CC010-A

	Chelmsford City Council Level 2 Strategic Flood Risk Assessment Detailed Site Summary Tables
Site details	
Site Code	**CW1f**
Address	Navigation Road Sites Chelmsford
Area	0.42ha
Current land use	Halfords Autocentre and Car Park
Proposed land use	Residential
Flood Risk Vulnerability	More Vulnerable
Sources of flood risk	
Location of the site within the catchment	This site is located in Chelmsford, immediately south east of Springfield Road on Navigation Road. The site is located within the Chelmer Operational Catchment of the Combined Essex Management Catchment. This management catchment is 3,413km^2 and spans the counties of Essex, Suffolk, and a small part of Cambridgeshire. This site is located in a highly urbanised part of the catchment, approximately 350m north of the confluence of the River Cam and River Chelmer, in the city centre.
Topography	Environment Agency 1m resolution LiDAR across the site shows that the topography is relatively consistent, but gently slopes downwards towards the south west of the site. The highest elevations are to the north east of the site, at 25.8mAOD, and the lowest elevations are to the south of the site, at 24.6mAOD. It is important to note that the site is situated within a densely populated and developed urban area, therefore LiDAR data is unlikely to be representative of the actual site topography. This is particularly the case in the north west of the site where there are existing buildings. This may have an impact on some of the flood risk datasets used in this assessment.
Existing drainage features	There are no existing drainage features within the borders of the site. The north of the site lies approximately 160m south east of the River Chelmer which flows north to south in this area. The south of the site lies approximately 350m from the confluence between the River Can and the River Chelmer. In addition, much of the site has impermeable surfaces and is within the main Chelmsford urban area, and is likely drained by the surface water drainage network.
Critical Drainage Area	The site is not located within a Critical Drainage Area.

Fluvial and tidal	**The proportion of site at risk FMFP:** **FZ3 – 0%** **FZ2 – 8.2%** **FZ1 – 91.8%** *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%** **1% AEP fluvial event – 0%** **0.1% AEP fluvial event – 18.1%** *Modelled results show the percentage of site at risk from a given AEP flood event.* **Available data:** The proportion of the site at flood risk is determined from the Environment Agency's Flood Map for Planning Flood Zones. This represents the undefended scenario. Therefore, the defended scenario outputs from the Environment Agency's 1D-2D ISIS-TUFLOW River Chelmer (2010) hydraulic model have been reported as a more accurate representation of the flood risk to this site due to the presence of flood defence structures. **Flood characteristics:** In the 3.3% AEP and 1% AEP events, the defended scenario modelling of the River Chelmer does not inundate the site boundary. In the 0.1% AEP undefended scenario, the north western and south western borders of the site are inundated by flood waters originating from the River Chelmer. The is due to the lower topography of Springfield Road and Navigation Road along these borders, which act as flow routes. Flood water extends into the site by a maximum of 20m on the north western border. The maximum depth and velocity* of water within the site is 0.25m and 0.55m/s respectively. **Please note: Hazard ratings for the defended model outputs for the River Chelmer are unavailable.*
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – 0% **1% AEP** – 0.1% Max depth – 0.0m – 0.15m Max velocity – 0.5m/s – 1m/s **0.1% AEP** – 12.2% Max depth – 0.6m – 0.9m Max velocity – >2m/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**: The site is unaffected during the 3.3% AEP surface water event. In the 1% AEP event, a large surface water flow path is present on Springfield Road. This crosses into the site along the north western

	boundary to approximately 1m. The maximum depth and velocity of this is quoted above, the hazard rating is 'Very Low Hazard/Caution'. In the 0.1% AEP event, the surface water flow path along Springfield Road is exacerbated with water entering the site along the north western border to around 5m. The maximum depth, hazard, and velocity are 0.15–0.3m, 1.0–2.0m/s, and 'Danger for Most' respectively. In addition, another flow path is present on Navigation Road along the south western border of the site. Due to an area of low topography, surface water is shown to pond in the south of the site, entering along the south western border and flowing approximately 42m north east. The maximum depth, velocity, and hazard of this ponding is 0.15–0.3m, 0.5-1.0m/s, and 'Very Low Hazard/Caution'.
Reservoir	According to the Environment Agency's (EA) risk of flooding due to reservoirs dataset, this site is not impacted in the 'Dry Day' scenario. In the Wet Day scenario, flood extents from Chignal Hall Farm Mashbury Hall Farm encroach along the south-western and north western border of the site The risk designation of Chignal Reservoir has not yet been determined while the others have been determined to be high risk, therefore, in the very unlikely event that the reservoirs fail, there is a risk to life.
Groundwater	The JBA Groundwater Emergence Map is provided as 5m resolution grid squares. The whole site is shown to have groundwater levels between 0.025m and 0.5m below the surface. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally which could lead to damage to property or harm to other sensitive receptors at, or near, this location. This will need to be assessed further as part of a site-specific flood risk assessment and is likely to require ground investigations to determine the true risk to the site.
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 no records of flooding on the site; however, it does show an incident of flooding associated with the River Chelmer to the south of Navigation Road, in very close proximity to the site. Essex County Council as LLFA has 0 records of flooding within the site boundary. The closest incidences are 205m to the north, north of Victoria Road, and 216m south west near Roseberry Yard. The date and cause of these incidents are unknown.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows no flood defences at or close to this site. The site does not lie within the Environment Agency's reduction in risk of flooding from rivers and sea dataset. The Margaretting Flood Alleviation Scheme to safeguard the city centre was cancelled in March 2022. The risk from flooding remains. The City Council continues to work with the Environment Agency to supplement existing flood defences and deliver a new series of catchment-based measures under the Chelmsford Flood Resilience Partnership. Developers

	should consult the Environment Agency to find out whether this site will be affected by this flood alleviation scheme. Sites affected by flood risk should devise an FRA on the basis that existing city centre flood defences are in place and, if sufficiently advanced, the catchment-based measures identified by the Chelmsford Flood Resilience Partnership project. In either scenario a financial contribution to the Chelmsford Flood Resilience Partnership project would be required.
Residual risk	Although the site does not lie within the Environment Agency Reduction in Risk of Flooding due to Defences dataset, the significant reduction in flooded extent in the defended hydraulic modelling outputs provided suggests that the site is at residual risk should the surrounding defences fail. The residual risk to the site posed by failure of flood defences, including overtopping and breach must be considered in a site-specific Flood Risk Assessment. Maintenance arrangements (including funding mechanisms) for the defences will need to be demonstrated for the lifetime of development, this will need to include how the existing defences can be improved and fixed.
Emergency planning	
Flood warning	The western two thirds of the site is located within both an Environment Agency Alert Warning Area, and an Environment Agency Flood Warning Area. Flood Alert Area: 051WAFEF6BC (The River Wid from Brentwood, to and including Writtle, and the River Can at Chelmsford) Flood Warning Area: 051FWFEF6C2 (The Rivers Can and Chelmer through Chelmsford, including the High Street and Meadows Shopping Centre).
Access and egress	Existing access and egress to the site is currently via Navigation Road along the south western border and Springfield Road along the north western border. In the fluvial 3.3% and 1% AEP event, defended model outputs for the River Chelmer show that safe access via both Springfield Road and Navigation Road is possible although Springfield road is affected to the southwest of the site in the 1% AEP event. In the fluvial 0.1% and 1% plus climate AEP events, defended model outputs for the River Chelmer show that safe access and egress may be impacted on both Springfield Road and Navigation Road. The junction between the two, on the northwest corner of the site, is inundated to a maximum depth and velocity of 0.3m and 0.1m/s. Navigation Road is shown to be completely inundated by flood water to a maximum depth and velocity of 0.25m and 0.58m/s. As such, access and egress from the site via Springfield Road and Navigation Road is severely impacted, but may be possible for emergency vehicles only. In the surface water 3.3% and 1% AEP events, access and egress is unlikely to be impacted. In the 0.1% AEP event, both access routes are shown to be severely impacted by surface water. Springfield Road is inundated to a maximum depth, velocity, and hazard of 0.3m - 0.6m, >2m/s, and 'Danger for Most' respectively, when approaching from the north. Navigation Road is shown to be inundated to a maximum depth, velocity, and hazard of 0.3m - 0.6m, 0.5m/s – 1m/s, and 'Danger for Some'. Access and egress in this event are severely impacted for all vehicle types. In the 1% AEP plus 40% climate change event, all access routes are impacted by surface water. Springfield Road is inundated to a maximum depth, velocity, and hazard of 0.4m, 1.39m/s, and 'Danger for Most' respectively when approaching from the north. In addition, Navigation Road is shown to be inundated to a maximum depth, velocity, and hazard of

	0.28m, 0.38m/s, and 'Danger for Some'. Access and egress in this event is likely to be impacted for all vehicle types. It important to note for the surface water datasets, that the site is situated within a densely populated, developed urban area and LiDAR data is unlikely to be representative of the site topography and structures such as underpasses. As such, surface water flow paths shown at highways or railways where there is an underpass, have been excluded from the calculation of maximum depth, velocity, and hazard. Arrangements for safe access and egress will need to be demonstrated for 1% AEP plus an appropriate allowance for climate change, using the depth, velocity, and hazard outputs. Given the considerable risk to the site during the breach and surface water scenarios, consultation with RMAs early on should be implemented to ensure an appropriate flood evacuation plan is put in place for the site. **Please note: Hazard ratings for the defended model outputs for the River Chelmer are unavailable.*
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** The River Chelmer has available climate change outputs for the Central (25%) allowance for the 2080s. The site is not impacted in either the 1% AEP or 1% AEP plus climate change events. Climate Change outputs for the 0.1% AEP event for the Chelmer 2010 model could not be produced for this study. At time of writing, the Environment Agency are currently undertaking updates to modelling in this area and developers should consult the Environment Agency to understand the latest available information. If climate change scenarios for the latest allowances for the 0.1% AEP event are not available, developers will need to undertake additional work as part of a site-specific FRA to determine the risk to the site in this scenario. **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. Unlike its baseline equivalent, 1% AEP plus climate change event impacts the site considerably more, inundating the lower spots of topography around the south of the site. The maximum depth, velocity, and hazard of this ponding is 0.1m, 0.7m/s, and 'Very Low Hazard/Caution'. In addition, the roads surrounding the site are more severely impacted too, with the extent on Navigation Road increasing by approximately 40m north west. As such, it can be inferred that this site is moderately sensitive to surface water climate change. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	• Geology at the site consists of:
	  ○ Bedrock Geology - London Clay Formation - Clay, silt, and sand.
	  ○ Superficial Geology - Glaciofluvial Deposits, Mid Pleistocene - Sand and gravel.
	• Soils at the site consist of:
	  ○ Freely draining slightly acid loamy soils
	SuDS
	• The site is considered to have very low susceptibility to groundwater flooding, this should be confirmed through additional site investigation work. Below ground development such as basements may still be susceptible to groundwater flooding.
	• BGS data indicates that the underlying geology is a mixture of clay, silt, sand, and clay 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
	• The entire site is located within two Nitrate Vulnerable Zones (2021-2014. These are as follows:
	  ○ Sandings and Chelmsford
	  ○ River Chelmer
	• The entire site is within Drinking Water Safeguard Zone SWSGZ1029
	• 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 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.

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. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces, and rainwater harvesting must be considered in the design of the site. • 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. • 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. • 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.
NPPF and planning implications	
Exception Test requirements	The site is classified as more vulnerable and is partly within Flood Zone 2, therefore the Exception Test is required for this site.

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:
	  ○ Partially within Flood Zone 2
	  ○ 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, including consideration of the residual risk from a failure, or overtopping of defences. In particular, the site is identified to be at significant groundwater flood risk and is likely to require ground investigations to determine the true risk to the site.
	• Consultation with Chelmsford City Council, Essex County Council, Anglian Water, and the Environment Agency should be undertaken at an early stage.
	• Climate Change outputs for the 0.1% AEP event for the Chelmer 2010 model could not be produced for this study. At time of writing, the Environment Agency are currently undertaking updates to modelling in this area and developers should consult the Environment Agency to understand the latest available information. If climate change scenarios for the latest allowances for the 0.1% AEP event are not available, developers will need to undertake additional work as part of a site-specific FRA to determine the risk to the site in this scenario.
	• 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 and 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 as close as possible 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. If safe access and egress cannot be provided during the design event, 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. • Developers should consult with Chelmsford City Council and the Environment Agency to determine whether any land within the site needs to be safeguarded for improvements to flood defences either as part of the development, or in the future. • 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

Whilst the majority of the site is at low risk of flooding from fluvial and surface water sources, there is significant risk from groundwater identified and part of the site is within Flood Zone 2, therefore the Exception Test will need to be passed before the site can be bought forwards. With regards to the flood risk portion of the Exception Test, development may be able to proceed if:

- Development is steered away from the area of fluvial flood risk along the north western and south western borders of the site and the small flow paths/areas of surface water ponding are incorporated and considered within the development design.
- The risk to the site from groundwater is quantified as part of a site-specific FRA and it can be demonstrated that the risk can be safely managed.
- 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. If this is not possible, or development is proposed within areas identified to be at residual risk of flooding due to breach /overtopping of defences, a suitable flood warning and evacuation plan will be required, including consideration of breach scenarios.
- 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 River Chelmer 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. The River Chelmer (2010) Environment Agency model has been used in this assessment.
Climate change	The central and upper end allowances were available for the River Chelmer (2010) 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 River Chelmer (2010) 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.