CC010-A

	Chelmsford City Council Level 2 Strategic Flood Risk Assessment Detailed Site Summary Tables
Site details	
Site Code	**GS17a**
Address	East Hanningfield
Area	0.85
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 within the Chelmer Operational Catchment, which is 657.4km^2. Within the operational catchment, the site is located at the upstream reach of the Sandon Brook catchment This catchment is not designated as artificial or heavily modified, and is predominantly rural. The site is bounded by agricultural land to the north, west and south and a residential area to the east.
Topography	EA LiDAR indicates that the site is relatively flat with a maximum elevation of 60.0mAOD in the north of the site and a minimum elevation of 58.2mAOD along the eastern site boundary.
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 a tributary to Sandon Brook located approximately 1.5km to the northeast of the site. There are no Ordinary Watercourses or ditches within the site boundary, however there a small unnamed ordinary watercourses to the north and south of the site..
Critical Drainage Area	The site is not in a critical drainage area.
Fluvial and tidal	**The proportion of site at risk FMFP:** **FZ3 – 0.0%** **FZ2 – 0.0%** **FZ1 – 100%** *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).* **Defended outputs:** **3.3% AEP fluvial event – 0.0%** **1% AEP fluvial event – 0.0%** **0.1% AEP fluvial event – 0.0%**

	Modelled results show the percentage of site at risk from a given AEP flood event. **Available data:** Proportion of the sites at flood risk are determined from the Environment Agency's Flood Map for Planning Flood Zones. This represents the undefended scenario. The Environment Agency's 1D-2D ISIS-TUFLOW detailed hydraulic model for Sandon Brook (2015) has been used within this assessment of fluvial flooding. **Flood characteristics:** This site is not at risk from fluvial flooding from Main Rivers. Close to the site's northern boundary and south-eastern boundary are the sources of two Ordinary Watercourses. These are unlikely to pose significant risk to the site, but as there is no detailed modelling available, the risk should be confirmed as part of a site-specific Flood Risk Assessment. The site is not at risk from tidal flooding.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP – 4.2%** Max depth – 0.3-0.6m Max velocity – 0.5-1.0 **1% AEP – 10.2%** Max depth – 0.6-0.9m Max velocity – 0.5-1.0m/s **0.1% AEP – 68.4%** Max depth – 0.9-1.2m Max velocity – 1.0-2.0m/s *The % SW extents quoted show the % of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 100-year includes the 30-year %).* The Environment Agency's Risk of Flooding from Surface Water mapping was used in this assessment. **Description of surface water flow paths:** In the 3.3% AEP event, surface water flooding is mostly located to the north of the site, with isolated spots towards the source of the northern Ordinary Watercourse, and the emergence of a surface water flow path along the southwestern boundary, flowing in a south-eastern direction towards the source of the Ordinary watercourse. This flow has a maximum depth and velocity of approximately 0.3-0.6m and 0.5-1.0m/s respectively. The highest hazard value for this AEP event is 'Danger for Most'. In the 1% AEP event, the flooding along the southwestern boundary is more extensive, with additional flooding along the western boundary. This has a maximum depth and velocity of approximately 0.6-0.9m and 0.5-1.0m/s respectively. The highest hazard value for this AEP event is 'Danger for Most'. In the 0.1% AEP event, surface water flooding is very extensive, inundating over two-thirds of the site, with the exception of the eastern boundary. This originates from fields to the west, flowing in a south-easterly, then easterly direction along the course of the Ordinary Watercourse. This flooding has a maximum depth and velocity of approximately 0.9-1.2m and 1.0-2.0m/s respectively. The highest hazard value for this AEP event is 'Danger for Most'.

Reservoir	According to the Environment Agency's (EA) risk of flooding due to reservoirs dataset, there is no risk of flooding in the 'Dry Day' or 'Wet Day' scenarios.
Groundwater	JBAs Groundwater Emergence Map is provided as 5m resolution grid squares. The whole site is shown to have negligible risk of groundwater emergence in this area, and any groundwater emergence incidence has a chance of less than 1% annual probability of occurrence.
Sewers	Sewer flooding records were not available for this assessment. The entirety of Chelmsford is identified as a Flood priority catchment in Anglian Water's Drainage and Wastewater Management Plan (DWMP). Developers should consult Anglian Water as part of any development proposal to ensure development does not exacerbate existing issues and maximise opportunities for development to deliver benefits in line with the long term strategic aims set out in the DWMP.
Flood history	The Environment Agency's Historic Flood Map shows records of flooding on the site. Essex County Council as LLFA has one record of flooding within 500m of the site. This lies approximately 450m to the southeast of the site although the date and source of this flooding has not been recorded.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows that there are no formal defences within the site boundary. The site does not lie within the Environment Agency's reduction in risk of flooding from rivers and sea dataset.
Residual risk	There may be residual risk to the site where the two unnamed ordinary watercourses flow under The Tye and Main Road culverts. If these were to block, water could back up and cause flooding in a similar pattern to the surface water risk mapping. This should be assessed as part of a site-specific flood risk assessment.
Emergency planning	
Flood warning	The entire site is not located in an Environment Agency Alert Warning Area, nor an Environment Agency Flood Warning Area.
Access and egress	Access and egress to the site is currently via an access road off The Common on the eastern site border. Access and egress are not impacted by surface water flooding in the 3.3% AEP, 3.3% plus climate change AEP events, 1% AEP event nor 1% plus climate change AEP event. Access and egress may be impacted by the 0.1% AEP event, and the 1% AEP event plus climate change, both central and lower scenarios. The maximum depth of this flooding is approximately 0.4m and the maximum velocity is approximately 1.1m/s. Access and egress are not impacted in the any fluvial events.
Dry Islands	The site is not located on a dry island.

Climate change	
Implications for the site	**Management Catchment: Combined Essex Management Catchment** Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** Sandon Brook has available climate change outputs for the Central (25%) and Upper End (72%) allowances for the 2080s, however the model extent does not extend as far as the site **Surface Water:** The latest climate change allowances have also been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. The 1% AEP plus 40% climate change corresponds to the 1% AEP upper end allowance for peak rainfall intensity for the 2070s epoch and is therefore the 'design event' scenario. The 1% AEP plus climate change event impacts the site much greater extent when compared to the baseline 1% AEP event, covering most of the east of the site. The maximum depth and velocity are approximately 0.9m and 1.5m/s respectively, with a maximum hazard on site aof 'Danger for All'. This change in extent and depth, shows that this site is sensitive to climate change in the surface water events. 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 drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	
	• Geology at the site consists of:
	  ○ Bedrock Geology- Claygate Member consisting of clay, silt and sand.
	  ○ Superficial Geology- Head consisting of clay, silt, sand and gravel.
	• Soils at the site consist of:
	  ○ loamy and clayey soil which is characterised as being slowly permeable, seasonally wet and slightly acidic.
	
	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 a mixture of clay, silt, sand, and gravel which is likely to be with highly variable permeability. This should be confirmed through infiltration testing. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site.

	• 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 not located within a historic landfill site. • Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation 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 that there are no surface water flow paths, during any AEP event. However, there is ponding in the 3.3%, 1% and 0.1% AEP events. Existing ponding 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	• 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.

	• SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.
NPPF and planning implications	
Exception Test requirements	The site is classified as 'More Vulnerable' and is at significant risk from surface water flooding. Whilst the Exception Test is only explicitly required for sites at risk form fluvial sources, CCC should carefully weigh up the benefits of developing the site against the significant risk, and satisfy themselves that users of the site can be kept safe throughout its lifetime.
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: ○ At risk of other sources of flooding (surface water) • All sources of flooding should be considered as part of a site-specific FRA, including consideration of the ordinary watercourse and the residual risk from culvert blockages. • Consultation with Chelmsford City Council, Essex County Council, Anglian Water, 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); and the Council's Local Plan Policy's SuDS Strategy. • The development should be designed with mitigation measures in place where required. **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 limited to pre-development greenfield rates. • Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and rainfall events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe. Given the significant risk to the site and proximity to the watercourse, a flood warning and evacuation plan should be prepared for the site. See Section 8.6 of the Level 1 SFRA for details of the requirements for plans.

	• Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk. • Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere.

Key messages

The site is not at risk from fluvial flooding, even when taking climate change into account. The site is at significant risk from surface water flooding, even during relatively frequent events. Whilst the Exception Test is only explicitly required for sites at risk form fluvial/tidal sources, CCC should carefully weigh up the benefits of development against this risk and satisfy themselves that users of the site will be safe throughout its lifetime. With regards to managing the flood risk, development may be able to proceed if:

- Development is steered away from the southwestern border of the site which is at risk from deep surface water flooding in the 3.3%, 1% and 0.1% AEP events.
- 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 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. Given the significant risk to the site at the 0.1% AEP events, a suitable flood warning and evacuation plan will be required.
- A site-specific FRA demonstrates that site users will be safe throughout the lifetime of the development 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

The key datasets used to make planning recommendations for this site were the Environment Agency's Flood Map for Planning, the Environment Agency's Risk of Flooding from Surface Water map and the Environment Agency's Sandon Brook model. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 2 and 3 have been taken from the Environment Agency's Flood Map for Planning mapping.
Climate change	The central and upper end allowances were available for the Sandon Brook (2015) 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 and tidal extents, depth, velocity and hazard mapping	Depth, velocity, and hazard data was derived from the Sandon Brook (2015) hydraulic model.
Surface Water	The Risk of Flooding from Surface Water map has been used to define areas at risk from surface water flooding.
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 Environment Agency's RoFSW.