponding in several locations across the site, largely contained in topographic ditches. The only exception is to the southeast of the site. This ponding occurs to the south of an unnamed Ordinary Watercourse flow path, which is contained in a ditch. The ditch bisects the site west to east. The ponding has a maximum depth and velocity of >1.20m and 2.00m/s respectively.

In the 0.1% AEP event, the extent of surface water flooding increases with flow paths emerging along the northern and eastern boundary of the site, associated with an unnamed Ordinary Watercourse that runs along the site boundary. These flow paths have a maximum depth and velocity of >1.20m and >2.00m/s respectively. The flow path present in the 3.3% and 1% AEP events increases in extent and is no longer contained by the ditch.

Section C

For the 3.3% and 1% AEP events there is surface water ponding and flow paths in several locations across the site, largely contained in ditches. The ponding has a maximum depth and velocity of 0.90m and 2.00m/s respectively.

In the 0.1% AEP event, the extent of surface water flooding increases with flow paths no longer being fully contained by ditches. These flow paths have a maximum depth and velocity of 1.20m and >2.00m/s respectively.

Reservoir	This site is not shown to be at risk of reservoir flooding from either the 'dry day' or 'wet day' extents.
Groundwater	Using JBA's Groundwater Emergence map, Sections A and B are not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. Section C is largely not considered to be susceptible to groundwater flooding. However, in small section of the eastern boundary there is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely. Groundwater levels are between 0.5m and 5m below the groundwater surface.
Sewers	According to the Thames Water Flood Data, there are 11 incidents of sewer flooding in the CM6 1 postcode area and 3 incidents of sewer flooding in the CM22 6 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 280m east of the eastern boundary of Section C. This relates to flooding from the River Roding in 1974, due to the channel capacity being exceeded. 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 Takeley 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 is a culvert on the northern boundary of Section A, taking an unnamed Ordinary Watercourse under the A120, for a distance of approximately 115m. If this structure were to block at the site's northern boundary, water could back up and flood further into the northern part of Section A, as shown in the ponding in the RoFfSW mapping as an indication. The Ordinary Watercourse in Section B has several small structures to enable access to Parker's farm. The risk anticipated from the blockage of these structures would be low given the size of the drain along vegetated field boundaries, but it could increase out of bank flooding in the developable area of the site, so this should be considered in a Flood Risk Assessment. It is recommended that the residual risk to the site due to a blockage of these structures is assessed at site-specific FRA stage, which may require detailed hydraulic modelling.
Emergency planning	
Flood warning	The site is not covered by modelled data in the Environment Agency's Flood Warning Service, nor the Flood Alert Service.

Access and egress	Vehicular access of Section A is possible via an access road off Smiths Green Lane, on the eastern boundary. Vehicular access to Section B is possible via an access road off Smiths Green Lane on the western site boundary (it may be that other access points are proposed in future master planning). Part of Section B may need to be accessed from Bambers Green Road to the east and Stortford Road to the south due to the Ordinary Watercourse bisecting the site west to east. Despite the presence of flows parallel to Smiths Green Lane, within the site boundary in all AEP events, these are not at depths or velocities which will impede access and egress. Therefore, access and egress are not significantly impacted in any of the surface water AEP events. Although the 3.3% surface water plus climate change (SW+CC) AEP model shows flooding on Smiths Green Lane, this is not at a depth or velocity which would impede access or egress. The 1% SW+CC model shows access and egress may be impacted with maximum depths of 0.25m and maximum velocities of 1.04m. Vehicular access and egress to Section C are possible via an access road in the south of the site, off the B1256, via Thornton Road and via Bambers Green Road to the east. Access and egress are impacted in all of the surface water AEP events. Surface water crosses the road in alignment with nearby water courses to a maximum depth and velocity of >1.20m and >2.00m/s. The 3.3% and 1% SW+CC models show that access and egress are impacted, with a maximum depth and velocity of 1.60m and 2.27m/s.
Dry Islands	The site is not located on a dry island.
Climate change	
Implications for the site	**Management Catchment:** Roding, Beam and Ingrebourne and Upper Lee (Smiths Green Lane acts as the boundary) **Fluvial:** There is no detailed model coverage to assess the impacts of climate change on fluvial risk. However, there are Ordinary Watercourses present on the site, and the ROFfSW mapping can provide an indication of fluvial flooding with 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 a slight 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 across the site, usually focussed around the site boundary. The impacts of climate change on fluvial flood risk from the ordinary watercourses should be investigated as part of a site-specific FRA, which may require hydraulic modelling to confirm risk. **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% surface water plus climate change AEP model is very similar in extent, depth and velocity to the 0.1% surface water AEP event. The maximum depth and velocity of this flooding is 1.30m and 1.99m/s respectively, located in the south of Section B. These depths and velocities are a 'hazard for all'. This shows that the site is sensitive to climate change during more frequent flood events. The 1% surface water plus climate change AEP model shows the emergence of flow paths from northeast to southwest in the centre of the site. The extent of the flooding in the north of the site also increases to a flow path flowing from north to south. The maximum depth and velocity of this flooding is 1.37m and 2.91m/s respectively, in the south of Section B, meaning the flooding is a 'hazard for all'. 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 largely '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.
	• A very small proportion of section C has Kesgrave Catchment Subgroup – sand and gravel and Head- clay, silt, sand and gravel as the superficial deposit. These are present along the western boundary and are likely to have varying drainage sue to varying characteristics.
	
	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 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 the Roding catchment and the wider Pincey Brook catchment. • Opportunities should be taken to open (or 'daylight') the culverted ordinary watercourse beyond the northern 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 Pincey Brook 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'. Whilst the site is shown to be in Flood Zone 1, there are Ordinary Watercourses present and therefore surface water mapping has been used to infer risk in the absence of fluvial data. If detailed modelling at site-specific FRA stage shows that parts of the site lie with FZ2/3, the Exception test will need to be applied. 'More Vulnerable' development is not permitted within Flood Zone 3b; this extent will need to be confirmed at site-specific FRA stage and development steered away from any 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:
	  ○ 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 may be required to assess the residual risk associated with potential blockage of the culverts on the unnamed Ordinary Watercourses.
	• 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:

- Development is steered away from areas at fluvial and surface water flood risk. Fluvial flood risk impacts will need to be investigated and confirmed as part of a site-specific Flood Risk Assessment, which may require a detailed hydraulic model.
- 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.
- 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. Consideration will be needed where the Ordinary Watercourse crosses Section B west to east, bisecting it.
- 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 ROFfSW mapping has been used as a proxy dataset and identifies fluvial flood risk at the southeastern and southern boundaries of the site.
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. 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.