



Essex County Council Preliminary Flood Risk Assessment

Final Report
January 2011



Prepared for



Revision Schedule

Preliminary Flood Risk Assessment January 2011

Rev	Date	Details	Prepared by	Reviewed by	Approved by
01	October 2010	Draft Report (for Internal Distribution)	<p>James Ogilvie Flood Risk Engineer</p> <p>Sarah Littlewood Assistant Hydrologist</p> <p>Matthew Graham Principal Consultant</p> <p>Stephen Cox Senior Hydrogeologist</p>	<p>Elizabeth Gent Principal Consultant</p>	
02	January 2011	Final Report	<p>James Ogilvie Flood Risk Engineer</p> <p>Matthew Graham Principal Consultant</p>	<p>Jon Robinson Head of Flood & Water Management</p>	<p>Jon Robinson Head of Flood & Water Management</p>

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URS / Scott Wilson
6-8 Greencoat Place
London
SW1P 1PL
United Kingdom

Tel: +44 (0)20 7798 5000
Fax: +44 (0)20 7798 5001

www.urs-scottwilson.com

Table of Contents

Executive Summary	vi
1 Introduction.....	1
1.1 Preliminary Flood Risk Assessment.....	1
1.2 Study Area.....	2
1.3 Aims and Objectives	4
2 LLFA Responsibilities	5
2.1 Introduction.....	5
2.2 Coordination of Flood Risk Management	5
2.3 Stakeholder Engagement	6
2.4 Public Engagement.....	7
2.5 Further Responsibilities	8
3 Methodology and Data Review	9
3.1 Introduction.....	9
3.2 Methodology	9
3.3 Data Sources.....	11
3.4 Data Limitations.....	12
3.5 Quality Assurance, Security and Data Restrictions	13
4 Historic Flood Risk	14
4.1 Overview of Historic Flooding in Essex	14
4.2 Analysis of Historic Flooding in Essex.....	15
4.3 Consequences of Historic Flooding	16
5 Future Flood Risk	17
5.1 Overview of Future Flood Risk.....	17
5.2 Locally Agreed Surface Water Information.....	19
5.3 Potential Consequences of Future Flooding	19
5.4 Effect of Climate Change and Long Term Developments.....	19
6 Flood Risk Areas.....	22
6.1 Overview	22
6.2 Review of Indicative Flood Risk Area.....	23
7 Next Steps	24
7.1 Future Data Management Arrangements.....	24
7.2 Scrutiny & Review Procedures.....	25
References	27

Annex 1: Records of past floods and their significant consequences (Preliminary Assessment Spreadsheet)	28
Annex 2: Records of future floods and their significant consequences (Preliminary Assessment Spreadsheet)	29
Annex 3: Records of Flood Risk Area and its rationale (Preliminary Assessment Spreadsheet)	30
Annex 4: Review Checklist	31
Annex 5: Flood Risk Mapping	32
Annex 6: Essex Flood Groups Structure	39
Annex 7: Inventory of Key Flood Risk Photos	41

Figures

Figure 1-1: Excerpt from Flood Risk Regulations 2009 relating to the production of PFRA	1
Figure 1-2: Essex County Council administrative area	3
Figure 2-1: Essex County Council Flood Group Structure	6
Figure 3-1: Sample spreadsheet sent to Essex Fire & Rescue Service for data collection	9
Figure 6-1: Indicative Flood Risk Area within Essex	22
Figure 6-2: Basildon Indicative Flood Risk Area	23
Figure 7-1: Flood Event Data Recording System - Part One	24
Figure 7-2: Flood Event Data Recording System - Part Two	24
Figure 7-3: PFRA Review Process	25

Tables

Table 1-1: Elements of Work required under the Flood Risk Regulations 2009	2
Table 2-1: Approaches to Engagement and Methods of Communication	7
Table 3-1: Key Flood Risk Indicators	10
Table 3-2: Relevant Information and Datasets	11
Table 3-3: Data Quality System from SWMP Technical Guidance (March 2010)	13
Table 3-4: Summary of data restrictions and licensing details	13
Table 5-1: National ranking of main settlements in Essex according to their susceptibility to surface water flooding	17
Table 5-2: Properties at risk from surface water flooding	18
Table 5-3: Flood risk threshold used to identify future consequences of flooding	19

Abbreviations

Acronym	Definition
AWS	Anglian Water Services
CFMP	Catchment Flood Management Plan
Defra	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EC	European Commission
ECC	Essex County Council
FWMA	Flood & Water Management Act 2010
IUD	Integrated Urban Drainage
LDF	Local Development Framework
LLFA	Lead Local Flood Authority
LoSA	Level of Service Agreements
LPA	Local Planning Authority
LRF	Local Resilience Forum
MoU	Memorandums of Understanding
PPS25	Planning and Policy Statement 25: Development and Flood Risk
PFRA	Preliminary Flood Risk Assessment
RBD	River Basin District
RFDC	Regional Flood Defence Committee
SAB	SuDS Approving Body
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
TW	Thames Water
WAG	Welsh Assembly Government

Executive Summary

This document has been prepared on behalf of Essex County Council who are the Lead Local Flood Authority (LLFA) for the administrative county boundary of Essex, as defined under the Flood Risk Regulations 2009. The Regulations require a number of key documents to be prepared including:

- Preliminary Flood Risk Assessments (PFRAs);
- Flood hazard maps and flood risk maps; and
- Flood risk management plans.

This PFRA report represents the first stage of the EC Floods Directive requirements. Under the Flood Risk Regulations (2009) Essex County Council must produce and submit a PFRA to the Environment Agency for review by 22nd June 2011. PFRAs are aimed at providing a high level overview of flood risk from surface water, groundwater and ordinary watercourses across the LLFA study area. In this case, the administrative area of Essex includes twelve lower tier district and borough councils and is served by two different water companies.

The methodology for producing this PFRA has been based on the Environment Agency's Final PFRA Guidance and Defra's Guidance on selecting Flood Risk Areas, both published in December 2010.

The Environment Agency has used a national methodology, specified by Defra to identify indicative Flood Risk Areas in England. Out of the ten indicative flood risk areas that have been identified nationally, one is located within Essex County Council's administrative boundary; this is situated in the south of the county and covers the areas of Basildon, Castle Point and Rochford, as well as a large part of Southend-On-Sea, which is a unitary authority and therefore is a LLFA and will prepare a separate report.

Flood risk data and records of historic flooding were collected from a number of local and national sources to develop a clear understanding of the flood risk across Essex. Information relating to 1342 flood events, caused by flooding from surface water, groundwater, ordinary watercourses, canals and small impounded reservoirs, was collected and analysed, although comprehensive details on flood extents and consequences during these events was largely unavailable.

1 Introduction

1.1 Preliminary Flood Risk Assessment

This document reports the findings of research undertaken by Scott Wilson on behalf of Essex County Council towards the preparation of a Preliminary Flood Risk Assessment (PFRA) for their administrative area.

The chief drivers behind this research and preparation of the PFRA report are two sets of new legislation, namely the Flood Risk Regulations 2009, which came into force on the 10th December 2009, and the Flood & Water Management Act (FWMA) which gained Royal Assent on the 8th April 2010. Under these pieces of legislation, all Unitary Authorities, and in two-tier systems, all County Councils, including Essex County Council, are designated 'Local Lead Flood Authorities' (LLFA) and have formally been allocated a number of key responsibilities with respect to local flood risk management. A full description of these responsibilities is provided in Chapter 2.

The purpose of the Flood Risk Regulations 2009 is to transpose the EC Floods Directive (Directive 2007/60/EC on the assessment and management of flood risks) into domestic law in England and Wales and to implement its provisions. In particular it places duties on the Environment Agency and LLFAs to prepare a number of documents including:

- Preliminary Flood Risk Assessments (PFRA);
- Flood hazard and flood risk maps;
- Flood Risk Management Plans.

An excerpt from the Flood Risk Regulations 2009 regarding the duty to prepare PFRAs is shown in Figure 1-1; the section highlighted in red shows the responsibilities of LLFAs.

Figure 1-1: Excerpt from Flood Risk Regulations 2009 relating to the production of PFRAs

PART 2
PRELIMINARY FLOOD RISK ASSESSMENTS

Duty to prepare preliminary assessment maps and reports: Environment Agency

9.—(1) The Environment Agency must prepare in relation to each river basin district—

- (a) a preliminary assessment map, and
- (b) a preliminary assessment report in relation to flooding from—
 - (i) the sea,
 - (ii) main rivers, and
 - (iii) reservoirs.

(2) This regulation is subject to regulations 31 and 32.

Duty to prepare preliminary assessment reports: lead local flood authorities

10.—(1) A lead local flood authority must prepare a preliminary assessment report in relation to flooding in its area.

(2) A lead local authority is not required to include in its report information about flooding from a source mentioned in regulation 9(1)(b) unless the authority thinks that it may affect flooding from another source.

(3) The Environment Agency—

- (a) must review a preliminary assessment report prepared under this regulation, and
- (b) may recommend modifications.

(4) Following a review, a lead local flood authority may revise its preliminary assessment report.

(5) The Agency's power to require information under regulation 36 includes power to require a lead local flood authority to provide a preliminary assessment report by a specified date.

(6) This regulation is subject to regulations 33 and 34.

Table 1-1 shows the elements of work required from Essex County Council under the Flood Risk Regulations 2009, along with the timescales of their respective delivery. The first two elements of work, highlighted in black, are covered by the preparation of this PFRA report.

Table 1-1: Elements of Work required under the Flood Risk Regulations 2009

22 nd June 2011	Prepare Preliminary Assessment Report.	<i>The PFRA should focus on local flood risk from surface water, groundwater, ordinary watercourses, canals and small impounded reservoirs.</i>
22 nd June 2011	On the basis of the PFRA, identify Flood Risk Areas.	<i>Flood Risk Areas are areas of significant risk identified on the basis of the findings of the PFRA, national criteria set by the UK Government Secretary of State and guidance provided by the Environment Agency.</i>
22 nd June 2013	Prepare Flood Hazard Maps and Flood Risk Maps for each Flood Risk Area.	<i>Used to identify the level of hazard and risk of flooding within each Flood Risk Area to inform Flood Risk Management Plans.</i>
22 nd June 2015	Prepare Flood Risk Management Plans for each Flood Risk Area.	<i>Plans setting out risk management objectives and strategies for each Flood Risk Area.</i>

It is noted that the scope of this PFRA is to consider past flooding and possible future flooding from the following local flood sources:

- Surface water;
- Groundwater;
- Ordinary watercourses; and
- Flooding from canals and small impounded reservoirs.

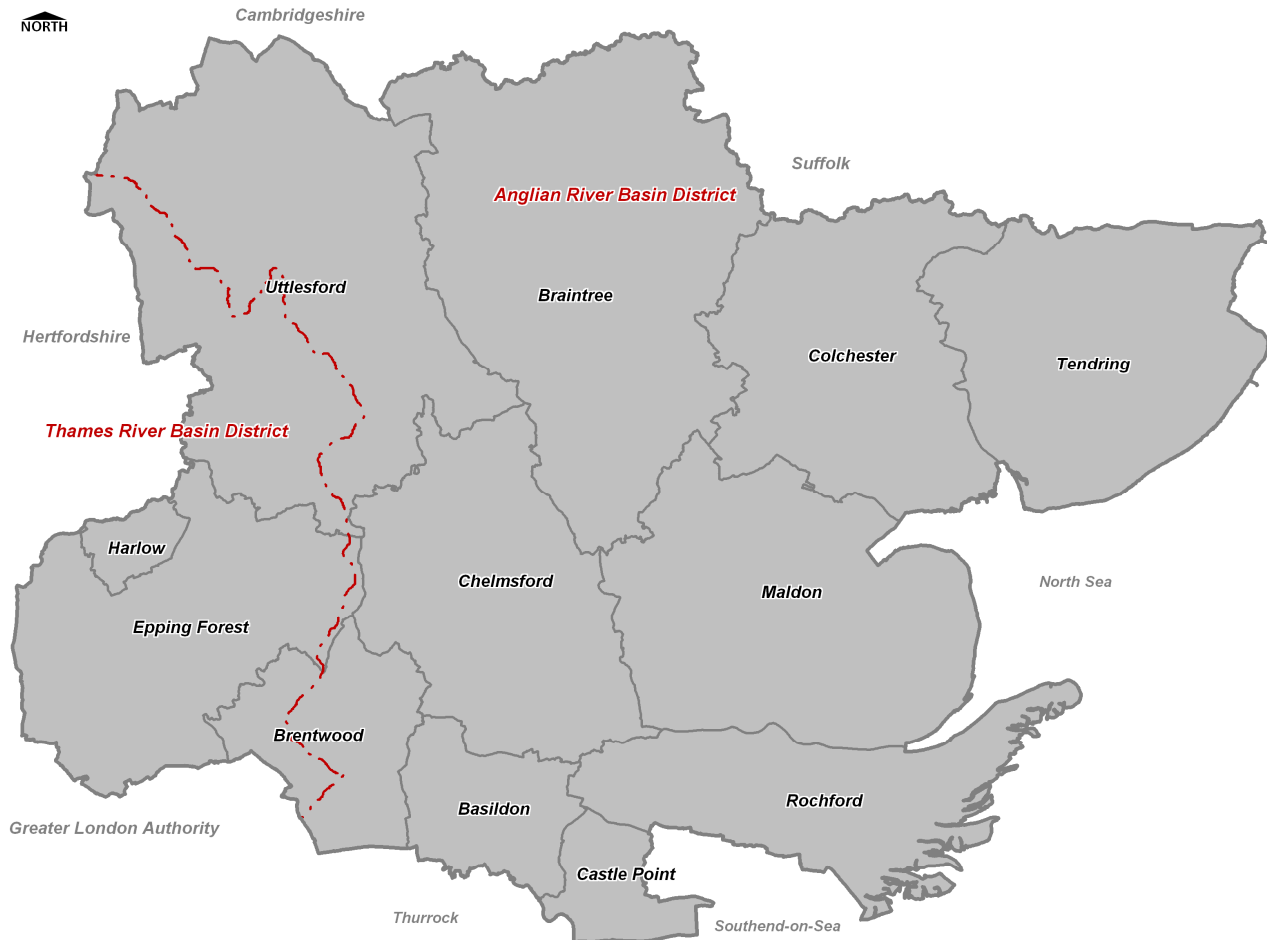
It is also noted that the PFRA report must consider floods which have significant harmful consequences for human health, economic activity and the environment.

As described in Figure 1-1, flooding associated with the sea, main rivers and reservoirs is the responsibility of the Environment Agency and does **not** need to be considered by the LLFA as part of the PFRA, unless it is considered that it may affect flooding from one of the sources listed above.

1.2 Study Area

The study area for this PFRA is defined by the administrative boundary of Essex County Council. This includes Braintree, Epping Forest, Harlow, Maldon, Rochford, Tendring and Uttlesford District Councils, and Basildon, Brentwood, Castle Point, Chelmsford and Colchester Borough Councils. The geographical extent of the study area is illustrated in Figure 1-2.

Figure 1-2: Essex County Council administrative area



The administrative area of Essex County Council covers approximately 3700 km² and includes 12 lower tier District and Borough authorities. There is a notable variation in the size of these lower tier authorities both in terms of geographical area and organisational size.

The study area falls across the Anglian River Basin District and the Thames River Basin District and is served by two water companies, Anglian Water and Thames Water. The study area is also served by two Environment Agency regions, Thames and Anglian regions. The Anglian Region is split into three areas (East, Central and North) with separate Regional Flood and Coastal Committees. Essex has 4 members on the Anglian (East) committee, no members on the Anglian (Central) committee and shares a member with Buckinghamshire and Luton on the Thames Committee. Precepts are paid to all committees depending on the number of households in the area.

Essex is bordered to the east by the North Sea and to the south by Southend-on-Sea Borough Council and Thurrock Borough Council and the River Thames estuary. To the north are the counties of Suffolk and Cambridgeshire; to the west is the county of Hertfordshire; and to the south-west the Greater London area.

1.3 Aims and Objectives

The PFRA is a high level screening exercise to locate areas in which the risk of surface water and groundwater flooding is significant and warrants further examination through the production of maps and management plans.

The aim of this PFRA is to provide an assessment of potential flood risk across the study area, including information on past floods and the potential consequences of future floods.

The key objectives can be summarised as follows:

- Summarise the methodology adopted for the PFRA with respect to data sources, availability and review procedures;
- Provide a summary of the systems used for data sharing and storing, and provision for quality assurance, security and data licensing arrangements;
- Assess historical flood events within the study area from the sources mentioned in paragraph 0, and the consequences and impacts of these events;
- Assess the potential harmful consequences of future flood events within the study area;
- Review the provisional national assessment of indicative Flood Risk Areas provided by the Environment Agency and provide explanation and justification for any amendments required to the Flood Risk Areas;
- Describe arrangements for partnership and collaboration for ongoing collection, assessment and storage of flood risk data and information;
- Identify relevant partner organisations involved in future assessment of flood risk; and summarise means of future and ongoing stakeholder engagement.

2 LLFA Responsibilities

2.1 Introduction

The preparation of a PFRA is just one of several responsibilities of LLFAs under the new legislation. This section provides a brief overview of other responsibilities Essex County Council are obliged to fulfil under their role as a LLFA.

2.2 Coordination of Flood Risk Management

In his Review of the summer 2007 flooding, Sir Michael Pitt stated that *“the role of local authorities should be enhanced so that they take on responsibility for leading the coordination of flood risk management in their areas”*. As the designated LLFA, Essex County Council is therefore responsible for leading local flood risk management across Essex.

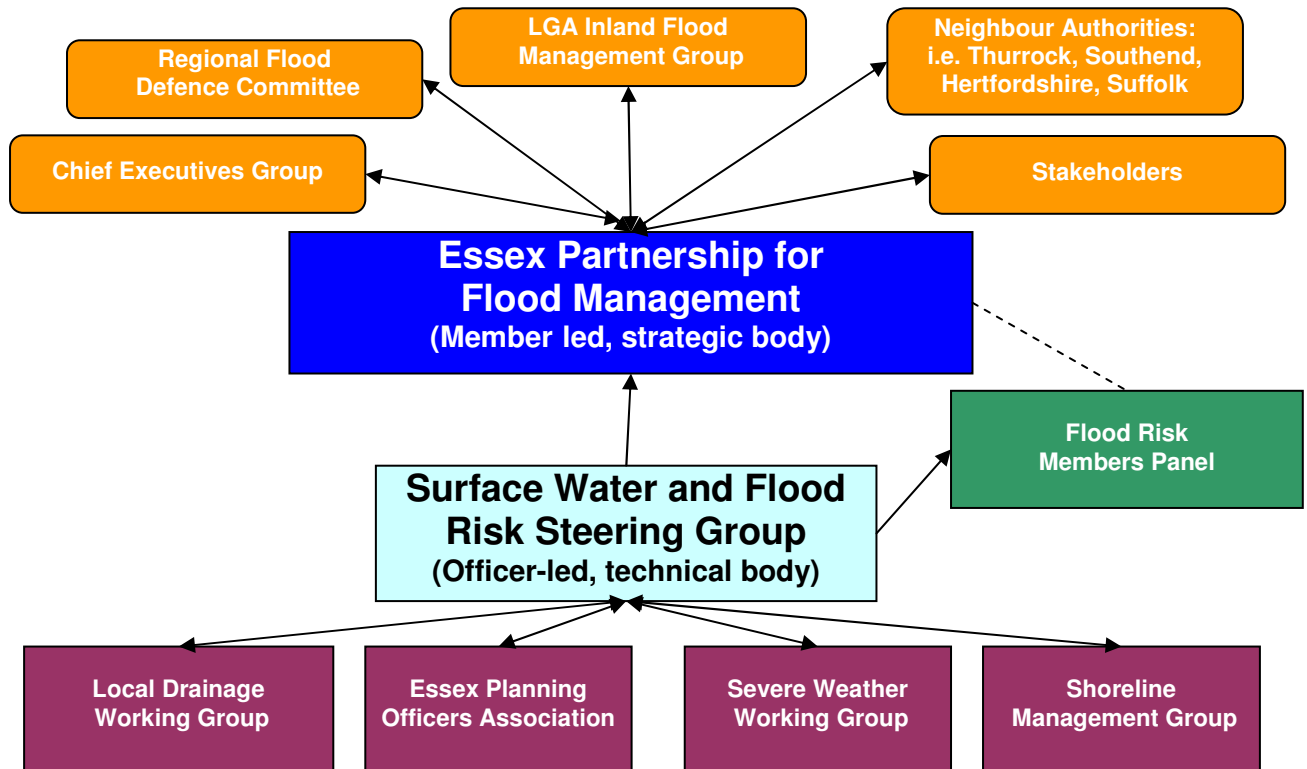
Much of the local knowledge and technical expertise necessary for Essex County Council to fulfil their duties as LLFA lies with the District and Borough councils and other partner organisations. It is therefore crucial that Essex County Council work alongside these groups and organisations as they undertake their responsibilities to ensure effective and consistent management of local flood risk throughout the county and to contribute to the provision of a coordinated and holistic approach to flood risk management across the study area.

As Lead Local Flood Authority, it is the role of Essex County Council to forge effective partnerships with the 12 Districts and Borough Councils, Anglian Water, Thames Water and the Environment Agency, as well as other key stakeholders. Ideally these working arrangements should be formalised to ensure clear lines of communication, mutual co-operation and management through the provision of Level of Service Agreements (LoSA) or Memorandums of Understanding (MoU).

In order to assist with this, Essex County Council has identified a number of panels, steering groups, partnerships and working groups across the different organisations and set up a Member-led Partnership for Flood Management to provide an overarching lead. It has also opened up its internal steering group to act as an officer-led operational group with representatives from Environment Agency, Anglian Water and a number of the District and Borough Councils.

An organogram of the overall Flood Group structure is provided in Figure 2-1 and a brief description of the role of each group is provided in Annex 6.

Figure 2-1: Essex County Council Flood Group Structure



2.3 Stakeholder Engagement

As part of the PFRA, the Essex Partnership for Flood Management has sought to engage stakeholders representing the following organisations and authorities:

- Essex County Council
- Basildon Borough Council
- Braintree District Council
- Brentwood Borough Council
- Castle Point Borough Council
- Chelmsford Borough Council
- Colchester Borough Council
- Epping Forest District Council
- Harlow District Council
- Maldon District Council
- Rochford District Council
- Tendring District Council
- Uttlesford District Council
- Town and Parish Councils of Essex
- Environment Agency
- Anglian Water
- Thames Water
- Network Rail
- Essex Fire & Rescue Service
- Essex Police Service
- British Waterways
- Highways Agency

It is important to note that we have communicated with and collated data from various sector/department leads within each of the lower tier authorities, including Emergency Planning, Strategic Planning, Highways, Drainage and Parks Departments.


2.4 Public Engagement

It is recognised that members of the public may also have valuable information to contribute to the PFRA and to local flood risk management more generally across Essex. Stakeholder engagement can afford significant benefits to local flood risk management including building trust, gaining access to additional local knowledge and increasing the chances of stakeholder acceptance of options and decisions proposed in future flood risk management plans.

However, it is also recognised that it is crucial to plan the level and timing of engagement with communities predicted to be at risk of flooding from surface water, groundwater and ordinary watercourses. This is to ensure that the potential for future management options and actions is adequately understood and costed without raising expectations before solutions can reasonably be implemented.

It is important to undertake some public engagement when formulating local flood risk management plans, following the designation of Flood Risk Areas within the study area as this will help to inform future levels of public engagement. It is recommended that Essex County Council follow the guidelines outlined in the Environment Agency’s “Building Trust with Communities” which provides a useful process of how to communicate risk including the causes, probability and consequences to the general public and professional forums such as local resilience forums. Examples of stakeholder communication at differing levels are summarised in Table 2-1.

Table 2-1: Approaches to Engagement and Methods of Communication



Type of Involvement	Description	Examples of Methods
Inform	Provide information, for example to help people understand the issue, or to announce a decision.	<ul style="list-style-type: none"> • Leaflets • Newsletter • Briefing note • Displays • Advertising • Newspapers, TV and radio • Video • Site visits • Internet
Gather information	Feedback is necessary in order to gain an insight into people’s comments, questions and concerns. This can help ECC understand what people know and what they value.	<ul style="list-style-type: none"> • Staffed displays • Surgeries • Staffed telephone lines • Internet (inviting feedback) • Public meetings • Surveys, questionnaires and interviews
Involve	Provide opportunities for everyone involved to talk and listen. To understand the issues and concerns of those involved. Although ECC makes the final decision, there is a real opportunity for the community to have an influence. There must be things that can change as a result of their involvement.	<ul style="list-style-type: none"> • Workshops • Focus groups • Surgeries • Liaison groups (different groups representing specific interests) • Facilitated meetings (meeting managed by a third party who is unconnected to the issues) • Partnership Provide opportunities for everyone involved to talk and listen. • The people taking part share the decision-making. • Liaison groups (as above) • Facilitated meetings (as above)

2.5 Further Responsibilities

Aside from forging partnerships and coordinating and leading on local flood management, there are a number of other key responsibilities that have arisen for Lead Local Flood Authorities from the Flood & Water Management Act and the Flood Risk Regulations. These responsibilities include:

- **Investigating flood incidents** – LLFAs have a duty to investigate and record details of significant flood events within their area. This duty includes identifying which authorities have flood risk management functions and what they have done or intend to do with respect to the incident, notifying risk management authorities where necessary and publishing the results of any investigations carried out. Further information with respect to this duty is provided in Chapter 7.
- **Asset Register** – LLFAs also have a duty to maintain a register of structures or features which are considered to have an effect on flood risk, including details on ownership and condition as a minimum. The register must be available for inspection and the Secretary of State will be able to make regulations about the content of the register and records.
- **SuDS Approving Body** – LLFAs are designated the SuDS Approving Body (SAB) for any new drainage system, and therefore must approve, adopt and maintain any new sustainable drainage systems (SuDS) within their area.
- **Flood risk management strategies** – LLFAs are required to develop, maintain, apply and monitor a strategy for local flood risk management in its area. The local strategy will build upon information such as national risk assessments and will use consistent risk based approaches across different local authority areas and catchments. The timescales for the delivery of the first iteration of these strategies are shown in Table 1-1.
- **Works powers** – LLFAs have powers to undertake works to manage flood risk from surface runoff and groundwater, consistent with the local flood risk management strategy for the area.
- **Designation powers** – LLFAs, as well as district councils and the Environment Agency have powers to designate structures and features that affect flooding or coastal erosion in order to safeguard assets that are relied upon for flood or coastal erosion risk management.

3 Methodology and Data Review

3.1 Introduction

The PFRA is a high-level screening exercise used to identify areas where the risk of flooding is considered to be significant and warrants further examination and management through the production of maps and management plans.

The approach for producing this PFRA was based upon the Environment Agency's PFRA Final Guidance, which was released in December 2010. The PFRA is based on readily available or derivable data and with this in mind, the following methodology has been used to undertake the PFRA.

3.2 Methodology

Data Collection from Partner Organisations

The following authorities and organisations were identified and contacted to share data for the preparation of the PFRA; 12 District and Borough councils, Parish councils, Thames Water, Anglian Water, Network Rail, the Environment Agency and Essex Fire and Rescue Service. An Essex County Council member-led PFRA Steering Group was established to coordinate this phase of work.

Figure 3-1 provides an example of the pro forma spreadsheets that were issued to Essex County Council, including Essex Fire & Rescue Service, to assist in the collection of anecdotal information on known flooding hotspots.

Figure 3-1: Sample spreadsheet sent to Essex Fire & Rescue Service for data collection

Location (Address, Town)	Location (Post Code)	Approx. Extent of Flooding	Depth of Flooding	Frequency of Flooding	Flooding Source	Residential Properties Flooded	Commercial Properties Flooded	Damage Caused	Other Impacts	Comments
1-6 Rivermill, Harlow	CM20 1NP	Corner Hodings Rd 4-5 dwellings	0.5m	Occasional - <1/year	Storm drains follow very heavy rainfall	Yes	No	Minor	Road has to close, disruption to traffic	Remedial works have been carried out.
Todd Brook	CM19 4EE	Stream/brook burst banks	up to 2m	<1/year	Brook	No	No	N/A	Horses tethered on adjacent fields affected	At least 1 emergency horses has occurred
Tysea Road	CM18 6AB	Several dwellings	0.5m	1 - 2 /year	Storm drains follow heavy rainfall	Yes	No	Minor		Residents have been flood boards that slide to arrest water penet
Threshers Brook	CM17	10 - 20m of roadway	0.5m	1 - 2 /year	Brook	No	No	Vehicles stranded	Road closure	

Assessing Historic Flood Risk

Existing datasets, reports and anecdotal information from the stakeholders listed above were collated and reviewed to identify details of major past flood events and associated consequences including economic damage, environmental and cultural consequences and impact on the local population.

It was anticipated that information would be provided in a geo-referenced format. However, where this was not the case for some datasets, this data was geo-referenced where possible. This made it possible to display this information using GIS software and overlay layers to identify the spatial distribution of historic flood events and relate these datasets to receptor information, in order to assess the overall flood risk.

Assessing Future Flood Risk

The identification of Flood Risk Areas through the PFRA should also take into account future floods, defined as any flood that could potentially occur in the future. This definition includes predicted floods extrapolated from current conditions in addition to those with an allowance for climate change. The assessment of future flood risk will primarily rely on a technical review of the Environment Agency’s Flood Map for Surface Water which has been recently circulated to Lead Local Flood Authorities. The Flood Map for Surface Water uses a numerical hydraulic model to predict the extent of flood risk from two precipitation return periods (1 in 30 and 1 in 200 year return rainfall events).

The following factors were considered when assessing *future* flood risk across the Essex study area; topography, location of ordinary watercourses (length), location of flood plains that retain water, characteristics of watercourses (culvert lengths, modifications), effectiveness of any works constructed for the purpose of flood risk management, location of populated areas, areas in which economic activity is concentrated, the current and predicted impact of climate change, and the predicted impact of any long-term developments that might affect the occurrence or significance of flooding, such as proposals for future development.

Identifying Flood Risk Areas

Information regarding historic and future flood risk will be used to formally identify Flood Risk Areas. To achieve this, *flood risk indicators* will be used to determine the impacts of flooding on human health, economic activity, cultural heritage and the environment. The use of flood risk indicators helps to develop understanding of the impacts and consequences of flooding. Key flood risk indicators are summarised in Table 3-1.

Table 3-1: Key Flood Risk Indicators

Impacts of flooding on:	Flood Risk Indicators
Human Health	Number of residential properties. Critical services (Hospitals, Police/Fire/Ambulance Stations, Schools, Nursing Homes, etc).
Economic Activity	Number of non-residential properties. Length of road or rail. Area of agricultural land.
Cultural Heritage	Cultural heritage sites (World Heritage Sites).
Environment	Designated sites (SSSIs, SACs, SPAs, etc) and BAP habitat.

The above indicators have been selected and analysed by Defra and the Environment Agency in order to identify areas where flood risk and potential consequences exceed a pre-determined threshold. The areas that have been identified using this methodology and exceed 30,000 people at risk have been mapped and identified as Indicative Flood Risk Areas. For further details, please refer to Defra’s Guidance for selecting and reviewing Flood Risk Areas for local sources of flooding (December 2010).

3.3 Data Sources

Table 3-2 catalogues the relevant information and datasets held by partner organisations and provides a description of each of the datasets.

Table 3-2: Relevant Information and Datasets

	Dataset	Description
Environment Agency	Environment Agency Flood Map (Fluvial)	Shows extent of flooding from rivers with a catchment of more than 3km ² during 1 in 100yr flood and 1 in 1000yr flood. Shows extent of flooding from the sea during 1 in 200yr and 1 in 1000yr flood events.
	Areas Susceptible to Surface Water Flooding	A national outline of surface water flooding held by the EA and developed in response to Pitt recommendations.
	Flood Map for Surface Water	A second generation of surface water flood mapping which was released at the end of 2010.
	Areas Susceptible to Groundwater Flooding	Mapping showing areas susceptible to groundwater flooding.
	National Receptors Dataset	A nationally consistent dataset of social, economic, environmental and cultural receptors including residential properties, schools, hospitals, transport infrastructure and electricity substations.
	Indicative Flood Risk Areas	National mapping highlighting key flood risk areas, based on the definition of 'significant' flood risk agreed with the Defra and WAG.
	Historic Flood Map	Attributed spatial flood extent data for flooding from all sources.
	North Essex and South Essex Catchment Flood Management Plans (CFMP)	CFMPs consider all types of inland flooding, from rivers, groundwater, surface water and tidal flooding and are used to plan and agree the most effective way to manage flood risk in the future.
District & Borough Councils	Strategic Flood Risk Assessments (SFRA)	SFRAs may contain useful information on historic flooding, including local sources of flooding from surface water, groundwater and flooding from canals.
	Historical flooding records	Historical records of flooding from surface water, groundwater and ordinary watercourses.
	Anecdotal information relating to local flood history and flood risk areas	Anecdotal information from authority members regarding areas known to be susceptible to flooding from excessive surface water, groundwater or flooding from ordinary watercourses.
Parish Councils	Anecdotal information from Parish Councils within Essex	Anecdotal information on flood risk, flood history and local flood hotspots.
Essex County Council	Highways Flooding Reports	Highways Flooding Reports for a number of locations within Essex, including analysis of the flood risk at each location.
	SWAS Risk Register	Database detailing highways schemes to address surface water flooding issues in Essex.

Essex Fire & Rescue	Historic flooding records	Records of historic flooding events from the Fire Service's call out history records including location, incident type and response given.
	Anecdotal information	Anecdotal information from each of the Station Managers regarding local flood risk hotspots in their areas.
Thames & Anglian Water	DG5 Register for Thames Water Utilities areas	DG5 Register logs and records of sewer flooding incidents in each area.
	DG5 Register for Anglian Water Services areas	DG5 Register logs and records of sewer flooding incidents in each area.
British Waterways	British Waterway's canal network	Detailed GIS information on the British Waterway's canal network, including the location of canal centrelines, sluices, locks, culverts, etc.
	Records of canal breaches and overtopping events	Records of historical canal breaches and canal overtopping events across Essex.

3.4 Data Limitations

A brief assessment of the data collection process is included in this chapter to provide transparency with respect to the methodology. By flagging up the issues identified in the data collection phase it is hoped this could serve as a catalyst to improve the collection of flood risk data going forward. A number of issues arose during the data collection process, as described below:

Inconsistent Recording Systems

The lack of a consistent flood data recording system across Essex County Council and the 12 District and Borough councils has led to major inconsistencies in the recording of flood event data. This has resulted in incomplete, or sometimes nonexistent, flood record datasets. Further information on addressing this issue in the future is included in Chapter 7.

Incomplete Datasets

As a result of the lack of consistent flood data recording arrangements (as described above), many councils have kept poor flood records. Some of the datasets collated are not exhaustive and it is felt that they are unlikely to accurately represent the complete flood risk issues in a particular area. The corresponding gaps in flood data will hinder also the identification of accurate flood risk areas.

Varied Quality of Data

Based upon the data collected from all sources described above, there was found to be varied quality in historic flood records and information. For example, within the District and Borough councils, one council provided details of historic flood events with precise geo-referenced locations, whereas another provided brief paper records of flooded locations during one flood event along with some anecdotal information on flood risk areas. Additionally, conversations with one council concluded that they held no flood history records at all as it had not been a requirement in the past. This is representative of the range of data quality across the 12 District and Borough councils.

Records of Consequences of Flooding

No data providers were able to provide comprehensive details of the consequences of specific past flood events, which made accurately assessing the consequences of historic flooding difficult.

3.5 Quality Assurance, Security and Data Restrictions

Data collected were subject to quality assurance measures to monitor and record the quality and accuracy of acquired information and datasets. A data quality score was given, which is a qualitative assessment based on the Data Quality System provided in the SWMP Technical Guidance document (March 2010). This system is explained in Table 3-3.

Table 3-3: Data Quality System from SWMP Technical Guidance (March 2010)

Data Quality Score	Description	Explanations	Example
1	Best available	No better available; not possible to improve in the near future	High resolution LiDAR, river flow data, raingauge data
2	Data with known deficiencies	Best replaced as soon as new data is available	Typical sewer or river model that is a few years old
3	Gross assumptions	Not invented but based on experience and judgement	Location, extent and depth of surface water flooding
4	Heroic assumptions	An educated guess	Ground roughness for 2d models

The use of this system provides a basis for analysing and monitoring the quality of data that is being collected and used in the preparation of the PFRA. As mentioned in section 3.4, the quality of some collected data was poor, which was identified and recorded using this system.

The security of data is also a key consideration when it comes to collecting, collating and storing sensitive data. All data collected is stored on local servers which are password protected. Essex County Council must adhere to these data security measures to ensure that sensitive data is held in a secure manner.

A summary table illustrating the restrictions on the use of this data is included in Table 3-4 below.

Table 3-4: Summary of data restrictions and licensing details

Organisation	Restrictions on Use of Data
	The use of provided data is restricted to Essex County Council and their consultants for the preparation of its preliminary flood risk assessment.
	The use of provided data is restricted to Essex County Council and their consultants for the preparation of its preliminary flood risk assessment.
	The use of some data is restricted to Essex County Council and their consultants for the preparation of its preliminary flood risk assessment. The use of other data is unrestricted.
	Necessary precautions must be taken to ensure that all information given to third parties is treated as confidential. The information must not be used for anything other than the purpose stated in the agreement. No information may be copied, reproduced or reduced to writing, other than what is necessary for the purpose stated in the agreement.

4 Historic Flood Risk

4.1 Overview of Historic Flooding in Essex

Flood records across Essex were collected from the data sources discussed in Table 3-2. Records of 1342 historical flood events and flooding hotspots were collected across Essex County Council's administrative area. The locations of these recorded flood events are mapped out on Figure A1 (presented in Annex 5).

These flood events came from a range of flood sources, and in many cases the source of flooding was unknown or not recorded. A summary of information specific to each source of flooding considered as part of the PFRA is included below.

Surface Water Flooding

Surface water flooding occurs when heavy rainfall exceeds the capacity of local drainage networks and water flows across the ground. Information on surface water flooding incidents was obtained from a number of sources, as discussed in Table 3-2. Key sources of surface water records were the 12 District and Borough Councils, Essex Fire and Rescue Service, Essex Highways department and a number of Catchment Flood Management Plans (CFMPs), which are high-level strategic plans published by the Environment Agency that focus on flooding in major river catchments.

Groundwater Flooding

Groundwater flooding occurs as a result of water rising up from the underlying aquifer or from water flowing from abnormal springs. This tends to occur after long periods of sustained high rainfall, and the areas at most risk are often low-lying where the water table is more likely to be at shallow depth. Groundwater flooding is known to occur in areas underlain by major aquifers, although increasingly it is also being associated with more localised floodplain sands and gravels.

The solid geology of Essex County is dominated by the London Clay Formation in the southern and eastern areas. However, the Chalk outcrops in the northwest with a southwest to northeast trending outcrop boundary. The London Clay Formation is an aquitard and does not allow significant movement of groundwater. The Chalk is classified by the Environment Agency as a Principal Aquifer and is utilised for public water supply.

A number of Strategic Flood Risk Assessments have been completed by the District and Borough Councils within Essex. Although many indicate the potential for groundwater flooding, only two incidences of groundwater flooding were recorded; one at Debden Green (water in pit in garden, 01/05/2000) and one at Hatfield Broad Oak (clay and London Clay Drainage problem, 11/10/2001). The CFMPs carried out within Essex do not identify any specific groundwater flooding incidents, however they also indicate that there is a risk of groundwater flooding. For the purposes of this PFRA document, there are no historic groundwater flooding records with significant consequences.

Sewer Flooding

Sewer flooding is often caused by excess surface water entering the drainage network. DG5 registers from Thames Water and Anglian Water were analysed to investigate the occurrence of sewer flooding incidents across Essex County. It was found that there were a total of 464 sewer flooding events that have been recorded by the water companies over the past decade. However, these events have not been geo-referenced so no comments can be made about their spatial extent and distribution. In addition, once a property is identified on the water companies DG5 register, it typically means that the water company can put

funding in place to take properties off the DG5 register. There are no records of properties affected by sewer flooding with significant consequences within Essex.

Canal and Ordinary Watercourse Flooding

Information was obtained from British Waterways which details the canal network throughout Essex, including the location of canals, weirs, sluices and locks. British Waterways also provided details of historic breaches or overtopping events that have occurred across the county. However, there were no records of overtopping events on ordinary watercourses in Essex within their records.

Interaction with Main Rivers and the Sea

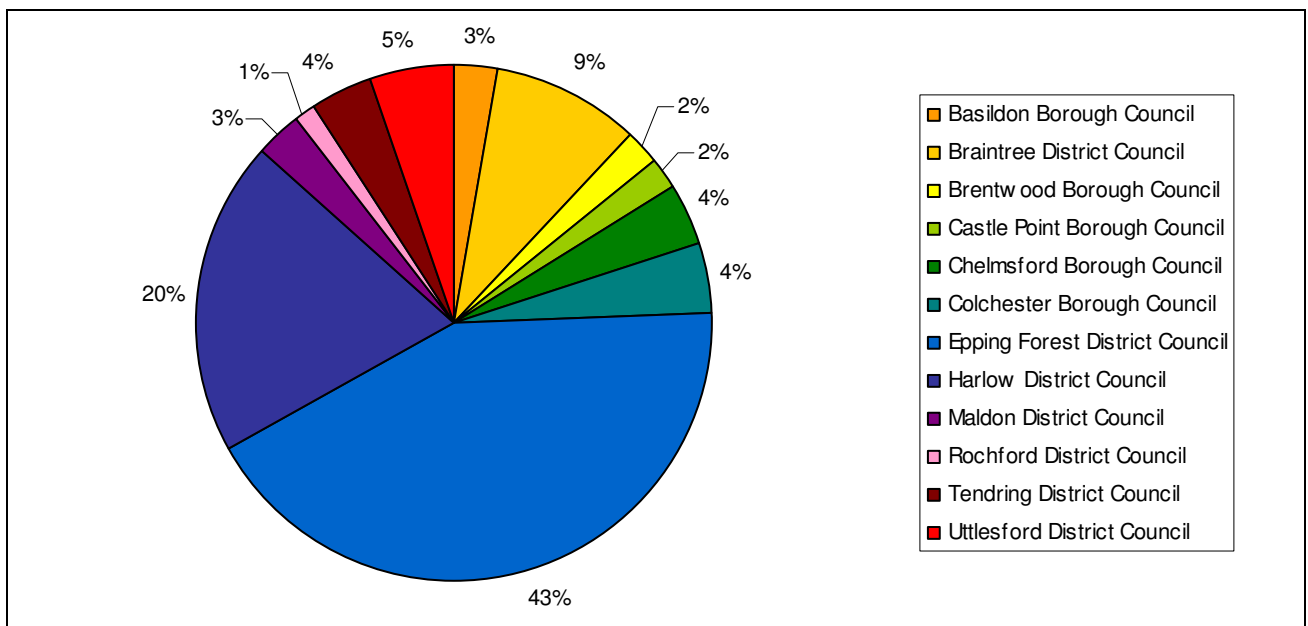
Insufficient data was available to draw definitive conclusions at this point. However, there is anecdotal evidence to suggest that surface water flooding is exacerbated in some areas, such as Colchester, during high tidal cycles when gravity drains and outfalls are blocked with high tidal waters.

4.2 Analysis of Historic Flooding in Essex

There is a large variation in the number of recorded historical flood events within each District and Borough council, ranging from 568 recorded events in one council to just 20 in another. However, it must be noted that this variation is most likely to be due to differences between different council authorities in recording and storing flood event data, and should not be taken as a representation of the range in frequency or severity of flood risk across the Essex County Council administrative area.

Figure 4-1 shows the distribution of the 1342 recorded flood events throughout Essex, highlighting the point discussed above. It can be seen that Epping Forest and Harlow, two areas covering just 10% of the overall spatial area of Essex, are responsible for providing nearly two-thirds (63%) of the recorded flood event data.

Figure 4-1: Distribution of recorded flood events across the 12 administrative areas



4.3 Consequences of Historic Flooding

As a result of the issues discussed in Chapter 3.4, insufficient data is available to draw definitive conclusions on the impacts and consequences of historic flood events on people, the economy and the environment, as this information has not been recorded in the past.

Due to the lack of information, no historic flood events can be considered to have 'significant consequences' and therefore none will be recorded in Annex 1 of the Preliminary Assessment Spreadsheet. However, a complete record of locations where flooding has occurred will be kept by Essex County Council as a future evidence base. This base will be built up in the future through ensuring full details of flood events are recorded; this will then be used to support and inform future PFRA cycles.

5 Future Flood Risk

5.1 Overview of Future Flood Risk

Surface Water Flooding

No local information is currently available on surface water flood risk in Essex. However, a Surface Water Management Plan is currently underway for the South Essex area, covering the council areas of Basildon, Rochford and Castle Point, and the results from this study will to inform the second cycle of the PFRA process, and the production of flood hazard and flood risk maps for this area.

The Environment Agency has produced a national assessment of surface water flood risk in the form of two national mapping datasets. The first generation of national mapping, Areas Susceptible to Surface Water Flooding (ASStSWF), contained three susceptibility bandings for a 1 in 200 year rainfall event. This dataset is illustrated in Figure A2. A comparison of this dataset with the historic flooding records that have been collected is shown in Figure A3; there is a reasonable correlation between the predictive mapping and the historic flooding locations.

The methodology has since been updated to produce the Flood Map for Surface Water, a revised model containing two flood events (1 in 30 year and 1 in 200 year) and two depth bandings (greater than 0.1m and greater than 0.3m). This dataset is illustrated in Figure A4.

Defra's 'National Rank Order of Settlements Susceptible to Surface Water Flooding' document ranks settlements across England according to the number of properties that are susceptible to surface water flooding from severe rainfall events. Table 5-1 shows the main settlements in each of the 12 Districts and Boroughs of Essex and the number of properties predicted to be at risk, along with the national ranking out of all of the 4215 settlements that were assessed in England.

Table 5-1: National ranking of main settlements in Essex according to their susceptibility to surface water flooding

District / Borough Council	Main Towns	National Order of Settlements Susceptible to Surface Water Flooding Properties (Rank)
Basildon	Basildon Billericay Wickford	3800 (84 th) 560 (511 th) 3400 (98 th)
Braintree	Braintree Witham Halstead	490 (561 st) 630 (476 th) 360 (684 th)
Brentwood	Brentwood Ingatestone	780 (402 nd) 500 (554 th)
Castle Point	Benfleet Canvey Island	100 (1411 th) 1700 (204 th)
Chelmsford	Chelmsford South Woodham Ferrers	2000 (159 th) 430 (612 th)
Colchester	Colchester	2500 (134 th)
Epping Forest	Epping	30 (2240 th)

	Loughton	1000 (313 th)
Harlow	Harlow	2500 (137 th)
Maldon	Maldon Burnham on Crouch	730 (426 th) 50 (1913 th)
Rochford	Rayleigh Rochford	400 (645 th) 1400 (242 nd)
Tendring	Harwich Clacton-on-Sea Frinton-on-Sea Brightlingsea	430 (614 th) 1300 (257 th) 240 (895 th) 30 (2221 st)
Uttlesford	Saffron Walden Newport Stanstead Great Dunmow	710 (435 th) 370 (681 st) 260 (839 th) 250 (871 st)

This table shows that surface water flood risk is relatively high in Essex, with nearly all the settlements assessed being ranked in the top 1000, which is approximately equal to the top 25% of all settlements in England. This document also suggests there are around 27,000 properties at risk of surface water flooding (from a 1 in 200 year event) in the main settlements of Essex alone.

A study carried out on behalf of the BBC in 2009 (BBC News, 2009) used the national surface water flood maps to calculate the number of properties that lie within surface water flood risk areas (from a 1 in 200 year event) in the seven eastern counties; a summary of their results is displayed in Table 5-2.

Table 5-2: Properties at risk from surface water flooding

County	Estimated number of properties at risk of surface water flooding
Bedfordshire	11,351
Cambridgeshire	14,777
Essex	28,008
Hertfordshire	28,297
Norfolk	15,302
Northamptonshire	9,976
Suffolk	17,268

This table shows that Essex, along with Hertfordshire, have the highest amount of properties at risk from surface water flooding in the east of England, highlighting the high risk levels in Essex.

Groundwater Flooding

There is no available information on future groundwater flood risk across Essex and groundwater rebound is not believed to be an issue in the county. The Environment Agency's national dataset, Areas Susceptible to Groundwater Flooding, has been used to form the basis of the assessment of future flood risk from groundwater. This dataset is illustrated in Figure A5.

Canals and Ordinary Watercourses

There is no available information on future flood risk from these sources. However, British Waterways are currently working on a study to better understand the future flood risk from canals, which will be available to inform the second cycle of the PFRA process.

5.2 Locally Agreed Surface Water Information

A definition of 'locally agreed surface water information' has been considered in conjunction with the Environment Agency and water companies in order to agree what surface water flood data best represents local conditions across Essex.

As there is no local information on future flooding available, 'locally agreed surface water information' will comprise the Flood Map for Surface Water dataset, which gives an overview of the future flood risk from surface water across Essex and is considered to be the most appropriate source of information. This dataset is illustrated in Figure A4.

5.3 Potential Consequences of Future Flooding

The Environment Agency has used the Flood Map for Surface Water mapping and the National Receptors Database to identify a number of areas across the country that exceed a given threshold, described in Table 5-3 below.

Table 5-3: Flood risk threshold used to identify future consequences of flooding

'Significant harmful consequences' defined as	Description
200 people or	<i>Flooded to a depth of 0.3m during a 1 in 200 year rainfall event</i>
20 businesses or	
1 critical service	

This assessment was carried out based on 1km² national grid squares, and the grid squares that exceed this criterion were identified. The grid squares within Essex where flood risk is considered to exceed this threshold are illustrated on Figure A6. These areas represent where flood risk is considered to be the most severe across the county of Essex.

The potential consequences on key flood risk indicators (as discussed in Table 3-1) have been assessed by the Environment Agency; this information has been included in Annex 2 of the Preliminary Assessment Spreadsheet.

5.4 Effect of Climate Change and Long Term Developments

The impacts of climate change

The impact of climate change on local flood risk is relatively poorly understood. Several national flood maps have informed the preliminary assessment report - specifically the Flood Map for Surface Water (surface runoff), Areas Susceptible to Surface Water Flooding (surface runoff), Areas Susceptible to Groundwater

Flooding (groundwater) and Flood Map (ordinary watercourses). These do not show the impact of climate change on local flood risk.

There was consensus amongst climate model projections presented in the IPCC fourth assessment report for northern Europe suggesting that in winter high extremes of precipitation are very likely to increase in magnitude and frequency. These models project drier summers with increased chance of intense precipitation - intense heavy downpours interspersed with longer, relatively dry periods (Solomon et al., 2007).

United Kingdom Climate Projections 2009 (UKCP09) provides the most up to date projections of future climate for the UK (<http://ukclimateprojections.defra.gov.uk>). In terms of precipitation, the key findings are:

By the 2080s, under Medium emissions, over most of lowland UK

- Central estimates are for heavy rain days (rainfall greater than 25 mm) to increase by a factor of between 2 and 3.5 in winter, and 1 to 2 in summer.

By the 2080s, under Medium emissions, across regions in England & Wales

- The central estimate (50% probability) for winter mean precipitation percentage change ranges from +14 to +23
- Central estimate for summer mean precipitation percentage change ranges from -18 to -24.

Certain key processes such as localised convective rainfall are not represented within this modelling so there is still considerable uncertainty about rarer extreme rainfall events for the UK. We can be more certain that heavy rainfall will intensify in winter compared to summer. The proportion of summertime rainfall falling as heavy downpours may increase. The impact of these changes on local flood risk is not yet known.

Appraisal guidance

Current project appraisal guidance (Defra, 2006) provides indicative sensitivity ranges for peak rainfall intensity, for use on small catchments and urban/local drainage sites. These are due to be updated following the UKCP09 projections above. They describe the following changes in peak rainfall intensity; +5% (1990-2025), +10% (2025-2055), +20% (2055-2085) and +30% (2085-2115). This was reviewed by the Met Office in 2008 using UKCP09 models (Brown et al., 2008). They suggest that, on the basis of our current understanding, these levels represent a pragmatic but not a precautionary response to uncertainty in future climate impacts. In particular for a 1 in 5 year event, increases in precipitation intensity of 40% or more by the 2080s are plausible across the UK at the local scale.

Long term developments

It is possible that long term developments might affect the occurrence and significance of flooding. However current planning policy aims to prevent new development from increasing flood risk.

In England, Planning Policy Statement 25 (PPS25) on development and flood risk aims to "ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall."

Adherence to Government policy ensures that new development does not increase local flood risk. However, in exceptional circumstances the Local Planning Authority may accept that flood risk can be increased

contrary to Government policy, usually because of the wider benefits of a new or proposed major development. Any exceptions would not be expected to increase risk to levels which are "significant" (in terms of the Government's criteria), but should be recorded here so that they can be reviewed in the future.

6 Flood Risk Areas

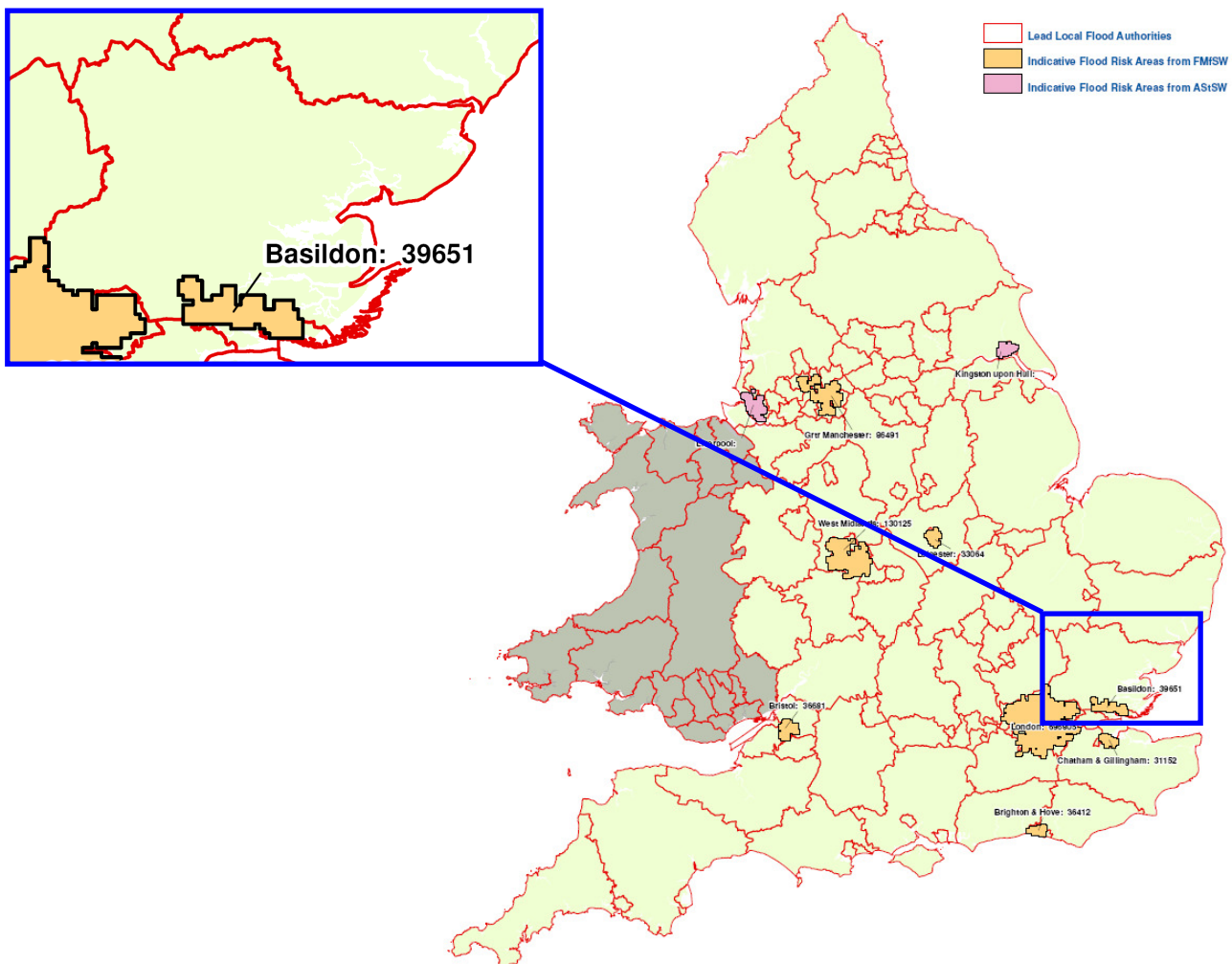
6.1 Overview

In order to ensure a consistent national approach, Defra and WAG have identified significance criteria and thresholds to be used for defining flood risk areas. Guidance on applying these thresholds has been released in Defra’s document “Selecting and reviewing Flood Risk Areas for local sources of flooding”. In this guidance document, Defra have set out agreed key indicators and threshold values which must be used to determine Flood Risk Areas.

The methodology is based on using national flood risk information to identify 1km squares where local flood risk is considered to be an issue; these areas within Essex are illustrated in Figure A6. Where a cluster of these grid squares leads to an area where flood risk is most concentrated, and over 30,000 people are predicted to be at risk of flooding, this area has been identified as an Indicative Flood Risk Area.

This guidance has now been released and the Environment Agency has applied it to identify Indicative Flood Risk Areas across the country. Of the ten (10) national Indicative Flood Risk Areas, one falls within Essex County Council’s administrative boundary, as shown in Figure 6-1 below.

Figure 6-1: Indicative Flood Risk Area within Essex



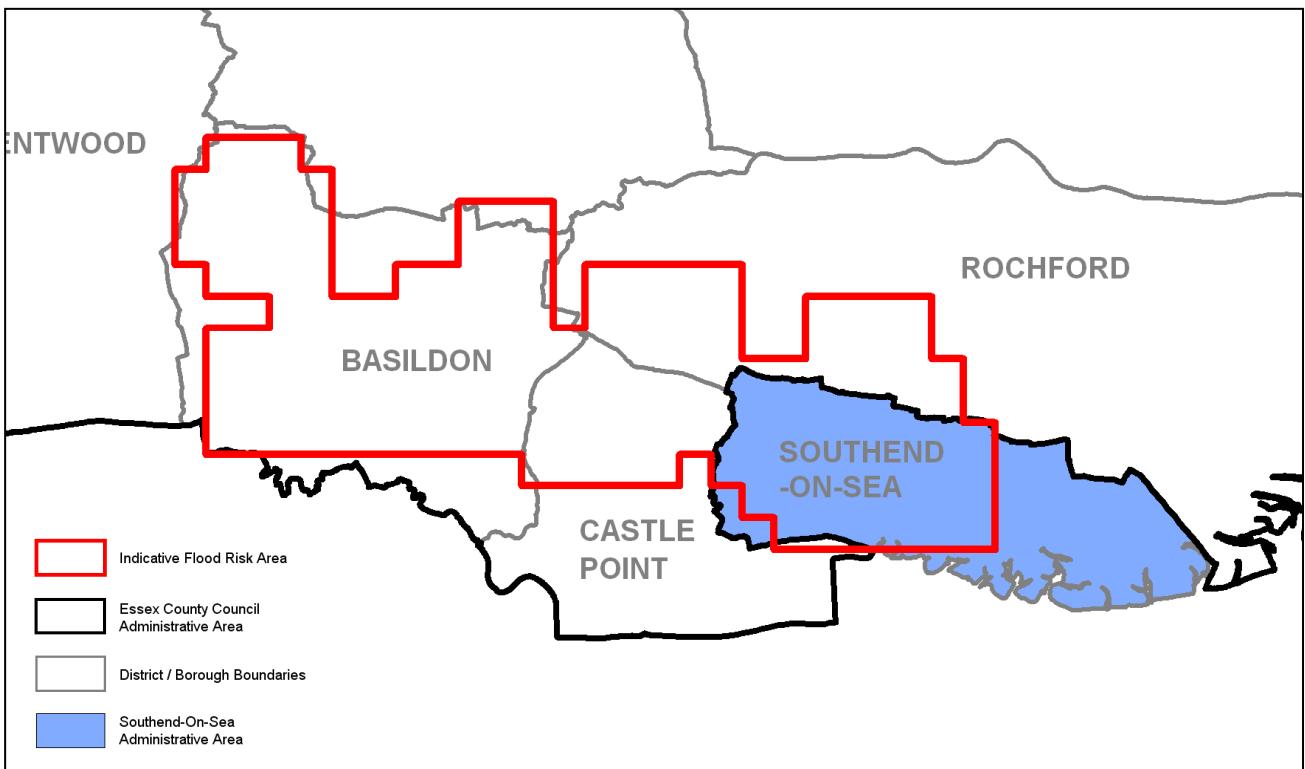
As shown in Figure 6-1, the area of Basildon has been identified as an Indicative Flood Risk Area, with nearly 40,000 people estimated to be at risk from flooding. This is the only Indicative Flood Risk Area within Essex that meets the specified criteria, although it must be noted that the designated area also covers parts of the Castle Point and Rochford administrative areas, as well as a large part of Southend-On-Sea, which is a separate Lead Local Flood Authority.

6.2 Review of Indicative Flood Risk Area

Figure 6-2 shows the geographical extent of the Basildon Flood Risk Area. As discussed in the previous section, the proposed Flood Risk Area also covers a large part of Southend-On-Sea which is not part of Essex County Council's administrative area. However, it does cover the same catchment area and ties in with high risk areas identified in the PFRA.

Essex County Council is not proposing any amendments be made to the Indicative Flood Risk Area.

Figure 6-2: Basildon Indicative Flood Risk Area



7 Next Steps

7.1 Future Data Management Arrangements

In order to continue to fulfil their role as Local Lead Flood Authority, Essex County Council are required to investigate future flood events and ensure continued collection, assessment and storage of flood risk data and information.

It is likely that this requirement will be met most effectively by the District and Borough councils recording events in their respective administrative areas. However, it is crucial that all records of flood events are documented consistently and formally assimilated by Essex County Council in order to inform future assessments and reviews and for input into the mapping and planning stages. It is recommended that a centralised database will be kept up to date by Essex County Council, who have the overall responsibility to manage flood data through the whole administrative area of Essex County.

The proposed method for flood event data collection and management is included below. A simple spreadsheet system has been created in which each of the 12 District and Borough councils can record details of flooding in their administrative area. The fields are colour coded to represent the details which are absolutely compulsory, and those which would be useful to have but not essential. Figure 7-1 and Figure 7-2 show the spreadsheet system which will be used for this.

Figure 7-1: Flood Event Data Recording System - Part One


A	B	C	D	E	F	G	H	I	J	
 Essex County Council Flood Event Data Recording System							Compulsory	Preferred	Optional	
1										
2										
3	Borough / District Council:	Records kept from:	01/10/2003		Total flood events:					
4	Basildon	Records kept to:	01/10/2003		1					
5										
6										
7										
8	Flood Event (Outline Name)	Event Date	Location (Address, Town)	Location (Post Code)	Event Duration (hours)	Estimated Return Period of Event	Depth of Flooding (m)	Extent of Flooding (m ²)	Flooding Source	Confidence of Source * (see notes)
9										
10	October 2003 Basildon High Street	01/10/2003	High Street, Basildon	SS14 1LB	8	1 in 5	0.5m	50	Pluvial	High
11										
12										

Figure 7-2: Flood Event Data Recording System - Part Two

K	L	M	N	O	P	Q	R	S	T	U
1										
2										
3										
4										
5										
6										
7										
8	Residential Properties Flooded	Commerical Properties Flooded	Critical Infrastructure at Risk	Damage Caused	Photos of Flood Event	Photo File Location	Details of any Actions Taken	Issue Resolved	Additional Notes or Information	Rainfall Event
9									Rainfall Depth (mm)	Rainfall Duration (hours)
10	0	1	None	Post office flooded - minor damage	Yes	D:\Flooding Photos\2003	none	No		20
11										4
12										

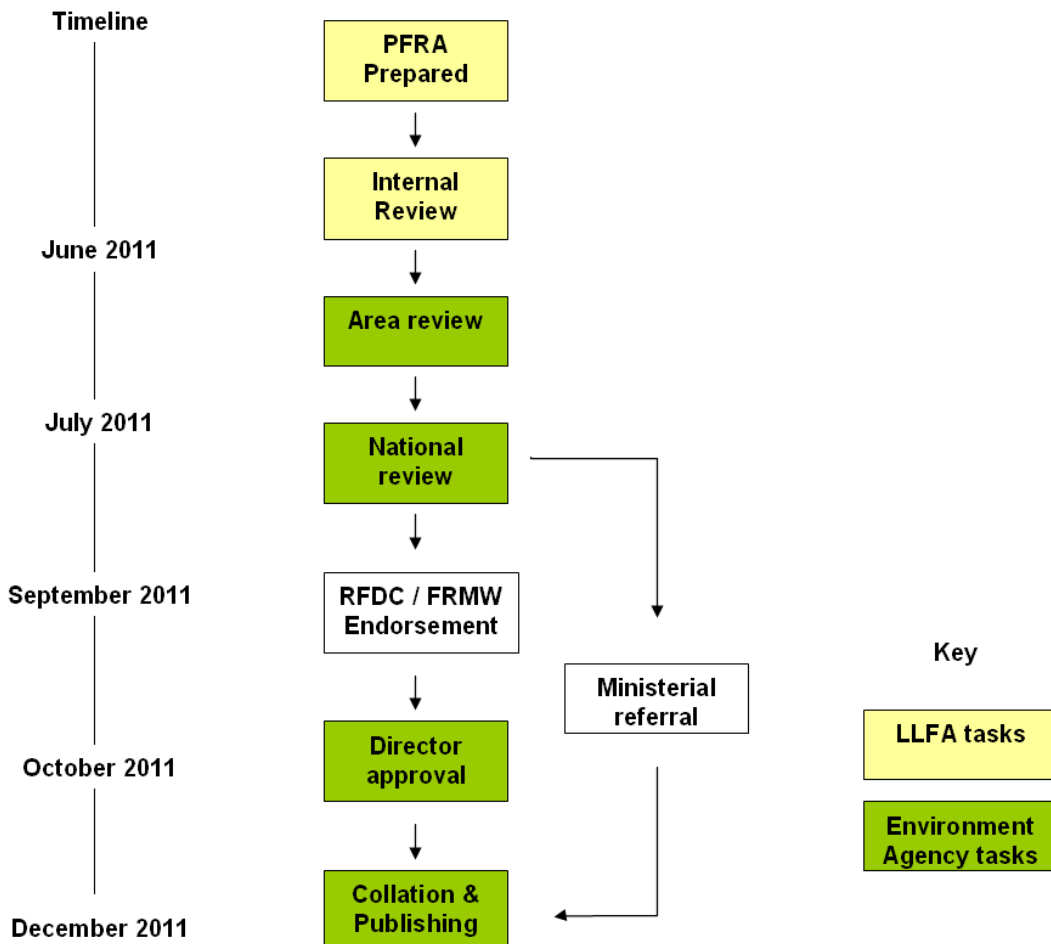
7.2 Scrutiny & Review Procedures

The scrutiny and review procedures that must be adopted when producing a PFRA are set out by the European Commission. Meeting quality standards is important in order to ensure that the appropriate sources of information have been used correctly to identify and understand flood risk.

Another important aspect of the review procedure is to ensure that the guidance is applied consistently, especially for the identification of Flood Risk Areas. A consistent approach will allow all partners to understand the risk and manage it appropriately. Whilst the Environment Agency has been given a role in reviewing, coordinating and publishing outputs for the Flood Risk Regulations, the primary tool for review will be based on existing LLFA processes.

Figure 7-3 illustrates the process that will be taken to review the completed PFRA, which is summarised below.

Figure 7-3: PFRA Review Process



On completion of the PFRA, internal approval should be obtained from the LLFA to review the PFRA and ensure it meets the required quality standards, before submission to the Environment Agency.

The Environment Agency will then undertake a technical review (area review and national review) of the PFRA, which will focus on instances where Flood Risk Areas have been amended and ensure the format of these areas meets the provide standard. If satisfied, they will recommend submission to the relevant Regional Flood Defence Committee (RFDC) for endorsement. RFDCs will make effective use of their local expertise and ensure consistency at a regional scale.

Once the RFDC has endorsed the PFRA, the relevant Environment Agency Regional Director will sign it off, before all PFRAs are collated, published and submitted to the European Commission.

The first review cycle of the PFRA will be led by Essex County Council and must be submitted to the Environment Agency by the 22nd of June 2017. They will then submit it to the European Commission by the 22nd of December 2017 using the same review procedure described in Figure 7-3 above.

References

BBC News (2009) Research reveals flood-risk areas, <http://news.bbc.co.uk/1/hi/england/7959207.stm>

Defra / WAG (2010) Selecting and reviewing Flood Risk Areas for local sources of flooding – Guidance to Lead Local Flood Authorities. Available from <http://www.defra.gov.uk/environment/flooding/documents/research/flood-risk-method.pdf>

Defra (2006) Flood and Coastal Defence Appraisal Guidance, FCDPAG3 Economic Appraisal, Supplementary Note to Operating Authorities – Climate Change Impacts. October 2006. Available from <http://www.defra.gov.uk/environment/flooding/documents/policy/guidance/fcdpag/fcd3cl>

Environment Agency (2010) Preliminary Flood Risk Assessment - Final Guidance (Report – GEHO1210BTGH-E-E). Available from <http://publications.environment-agency.gov.uk/pdf/GEHO1210BTGH-e-e.pdf>

Environment Agency (2010) Preliminary Flood Risk Assessment – Annexes to the Final Guidance (Report – GEHO1210BTHF-E-E). Available from <http://publications.environment-agency.gov.uk/pdf/GEHO1210BTHF-e-e.pdf>

H.L. Miller (eds.). Summary for Policymakers. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. 9. Available for download from <http://www.ipcc.ch/ipccreports/ar4-wg1.htm>

S J Brown, M Beswick, et al. (2008) Met Office Submission to the Pitt Review - Executive Summary, The extreme rainfall of Summer 2007 and future extreme rainfall in a changing climate.

Annex 1: Records of past floods and their significant consequences (Preliminary Assessment Spreadsheet)

Please refer to Annex 1 of the Preliminary Assessment Spreadsheet attached with this report. However, as discussed in Chapter 4.3, due to the lack of data that was available regarding the consequences of past flooding, no flood events have been designated as 'locally designated' so none have been recorded in this section.

Annex 2: Records of future floods and their significant consequences (Preliminary Assessment Spreadsheet)

Please refer to Annex 2 of the Preliminary Assessment Spreadsheet attached with this report. This spreadsheet includes a complete record of future flood risk within Essex, including details of the potential consequences of flooding to key risk receptors within the county.

Annex 3: Records of Flood Risk Area and its rationale (Preliminary Assessment Spreadsheet)

Please refer to Annex 3 of the Preliminary Assessment Spreadsheet attached with this report. This spreadsheet includes information and details about the identified Flood Risk Area within Essex.

Annex 4: Review Checklist

Please refer to Annex 4, attached to this report, which contains the Review Checklist that has been provided by the Environment Agency to act as a checklist for reviewing PFRA submissions.

Annex 5: Flood Risk Mapping

NORTH






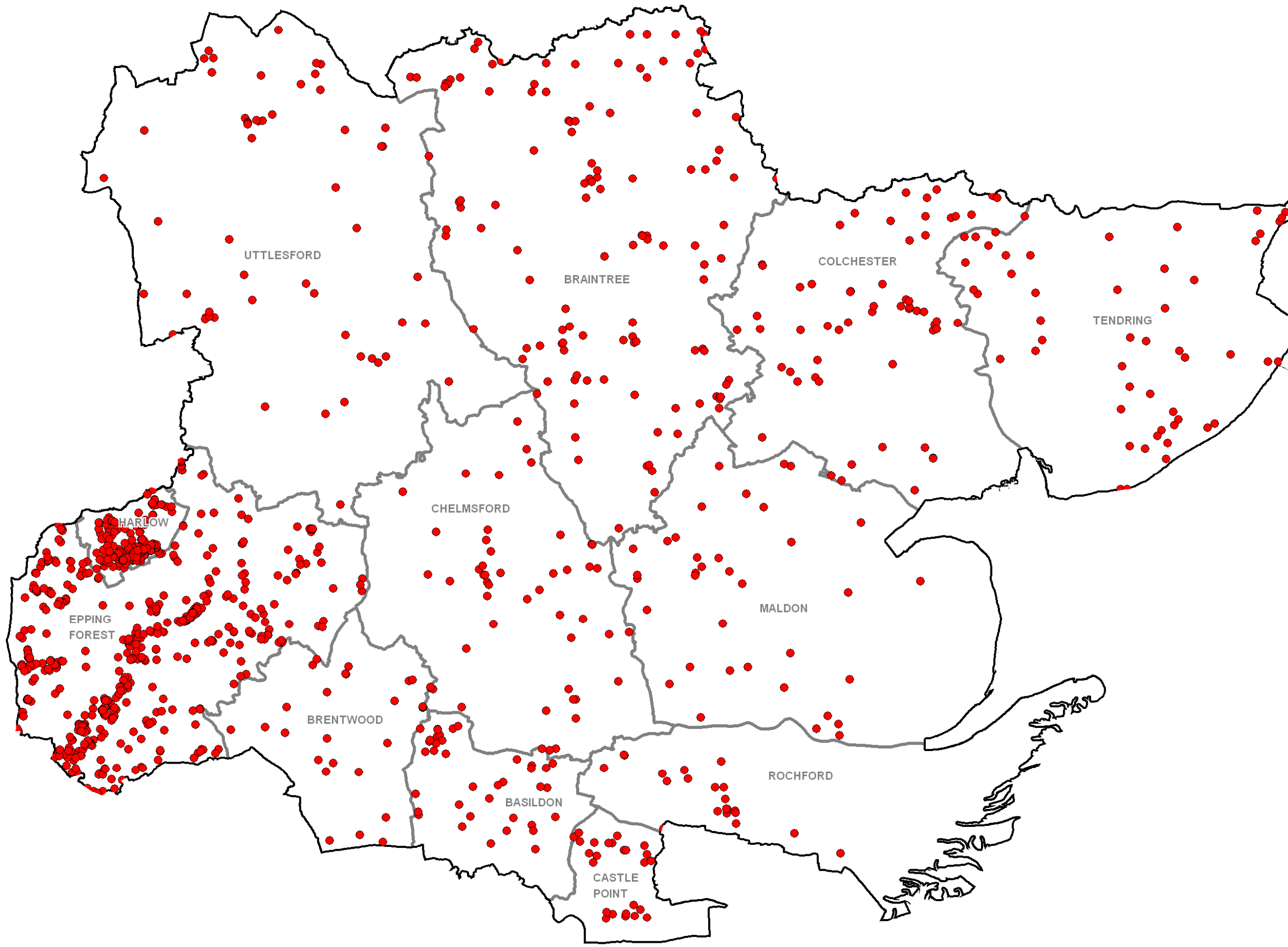
Essex County Council

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LEGEND

-  Essex County Boundary
-  District / Borough Boundaries
-  Reported Historic Flooding Incidents (1342 Events)



DRAWN BY JO	CHECKED BY MG	PASSED BY JR	DATE JAN 2011
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SCALE @ A3 1 : 280,000	ISSUING OFFICE London
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ESSEX COUNTY COUNCIL
PRELIMINARY
FLOOD RISK ASSESSMENT

HISTORIC SURFACE WATER
FLOODING INCIDENTS

Scott Wilson
6-8 Greencoat Place
London, SW1P 1PL
Tel: (020) 7798 5000



DRAWING NUMBER

FIGURE A1

NORTH








Essex County Council

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LEGEND

-  Essex County Boundary
-  District / Borough Boundaries
-  AStSWF More
-  AStSWF Intermediate
-  AStSWF Less



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JO	MG	JR	JAN 2011

SCALE @ A3	ISSUING OFFICE
1 : 280,000	London

ESSEX COUNTY COUNCIL
PRELIMINARY
FLOOD RISK ASSESSMENT

AREAS SUSCEPTIBLE TO
SURFACE WATER FLOODING

Scott Wilson
6-8 Greencoat Place
London, SW1P 1PL
Tel: (020) 7798 5000



DRAWING NUMBER

FIGURE A2

NORTH









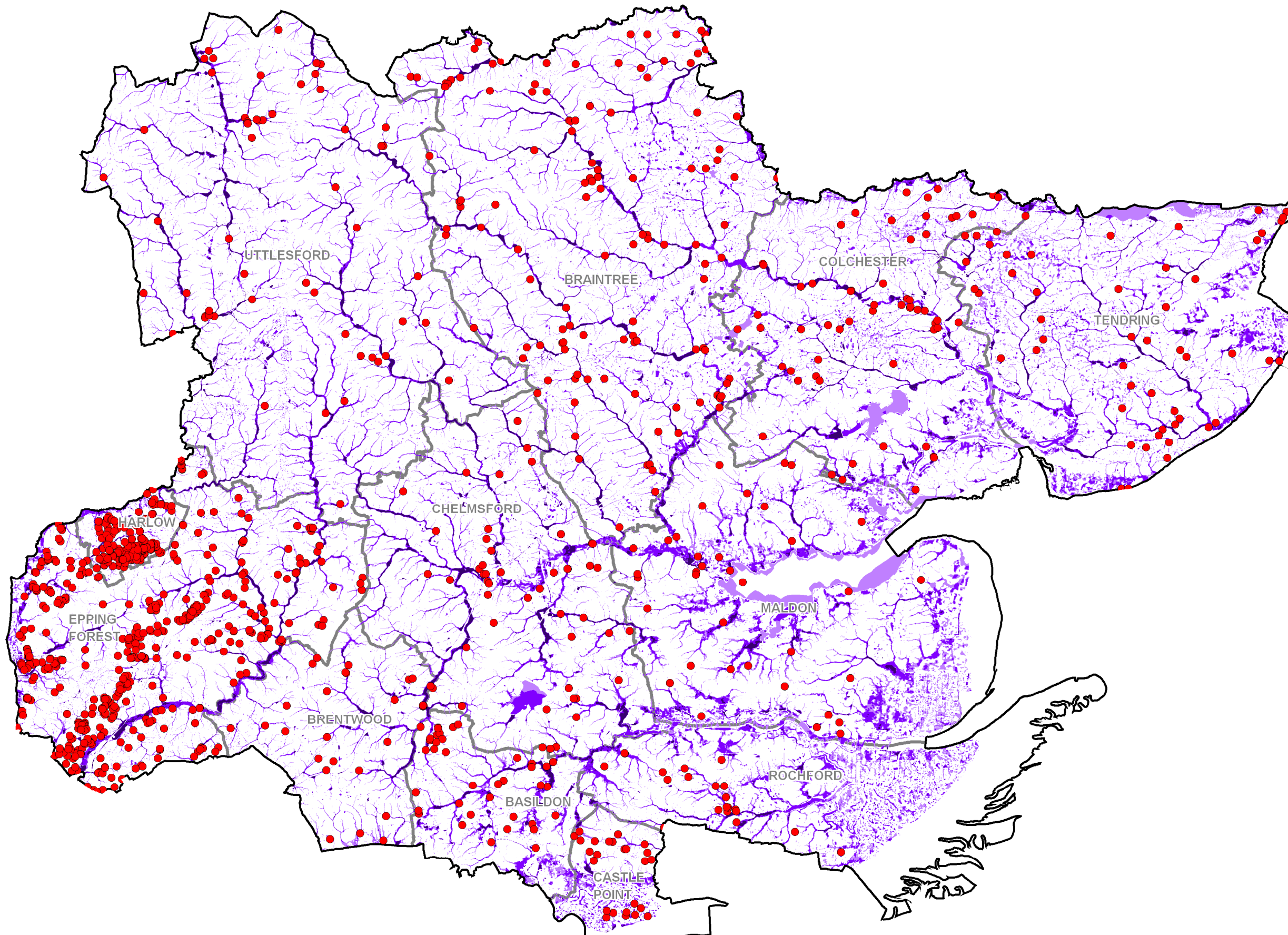
Essex County Council

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LEGEND

-  Essex County Boundary
-  District / Borough Boundaries
-  Historic Flood Events
-  ASstSWF More
-  ASstSWF Intermediate
-  ASstSWF Less



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JO	MG	JR	JAN 2011

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1 : 280,000	London

ESSEX COUNTY COUNCIL
PRELIMINARY
FLOOD RISK ASSESSMENT

ASTSWF MAPPING AND
HISTORIC SURFACE WATER
FLOODING INCIDENTS

Scott Wilson
6-8 Greencoat Place
London, SW1P 1PL
Tel: (020) 7798 5000



DRAWING NUMBER
FIGURE A3





NORTH



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 ESSEX COUNTY COUNCIL LICENCE NO. 100019602, 2010.

LEGEND

-  Essex County Boundary
-  District / Borough Boundaries
-  Surface Water 'Deep'
-  Surface Water 'Shallow'

DRAWN BY	CHECKED BY	PASSED BY	DATE
JO	MG	JR	JAN 2011

SCALE @ A3	ISSUING OFFICE
1 : 280,000	London

ESSEX COUNTY COUNCIL
 PRELIMINARY
 FLOOD RISK ASSESSMENT

FLOOD MAP FOR
 SURFACE WATER
 1 in 200 YEAR MAPPING

Scott Wilson
 6-8 Greencoat Place
 London, SW1P 1PL
 Tel: (020) 7798 5000



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FIGURE A4

NORTH



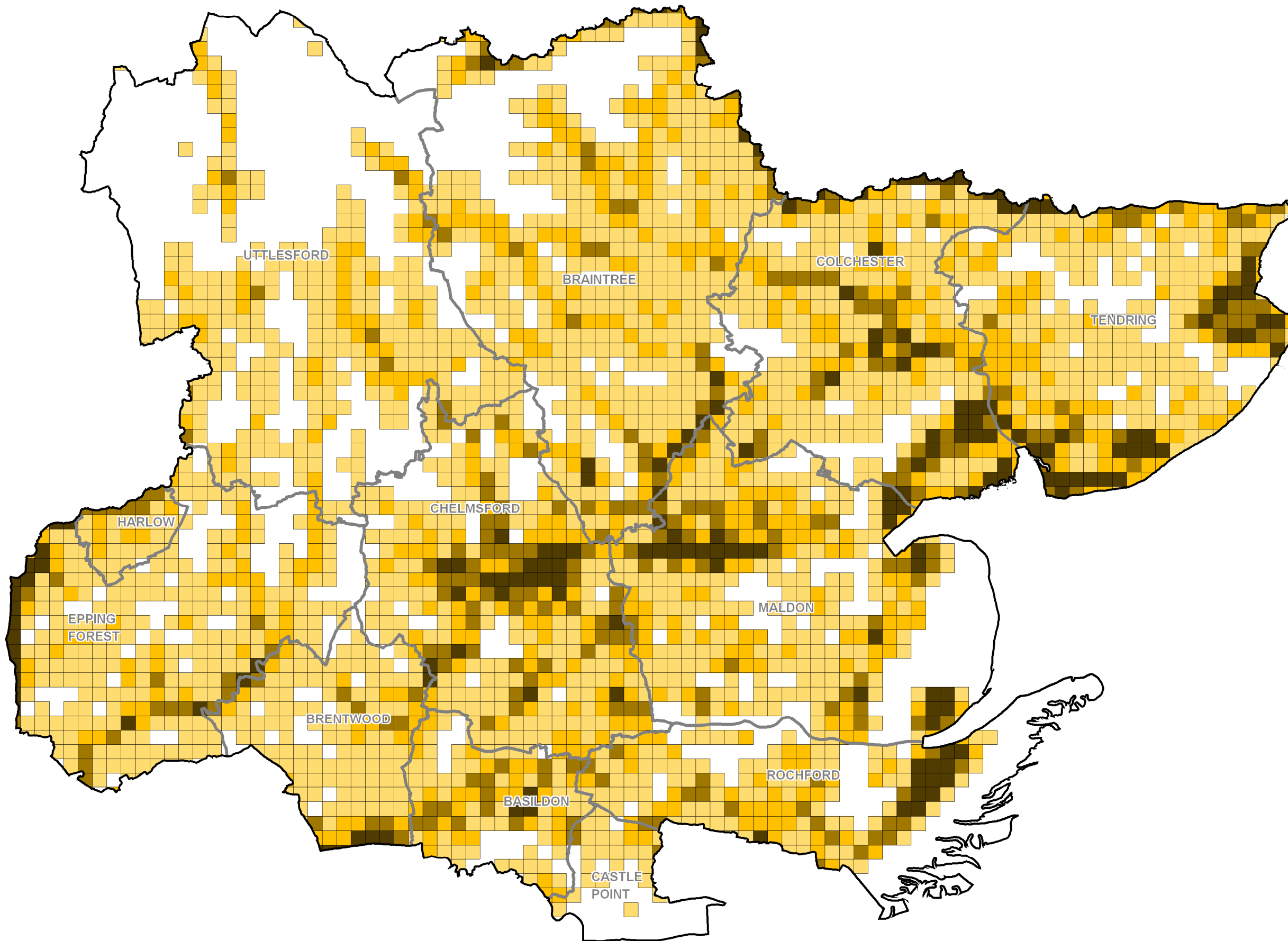
Essex County Council

NOTES

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LEGEND

- Essex County Boundary
- District / Borough Boundaries
- < 25%
- 25% to 50%
- 50% to 75%
- > 75%



DRAWN BY JO	CHECKED BY MG	PASSED BY JR	DATE JAN 2011
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SCALE @ A3 1 : 280,000	ISSUING OFFICE London
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ESSEX COUNTY COUNCIL
PRELIMINARY
FLOOD RISK ASSESSMENT

AREAS SUSCEPTIBLE
TO GROUNDWATER
FLOODING

Scott Wilson
6-8 Greencoat Place
London, SW1P 1PL
Tel: (020) 7798 5000






DRAWING NUMBER

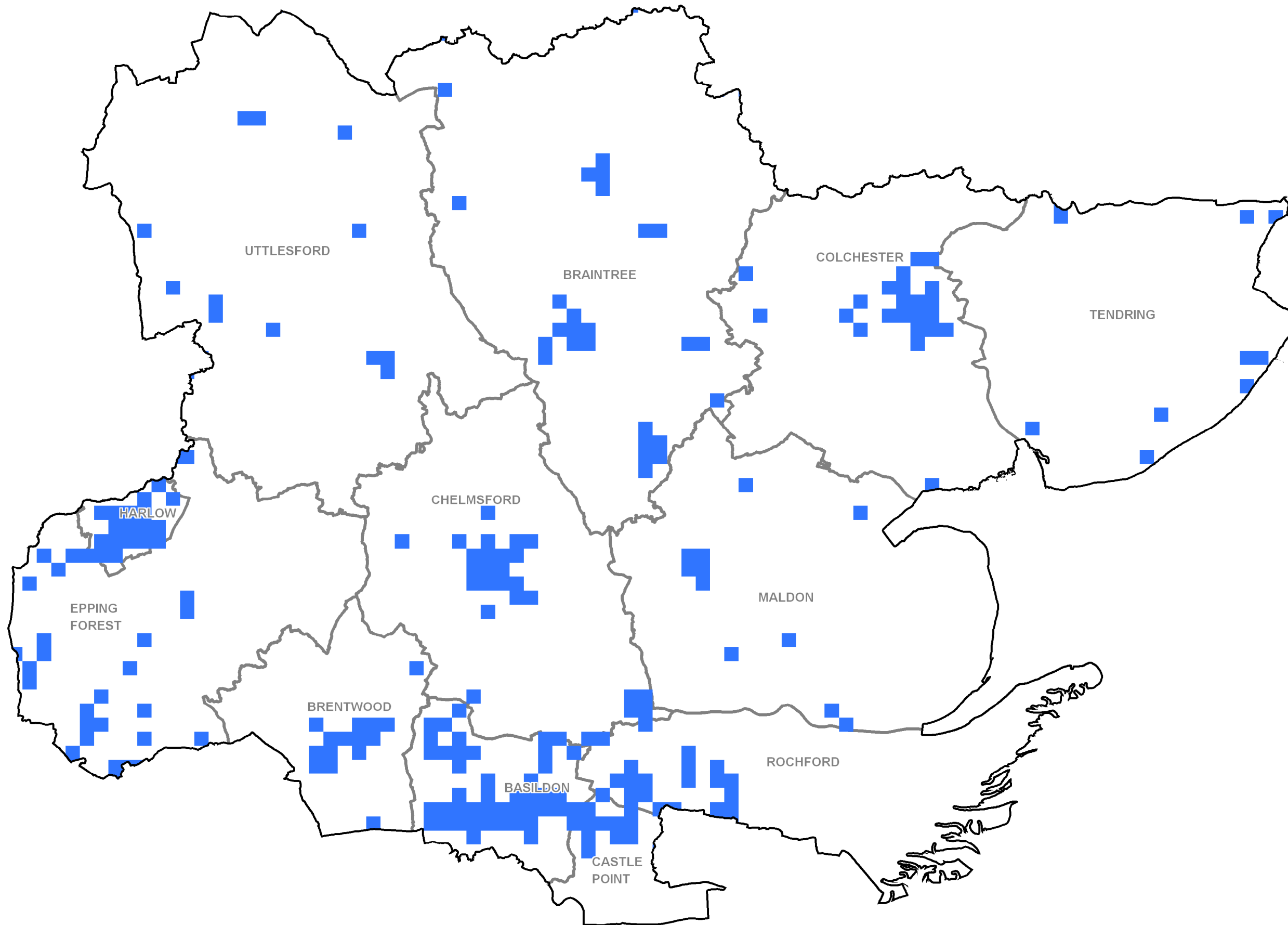
FIGURE A5

NORTH

NOTES
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 ESSEX COUNTY COUNCIL LICENCE NO. 100019602, 2010.

LEGEND

-  Areas Above Flood Risk Threshold
-  Essex County Boundary
-  District / Borough Boundaries



DRAWN BY JO	CHECKED BY MG	PASSED BY JR	DATE JAN 2011
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SCALE @ A3 1 : 280,000	ISSUING OFFICE London
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ESSEX COUNTY COUNCIL
 PRELIMINARY
 FLOOD RISK ASSESSMENT

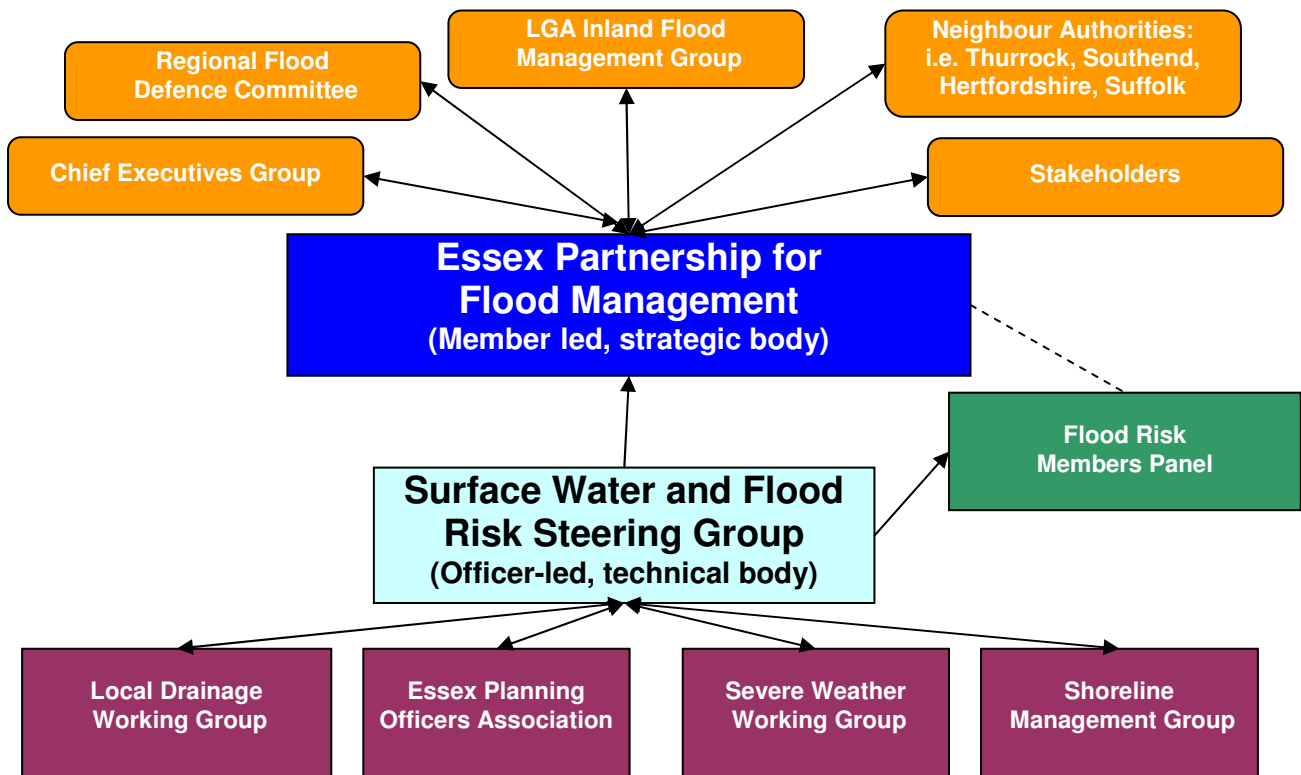
AREAS WITH 'SIGNIFICANT
 HARMFUL CONSEQUENCES'
 FROM FUTURE FLOODING

Scott Wilson
 6-8 Greencoat Place
 London, SW1P 1PL
 Tel: (020) 7798 5000



DRAWING NUMBER
FIGURE A6

Annex 6: Essex Flood Groups Structure



Essex Partnership for Flood Management

This is a group led by elected members which focuses on overall strategy and in particular funding and communications. It meets every 3 months. The chair of the partnership is Cllr Tracey Chapman, an Essex County Council cabinet member with the lead for Emergency Planning. It also has a councillor from each district, usually a cabinet member or chair of a relevant committee. There will also be representatives from the Environment Agency, Thames Water, Anglian Water and the Essex Fire and Rescue Service.

Flood and Water Management Steering Group

This steering group was originally formed from ECC staff to discuss the new legislation and the council's response to it. It included representatives from Development Management, Highways, Natural Environment, Asset Management, Built Environment and Emergency Planning. It has now been expanded to include representatives from the Environment Agency and several districts which still have drainage teams. The group meets monthly and provides technical insight into the work taking place.

Flood Risk Members Panel

This group meets every two months and consists of the three relevant Cabinet Members, Cllr Tracey Chapman (Emergency Planning and Environment), Cllr John Jowers (Localism and Planning) and Cllr Norman Hume (Highways and Transportation) and their requisite lead officers. It decides internal funding issues and approves the direction of policy, ensuring that all the relevant areas of the council are talking to each other.

Local Drainage Working Group

This is a district council initiated group which brings together the remaining drainage expertise within the group. The purpose of the group was for those remaining drainage engineers to give advice and guidance to less experienced officers in other districts who were in charge of the drainage function. It is a useful forum for gaining on the ground information about flooding. ECC are now a member of the group and attend meetings to give updates of progress.

Essex Planning Officers Association

EPOA represents the 12 planning authorities in Essex as well as the Unitary Authorities of Southend-on-Sea and Thurrock as well as the County Council. It has a senior officers group which Keith Lawson, the lead officer on flooding, attends. There are also planning policy and development control groups.

Severe Weather Working Group

This is a sub-group of Essex's Emergency Resilience Forum, focused on flooding. Two of ECC's emergency planners who also sit on the Flood and Water Management Steering Group also attend this group and relay information between the groups.

Shoreline Management Group

The Shoreline Management Plans for Essex are due to be published later this year which the Environment Agency is leading on. The coastal officer for ECC sits on the steering group.

Stakeholders

While the partnership's group direct membership has had to be restricted to accommodate 12 councils, there are a large number of stakeholders where a contact has been made so that they are aware of the group and can be contacted whenever relevant. These include Highways Agency, Network Rail, Essex & Suffolk Water, Essex Police and National Grid.

Chief Executives Group

This is a forum for the chief executives of all the councils of Essex to meet and discuss issues. David Marchant, Chief Executive of Castle Point and a former civil engineer himself, informs the group on flooding issues.

Regional Flood and Defence Committees (RFDC)

Essex sits on 3 RFDCs because of its catchment areas: Thames RFDC, Anglian (Central) and Anglian (East). Anglian (East) is by far the largest within the county and Cllr Chapman sits on that committee to represent Essex with four other councillors.

Annex 7: Inventory of Key Flood Risk Photos

The following selection of photos was acquired from a number of sources; these photos are representative of the issues relating to surface water flooding across Essex.



Bridge Street, Coggeshall Parish, Colchester



Great Yeldham Parish, Braintree



Great Yeldham Parish, Braintree



Helions Bumpstead Parish, Braintree



Rectory Road, Sible Bumpstead, Braintree



Swan Street, Sible Hedingham, Braintree



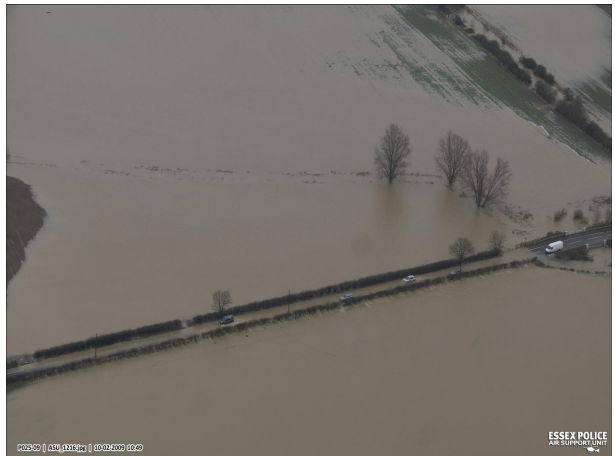
Essex Police Air Support Unit, Feb 2009



Essex Police Air Support Unit, Feb 2009



Essex Police Air Support Unit, Feb 2009



Essex Police Air Support Unit, Feb 2009



Essex Police Air Support Unit, Feb 2009



Essex Police Air Support Unit, Feb 2009