Appendix F – Cumulative Impact Assessment

This section provides a summary of the catchments where the level of flood risk and development pressures mean they could be affected by cumulative impacts and identifies recommendations for local planning policy for Chelmsford City Council so the impacts are addressed.

1 Background

1.1 Introduction

The cumulative impact of development should be considered at both the Local Plan making and the planning application and development design stages. Appropriate mitigation measures should be implemented so flood risk is not exacerbated, and where possible the development should be used to reduce existing flood risk issues.

To understand the impact of future development on flood risk in the study area, catchments were identified where cumulative development may have the greatest potential effect on flood risk, and where further assessment would be required within a Level 2 Strategic Flood Risk Assessment (SFRA) or site-specific Flood Risk Assessment (FRA). The potential change in developed area within each catchment and communities sensitive to increased risk of surface water flooding, alongside evidence of historic flooding incidents have been considered to identify catchments at the highest risk. Where catchments have been identified as sensitive to the cumulative impact of development, the assessment concludes with recommended strategic planning policy suggestions to manage the risk.

1.2 Strategic flood risk solutions

Chelmsford City Council (CCC) have a vision set forth in their Local Plan for the future management of flood risk and drainage in the region. The plans consider flood risk management, alongside wider environmental and water quality enhancements. Strategic solutions may include upstream flood storage, integrated major infrastructure/ Flood Risk Management (FRM) schemes, new defences, and watercourse improvements as part of regeneration and enhancing green infrastructure, with opportunities for natural flood management and retrofitting sustainable drainage systems. Essex County Council's Essex Local Flood Risk Management Strategy (as Lead local Flood Authority (LLFA)) and the Thames River Basin Flood Risk Management Plan set out specific actions for the authority region.

Section 2 sets out the strategic plans that exist for the authority region. The following list summarises the key outcomes these strategies are seeking to achieve. It is anticipated that this vision will be delivered by new development alongside retrofitting and enhancing green infrastructure and flood defence schemes in the existing developed area.

The strategic policy vision from the Catchment Flood Management Plans (CFMPs) and the River Basin Management Plans (RBMPs) focus on community engagement and seeking opportunities to fund and deliver flood alleviation schemes in areas deemed high-risk; re-naturalising watercourses, safeguarding the floodplains and encouraging collaboration and creating new partnerships to reduce the risk of flooding and to enhance the natural environment. Within Chelmsford City Council's Administrative Area, strategic solutions encourage development that:

- Reduces risk to people, economic damage and community disruption;
- Uses sustainable flood storage and mitigation schemes to store water and manage surface water runoff in locations that provide overall flood risk reduction as well as environmental benefits;
- Requires engagement with a variety of stakeholders across the region to develop plans and seize opportunities for collaborative partnership working;
- Provides a greater role for communities in managing flood risk;
- Improves knowledge and understanding of flood risk and management responsibilities, and of watercourse networks and drainage infrastructure,
- Promotes sustainable and appropriate development;
- Delivers flood risk management measures that have social, economic and environmental benefits; and
- Promotes and considers Sustainable Drainage Systems (SuDS) at the earliest stage of site development.

In some locations the Environment Agency (EA) has committed to assist Local Planning Authorities (LPAs) in identifying areas which may be most affected by increased flood risk due to development and/or climate change. However, this work is stated to likely fall short of extensive hydraulic modelling and detailed mapping of theoretical flood extents. The headline message is therefore:

Flood risk is increasing, perhaps substantially, so Planners, Emergency Planners, Asset Managers and others will need to mitigate this through a mix of collaborative working, planning policies, use of 'worst case' scenarios, development of contingency plans and some detailed analysis.

1.2.1 Opportunities and projects in/ affecting Chelmsford

Chelmsford City Council is already included within the **Essex Local Nature Partnership (ELNP).** The following are other stakeholders and project delivery schemes affecting areas within Chelmsford City Council's Administrative Area:

Combined Essex Catchment Partnership:

The Combined Essex Catchment Partnership is co-hosted by the **Essex Rivers Hub** (which is in-turn hosted by the Essex Wildlife Trust) and the Environment Agency. It is a collaboration between relevant partners to

deliver projects that will improve water quality and availability, reduce agricultural pollution, improve navigation and community engagement, biodiversity and land use. The Partnership covers the combined areas of previous catchment partnerships, as well as other catchments relevant to Chelmsford, such as the River Can, River Chelmer, and River Ter.

Essex Wildlife Trust Nature Reserves

Essex Wildlife Trust manages 12 Nature Reserves within Chelmsford City Council's Administrative Area. These are:

- Newland Grove
- Little Waltham Meadows
- Sandylay and Moat Woods
- Phyllis Currie
- Hitchcock's Meadow
- Danbury Ridge
- Heather Hills
- Thrift Wood
- Woodham Fen
- Shotgate Thickets
- Crowsheath Wood
- Hanningfield Reservoir

These sites are home to various important and protected habitats and species, including:

- Grassland
- Woodland
- Wet Woodland
- Alder Carr Woodland
- Lowland Meadow and Pasture
- Lowland Heath
- Lowland dry acid grassland
- Ponds
- Lakes
- Rivers
- Bog
- English Elm
- English Oak
- Bee orchid
- Emperor dragonfly
- Glow-worm
- Eyebright
- Green-winged orchid
- Pignut
- Common Beech
- Sessile oak
- Wild service tree
- Tormentil
- Greater butterfly-orchid
- Southern wood ant
- Common cow-wheat
- Great spotted woodpecker
- Nightingale
- Treecreeper
- Early purple orchid
- Small-leafed lime
- Common twayblade
- Banded demoiselle
- Black-tailed skimmer
- Heather
- Adder
- Slow Worm
- Common Lizard
- Bluebell
- Devil's-bit scabious
- Tufted Duck
- Pochard
- Gadwall
- Cowslip

- Hairy Violet

Natural Flood Management techniques could be encouraged at some of the reserves to aid flood storage and improve natural habitats.

1.3 Assessment of cross-boundary issues

The Chelmsford study area partially contains catchment areas within the following Local Authorities (see Figure 1.2 in the main SFRA report for the Local Authority boundaries):

- Basildon Borough
- Braintree District
- Brentwood District
- Epping Forest District
- Maldon District
- Rochford District
- Uttlesford District

The topographic characteristics of the study area and the River Chelmer catchment are dictated by the Essex hills and mountains. The southern end of the Chilterns in the northern tip of the study area, lowland Thames Valley through the middle reach and chalk hills in the south. The high ground in the south of the region creates the watershed for a number of tributaries to the River Loddon, which flows northward into the River Thames. The River Chelmer, River Can, River Wid and Sandon Brook drain the majority of the Chelmsford study area. Some cross-boundary tributaries also drain small sections in the far west, including the Burghfield Brook and Foudry Brook, and parts of the River Thames catchment also. See Section 1.5 of the main report for further details on the study area.

As such, future development, both within and outside of Chelmsford City Council's Administrative Area can have the potential to affect flood risk to existing development and surrounding areas, depending on the effectiveness of SuDS and drainage implementation.

Development control should address the potential impact on receiving watercourses from development in the City during the planning stage and appropriate development management decisions put in place so there are no adverse impacts on flood risk or water quality. All developments are required to comply with the NPPF and demonstrate they will not increase flood risk elsewhere. Therefore, providing developments near watercourses in neighbouring authorities comply with the latest guidance and legislation relating to flood risk and sustainable drainage, they should not normally result in an increase in flood risk within the City. The neighbouring authorities were contacted for information on their site allocations, to determine where development in neighbouring authorities may have an impact.

The **Review of the adopted Chelmsford Local Plan** (2022 – 2041) is currently being prepared alongside the evidence base. The flood risk and sustainable drainage policies in the adopted plan (2013 - 2036) have therefore not yet been updated to ensure compliance with the NPPF.

The following Local Plans have been adopted by neighbouring local authorities and include policies relevant to flood risk and drainage:

- **Basildon Local Plan** (Currently under review, due end unknown)
- **Braintree Local Plan** (2013 – 2033)
- **Brentwood Local Plan** (2016 – 2033)
- **Epping Forest Local Plan** (2011 – 2033)
- **Maldon Local Plan** (2014 - 2029)
- **Rochford Local Plan** (Currently under review, due end 2040)
- **Uttlesford Local Plan** (Currently under review, due end unknown)

For the Cumulative Impact Assessment (CIA), the study area was assessed at a sub-catchment level (see Figure F-1).

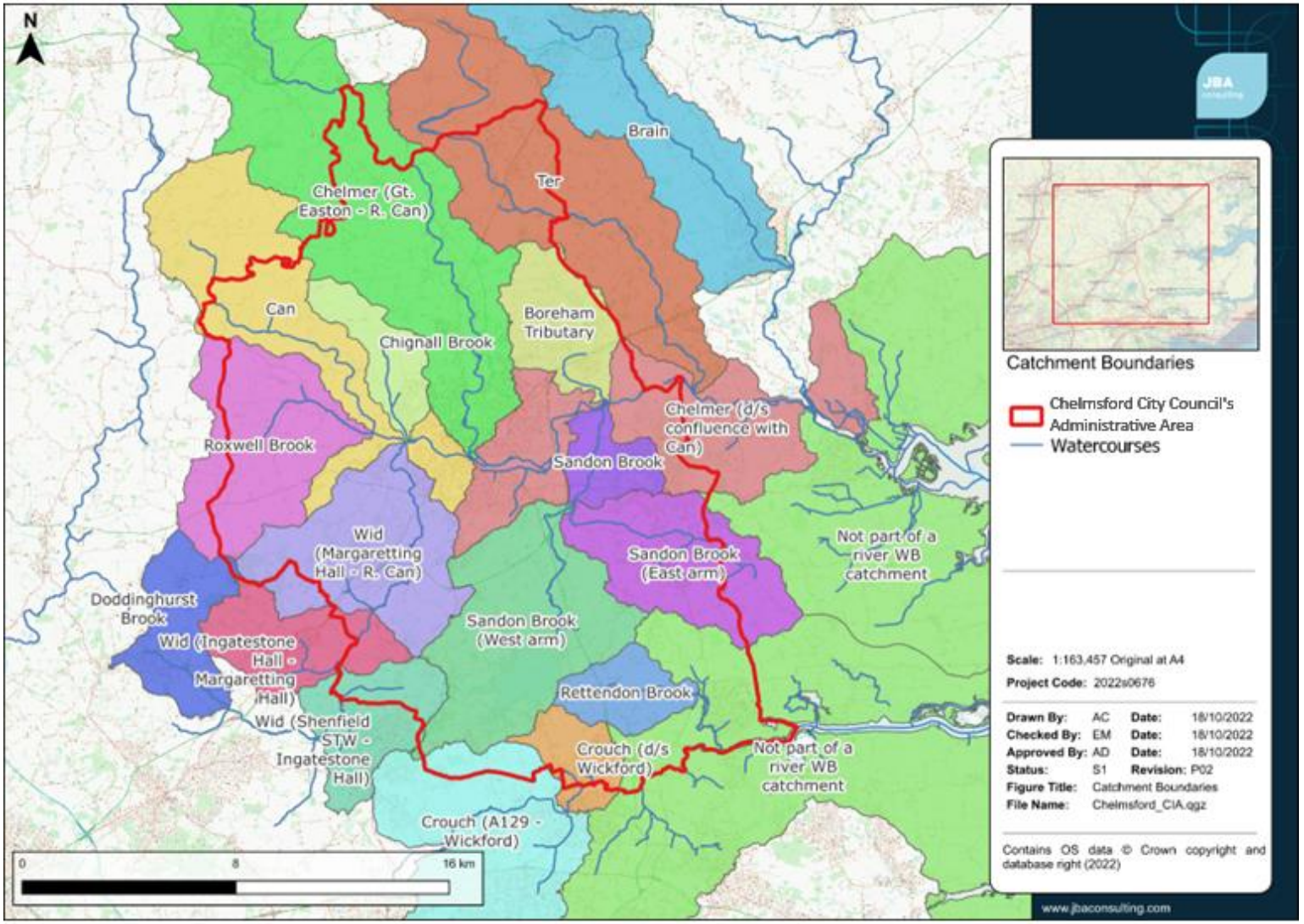

Figure F-1: Catchments within Chelmsford City Council's Administrative Area.

1.4 Cumulative impact assessment methodology

This broadscale assessment determines where the potential cumulative impact of developments may have the greatest effect on flood risk across the study area. Catchments at the highest risk are taken forward to a catchment-level analysis. Potential change in developed areas within each catchment from neighbouring authorities was also considered. In this instance, historic records of flooding events were not available, however some baseline records were derived from recent Section 19 reports and a supplied asset register. The recorded incidents from these provide a general overview but were included in the assessment. Analysis of this data facilitated the identification of catchments at the greatest risk of cumulative impacts of an increase in impermeable area within the catchment.

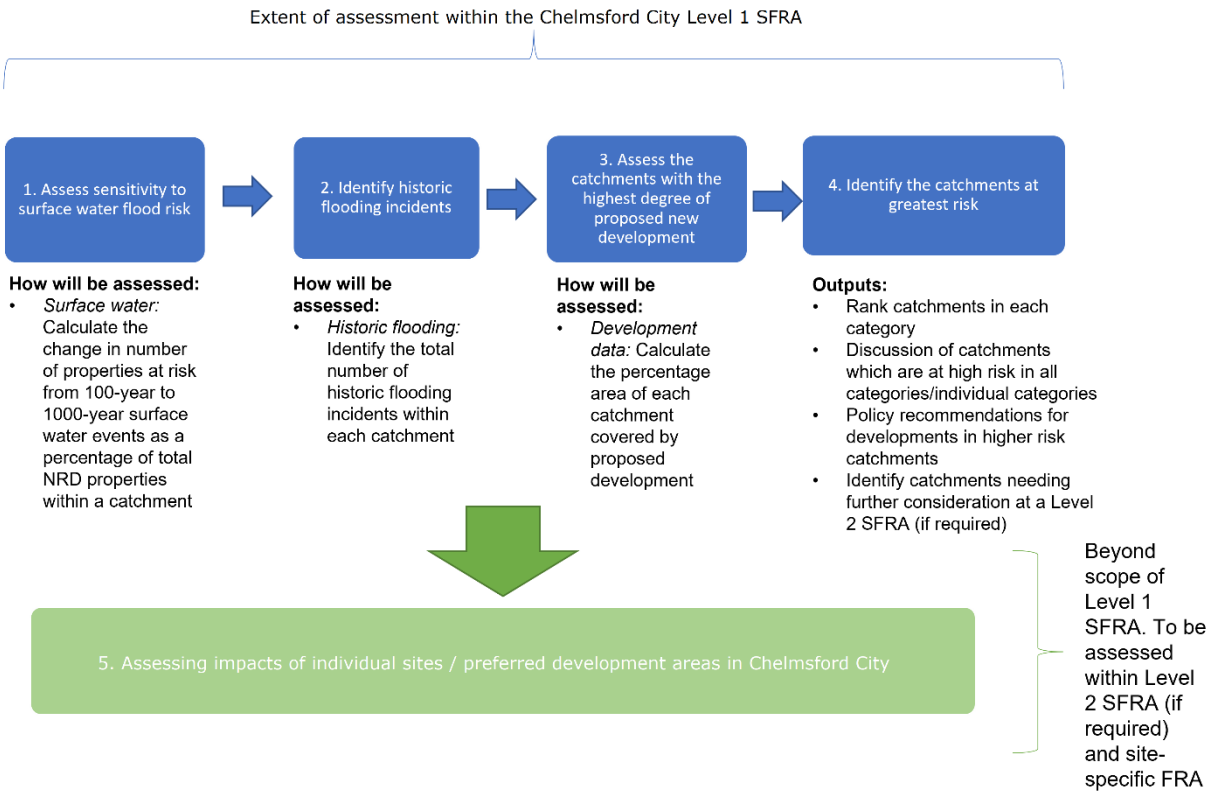

Figure F-2: Overview of the method used within the Cumulative Impact Assessment

Figure F-2 shows the methodology used and Table F-1 summarises the datasets used within the cumulative development scenario.

Future development sites within the study area were provided by CCC and neighbouring authorities. Catchments within the study area were initially ranked using the following four metrics: sensitivity to increased fluvial flood risk; prevalence of recorded historic flood incidents (limited by the data available); sensitivity to increased risk of surface water flooding; and area of new development proposed within the catchment.

The final results of this assessment gave a cumulative impact rating of low, medium, or high for each metric, for each catchment within the study area,

the boundaries of which were derived from the Water Framework Directive catchments. The rating of each catchment in each of these assessments was combined to give an overall ranking.

1.4.1 Sensitivity to increases in flood flows

For the purpose of the CIA this is the measure of the increase in the number of properties at risk of surface water flooding from a 1 in 100-year event to a 1 in 1,000-year event. It is an indicator of where local topography makes an area more sensitive to increases in flood risk that may be due to any number of reasons, including climate change, new development etc. It is not an absolute figure or prediction of the impact that new development will have on flood risk, but rather an indicator of the sensitivity of receptors to cumulative effects.

The National Receptor Database (NRD) dataset 2021 was used to identify all properties within the Chelmsford study area.

This data was analysed for the 1,000-year and 100-year surface water flood extents respectively to determine the number of properties in each catchment, in each surface water flood extent. The difference between the two values was then taken as a percentage of the total number of properties within the catchment to allow comparison between catchments of different sizes.

1.4.2 Growth in the area

Development within the study area has the potential to affect flood risk in neighbouring authorities, especially if there are existing flood risk issues. The River Chelmer drains out of Uttlesford District into the north of Chelmsford, through the north-east of the study area and exits into Maldon District, where it drains into the North Sea. It is joined by a number of tributaries draining the south and west of CCC's Administrative Area, including the River Can, Roxwell Brook, River Wid, and Sandon Brook.

Areas for future proposed development were received from CCC and neighbouring authorities and were assessed as part of this CIA. The area of new development within each catchment was expressed as a percentage of the total catchment area to determine the potential for increase in flood risk as a result of new development.

1.4.3 Historic flood risk

Recorded flooding events data for fluvial or surface water flooding within most, but not all neighbouring Local Authorities was made available for this assessment. Historic flood risk was also determined from limited recorded data from most local authorities. Historic flooding incidents data for sewer flooding were provided for this assessment. Details of historic flood events can be found in Section 5.1 of the main SFRA report. Each point represents a location where it is known there has been at least one flood event (however, the nature and scale of these flood events varies significantly).

A count of each historical flood incident was conducted for each catchment to determine the historic flood risk of the catchments.

A summary of the datasets used to calculate the historic flood risk and the sensitivity to increases in flood flows for each catchment is shown in Table F-1.

Table F-1 Summary of datasets used within the Broadscale Cumulative Impact Assessment

Dataset	Coverage	Source of Data	Use of Data
Catchment Boundaries	Chelmsford Study Area & within neighbouring authorities	Water Framework Directive Catchments	Assessment of susceptibility to cumulative impacts of development by catchment.
National Receptor Dataset (2014)	Chelmsford Study Area & neighbouring authorities	Environment Agency	Assessing the number of properties at risk of surface water flooding within each catchment.
Risk of Flooding from Surface Water	Chelmsford Study Area	Environment Agency	Assessing the number of properties at risk of surface water flooding within each catchment.
Fluvial Flood Zones 2 and 3	Chelmsford Study Area	Environment Agency	Assessing the number of properties at risk of fluvial flooding within each catchment
Future development areas (recently built out sites/sites under construction/sites with planning permission/previously allocated sites/currently allocated sites)	Chelmsford Study Area & neighbouring authorities	Chelmsford City Council; Basildon Borough Council, Braintree District Council, Epping Forest District Council, Maldon District Council, Uttlesford District Council.	Assessing the impact of proposed future development on risk of flooding.
Historic Flooding Incidents	Chelmsford Study Area & neighbouring authorities	Thames Water; Chelmsford City Council; Essex County Council;	Assessing incidences of historic flooding within the study area.

1.4.4 Ranking the results

The ranking results were combined from all four assessments to give an overall High, Medium and Low ranking for all catchments within the study area. Each ranking was then totalled to give a final combined ranking, this was done twice, once without the inclusion of the CCC's proposed development site data (to gain a current baseline), and once including the site data, to provide the development impact ranking.

The results for each assessment were ranked into High, Medium and Low risk as shown in Table F-2. Ranking delineations were given at natural breaks in the results.

Table F-2: Ranking assessment criteria

Flood risk ranking	% of properties at increased risk of Fluvial flooding	% of properties at increased risk of SW flooding	Total number of data points in the Historic Flooding Incidents Register	% Area of Catchment Covered by new development
Low risk	<1%	<1%	<10	<2%
Medium risk	1 to 3 %	1% to 4%	10-20	2 to 9%
High risk	>3%	>4%	>20	>9

1.4.5 Assumptions

The assumptions made when conducting the CIA are shown in Table F-3.

Policy recommendations with regards to managing the cumulative impact of development are described in Section 2.2 of the CIA. Appropriate policies will address the issue of incremental increase due to cumulative effects in flood risk both within and downstream of Chelmsford City Council's Administrative Area.

Table F-3: Assumptions of the cumulative impact assessment

Assessment aspect	Assumption made	Details of limitation in method	Justification of method used
Surface water flood risk; Flood Zone 2 and 3	Total number of properties flooded	Assumption that all properties have been included in the 2021 NRD dataset. It may not include all new build properties.	This was the most up to date and best data available.
Historic Flooding incidents	Total number of historic events and severity of flooding	Only flooding incidents recorded that could be georeferenced with XY coordinates to produce GIS files. Each point represents a location where it is known there has been at least one flood incident. The severity of the historic flooding event relating to the point has not been considered, just the total number of points within each catchment where there has been a flood incident.	GIS data sourced provided the best available results for the location of historic flooding incidents in Chelmsford and neighbouring authorities.

1.5 Cumulative impact assessment

1.5.1 Sensitivity to fluvial flooding

The number of properties within Flood Zone 2 not presently within Flood Zone 3 was taken, as a percentage of the total properties in the catchment. These properties are considered sensitive to increased flood risk as a result of climate change.

Catchments with greater than 3% properties at increased risk were considered high risk.

Table F-4 Catchments considered highly sensitive to increased fluvial flood risk in future

Catchment	% properties sensitive to increased fluvial flood risk	Rank
Not part of a river WB catchment (WB_ID-45)	5.93	1
Can	4.89	2
Chelmer (downstream confluence with Can)	3.67	3
Wid (Ingatestone Hall – Margaretting Hall)	3.01	4

1.5.2 Sensitivity to surface water flooding

The number of properties within the 1000-year surface water extent not presently within the 100-year extent was taken, as a percentage of the total properties in the catchment. These properties are considered sensitive to increased flood risk as a result of climate change.

Catchments with greater than 4% properties at increased risk were considered high risk.

Table F-5 Catchments considered highly sensitive to increased surface water flood risk in future

Catchment	% properties sensitive to increased surface water flood risk	Rank
Rettendon Brook	8.16	1
Crouch (downstream Wickford)	4.69	2
Sandon Brook (East arm)	4.25	3

1.5.3 Prevalence of historic flooding incidents

Historic flood incidents data for fluvial or surface water was available for this assessment from Essex County Council and Chelmsford City Council. While this will not provide a detailed scope of historic flooding incidents across the region, the number of flood incidents in each catchment from the data available were identified to provide a broadscale understanding of flood risk.

Historic sewer flooding incidents data were not available for this assessment. Catchments with more than 20 recorded incidents were considered high risk.

For a more detailed assessment of historic flood risk or Level 2 SFRA, acquiring historic flooding incidents records from all neighbouring authorities is recommended.

Table F-6 Catchments with the highest number of recorded historic flood incidents

Catchment	Number of recorded incidents	Rank
Sandon Brook (West arm)	33	1
Crouch (A129-Wickford)	31	2
Chelmer (downstream confluence with Can	28	3
Chelmer (Gt. Easton – R. Can)	25	4
Can	21	5

1.5.4 Area of proposed development

CCC and neighbouring authorities provided a list of likely new development sites and the total area of new development in each catchment was measured, as a percentage of catchment area. Catchments with more than 9% of their area earmarked for development were considered high risk.

Table F-7 Catchments with the highest percentage cover of proposed development

Catchment	Area of proposed development (ha)	Area of proposed development (%)	Rank
Boreham Tributary	263.63	15.17	1
River Ter	773.21	9.72	2

1.6 Overall rankings

As can be seen from the above tables and Figure F-2, there are catchments that are at high risk in multiple categories. Rankings from each assessment have been combined to give an overall ranking. A Red-Amber-Green (RAG) rating was then applied to the catchments, with red being high risk, amber being medium risk and green being low risk (Figure F-3). The catchments with a combined ranking score of less than 30 were deemed high risk.

The catchments rated as High-Risk in the broadscale assessment are shown in Table F-8.

Table F-8: High Risk catchments as shown in Figure F-3

Waterbody Name	Rank
Chelmer (Gt. Easton – R. Can)	1
Can	2
Not part of a river WB catchment*	3
Sandon Brook (East Arm)	4
Chelmer (downstream confluence with Can)	5

Some catchments that border Chelmsford City Council's Administrative Area or are within neighbouring catchments were discounted from the final RAG Assessment outputs as their results were not applicable due to their being no countable data for one or more assessment criteria.

* This is one of two tidal zones that encroach into the Chelmsford study area, along the banks of the River Blackwater estuary and, in this case the River Crouch estuary. These do not come within the boundaries of fluvial catchments due to tidal influence. This is not considered within the CIA, however it is recommended that consideration to tidal flooding is taken for any development proposal within these tidal zones.

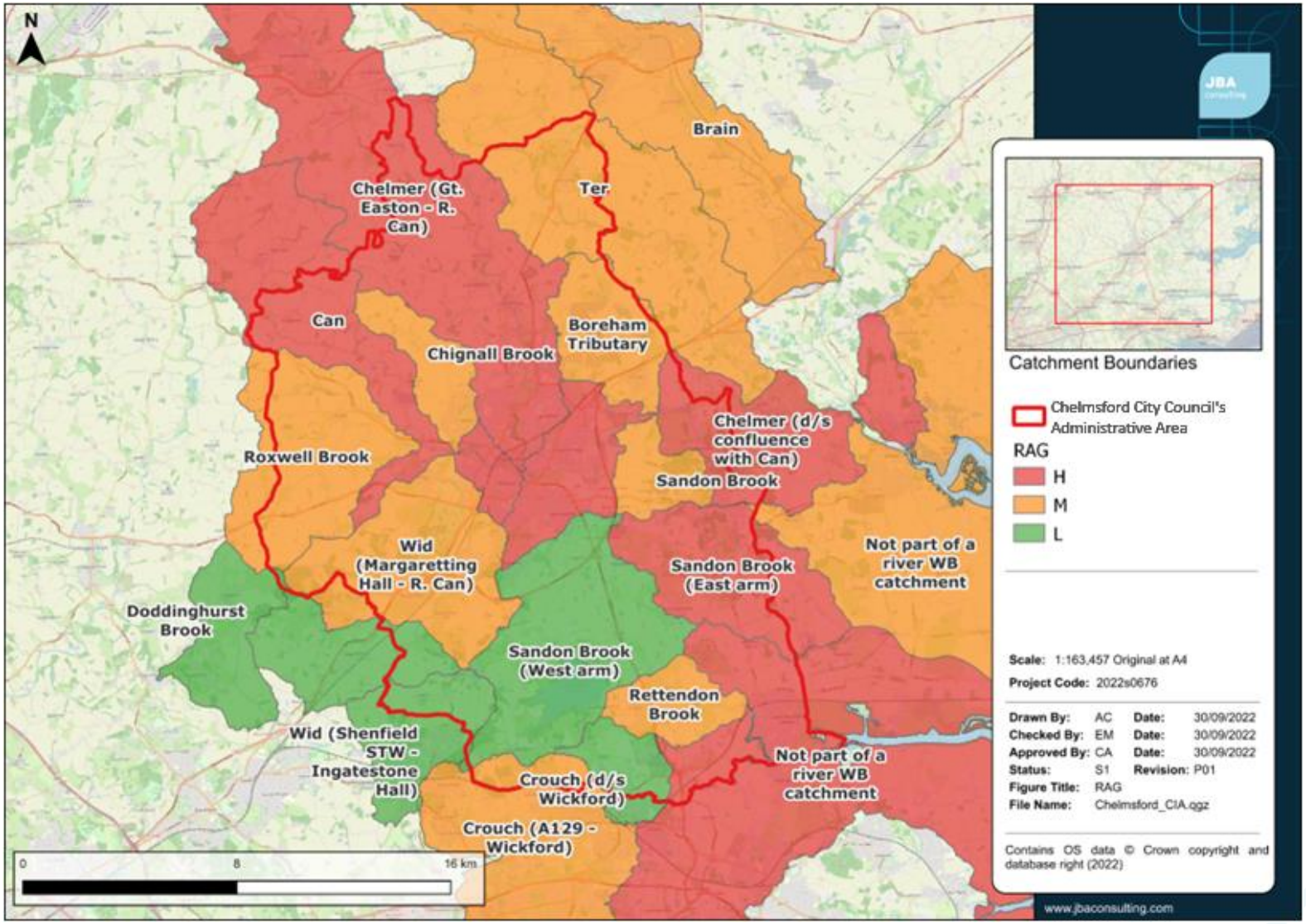

Figure F-3: Final catchment rankings of susceptibility to the impacts of cumulative impacts within Chelmsford City Council's Administrative Area.

2 Policy recommendations

2.1 Broadscale recommendations

The broadscale cumulative impact assessment for CCC's Administrative Area has highlighted that the potential for development to have a cumulative impact on flood risk is moderately low across the area. Catchments have been identified as high, medium or low risk.

New development can potentially increase flood risk and thus the need for incremental action and betterment in flood risk terms across all of CCC's Administrative Area is appropriate.

The following policy recommendations therefore apply to all catchments within the study area:

- CCC should work closely with neighbouring local authorities to develop complementary Local Planning Policies for catchments that drain into and out of the study area to other local authorities in order to minimise cross boundary issues of cumulative impacts of development.
- Developers should incorporate SuDS and provide details of adoption, ongoing maintenance and management on all development sites. Proposals will be required to provide reasoned justification for not using SuDS techniques, where ground conditions and other key factors show them to be technically feasible. Preference will be given to systems that contribute to the conservation and enhancement of biodiversity and green infrastructure where practicable. Developers should refer to the relevant LLFA guidance (Essex County Council) for the requirements for SuDS in CCC's Administrative Area, including Technical and Development Type-specific Guidance for Developers.
    - **Essex County Council Planning Advice and Guidance**

Further guidance on SuDS can be found in Section 9 of the main SFRA report.

- Essex County Council as LLFA will review Surface Water Drainage Strategies in accordance with their local requirements for major and non-major developments. These should take into account all sources of flooding so that future development is resilient to flood risk and does not increase flood risk elsewhere.
- Where appropriate, the opportunity for Natural Flood Management in rural areas, SuDS retrofit in urban areas and river restoration should be maximised. Culverting should be opposed, and day-lighting existing culverts promoted through new developments.
- Runoff rates from all development sites must be limited to greenfield rates (including brownfield sites) for all sites. For Brownfield sites, if it is demonstrated that greenfield rates are not practicable then the runoff rates should be restricted to the closest rate that is practicable or flow matching rates. All development (including brownfield sites) falling within Critical Drainage Areas should restrict runoff rates to 1-year greenfield rates. Developers should refer to the relevant LLFA guidance for the requirements for SuDS in the CCC's Administrative Area.

- All development proposals should undertake a site-specific Flood Risk Assessment. Site-specific FRAs should explore opportunities to provide wider community flood risk benefit through new developments. Measures that can be put in place to contribute to a reduction in flood risk downstream should be considered. This may be either be by provision of additional storage on site e.g. through oversized SuDS, natural flood management techniques, green infrastructure and green-blue corridors, and/ or by providing a Partnership Funding contribution towards any flood alleviation schemes.
- CCC should consider requiring developers to contribute to community flood defences outside of their red line boundary to provide wider benefit and help offset the cumulative impact of development. There are proposed and ongoing Flood Alleviation Schemes which may help to reduce fluvial risk in the City Centre, and there may be opportunities for development to support the funding/delivery of these schemes.

Section 8.3 of the main SFRA report details the local requirements for mitigation measures. Catchment-specific recommendations are made for High-Risk catchments below.

2.2 Recommendations for High-Risk catchments

High risk catchments are detailed in Table F-8. From analysing the results produced above, high-level recommendations for flood storage and betterment have been proposed for sites in each of the High-Risk catchments. These recommendations should be considered by developers as part of a site-specific assessment, but more detailed modelling must be undertaken by the developer to ascertain the true storage needs and potential at each site at the planning application stage. Within the FRA consideration should be given to the potential cumulative effects of all proposed development and how this affects sensitive receptors.

Developers should also include a construction surface water management plan to support the Construction Drainage Phasing Plan. This should provide information to the EA, the LLFA and the LPA regarding the proposed management approach during the construction phase to address surface water management during storm events.

For developments in High-Risk catchments, the LLFA and LPA should consult with Local Non-For-Profit organisations such as wildlife trusts, rivers trusts and catchment partnerships (see Section 1.2.1) to understand ongoing and upcoming projects where NFM, flood storage and attenuation, and environmental betterment may be possible alongside developments and aid in reducing flood risk.

2.2.1 Recommendations for Developments in High-Risk Catchments

LPAs should work closely with the EA and the LLFA to identify any areas of land that should be safeguarded for any future flood alleviation schemes and natural flood management features.

The LPAs should explore the potential for development in High-Risk catchments to contribute towards works to reduce flood risk and enable

regeneration as well as contributing to the wider provision of green infrastructure.

The LLFA should work closely with the EA to identify any areas of land that should be safeguarded for any future flood alleviation and natural flood management features in the upper catchments.

2.3 Development within Medium risk catchments

Catchments that have been scored an overall ranking of medium, but where development proposals are present, should also consider the following recommendations:

- LPAs should work closely with the EA and the LLFA to identify any areas of land that should be safeguarded for any future flood alleviation schemes and natural flood management features.
- There is the potential for development in these catchments to contribute towards works to reduce flood risk and enable regeneration as well as contributing to the wider provision of green infrastructure.

Medium Risk Catchments within Chelmsford City Council's Administrative Area:

- Rettendon Brook
- River Ter
- Boreham Tributary
- River Brain
- River Crouch (A129-Wickford)
- Sandon Brook
- Roxwell Brook
- Wid (Margaretting Hall – R. Can)
- Chignall Brook
- Not part of a river WB catchment* (River Blackwater estuary)