St.Helens Council

Preliminary Flood Risk Assessment (PFRA)

2017-2023

Flood and Water Management Act 2010
Flood Risk Regulations 2009

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A. Document Information

A.1 This document has been produced solely for the purpose of describing the St. Helens Flood Risk Assessment. Every care has been taken to produce this document to latest Government Guidelines and Flood Mapping data. This document may contain errors, please notify St Helens Council on the contact details below with any errors that are present and where the errors are located using the referencing system. Contact Number on (01744) 676789 / Email using Flood@sthelens.gov.uk or through the website on www.sthelens.gov.uk.

A.2 This document is a live ongoing review process and will be reviewed every 6 years, this is the 2nd Edition of the PFRA from the first one produced in 2011 (in which both versions can be made available for assessment and monitoring use). The next scheduled review (3rd Edition) is for the years 2023-2029, however this can change depending on the structure for the Merseyside Authorities and change to Legislation.

A.3 This document should be used in conjunction with the Legislative Flood and Water Management Act 2010 and the Flood Risk Regulations 2009. No other document will accompany this submission. This document is to be used a Preliminary Flood Risk Assessment which feeds into the Lead Local Flood Risk Management Strategy and its subsequent reviews. This document will also be referenced and support the Council duties in Sustainable Drainage and any development guidance in relation to Sustainable urban Drainage Systems (SuDS).

A.4 PFRA (2017-2023), 2nd Edition, Version 1a, St Helens Council Lead Local Flood Authority.

A.5 Address: Highways Design, 4th Floor, Wesley House, Corporation St, Saint Helens WA10 1HF.

B. Amendments

B.1 Below provides a list of the amendments made to this document at the time of writing.

Date	Personnel (with initials)		Areas of Amendment
23/02/2017	MC	LLFA Officer	First Draft
05/04/2017	MC	LLFA Officer	Content and Structure Update
04/05/2017	MC	LLFA Officer	Content and Structure Update
17/05/2017	MC	LLFA Officer	United Utilities added sections (sewers)
29/05/2017	MC	LLFA Officer	Content and Structure Update
01/06/2017	MC	LLFA Officer	Content and Structure Update
04/06/2017	MC	LLFA Officer	Draft Complete
06/06/2017	MC	LLFA Officer	Draft Checked

C. Final Sign Off

C.1 Below provides a list of the final sign-off to this document.

Published	Originator	Checked By	Reviewed By	Approved By
Name	Matthew Catherall	Matthew Catherall	John Sheward	John Sheward
Date:	04/06/2017	06/06/2017	06/06/2017	
	Signature 	Signature 	Signature 	Signature
Document Status:	Draft			

D. Environment Agency (Self-assessment form – January 2017)

D.1 The Environment Agency have produced and written a Self-Assessment Form (January 2017) and associated guidance for the LLFA with options for its delivery for the 2nd Edition Review. St Helens Council will be taking the option to rewrite the PFRA and not adding an amendment to the existing PFRA (2011). To adhere to the requirements the following table is produced as a checklist.

PFRA report section			Activity for PFRA/FRA review	Response
1	Governance and partnership	1.1	Since publication of the PFRA in 2011, have there been any changes to, or creation of new, risk management authorities (RMAs) with responsibilities in the LLFA area?	New FWMA Schedule Enactment
		1.2	Are all roles and responsibilities for collecting and recording flood risk data and information clearly defined, including the respective roles and responsibilities of upper and lower tier authorities and other RMAs where relevant?	
2	Data systems and management	2.1	Do you have an up to date record of relevant sources of flood risk data and information for the LLFA area, including those held by other organisations?	EA modelling data has been revised and utilised since June 2011. Asset Register in place since June 2011. With Flood Contractor Framework being renewed in June 2017.
		2.2	Have sources of 'locally agreed surface water information' been established and maintained for the LLFA area and agreed with relevant partners?	
		2.3	Are systems in place to collect, record and share data and information for the purpose of assessing flood risk in the LLFA area?	
		2.4	Are systems in place to assure the quality and security of data and information recorded for the purpose of assessing flood risk in the LLFA area?	
		2.5	Do you understand the condition and performance of the public, third party and private assets in your register in terms of flood risk?	
3	Past floods since Dec 2011 only) required for reporting to the European Commission	3.1	Have any flood events occurred since publication of the original PFRA report in December 2011 that have added to or changed your understanding of significant flood risk in the LLFA area? See the guidance document on which floods to report.	Updated records from storm events since the June 2011 Release.
		3.2	Has your current understanding of significant flood risk in the LLFA area changed as a result of the consequences of floods that have occurred since 2011? How?	
4	Future flood information Information on future floods is required for reporting to the European Commission	4.1	Have you created or received new information on potential future floods that has added to or changed your understanding of significant flood risk in the LLFA area since publication of your original PFRA report in 2011?	EA modelling data has been revised and utilised since June 2011. Ongoing investigations and data gathering from storm events and FWMA section 19s.
		4.2	Have you created or received new information to improve the understanding of the future impact of climate change on flood risk in the LLFA area?	
		4.3	Have you created or received new information on long term developments to improve your understanding of flood risk in the LLFA area?	
		4.4	Has your understanding of flood risk in the LLFA area changed since 2011 as a result of new information on the potential consequences of future floods, the impact of climate change or long term developments? How?	
5	Identification of Flood Risk Areas for 2nd planning cycle Identified FRAs are required for reporting to the European Commission	5.1	Are the indicative FRAs an appropriate representation of significant **surface water** flood risk in your LLFA area?	Information within the PFRA 2017-23
		5.2	Do the consequences of flooding from **other local sources,** ie groundwater or ordinary watercourses, or from **combined multiple sources**, indicate any other areas of significant risk?	
		5.3	Has your PFRA review identified **any other information** which indicates other areas of significant risk?	
		5.4	On the basis of the national evidence provided and your review, do you agree with the indicative FRAs for your area?	
		5.5	On the basis of local evidence and your review, are you amending or identifying any additional FRAs for your area?	
6	Updating the original preliminary assessment	6.1	Have you completed an addendum to update your preliminary assessment report? Updates are required for reporting to the European Commission	Information within the PFRA 2017-23

E Executive Summary

E.1 The Environment Agency have produced and written a Self-Assessment Form (January 2017) and associated guidance for the LLFA with options for its delivery for the 2nd Edition Review. St Helens Council will be taking the option to rewrite the PFRA and not adding an amendment to the existing PFRA (2011). To adhere to the requirements the following table is produced as a checklist. Depending on the approach taken for the EU exit, this does not; alter the requirement for LLFAs to review preliminary assessment reports and FRAs by 22nd June 2017.

E.2 This Preliminary Flood Risk Assessment has been prepared by St Helens Council as Lead Local Flood Authority (LLFA) in order to meet the duties to manage local flood risk and deliver the requirements of the Flood Risk Regulations (2009) and the Flood and Water Management Act (2010). The production of the Preliminary Flood Risk Assessment (PFRA) is imposed by Sections 10 - 12 of the Flood Risk Regulations (2009) and it is the first step in the management of local flood risk. The PFRA process is aimed at providing a high level overview of flood risk from local flood sources through a review of historic flooding incidents and the predicted future extents of flooding, based on the outputs of computer models from both St Helens Council and the Environment Agency.

E.3 In January 2017 the Department for Environment, Food and Rural Affairs (DEFRA) and the Environment Agency (EA) replaced its guidance on significant risk for the identification of flood risk areas for Lead Local Flood Authorities (LLFAs). The new Regulations require LLFAs to determine whether any part or parts of their area face significant risk of flooding and to identify any such areas as Flood Risk Areas (FRAs). This was produced under regulation 14 (3) of the Flood Risk Regulations 2009 (the Regulations), and replaced the previous guidance published in 2010. LLFAs are only required to do this in relation to local flood risks which include flooding from: Surface Water, Groundwater and Ordinary Watercourses.

E.4 LLFAs do not need to consider risks of flooding from the sea, main rivers or reservoirs, except where these may affect flooding from another source. Flood hazard and risk maps and flood risk management plans must subsequently be prepared for the FRAs identified. The purpose in reviewing the results lies with the determination of whether the level of flood risk is severe enough to be reported at both a European and National scale. DEFRA has identified that a FRA containing a cluster of over 30,000 people would be considered for significant European importance, St Helens Council administrative area is not identified as such as zone.

E.5 It is the responsibility of the LLFA to decide what it considers as a historical flood with “significant harmful consequences” at a local level. Initially there was no specific guidance determining the national flooding importance level. St Helens Council have liaised with several neighbouring LLFAs in shaping and finalising this significance level. This has led to the formation of the Cheshire Mid-Mersey Partnership with the aim to identify and resolve flooding issues at both the Tactical and Strategic levels whilst adhering to best industrial practices. St Helens Council has decided that a flood of “significant harmful consequences” would have one or more of the following characteristics: 200 individuals affected, 83 residential properties, 20 businesses, 2 or more critical services or a transport link that is impassable for more than 5 hours.

E.6 A review of information on past flood incidents have been received from various stakeholders, both locally and nationally, which include water and sewerage companies, utility companies, the Canal & River Trust, the Emergency Services, and other Risk Management Authorities. There were several limitations associated with the stakeholder data. The main issues related to inconsistent and incomplete records, resulting in limited knowledge of flooding sources and the consequences of events. There have been 3 flooding events identified from local sources that have been deemed to have “significant consequences”.

E.7 An analysis of data available on future flood risk has found that there could be flooding with adverse consequences as a result of surface water flooding. Modelling outputs provided by the Environment Agency indicate that up to 1816 properties, 1650 residential and 33 business, could be at risk from surface water flooding in a 1% (1 in 100) annual probability rainfall event. Therefore the scale of risk is not sufficient to be considered a FRA. Additional detailed mapping that has been conducted as part of the St Helens Council Surface Water Management Plan Level 1 and 2.

E.8 The information on flood risk gathered for this PFRA will be used for future steps to guide flood risk management in St Helens Council. 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 January 2017. Section 17 of the Flood Risk Regulations (2009) states subsequent reviews must be carried out at intervals of no more than 6 years. This document is the first review of the original PFRA published in June 2011. To progress St Helens Council approach to flood risk management, including ongoing work post-PFRA submission, it will be designed to meet its objectives under the Flood Risk Regulations (2009) and the Flood and Water Management Act (2010) to:

- Continue to develop links with adjacent LLFAs and other bodies responsible for flood risk management;
- Utilise data collected to maintain GIS database, for future development, investigation, planning queries etc;
- Provide assessments to identify the flood risk management prioritisations over the entire administrative area;
- Update the current Local Flood Risk Management Strategy;
- Continually update the Asset Register;
- Record, document and (where appropriate) investigate future floods;
- Require developers to give priority to the use of Sustainable Urban Drainage Systems (SuDS), where appropriate.

F Abbreviations and Definitions

F.1 Abbreviations list used within the Preliminary Flood Risk Assessment.

Abbreviation	Description
AOD	Above Ordinance Datum
AStSWF	Areas Susceptible to Surface Water Flooding
AStGwF	Areas Susceptible to Groundwater Flooding
BGS	British Geological Survey
BUA	Built-up Areas
BUASD	Built-up Areas Sub-divisions
CFMP	Catchment Flood Management Plan
COW	Critical Ordinary Watercourse
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EC	European Commission
EU	European Union
FWMA	Flood and Water Management Act 2010
FRA	Flood Risk Area
GIS	Geographical Information Systems
IPCC	Intergovernmental Panel on Climate Change
LDF	Local Development Framework
LGF	Local Government Forum
LLFA	Lead Local Flood Authority
LoSA	Level of Service Agreements
LPA	Local Planning Authority
LRF	Local Resilience Forum
MoU	Memorandums of Understanding
NRD	National Receptor Database
NRD:	National Receptor Dataset
OEFRPG	Operational Emergency Flood Response Plan Groups
OFWAT	Water Services Regulation Authority
OS:	Ordinance Survey
PFRA	Preliminary Flood Risk Assessment
RBD	River Basin District
RFCC	Regional Flood and Coastal Committee
RoFSW	Risk of Flooding from Surface Water
SAB	SuDS Approving Body
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Urban Drainage Systems
SWMP	Surface Water Management Plan
UKCP09	United Kingdom Climate Projections 2009
uFMfSW	Updated Flood Map for Surface Water
UU	United Utilities

F.2 Definitions list used within the Preliminary Flood Risk Assessment.

Abbreviation	Description
Catchment	The area contributing surface water flow to a point on a drainage or river system. Can be divided into sub-catchments.
Discharge.	The discharge of a river is the volume of water, which flows through it in a given time. It is usually measured in cubic meters per second (m^3/s). The volume of the discharge will be determined by factors such as climate, vegetation, soil type, drainage basin relief and the activities of man.
Flood	A temporary rise of the water level, as in a river or lake resulting in its spilling over and out of its natural or artificial confines onto land that is normally dry. Floods are usually caused by excessive runoff from precipitation or snowmelt, or by coastal storm surges or other tidal phenomena.
Return Period	Also known as a recurrence interval is an estimate of the interval of time between events, in the instance of a 1 in 200 year storm the propability is 0.005%, however it does not mean that it will occur once, multiple instances of the same event can occur in each year.
SuDS	Sustainable drainage systems or sustainable (urban) drainage systems: a sequence of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques (may also be referred to as SuDS).
Significant	Defined threshold of flooding consequence.
Consequence	A condition or occurrence traceable to a cause e.g. the flood was an inevitable **consequence** of the prolonged, heavy rains.

G. Contents

G.1 Main contents list for this PFRA.

G.2 Appendices contents list for this PFRA.

1. Introduction and Background

1.1 Background

1.1.1 The Pitt Report in 2008 was the catalyst for Local Authorities and partner agencies to become more responsible for flood risk. The Flood Risk Regulations 2009 (FFR) transpose the provisions of the EC Floods Directive (Directive 2007/60/EC) on the assessment and management of flood risk into domestic law in England and Wales under the European Communities Act 1972. The aim of the Regulations is to reduce the likelihood and consequence of flooding. The FRR 2009, which sets out a flood risk management strategy, consists of four stages:

- Stage 1 - Production of a Preliminary Flood Risk Assessment report;
- Stage 2 - Identification of Flood Risk Areas;
- Stage 3 - Production of appropriate Flood Hazard and Flood Risk Maps and;
- Stage 4 - Preparing Flood Risk Management Plans.

1.1.2 This PFRA is the first of the two stages in the process. This report also provides the evidence and appraisal for the second stage of identifying Flood Risk Areas (FRA). The identification of FRAs will establish where the final two stages of preparing hazard and risk maps and flood risk management plans are required. The PFRA (and any subsequent maps and plans) will form part of the local flood risk management strategy that St Helens Council is required to prepare under the FWMA 2010.

1.1.3 The FWMA 2010 identified a number of responsibilities, powers and duties to be executed in phases to help manage flood risk in a more holistic way. The FWMA 2010 defines a lead role for local authorities and St Helens Council is designated as a Lead Local Flood Authority (LLFA) responsible for the management of local sources of flooding such as surface water. An overview of these duties is provided in Section 3. The Environment Agency retains its role in managing flood risk from main rivers and coastal sources.

1.2 Preliminary Flood Risk Assessments (PFRA)

1.2.1 St Helens Council is required by the FRR 2009 to produce a PFRA. The PFRA is a high level screening exercise to identify areas in which the risk of local flooding is significant and warrants further examination through the production of maps and management plans. This report marks the first of a four stage process and is set to take place over a cyclical 6 year period. Section 17 of the FRR 2009 states subsequent reviews must be carried out at intervals of no more than 6 years. This document is the first revision of the original PFRA published in June 2011. The outcome of the review is to provide evidence for the identification of FRA's (Stage 2). The PFRA makes use of existing and available data, and focuses on local flood risk sources. Local sources of flooding for the purposes of the PFRA are:

- Groundwater - Water that flows out from the ground due to high water tables locally or regionally;
- Ordinary Watercourse - Out of channel flows from watercourses (streams and ditches) not designated as Main River;
- Surface runoff - Water that flows over land following a heavy rainfall event before entering natural or artificial channel.

1.2.2 Note for the purpose of the PFRA the LLFA does not have to report on flood risk from Main Rivers and the sea, reservoirs and canals, except where these may affect flooding from another source. With the exception of canals flood risk is the responsibility of the Environment Agency. For canals, the primary responsibility for land drainage and flood prevention rests with private parties. The Rivers and Canals Trust do not have any specific statutory responsibilities (under FWMA 2010) in relation to flooding and therefore its responsibilities are those of an owner and operator of its canals and other waterways. Table 1a indicates the work required to meet the requirements of the FFRA. The PFRA provides a useful source of reference for future local flood risk management strategies, informing the production of Flood Hazard and Flood Risk Maps (Stage 3), and contributing to the preparation of Future Flood Risk Management Plans (Stage 4). This PFRA aims to meet the first two requirements.

❖ **Table 1a: Elements of Work required under the Flood Risk Regulations, 2009.**

Timescale (1st review)	Assessment or Plan	Description	Timescale (revision)
22/06/2011	Prepare PFRA Assessment Report	The PFRA should focus on local flood risk arising from surface water, groundwater, Ordinary Watercourses, and canals.	22/06/2017
22/06/2011	On the basis of the PFRA, identify Indicative FRAs	Indicative Flood Risk Areas are a defined term, and are areas of nationally significant risk affecting 30,000 people or more. The PFRA is required to record "locally significant risk areas".	22/06/2017
22/06/2013	Prepare Flood Hazard / Flood Risk Maps for each FRA	The hazard and risk maps will show the likely extent, depth, direction, speed of flow and probability of possible floods and their consequences.	22/06/2019
22/06/2015	Prepare Flood Risk Management Plans for each FRA	The Flood Risk Management Plans will set out what the risk management objectives are, the measures proposed to achieve those objectives and how the measures are to be implemented.	22/06/2021

2. Aims and Objectives of the PFRA

2.1 Aims

2.1.1 The primary aim of this PFRA is to provide an assessment of potential local flood risk by applying a high level screening exercise across the administrative area of St Helens Council; hereby referred to as the study area. The analysis uses existing and available information and is intended to reassess governance and partnership working, as well as information sharing within the adjacent LLFA areas. This version of the PFRA will also provide assurance the Council's roles, responsibilities, and continual development under the FRR 2009 and FWMA 2010. The PRFA review is an opportunity to ensure those assessments are up to date and fit for purpose.

2.1.2 The risk of local flooding is defined as significant by European Standards for the PFRA if the flooding is affecting a cluster of more than 30,000 people. These local flooding risks are grouped in areas and are deemed Indicative FRAs. If these areas are found to exist within the Local Authority Boundary then they may warrant further examination at a later stage through the production of Flood Risk and Hazard maps and Flood Management plans. Depending on the approach taken to EU exit, there may be potential to make changes to the FRR in the coming years. The EU exit does not alter the requirement for LLFAs to review preliminary assessment reports and FRAs by 22nd June 2017 as the UK will still be a full member of the EU at that point. Any proposals to refine the approach to the flood hazard mapping and/or preparing FRMPs will be consulted on later in the cycle.

2.2 Objectives

2.2.1 The primary objectives of this PFRA is to:

- Identify relevant partner organisations involved in future assessment of flood risk;
- Summarise the means of future and ongoing stakeholder engagement;
- Describe arrangements for ongoing collection, assessment and storage of flood risk information;
- Summarise data sharing and storing systems including (quality assurance, security and data licensing arrangements);
- Summarise the methodology adopted for the PFRA with respect to data sources, availability and review procedures;
- Assess historic flood events and where possible, the consequences and impacts of these events;
- Establish an evidence base of historic flood risk information to support the review of the Local Flood Risk Strategy;
- Assess the potential harmful consequences of future flood events within the study area;
- Review the provisional national assessment of indicative FRAs provided by the Environment Agency and provide an explanation and justification for any amendments required to the FRAs.

2.3 St Helens Council Study Area

2.3.1 St. Helens Borough covers approximately 13,900 hectares, used primarily for agricultural purposes, and is generally 48.8 metres above sea level. 2017 mid-year estimate, the population of St. Helens is approximately 177,100. The vast majority of the Borough lies within the catchment of the River Mersey and in the Sankey sub catchment, the remainder lies within the Alt Catchment; There is a watershed in the Borough on the approximate line of the M62 motorway. The Sankey Brook is the primary watercourse draining St. Helens which runs from the central low lying lands of the Borough, east and then south, into the River Mersey at Sankey Bridges in Warrington. The central area of the Borough is drained by a radial pattern of tributaries including Black Brook draining the north and running west of Billinge Hill, Rainford Brook and Windle Brook to the north-west and west respectively, and Sutton Brook to the south draining Rainhill. To the south of the M62, the Borough drains direct to the Mersey through the small tributaries of Whittle. Union Bank and Penketh Brook. Simonswood Brook in the northwest of the Borough drains to the River Alt to the west.

❖ **Figure 2a: Study Area for St Helens Council PFRA**

3. Flood Responsibilities

3.1 Coordination of Flood Risk Management

3.1.1 The preparation of a PFRA is just one of several responsibilities of LLFAs under FRR 2009 and FWMA 2010. This section provides an overview of other responsibilities St Helens Council are obliged to fulfil under their role as a LLFA. 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, St Helens Council is therefore responsible for leading local flood risk management across the area.

❖ **Table 3a: Flood Risk Responsibilities**

Level of Flood Risk	Organisation	Responsibilities
National Flood Risk	Environment Agency (EA)	Responsible for Main Rivers, the Sea and Reservoirs.
Local Flood Risk	Lead Local Flood Authority (LLFA)	Responsible for Canals (where not in private ownership), Groundwater, Ordinary Watercourses, and Surface runoff. The LLFA is the unitary authority for the area. Note for Canals - The Canals and Rivers Trust do not have any specific statutory responsibilities (under FWMA 2010) in relation to flooding and, therefore, its responsibilities are those of an owner and operator of its canals and other waterways.
Local Flood Risk	Water Company (i.e. United Utilities)	Responsible for sewers except where it is wholly or partly caused by rainwater entering the system. Floods or raw sewage caused by blocking of a sewer for example are not covered by the regulations, neither is flooding from burst water mains.

3.1.1 Local knowledge and technical expertise necessary for St Helens Council to fulfil their duties as a LLFA lies with the Council and other partner organisations. It is therefore crucial that the Council work alongside these partners as they undertake their responsibilities to ensure effective and consistent management of local flood risk. Since the first publication of the PFRA in June 2011 a number of partnerships and working groups have been established across different organisations.

3.2 Stakeholder Engagement

3.2.1 As part of the PFRA, the St Helens Council Working Group for Flood Management has sought to engage stakeholders representing the following organisations and authorities including: United Utilities; Environment Agency; Local Fire and Rescue Service and the Local Police Service. Data has also been collated internally within St Helens Council. The Environment Agency, United Utilities and St Helens Council are all classed as Risk Management Authorities (RMAs). It is crucial that the Council continues to forge successful partnership RMAs, to ensure effective coordination and management of flood risk across the area.

3.2.2 Due to the position of the study area being situated within the River Mersey Catchment St Helens Council is in consultation with neighbouring Local Authorities. St Helens Council is part of two sub-regional LLFA working groups formed in 2010; the Cheshire and Mid-Mersey Flood Working Group and the Merseyside Flood Working Group. The groups (hereby known was the Partnership) operate at both Tactical and Strategic levels.

3.2.3 The Partnership has a critical role to play in managing the risk of flooding from all sources and in working with communities to help them become more resilient. It provides a forum to enable RMAs, other partners and communities, to identify how they can work together to deliver an improved and more effective and efficient flood risk management service. The RMA's of the Partnerships are:

❖ **Table 3b: Flood Risk Responsibilities**

Cheshire and Mid-Mersey	Merseyside	Additional Boarder Authorities
Cheshire East Council	Knowsley Borough Council	Lancashire County Council
Cheshire West and Chester Council	Liverpool Borough Council	Wigan Borough Council
Halton Borough Council	Sefton Borough Council	
St Helens Borough Council	St Helens Borough Council	
Staffordshire County Council	Wirral Borough Council (Lead)	
Warrington Borough Council (Lead)	Environment Agency	
Environment Agency	United Utilities	
United Utilities		

3.3 The Tactical Group

3.3.1 Technical and operational leads / managers meet on a monthly basis to coordinate delivery, share skills and implement decisions made at the Strategic level. The Tactical Group reports directly to the Strategic Group who are responsible for setting the overall strategic direction of the partnership.

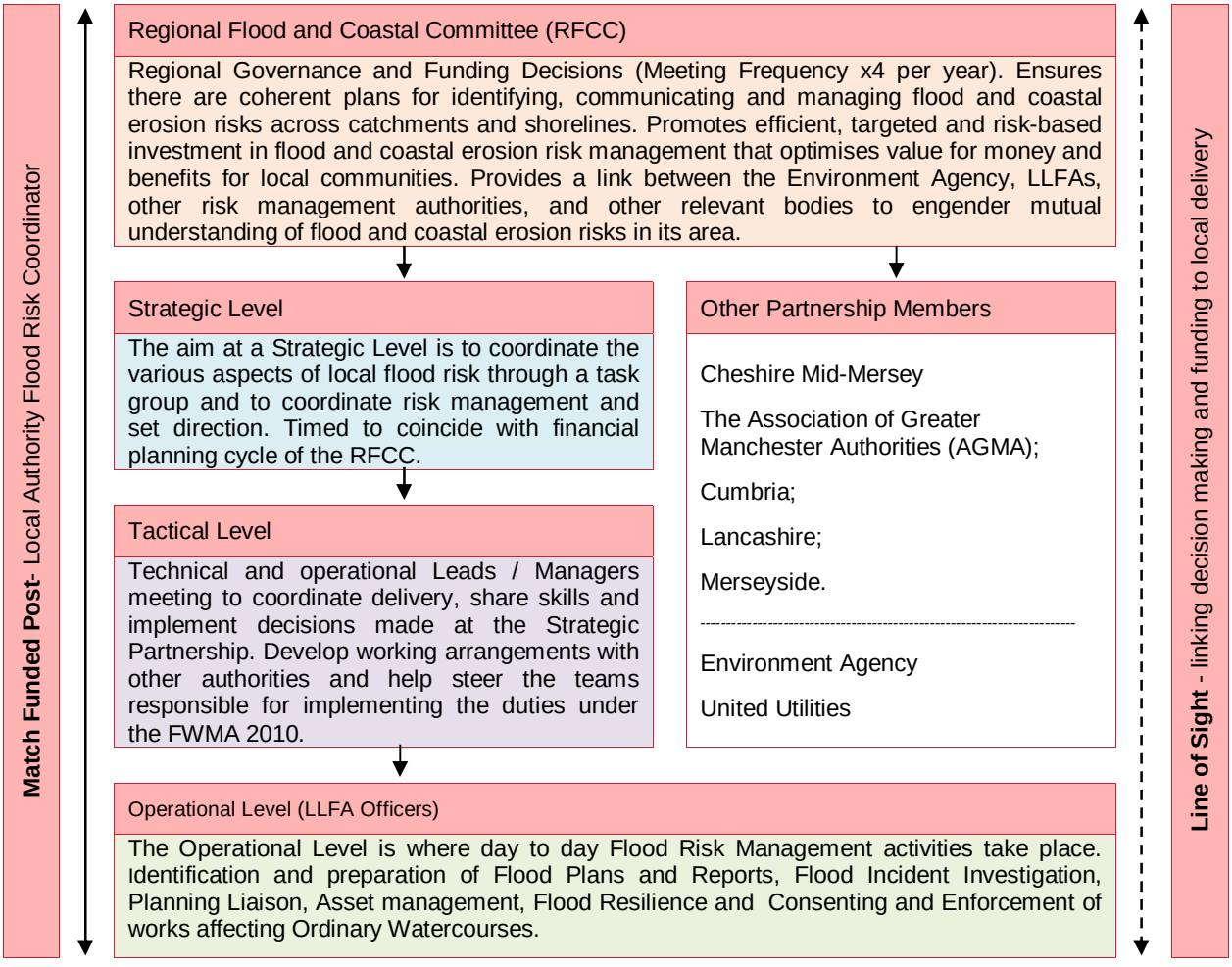
3.4 The Strategic Group

3.4.1 Set the strategic direction for joint working and the management of flood risk across the Partnership. Elected Members and senior representatives from the RMAs meet each quarter. The meetings are timed to coincide with financial the planning cycle of the Regional Flood & Coastal Committee (RFCC).

3.5 Regional Flood & Coastal Committee

3.5.1 The RFCC for the North West region provides a local democratic role in the identification and management of flood and coastal erosion risk in order to ensure the purposeful and efficient spending of public money and other resources. The RFCC needs to work with LLFAs, the Environment Agency and other RMAs to develop a mutual understanding of risk across its locality, and use this understanding to help develop plans to manage risk reflecting DEFRA's aims for flood and coastal erosion risk management. RFCC meetings are held each quarter, although there may be additional meetings at a sub-group level where local authorities are working together. The RFCC provides a platform for frequent knowledge transfer with all Partnerships situated in the North West region (which are identified in the Figure 3a below.

❖ **Figure 3a: Flood and Coastal Erosion Risk Management Partnership Structure**



3.6 Public Engagement

3.6.1 It is recognised that members of the public may also have valuable information to contribute to local flood risk management. The Environment Agency's 'Building Trust with Communities' (2005) document provided the basis for St Helens Council of how to communicate risk including the causes, probability and consequences to the general public and professional forums such as local resilience. The enforcement of FRR 2009 and FWMA 2010 into UK law accelerated the need for Councils to increase public engagement. This has brought 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.

3.7 Further Responsibilities

3.1.1 In addition to increasing partnership relations, coordinating, and leading on local flood management there are a number of other key responsibilities that have arisen for LLFAs since the introduction of the FRR 2009 and FWMA 2010. St Helens Council have fully complied to the aforementioned responsibilities since the first publication of the PFRA and will continue to strengthen these for the period 2017 – 2023. These responsibilities include:

❖ **Table 3c: Further Responsibilities**

Responsibilities	FWMA 2010	Description
Investigating flood incidents	Section 19	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.
Asset Register	Section 21	have a duty to maintain a register of structures or features which, in the opinion of the authority, are likely to have a significant effect on a flood risk in its area, and a record of information about each of those structures or features, including information about ownership and state of repair. 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	Schedule 3	LLFAs were to be required to establish SuDS Approval Bodies (SAB) which would have required St Helens Borough Council to approve and adopt sustainable drainage systems (SuDS) for new developments. In December 2014, the Government announced changes to the planning system that require developers to prioritise the use of SuDS where technically feasible and economically viable. LLFAs became statutory consultees for major development proposals from April 2015. These changes are set out in Paragraph 103 of the National Planning Policy Framework (NPPF) and are supported by DEFRA's Non-Statutory Technical Standards for SuDS.
Local Strategy for Flood Risk Management	Section 9	LLFAs are required to develop, maintain, apply and monitor a local strategy for 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.
Works powers	Section 39	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	Section 30	LLFAs 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.
Duty to Cooperate and Share information	Section 13	LLFAs, as well as other Flood Authorities (Environment Agency, Water Company, other LLFAs) have a duty to cooperate with each other, and also the power to request information, in connection with flooding, of any person or body.
Consenting changes to Ordinary watercourses	Section 21	If riparian owners wish to build a culvert/structure or make any alteration likely to affect the flow of an ordinary watercourse, land drainage consent is required from St Helens Council as an LLFA.

4. Methodology and Data Review

4.1 Methodology

4.1.1 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 flood risk and flood hazard maps and flood risk management plans. In January 2017 DEFRA replaced its guidance on significant risk for the identification of FRAs for LLFAs about the criteria for assessing and reviewing whether a risk of flooding is significant. This replaced the previous guidance published in 2010 (updated March 2011). The PFRA involves collecting information on past (historic) and future (potential) floods and Identifying FRAs and assembling the information into a preliminary assessment report. The following phased process has been undertaken in order to produce this report:

❖ **Table 4a: Report Phases**

Phase	Description	Phase	Description
1	Key partnership liaison	3	Review of indicative FRAs
	Stakeholder partnership meetings		GIS mapping
2	Review and analysis of historic flood risk data		Draft report writing
	Review and analysis of future flood risk data	4	Internal draft review from Council staff
	GIS mapping of data		Council approval
	Draft report writing		Draft submitted to EA by 22nd June 2017

4.2 Phase 1

4.2.1 The following authorities and organisations that were identified to share data for the preparation of the PFRA in Table 4b including a list of critical services that have been defined critical by the EA:

❖ **Table 4b: Data Sharing and Critical Services**

Data Sharing Authorities	Critical Services
United Utilities	Schools
Environment Agency	Police Stations / Prisons
Local Planning Authority	Nursing / Care / Retirement Homes
Emergency Services	Fire Stations / Ambulance Stations / Hospitals
Others LLFA specific	Electricity Installations / Sewage Treatment Works

4.3 Phase 1 Data Collection

4.3.1 Table 4e catalogues the relevant information and datasets received from partner organisations and provides a description of each of the datasets that were obtained by St Helens Council. The data is geo-referenced where possible. This has 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. The majority of the data has been specifically provided for this PFRA study and is not publicly available due to data protection requirements, therefore there are restrictions on data use. St Helens Council must adhere to these data security measures. All data collected is stored on secured local servers, which are password protected. Table 4c illustrates the restrictions on the use of this data.

❖ **Table 4c: Summary of Data Restrictions and Licensing Details**

Phase	Description
United Utilities	The use of provided data is restricted to St Helens Council and their partners for the preparation of its preliminary flood risk assessment
Environment Agency	The use of some data is restricted to St Helens Council and their consultants for the preparation of its preliminary flood risk assessment. The use of other data is unrestricted.

❖ **Table 4d: Recording the Quality of Data**

Data Quality	Description (Colour Key)	Explanations (Colour Key)	Example (Colour Key)
1	Best possible	No better available; not possible to improve in the near future	High resolution LIDAR, River/sewer flow Data, Rain Gauge Data
2	Data with known deficiencies	Best replaced as soon as new data are 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 much surface water flooding. Operation of un-modelled highway drainage. 'future risk' inputs e.g. rainfall, population
4	Heroic assumptions	An educated guess	Ground roughness for 2D models

❖ **Table 4e: Relevant Information and Datasets Description**

	Dataset	Description	Rating
Environment Agency	Risk of Flooding from Surface Water (RoFSW)	Published 2013 national surface flood map supersedes: Areas Susceptible to Surface Water Flooding maps (2008) Updated Flood Map for Surface Water (2010) Dataset provides banding for High, Medium and Low risk to depth and velocity. Dataset is updated annually.	2
	Flood Map (Rivers & Sea)	Shows the extent of flooding from rivers with a catchment of more than 3km^2 and from the sea.	2
	Areas Susceptible to Groundwater Flooding (AStGF)	1 kilometre square grid that identifies at a broad scale areas susceptible to flooding from groundwater on the basis of geological and hydrogeological conditions.	3
	National Receptor Database (NRD)	A national dataset of social, economic, environment and cultural receptors including residential properties, school, hospitals, transport infrastructure and electricity substations.	2
	Indicative Flood Risk Areas	Nationally identified flood risk areas, based on the definition of 'significant' flood risk described by DEFRA & WAG.	2
	Historic Flood Map (HFM)	GIS layer showing the maximum extent of all individual Recorded Flood Outlines from river, the sea and groundwater springs and shows areas of land that have previously been subject to flooding	3
	Mersey Estuary Catchment Flood Management Plan (CFMP)	CFMP's consider all types of inland current and future 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.	2
	LiDAR Data	Topographic Information held for St Helens Council is generally high resolution data.	1
	Rain Gauge Information	1no. Gauge information available at selected sites across St Helens Council – available on request (Billinge Hill)	2
	Telemetry	EA operates telemetry system in Warrington, (which is nearest telemetry point) where watercourse level and flow information is collected. – available on request	1
St Helens Council	Anecdotal information	Anecdotal information: flood risk, flood history and local flood hotspots.	4
	Area Flood Risk Studies	Flood Risk Studies commissioned by the Council for: Grappenhall, Longford / Orford, Croft, Culcheth, Burtonwood	2
	CMM Partnership Ordinary Watercourse Critical Asset Identification & Condition Survey	Outputs from partnership work consist of: Identification of critical assets, CCTV survey of identified culverts, Flood modelling, Ordinary Watercourse Condition data	2
	St Helens Council Flood Risk Asset Inspection Project	Borough wide asset inspection works undertaken by Consultant on behalf of St Helens Council & Blockage Sensitivity Testing.	2
	Strategic Flood Risk Assessment Level 1	The Stage 1 SFRA focuses on collecting information regarding all sources of flooding. This helps to identify the spatial distribution of flood risk sources.	3
	Strategic Flood Risk Assessment Level 2	The Stage 2 SFRA focuses on the details nature of flood hazard taking into account the presence of flood risk management measures such as flood defences and the location of key development and regeneration areas.	2
	Critical Infrastructure dataset	Contains information of critical infrastructure.	2
	Water Cycle Strategy	The Water Cycle Strategy identifies the water services infrastructure that is needed to support and enable sustainable development in the mid Mersey area.	2
	Surface Water Management Plan Stage Interim Reports	Information on future surface water flood risk is outlined in these documents.	2
	S19 Flood Investigation reports	LLFAs have a duty to investigate and record details of significant flood events within their area. Reports include photographic evidence during and after flood event.	2
	Historic Flooding Records	Historic records of flooding from surface water, groundwater and ordinary watercourses.	2
	Asset Register / Record	Register of flood risk management assets.	2
	Scheme Business Cases	Business cases for schemes contain information regarding risk and potential solutions.	2
nited Utilities	Flooding Register	Registers logs and records of sewer flooding incidents for each area.	2
	Modelling Information	Models of drainage systems operated and maintained by United Utilities.	2
	Asset Register	Asset register available to St Helens Council on request.	2
	Telemetry	Information regarding sewer performance	2
Fire & Rescue	Incident Response Register	Issue logs of all events recorded by Cheshire Fire and Rescue Service. This includes internal floods such as burst pipes and sewerage problems	2
Other Sources	Media Records	Information obtained from online media – news websites / social media etc.	2

4.4 Partner Organisations

4.4.1 The first edition of the PFRA identified a number of issues during the data collection process. Whilst a number of processes have since been improved a number of limitations still remain. Table 4e below identifies these limitations.

❖ **Table 4f: Limitations in Data**

Limitation	Description
Inconsistent Recording Systems	Inconsistent Recording has been addressed as part of undertaking Sections 19 and 21 of the FWMA 2010. Only sections of the study area that have recently been flooded have been scrutinised for consistency, the limitation of inconsistent recording still applies for those sections of the study area that have only experienced flooding historically.
Incomplete Datasets	Some of the datasets collated are not exhaustive and are questionable to accurately represent the complete local flood risk issues in a particular area. St Helens Council, along with the other stakeholders, has strived to reduce the number of incomplete datasets since 2011. Knowledge gaps still remain in sections of the study area that have only experienced flooding historically
Varied Quality of Data	Depending upon stakeholder objectives/resources of collecting information there have been varied quality in historic flood records making it difficult to accurately assess past consequences.
Records of Consequences of Flooding	It is not always possible to identify flooding source, particularly from engineered systems that are typically interconnected, resulting in combination of sources of flooding. Data records are not always comprehensive for specific past flood events. Since 2011 there has been increased co-operation with stakeholders to standardise the recording procedure to become more aligned and comprehensive, increasing confidence to identifying flooding source and consequence.
Quality Assurance	Data collected was 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 approach.

4.5 Phase 2 – Data Review and Analysis

4.5.1 Existing datasets, reports and anecdotal information from the stakeholders have been collated and reviewed to identify details of major past flood events which had locally significant harmful consequences. The analysis included an assessment of economic damage, environmental and cultural consequences and impact on the local population. For further information on historical flooding please refer to Section 5 of this PFRA.

4.6 Assessing Future Flood Risk

4.6.1 The identification of FRAs 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 risks will primarily rely on a technical review of the Environment Agency's Risk of Flooding from Surface Water (RoFSW) maps first published in 2013 and updated annually.

4.6.2 The previous PFRA relied upon a technical review of surface water flood depth maps (1 in 200 annual chance of flood with 180 minute duration) produced for the Surface Water Management Plan (SWMP) as the best available information. For areas not covered by the SWMP modelling the Environment Agency's Areas Susceptible to Surface Water Flooding Map was used. Both datasets have been superseded by the RoFSW which when compared to observe actual flooding better represents the flood extents. In January 2017 the PFRA guidance, first published in 2011, was revised due to increased understanding of the FWMA 2010 requirements, data collection and recording methods, completion of flood alleviation schemes, and technological advances to produce more accurate model predictions. Table 4g summarises the main differences between the guidance documents.

❖ **Table 4g: Risk Categories for RoFSW Maps**

Description	2011 PFRA	2017 PFRA	Predicted Depth (mm) Banding	Predicted Velocity (m/s) Banding
Rainfall Return Period for analysis	1 in 30 year (3.3%) 1 in 200 year (0.5%)	1 in 30 (3.3%) 1 in 100 (1%) 1 in 1000 (0.1%)	>900 300 to 900 <300	>0.25 <0.25
Number of "blue squares" formed within a 3x3 km square grid to create a cluster.	**8**	**5**		

4.6.3 For further information on future flooding please refer to Section 6 of this PFRA. Further information regarding the Risk of Flooding from Surface Water Maps (formerly known as the updated Flood Map for Surface Water - uFMfSW) is available at the following webpage:

❖ https://www.gov.uk/government/publications/flood-maps-for-surface-water-how-they-were-produced

4.6.4 The following factors were considered when assessing the future flood risk across the study area below

- Topography, Location, and type, of drainage systems.
- Characteristics of watercourses (lengths, modifications).
- Location of Ordinary Watercourses and Flood Plains that retain water.
- Residential / economical areas.
- Effectiveness of any works constructed for the purpose of flood risk management.
- Current and predicted impact of climate change / Proposals for future development.

4.7 Phase 3 Reviewing Flood Risk Area

4.7.1 Information on historic and future flood risk has been used to formally review FRAs. Flood risk indicators have been used to determine the impacts, and consequences, of flooding on human health, economic activity, environment and cultural heritage. The flood risk 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 FRAs (Appendix A, Figure 5).

❖ **Table 4h: Key Flood Indicators and Impacts**

Impact of flooding on:	Flood Risk Indicators
Human Health	Number of residential properties. Critical services (Hospital, Police / Fire / Ambulance Stations, Schools, Nursing, Homes, etc.). The number of critical services can be identified using the National Receptor Dataset (NRD). However the LLFAs note that NRDs do not show the impact of flooding of individual sites.
Economic Activity	Number of non-residential properties. Principal road that is flooded for longer than 5 hours. Area of agricultural land. With the details of the lengths placed into NRDs. it is also important to consider significant consequences by looking at the importance of the route (national, regional, local), alternatives and diversions. This is important in a case of any settlement, routes, rail networks being cut off by flooding.
Environment	Designated sites (SSSIs, SACs, SPAs, etc.) and BAP habitat. It also identifies the flooding consequences around pollution (PPC, COMAH) and Contaminated land.
Cultural Heritage	Cultural heritage sites (World Heritage Sites), Scheduled Ancient Monuments, Listed Buildings, Conservation Areas, Registered Parks and Gardens.

4.8 Phase 3 Criteria Indicators

4.8.1 Table 4i sets out for people, services, properties and communities, the level of flood risk which LLFAs should consider to be significant for the purposes of the Regulations. These indicators and criteria relate to the risk of surface water flooding from a rainfall event with a 1% (or 1 in 100) chance of occurring in any one year. The Environment Agency has provided a set of indicative FRAs for LLFAs to consider. LLFAs are only required to do this in relation to local flood risks, including risks of flooding from surface water, groundwater and ordinary watercourses. They do not need to consider risks of flooding from the sea, main rivers or reservoirs, except where these may affect flooding from another source.

❖ **Table 4i: Indicators and criteria for assessing whether the risk of local flooding is significant for the purposes of identifying FRAs**

Method	Definition	Indicator	Criteria
Cluster method	A cluster is formed where, within a 3x3 km square grid, at least 5 of the 1km squares meet the criteria for one or more of the indicators. Where multiple overlapping grids meet the requirement, these are unified to form a larger cluster. All of the clusters (both small and large) have been identified as indicative flood risk areas.	Number of people at risk of surface water flooding*	200 people or more per 1km grid square. Number of people taken as 2.34 times the number of residential properties at risk.
		Number of key services at risk of surface water risk* e.g. hospitals, schools	More than one per 1km grid square
		No of re[portable properties (non res and residential) properties at risk*	20 or more per 1km grid square
Communities at risk method	Community areas, as defined by the Office for National Statistics built-up areas (BUAs) and built-up areas sub-divisions (BUASD), where there is a large number of properties at risk.	Number of reportable properties (residential and non-residential) properties at risk*	3,000 or more reportable properties (residential and non-residential) within a BUA/BUASD.

*Risk of surface water flooding from a rainfall event with a 1% (or 1 in 100) chance of occurring in any one year

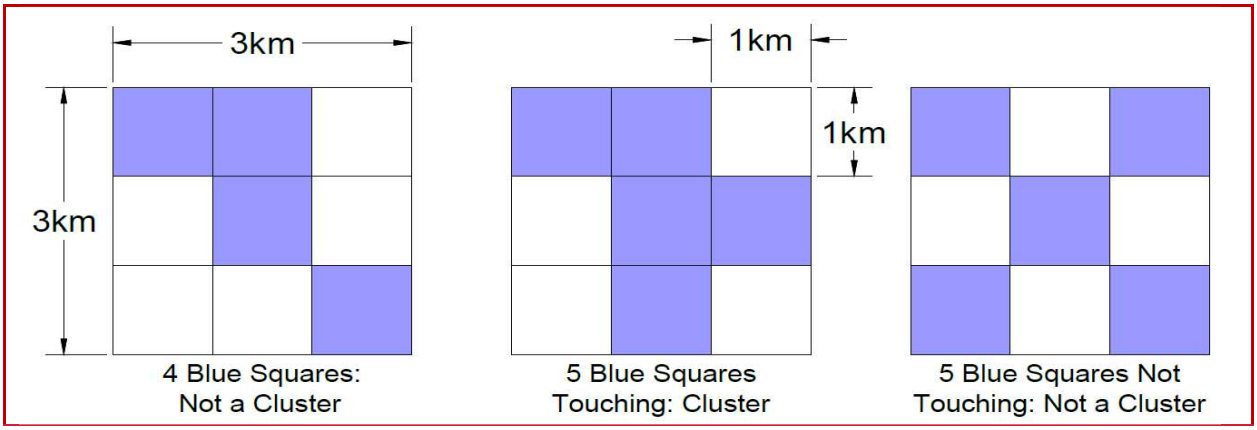
4.9 Phase 3 Criteria Methods

4.9.1 The Environment Agency has used two methods and information held nationally to derive these indicative areas. The methods are the Cluster method and Communities at risk method:

❖ **Table 4j: Criteria Methods**

Criteria	Description
The Flood Risk Areas cluster method:	As used in the first cycle to identify high concentrations of risk. The country was divided into 1km squares and national information used to identify the squares meeting one or more of the cluster method related criteria in Table 4i. A cluster is formed wherever, within a 3x3 km square grid, there are at least 5 squares meeting the criteria. Often multiple grids that meet this requirement will overlap. Overlapping grids are unified to form a larger cluster. All clusters, large and small are identified as indicative FRAs. A rainfall event with a 1% chance (1 in 100 year return period) of occurring in any year has been utilised to generate the clusters rather than 0.5% chance (1 in 200 year return period) as in 2011 PFRA. This is because current surface water risk products do not include the assessment of a 0.5% chance rainfall event.
The Environment Agency's Communities at Risk method:	Developed since 2010 which complements and validates the cluster method by identifying built up areas where the total flood risk is high. Indicative FRAs are identified wherever there are 3,000 or more reportable properties (residential and non- residential) at risk within a built-up area (BUA) or built-up area sub-division (BUASD) as defined by the Office for National Statistics. As with method 1, this is for a rainfall event with a 1% chance of occurring in any year

❖ **Figure 4a: Cluster Definition Example**



4.9.2 When determining the FRAs, St Helens Council will began with the Environment Agency's indicative FRAs and used its local knowledge and information to provide confidence with reference to Table 4i. The Environment Agency has suggested some additional indicators and criteria to consider in relation to Table 4i at the local level which may be sufficient for a flood risk to be considered significant factors to identify a change from the indicative FRAs.:

- Consequences of flooding for agricultural land.
- The combined impact of flooding from multiple sources.
- Vulnerable local sites, such as caravan parks or camp sites.
- Consequences of flooding for roads, rail or other infrastructure.
- Flood risk from other local sources e.g. groundwater, local watercourses
- Areas susceptible to more frequent, less extensive flooding, that could over time result in significant damages.
- Location of sites for Integrated Pollution Prevention and Control or Control of Major Accident Hazard regulation.
- Consequences of flooding for internationally or nationally designated environmental sites or internationally or nationally important cultural heritage features, and

4.9.3 There is no national criterion for these local factors, but when considering whether a local factor related risk is significant, it should be assessed whether the magnitude of risk in relation to a local factor, or a combination of local factors, is comparable to the scale of the risk presented by the criteria in Table 4e. Additional information to the methods used by the EA to develop indicative FRAs for this PRFA review is contained in Appendix B.

4.10 Phase 3 Review

4.10.1 Upon reviewing the information supplied by the EA, St Helens Council does not meet the threshold for Method 1 - Cluster analysis, Method 2 - Communities at risk (C@R) approach St Helens Council also is below the 30,000 people threshold value for identification in sensitivity analysis as proxy for climate change (Absolute and percentage increases in number of people at risk from a 0.1% rainfall event compared to a 1% event).

5. Past Flood Risk

5.1 Introduction

5.1.1 This section summarises the readily available and relevant information on historic floods. The PFRA guidance requires floods identified with "significant harmful consequences" to be reported in the spreadsheet in Annex 1 (external spreadsheet) of this report. Significant harmful consequences" are considered to be impacts of flooding that may have negative consequences for human health, the social and economic welfare of individuals and communities, infrastructure, and the environment (including cultural heritage).

5.1.2 The definition of a past flood with "significant harmful consequences" is determined by the LLFA. The level of significance is chosen so that only relatively harmful flood events are included in the PFRA. Such flood events are those that would be deemed significant when considered from a national perspective. For the purposes of this PFRA, the definition of "significant" has been defined by St Helens Council as followed:

❖ **Table 5a: Flood Event of Significant Harmful Consequences**

Impact of flooding:	Category	Consequence
Human Health	Number of individuals	200+
Economic Activity	Number of critical services	2 or more
	Number of residential properties	83+
	Number of non-residential properties	20+
	Principal Highway Network	Transport links impassable for more than 5 hours.

5.1.3 Using the definition above, St Helens Council has 3 records of local floods locations with historically significant harmful consequences. Irrespective of "significance", St Helens Council considers that all flood events that affect property or people justify consideration. Therefore, where known, information on all flood events has been gathered. A summary of the information specific to each source of flooding relevant to the PFRA is included in this chapter. Other floods that do not meet the criteria, or for which the consequences are not known, are not included in Appendix A Figure 10, as per the PFRA guidance, but their locations are plotted on the relevant figures.

5.1.4 It is noted that flooding can be the result of complex interactions between the different sources (e.g. Main River and surface water) and the degree of influence from other sources are not always fully understood. The St Helens Council Local Flood Management Strategy, first published in September 2014, addressed these issues from the first publication of the PFRA. The strategy is to be reviewed by June 2021.

5.2 Surface Water Flooding (Overland Flow)

5.2.1 Surface water flooding, also known as pluvial flooding, results from overland flow before the runoff enters a watercourse or drainage system. It is usually the result of high intensity rainfall exceeding the hydraulic capacity of the receiving system. However it can also occur with lower intensity rainfall when the land has a low permeability and/or is already saturated, frozen or developed. Surface water flooding within the United Kingdom is becoming a regular issue due to the high rate of developments creating large impermeable surfaces. There are certain locations within the study area where this flooding mechanism is more prominent due to the increased urban nature of the catchment, combined with the complex hydraulic interactions between urban watercourses, surface water drainage systems, and combined sewer systems at overflow locations such as an example of Peasley Cross in St Helens.

5.2.2 Some records do not identify the number, and duration, of properties flooded. This has led to low confidence as often only street names have been reported, regularly from local media, and do not specifically identify the nature of the flooding, possible causes, or exact locations. Appendix A Figure 10 shows the locations of all known past flood events collated from key RMAs and stakeholders. There are a total of 37 recorded historical surface water flooding events of varying significance and type. St Helens Council has identified no incidents of historically significant harmful consequences for surface water flooding. Areas affected by surface water flooding which have not been classified as having significant harmful consequences will be reviewed as part of St Helens Council longer-term strategy.

5.3 Ordinary Watercourse Flooding (Fluvial)

5.3.1 Flooding from any type of watercourse, also known as fluvial flooding, occurs when intensive or prolonged rainfall causes a watercourse to exceed hydraulic capacity. The additional inflow causes the water to rise above its banks or retaining structures and subsequently flows onto the land. All watercourses within the study area have been identified using the Environment Agency's Detailed River Network (DRN) and are classified as either Main River or Ordinary Watercourse. These are indicated in Figure 5c.

5.3.2 Main Rivers are usually larger rivers and streams. Other rivers are called Ordinary Watercourses. The Environment Agency carries out maintenance, improvement or construction work on Main Rivers to manage flood risk under the Water Resources Act 1991. Environment Agency powers to carry out flood defence work apply to main rivers only. Lead local flood authorities, district councils and internal drainage boards carry out flood risk management work on ordinary watercourses. The Environment Agency decides which watercourses are Main Rivers. It consults with other risk management authorities and the public before making these decisions.

5.3.3 The Main River map is then updated to reflect these changes. Inclusion of Main Rivers is beyond the scope of this PFRA. Ordinary Watercourses are any watercourses that are not designated a Main River by the Environment Agency and therefore come under the powers of St Helens Council. These include every river, stream, ditch, drain, cut, dyke, sluice, sewer (other than a public sewer) and passage through which water flows and which does not form part of a Main River. Ordinary Watercourses with known flood risks associated to them (limited channel capacity, channel constrictions or a poor maintenance regime) were previously designated Critical Ordinary Watercourses (COWs). These were not classified as Main River but which the Council had agreed with the Environment Agency to be critical because they have the potential to put at risk from flooding large numbers of people or property.

5.3.4 In 2006/7, the Environment Agency reclassified all COWs as Main Rivers and took over responsibility for their maintenance and management, in a process known as enmainment. St Helens Council has identified no historically significant harmful consequences for fluvial flooding from Ordinary Watercourses. Areas affected by fluvial flooding which have not been classified as having significant harmful consequences will be reviewed as part of St Helens Council longer-term strategy.

5.4 Sewer Flooding

5.4.1 Sewer flooding is often caused when drainage systems exceed their hydraulic capacity during periods of intensive, or prolonged, rainfall. However sewer flooding can also be caused when a blockage occurs on the network restricting the flows. These drainage systems are owned and maintained by the sewage undertaker (United Utilities). There are 3 types of sewer:

- Foul only flows;
- Surface water flows;
- Both foul and surface water flows (combined system).

5.4.2 Combined sewerage systems are mostly associated with sections of the study area developed during the Victorian era. To maintain hydraulic efficiency the combined system contains a number of relief structures to divert excess flows to adjacent watercourses to reduce the risk of sewer flooding from manholes. These structures are known as Combined Sewer Overflows (CSOs). The operation of these increases the risk of fluvial flooding, as well as pollution of the watercourse. Each CSO has a permit from the environment agency which outlines the conditions in which the asset can discharge. Developments from the late 1970s / early 1980s have been constructed using individually separate foul and surface water systems.

5.4.3 There are some housing developments from the early 20th century that utilise the principles of the separate system where both foul and surface water flows are routed in the one manhole. These dual manholes operate in a similar manner to CSOs and are normally situated at the head of the sewerage network, whereas CSOs are situated in the main body of the system. Dual manholes can cause major pollution problems from storm sewage discharges or dry weather discharges via surface water sewers as a result of foul sewer blockages.

5.4.4 United Utilities have provided an incident register for locations that have experienced internal (i.e. flooding within a property) and external flooding from a number of sources. The register has been filtered to identify hydraulic issues, such as overloading of the sewerage system or restriction at outfall locations caused by high level in the receiving watercourse. “Other” causes of flooding, for example blockages, asset failure or other operational issues, have been discounted from this PFRA.

5.4.5 Figure 11 in Appendix A presents the historic sewer flooding information provided by United Utilities. There have been a total of 270 flooding incidents (213 external and 57 internal) (since 2008) across the study area. Areas affected by sewer flooding which have not been classified as having significant harmful consequences will be reviewed as part of St Helens longer-term strategy.

5.5 Groundwater Flooding

5.5.1 Groundwater flooding occurs when the water table rises above normally expected and anticipated levels and emerges at the ground surface. Groundwater flooding occurs in response to a combination of already high groundwater levels (regularly during mid or late winter) and intense or unusually prolonged periods of rainfall. Other mechanisms which produce groundwater flooding including:

- Artificial structures;
- Mine water rebound;
- High in-bank river levels;
- Groundwater rebound (which occurs when abstraction, typically for drinking water, industrial or mine dewatering purposes, stops and water levels return to pre-abstraction levels).

5.5.2 The occurrence of groundwater flooding is usually localised and, unlike flooding from watercourses, does not generally pose a significant risk to life due to the slow rate at which the water level rises but can last several months and can cause significant social and economic disruption to the affected areas. There are known locations with high groundwater within St Helens however, there are no specific records or reported incidents of groundwater flooding. Therefore it is considered currently that there are no groundwater flood incidents that would result in ‘significant harmful consequences’ as defined by the PFRA threshold.

5.6 Canals

5.6.1 The Canal & Rivers Trust, formerly British Waterways, is the organisation delegated for the maintenance of 2,000 miles of waterways in England and Wales. These engineered systems are heavily controlled and are unlikely to respond in the same manner during periods of rainfall as natural watercourses. The probability of flooding is more associated with residual risks, such as overtopping of canal banks, breaching of embanked reaches or asset (gate) failure. Each canal also has significant interaction with other sources of flood risk, such as the main rivers and the minor watercourses that feed them, or drains that cross beneath them. St Helens Council has one major Canal within its boundary (St Helens Canal) which is maintained by a number of parties (Canal & Rivers Trust, Local Authority and Private Landowners). St Helens Council has identified 2 historically significant harmful consequences for flooding from canals. Areas affected by canal flooding which have not been classified as having significant harmful consequences will be reviewed as part of the longer-term strategy.

5.7 Interaction with Main Rivers

5.7.1 Many of the sources previous mentioned connect to the Main Rivers which eventually drain to the Irish Sea. The PFRA ID is how the watercourses are branched to one another. The main draining watercourse Sankey Brook is designated 1 with the other Main River given higher numbers depending on the position in the network (2-4). Each watercourse is then grouped into a Catchment (A) and sub catchment (a). For the study area the Main Rivers are:

❖ **Table 5b: List of Watercourses**

			River Hierarchy Breakdown (Appendix A Figure 12)			
List of Main Rivers	PFRA ID	Tidal	Catchment	Sub Catchment	Number level	
Sankey Brook**	A-1	Partially	A	-	1	* Warrington (a)
**(additionally referred in sections as Sankey Canal, Sankey Canal (disused))						
Newton Brook	B-2	No	B	-	2	
Ellam's Brook	B-a-3	No	B	-a-	3	
Dean Brook	B-a-4	No	B	-a-	4	
Millingford Brook	B-b-3	No	B	-b-	3	
Down Brook	B-b-4	No	B	-b-	4	*Part in Wigan
Black Brook**	C-2	No	C	-	2	
**(additionally referred in sections as St Helens Canal, St Helen's Canal Blackbrook Branch)						
Clipsley Brook	C-a-3	No	C	-a-	3	
Rainford Brook	D-2	No	D	-	2	
Reeds Brook	D-a-3	No	D	-a-	3	
Pasture Lane Brook	D-b-3	No	D	-b-	3	
Randle Brook	D-c-3	No	D	-c-	3	
Barker's Brook	D-c-4	No	D	-c-	4	
Hardshaw Brook	E-2	No	E	-	2	
Windle Brook	E-a-3	No	E	-a-	3	
Longford Brook	E-a-4	No	E	-a-	4	
Mill Brook	E-b-3	No	E	-b-	3	
Sutton Brook	F-2	No	F	-	2	
Sherdley Brook	F-a-3	No	F	-a-	3	
Travers Entry Brook	F-b-3	No	F	-b-	3	
Sutton Mill Brook	F-c-3	No	F	-c-	3	
Pendlebury Brook	F-c-4	No	F	-c-	4	
Simonswood Brook	G-1	No	G	-	1	* Knowlsey (a)-
Whiston Brook	H-1	No	H	-	1	* Knowlsey (b)-
Penketh Brook	I-1	Partially	I	-	1	* Warrington (b)
Union Bank Brook	J-1	Partially	J	-	1	* Warrington (c)
Whittle Brook	J-a-2	Partially	J	-a-	2	
Burtonwood Brook	K-1	No	K	-	1	* Warrington (d)

5.7.2 Ordinary Watercourses flow into Main Rivers, and vice versa, and Main Rivers flow into or under canals and urban drainage systems outfall into Main Rivers. Flooding mechanisms associated with these interactions are often the result of flow backing up because another source has prevented normal discharge. Information about historical flooding will often be due to an unknown source, or because of interactions between sources. This interaction will be difficult to identify without detailed flood risk studies. Concerning flooding directly from main rivers, the Environment Agency has legal responsibility for them and as such has not been discussed within this PFRA.

5.8 Summary

5.8.1 St Helens Council have reviewed and identified that there are 5 nationally significant or historical local significant flooding incidences within the study area. There are instances of flooding that are not significant, which the Council are aware. The consequence of past flooding means that no records match the threshold to be reported in the Annex Spreadsheets as historic locally significant flooding

6. Future Flood Risk

6.1 Introduction

6.1.1 Whilst analysis of past flooding provides valuable information on the nature and extents of flooding that have occurred in St Helens in the past, it does not necessarily inform us about how and where flooding may occur in the future. Predictions of future flood risk are produced using combinations of hydrological and hydraulic modelling and analysis of past hydrological records to make future predictions. The following sections of this PFRA discuss the potential sources of flooding within the study area. Sources of flooding include Ordinary watercourses -fluvial-, Surface water, Groundwater and Canals.

6.2 Surface Water Flooding

6.2.1 As identified in Table 4e there are a number of national and local level surface water flooding datasets available for the study area. Since 2008 The Environment Agency has produced a series of surface water flood maps to aid local authorities in determining areas at risk of flooding. The latest incarnation of the maps is the Risk of Flooding from Surface Water -RoFSW- maps. This has been previously discussed in section 4.3.1 of this report. Environment Agency guidance on using surface water flood risk information recommends that St Helens Borough Council, as an LLFA, should: review, discuss, agree and record, with the Environment Agency, United Utilities, and other interested parties, what surface water flood data best represents their local conditions, known as “locally agreed surface water information”. Whilst this is not a requirement under the Regulations, it does inform the PFRA process as this information should play an important role in identifying FRAs.

6.2.2 St Helens Council has agreed with all interested parties that the Risk of Flooding from Surface Water -RoFSW- mapping is the most appropriate dataset that represents the risk of flooding from surface water within the study area at a high level. Appendix A Figure 7 and table 6a identify areas within St Helens Council potentially at risk of surface water flooding. It should be noted that the RoFSW dataset -successor to uFMfSW- contains the following limitations:

- Urban areas, rainfall reduced to 70% -represent infiltration-, rainfall reduction 12mm/hr -represent drainage system-;
- Large subsurface drainage elements, such as flood relief culverts and flood storage, are not included. These assumptions can affect the modelled extent and pattern of flooding.
- At the national scale there is limited recorded surface water flood data that exists for LLFAs to perform validation, so in many places no validation has been carried out yet;
- As with many other flood models the input information, model performance and modelling that were used to create the RoFSW vary for different areas; affect the reliability of flood extents and the suitability for different applications;
- RoFSW does not take individual property threshold heights into account;
- The flood extents show predicted patterns of flooding based on modelled rainfall. In reality, no two storms are the same, and so two floods of similar rarity may result in different patterns of flooding and consequently these maps cannot definitively show that an area of land or property is, or is not, at risk of flooding;
- It does not show future scenarios, for example climate change.

6.2.3 This dataset has been used to assess the potential surface water flood risk to properties across the study area, summarised in Table 6a. In order to verify information provided by Environment Agency, St Helens Council undertook an internal review to assess confidence in the data. The method employed by St Helens Council is based upon PFRA FAQ guidance -April 2017- which states that the “The definition for “At Risk” is as described in the technical report for the Updated Flood Map for Surface Water -uFMfSW*- property points dataset -Environment Agency, 2014- i.e. depth of >0mm for >50% of wetted perimeter. uFMfSW is now referred to as the Risk of Flooding from Surface Water -RoFSW- map.

❖ **Table 6a: Numbers of Properties Potentially at Risk from Surface Water Flooding in the Future -EA- and Data Verification Analysis -LA-**

Property Type	EA Susceptibility to surface water flooding banding			LA Susceptibility to surface water flooding banding -Residential Property-		
	Low	Medium	High	Low	Medium	High
All	7,055	1816	Un-available	6930	1783	626
Residential	6,363	1,650	Un-available	5817	1489	517
Non-Residential	566	133	Un-available	1017	268	101
Key Services	126	33	Un-available	96	26	8

6.2.4 The minimal discrepancy between the Environment Agency and St Helens Council property counts maybe due to the different methods used when trimming the data to the St Helens Council boundary -Actual boundary vs 1km2 grid square- and property classicisation. St Helens Council considers that the figures provided by Environment Agency are acceptable for the purpose of the PFRA as a strategic level document. The level of future flood risk and the estimated associated consequences are provided in the spreadsheet in Annex 2. Further information to background and limitations to risk of surface water mapping by the Environment Agency can be obtained via the following link.

❖ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/297432/LIT_8988_0bf634.pdf

6.3 Sewer Flooding

6.3.1 Hydraulic -1D- sewer models have been created which cover the majority of the sewerage network maintained by United Utilities. These have been verified against a flow survey to provide an accurate representation of network performance during both dry weather and storm conditions. A suite of design storm events of differing return periods, durations, and inclusive of the effects of climate change, are then applied to the models to assess hydraulic performance.

6.3.2 The outputs include a range of predicted surcharge levels and flood volumes at individual node locations. Clusters of flooding nodes are then grouped based upon the common hydraulic deficiencies and / or geographic location and are checked against historical records to confirm existing flooding locations, as well as a tool to predict future flooding locations. Whilst this data allows a high-level analysis of sewer flood risk, there are a number of limitations with the data:

- Not all sewer networks are modelled;
- Model confidence is low in sections of the network that were not covered by flow monitor during the survey period;
- The models are calibrated for a particular period and conditions the flow survey was installed and may not fully take into consideration the effects of seasonality;
- 1D models do not represent the flow path unlike 2D and Integrated Catchment Modelling -ICM- models. Predicted flood volume in 1D models departures and returns to the system at the same location, in truth it may not be the case;
- Not all models accurately represent interaction watercourses at outfall locations. A number of 1D models are to be upgraded to include representation of watercourses, Integrated Catchment Modelling -ICM- which includes the 2D element, during the coming years. This will enable increased understanding of hydraulic interactions of all systems, in particular the operational performance of CSOs and flood routing paths of surfaces waters.

6.3.3 Figure 11 in Appendix A presents the historic sewer flooding information provided by United Utilities. There have been a total of 270 flooding incidents -213 external and 57 internal- across the study area (Since 2008). These known flooding locations are coherent with predictions from the hydraulic sewer model, therefore providing confidence to sections of the study area where flooding is predicted but has gone unreported.

6.3.4 Based on information readily available on their website in their “Strategic Direction Statement” United Utilities are proposing to address a significant number of sewer flooding problems by 2020. Based on figures from 2015, this will include a 40% reduction to the number of properties experiencing internal foul flooding. This is to be achieved through investment in the completion of a number of studies and capital works projects.

6.4 Groundwater Flooding

6.4.1 The Environment Agency’s national dataset, Areas Susceptible to Groundwater Flooding -AStGWF- provides the main dataset used to assess the future risk of groundwater flooding. The AStGWF map uses four susceptible categories to show proportion of each 1km grid square where geological and hydrogeological conditions show that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring. In common with the majority of datasets showing areas which may experience groundwater emergence, this dataset covers a large area of land, and only isolated locations within the overall susceptible area are actually likely to suffer the consequences of groundwater flooding.

6.4.2 Unless an area identified as “susceptible to groundwater flooding" is also identified as “at risk from surface water flooding", it is unlikely that this location would actually experience groundwater flooding to any appreciable depth, and therefore it is unlikely that the consequences of such flooding would be significant. The AStGWF dataset was derived using the British Geological Society -BGS- 1:50,000 scale Groundwater Flood Susceptibility Map produced in 2010, utilising the top two susceptibility bands. Two hydrogeological conceptual models have been used in the development of the susceptibility dataset. These are:

❖ **Table 6b: Groundwater Flooding Types**

Permeable Superficial Deposit -PSD- flooding	Clearwater flooding
Associated with shallow unconsolidated sedimentary aquifers which overly non-aquifers. These aquifers are susceptible to flooding as the storage capacity is restricted. Direct rainfall recharge can be relatively high and the sediments may be very permeable thus creating a good hydraulic connection with adjacent watercourses. Intense rainfall can cause a rapid response in groundwater levels; rising river levels. As the upstream catchment responds to the rainfall, this can create increased heads that drive water into the aquifer.	Caused by the water table in an unconfined aquifer rising above the land surface in response to extreme rainfall. Occurs when antecedent conditions of high groundwater levels and high unsaturated zone moisture content combine with intense rainfall

6.4.3 The Groundwater Flood Susceptibility Map does not incorporate anomalous discharge from springs or flooding associated with urban groundwater rebound, mine water discharge, urban drainage, or any other flooding associated with changes in the engineered environment. Figure 8 in Appendix A shows the AStGWF map and indicates that the northern parts of the borough are more susceptible to rising groundwater levels.

6.5 Ordinary Watercourse

6.5.1 There is at present no specific Borough wide modelling for ordinary watercourses however the Environment Agency have produced Flood Zone Maps which shows the results of coarse modelling of catchments over 3km^2 -Figure 9 in Appendix A-. The Environment Agency Flood Map does not provide information on flood depth, speed or volume of flow. In order to better understand the risk of flooding from ordinary watercourse, St Helens Council Borough Council in 2012 commissioned JBA Consulting to assist the Council with development of an asset database and also to determine the flood risk associated with the assets collated.

6.5.2 JBA Consulting simulated flooding caused by 100% blockage scenario in pipes, culverts or bridges using JScreen software. JScreen defined the extent of flood, and analysed its consequences highlighting the different property types that are vulnerable to flood risk if a culvert or any other flood risk asset were to fail.

6.5.3 In 2014/15, St Helens Council Borough Council as part of the Cheshire Mid-Mersey Partnership -CMMP- undertook a project to improve the knowledge of flood risk from the ordinary watercourse network across the partnership area by undertaking asset inspections, topographical surveys and modelling works on ordinary watercourses which had been identified using the best available information at the time as potentially high risk. This project was considered to build upon the previous work completed by JBA due to the increase in collection of information. CH2M Hill was appointed in November 2014 under the Water and Environment Management -WEM- Framework to undertake appropriate assessment of more than 30 km of non-main watercourse across the CMMP areas. Three separate surveys were outlined to capture the required data for the proposed study outputs including: T98 Conditional Asset Assessment, CCTV survey and Topographical survey.

6.5.4 Catchment wide modelling and mapping was undertaken by CH2M following the completion of the survey investigations enabling visualisation of possible implications of events with return periods of 1 in 5 year, 1 in 30 year and 1 in 100 year. The modelled flood risk mapping represents the current situation of assets on the ground using the surveyed data to populate model data. Model results have been used to produce depth grids, flood outlines and property counts based on properties from the Nation Receptor Database -NRD- to identify properties at risk. Summary of property counts -locations extracted from NRD- within flood outline for modelled reach as part of CH2M Hill study are shown in the table 6c below. The small size of the watercourses considered within this study means there were no observed flow data sets available, therefore best practice outlined by the Environment Agency was followed:

- Catchments delineated using GIS and FEH CDROM.
- Catchment descriptors from FEH CDROM used within ReFH analysis to calculate inflows for required return periods.

❖ **Table 6c: Additional Modelling Results**

Location	Grid Area -km²-	Property Count 1 in 5yr	Property Count 1 in 30yr	Property Count 1 in 100yr
Bold Heath	1	2	3	4
Eccleston	1	0	0	0
Wargrave	1	0	0	0
Billinge	4 -1-	375 -94-	414 -103-	430 -107-

6.5.5 Although it appears that flooding may occur, property counts do not achieve the threshold to be determined as having “significant harmful consequences“. The level of future flood risk and the estimated associated consequences are provided in the spreadsheet in Annex 2.

6.6 The River Mersey

6.6.1 The Environment Agency do not classify the reach of the River Mersey through St Helens Council as Main River, as it is a heavily modified river system as extensive re-sectioning and embankment works were carried out in the 1960s. Although not classified as a main river, the Environment Agency does manage the river, with the River Mersey and its five main tributaries (Sankey Brook) forming the focus of the Environment Agency's Flood Risk Management Strategy for St Helens Council.

6.7 Canals

6.7.1 All the Canals with St Helens Council Boundary are classed as Main River Watercourses; therefore any risk designated with the Canal will be looked as Main River. Where issues arise with the Canal sections, this will be discussed with the Canals and Rivers Trust and/or relevant land owners (in which Local Authority is one).

6.8 Summary

6.8.1 Based on DEFRA thresholds of more than 30,000 people at flood risk, there is no evidence to indicate that there is a significant flood risk from local flooding sources in St Helens Council. However as stated in Table 6a there are up to 1816 properties potentially at risk during a flood event with a 1% -1 in 100- annual probability. Majority of Risk in St Helens comes from Main River unmaintained disused Canals and/or historic hydraulic urban connections.

7. Climate Change

7.1 Introduction

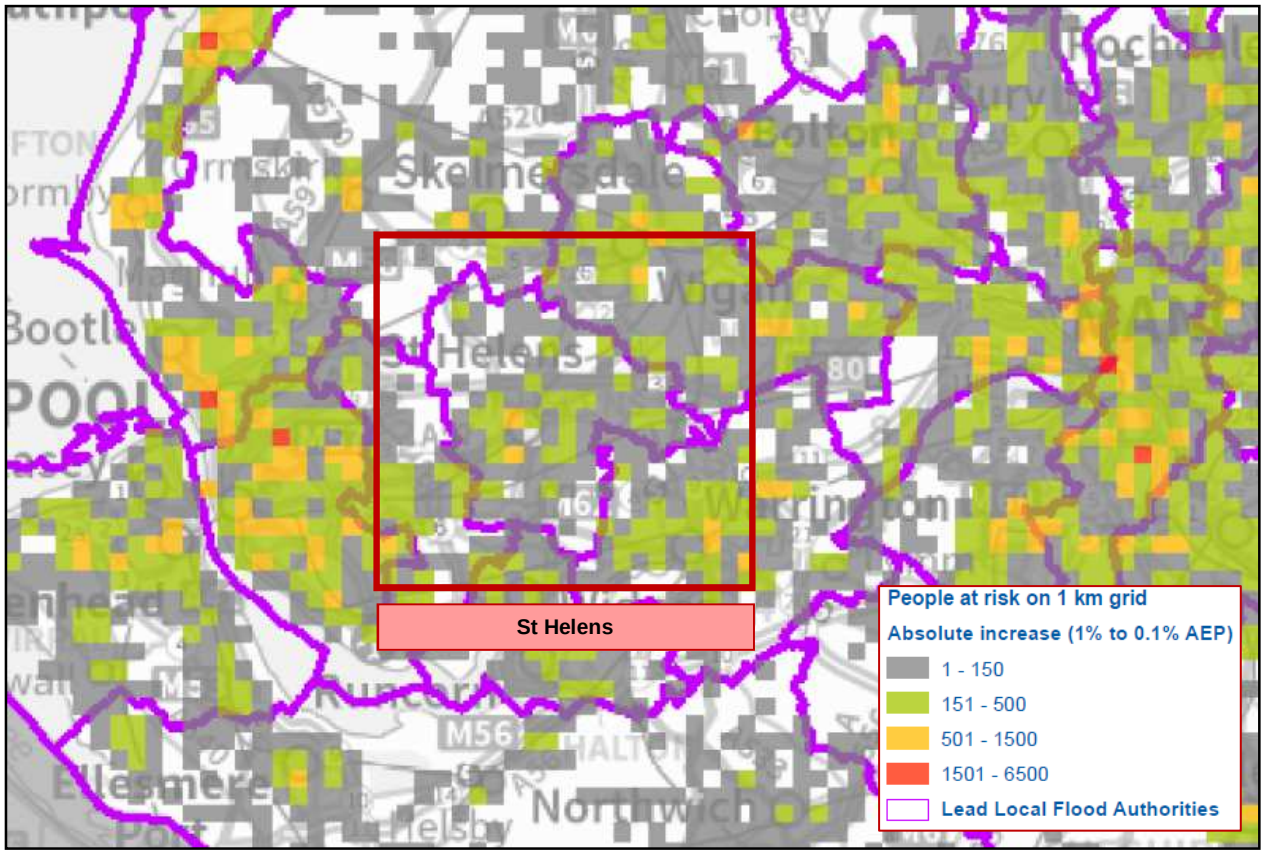
7.1.1 Generally, preliminary assessment reports in 2011 described only the broad implications of climate change at river basin district level, based on UK Climate Projections, 2009 -UKCP09-. Since then, some LLFAs have carried out local studies that included climate change assessments on flood risk. The next set of climate projections is due in 2018 -UKCP18-. Until then UKCP09 is still a valid tool to aid decision-makers to assess the full range of risks from the changing climate and advise to adapt.

7.2 Initial Review

7.2.1 Whilst a significant amount of work has been completed since the introduction of the PFRA in 2011 it is still recognised that the implications of climate change for local flood risk are still not well understood. The Environment Agency have carried out a simple analysis at the national level to compare the number of people at risk from surface water flooding from a rainfall event with a 1% chance -1 in 100 year return period- of occurring in any year to the number at risk from an event with a 0.1% chance -1 in 1000 year return period- of occurring in any year. The numbers of people at risk are counted per 1 kilometre grid square across England. The resulting 'heat map' shows how the absolute number of people at risk increases between these two rainfall events for each 1km grid square.

7.2.2 This method is not based on climate projections, and it does not account for future population growth. It does provide a simple way, however, of identifying areas that could be susceptible to increased rainfall intensity as a proxy for climate change. It is a reasonable proxy for an upper end climate change scenario for the end of the century, both in the pattern of change across the country and the percentage increase in intensity compared to the current climate. Figure 7a shows an extract from the 'heat map'. Red and orange squares indicate the highest increase in numbers of people at risk, and green and grey indicate lower increases.

❖ **Figure 7a: Extract from the 'heat map' illustrating absolute increase in numbers of people at risk from surface water flooding for a 0.1% -1000 year- rainfall event compared to a 1% event -100 year-**

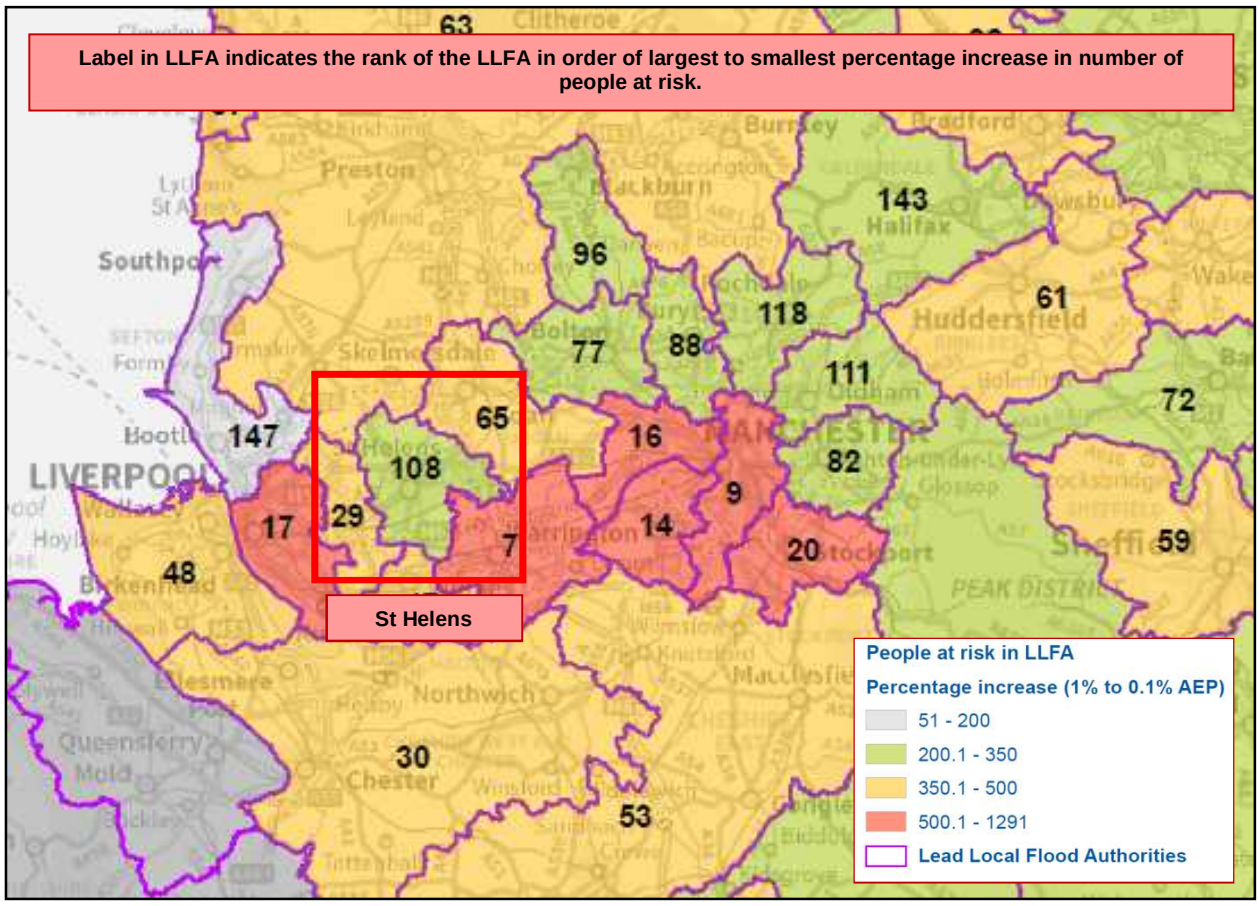


7.2.3 This 'heat map' provides an initial understanding of how climate change may affect local flood risk in the future, and helpful when considering the indicative FRAs as part of this PFRA review. At the national scale the administrative area of St Helens Borough Council is positioned 108th out of 152 LLFAs when reviewing the percentage increase in people at risk of flooding in LLFAs for the 0.1% rainfall event compared with the 1% event. Whilst this may sound low St Helens Borough Council is positioned 132th in absolute increase in people at risk of flooding. Need to also understand that due to the drainage network and St Helens sitting in the top of the catchment the downstream flow Local Authority of Warrington Borough Council is 7th out of 152 LLFAs for percentage increase in people at risk of flooding.

❖ **Table 7a: Absolute and percentage Increase in the number of people at risk of flooding by LLFA for 0.1% - 1000 year- rainfall event compared with 1% -100 year- event**

Rank	LLFA Name	Residential properties -1 in 100 year-	Residential properties -1 in 1000 year-	Non residential properties -1 in 100 year-	Non residential properties -1 in 1000 year-	Key Services -inc electricity sub-station--1 in 100 year-	Key Services -inc electricity sub-station- -1 in 1000 year-	Number of People -1 in 100 year-	Number of People -1 in 1000 year-	Absolute increase between 1 in 100 and 1 in 1000 year	Percentage increase in people at risk
7	Warrington -B-	890	7,298	117	855	25	142	2,083	17,077	14,994	720
17	Liverpool District -B-	2,839	18,152	466	2,573	52	270	6,643	42,476	35,833	539
29	Knowsley District -B-	1,013	5,483	100	426	28	109	2,370	12,830	10,460	441
30	Cheshire West & Chester	1,767	9,403	251	1,096	43	159	4,135	22,003	17,868	432
47	Halton -B-	809	3,886	127	830	18	59	1,893	9,093	7,200	380
48	Wirral District -B-	2,367	11,355	202	876	43	206	5,539	26,571	21,032	380
53	Cheshire East	2,204	10,481	430	1,343	31	148	5,157	24,526	19,369	376
98	Staffordshire County	8,074	32,580	1,029	3,912	87	412	18,893	76,237	57,344	304
106	Cambridgeshire County	8,915	34,888	778	2,697	169	584	20,861	81,638	60,777	291
107	Cornwall	3,745	14,543	1,373	3,822	41	142	8,763	34,031	25,268	288
108	St. Helens District -B-	1,650	6,363	133	566	33	126	3,861	14,889	11,028	286
109	Northumberland	2,365	9,101	396	1,227	29	112	5,534	21,296	15,762	285
110	Coventry District -B-	3,241	12,372	483	1,636	37	160	7,584	28,950	21,366	282
147	Sefton District -B-	17,388	35,772	1,501	2,886	288	500	40,688	83,706	43,018	106

❖ **Figure 7b: Extract from percentage increase in the number of people at risk of flooding by LLFA for 0.1% - 1000 year- rainfall event compared with 1% -100 year- event**



7.3 Impact Evidence of Climate Change

7.3.1 Over the past century around the UK sea level rises have occurred and more of our winter rain falling in intense wet spells. Seasonal rainfall is highly variable. It seems to have decreased in summer and increased in winter, although winter amounts changed little in the last 50 years. Some of the changes might reflect natural variation; however the broad trends are in line with projections from climate models. Greenhouse gas -GHG- levels in the atmosphere are likely to cause higher winter rainfall in future. Past GHG emissions mean some climate change is inevitable in the next 20-30 years. Lower emissions could reduce the amount of climate change further into the future, but changes are still projected at least as far ahead as the 2080's. By 2080, the latest UK climate projections -UKCP09- are that there could be around three times as many days in winter with heavy rainfall -more than 25mm in a day-. It is plausible that the amount of rain in extreme storms -with a 1 in 5 annual chance or rarer- could increase locally by 40%.

7.4 Projections for North West River Basin

7.4.1 If emissions follow a medium future scenario, UKCP09 projected changes by the 2050s relative to the recent past in the North West are:

- Winter precipitation increases of around 14% -very likely to be between 4 and 28%-
- Precipitation on the wettest day in winter up by around 11% -very unlikely to be more than 25%-
- Relative sea level at Morecambe very likely to be up between 6 and 36cm from
- 1990 levels -not including extra potential rises from polar ice sheet loss-
- Peak river flows in a typical catchment likely to increase between 11 and 18%
- Increases in rain are projected to be greater near the coast than inland.

7.5 Implications for Flood Risk

7.5.1 Climate changes can affect local flood risk in several ways. Impacts will depend on local conditions and vulnerability. Wetter winters and more of this rain falling in wet spells may increase river flooding especially in steep, rapidly responding catchments. More intense rainfall causes more surface runoff, increasing localised flooding and erosion. In turn, this may increase pressure on drains, sewers and water quality. Storm intensity in summer could increase even in drier summers. Rising sea or river levels may also increase local flood risk inland or away from major rivers because of interactions with drains, sewers and smaller watercourses. Where appropriate, St Helens Council will be involved in local studies to understand climate impacts in detail, including effects from other factors like land use. Sustainable development and drainage will help with adaptation to climate change and manage the risk of damaging floods in future.

7.6 Adapting to Change

7.6.1 Past emission means some climate change is inevitable. It is essential St Helens Council and the UK respond by planning ahead. St Helens Council can prepare by understanding current and future vulnerability to flooding, developing plans for increased resilience and building the capacity to adapt. Regular review and adherence to these plans is key to achieving long-term, sustainable benefits. Although the broad climate change picture is clear, St Helens Council has had to make local decisions with less certainty. A range of measures therefore will need to be considered to retain the flexibility to adapt. This approach, embodied within flood risk appraisal guidance, will help to ensure that St Helens Council does not increase the vulnerability to flooding.

7.7 Long Term Developments

7.7.1 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, Section 10 of National Planning Policy Framework -section of relevance formally 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.

7.7.2 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-. St Helens Council will ensure new developments will manage surface water at source and ensure developments do not contribute to flooding problems elsewhere. Where possible, new developments may relieve existing problems by improved management of surface water flows.

7.8 Local Drainage Capacity

7.8.1 Since the introduction of the FWMA 2010 St Helens Council has strived to increase its knowledge to the local drainage systems in order to ascertain capacity. This has been documented as part of the asset register, although there still remains a knowledge gap in sections of the study area. To develop flood alleviation strategies within the study area, additional investigation to identify these local drainage systems are required. This is an ongoing exercise and will be addressed in future reports.

8. Review of Flood Risk Areas

8.1 Future Data Management Arrangements

8.1.1 As described in Section 4 in order to ensure a consistent national approach, DEFRA have identified significant criteria and thresholds to be used for defining FRAs.

8.1.2 Guidance on applying these thresholds has been released in the Environment Agency's *"Review of preliminary flood risk assessments -Flood Risk Regulations 2009-: Guidance for lead local authorities in England"* -25th January 2017- which superseded DEFRA's *"Selecting and reviewing Flood Risk Areas for local sources of flooding"* -first published September 2013, withdrawn February 2017-. This guidance document sets out agreed key risk indicators and threshold values which must be used to determine FRAs.

8.1.3 The methodology is based on using national flood risk information to identify 1km grid squares where local flood risk exceeds a defined threshold. 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 FRA. Figure A in Appendix 5 shows the High Risk Areas identified by DEFRA.

8.1.4 None of the clusters shown affect more than 30,000 people across the study area and therefore there are no Indicative FRAs within the St Helens Council boundary as defined by the PFRA criteria St Helens Council has accepted the current proposed indicative significant FRAs. However, it is recognised that St Helens Council has many locally significant flood risk issues.

9. Next Steps

9.1 Future Data Management Arrangements

.1.1 In order to continue to fulfil the role of Local Lead Flood Authority St Helens Council is required to investigate future flood events and ensure continued collection, assessment and storage of flood risk data and information. The central flood data collection spreadsheet will be updated with each flood event. This is discussed further in the Lead Local Flood Risk Management Strategy.

9.2 Policy for Investigations and Recording

9.2.1 All flood events will be subject to investigations and recording. The local threshold for formal investigation leading to publication is discussed further in the Lead Local Flood Risk Management Strategy. It is crucial that all records of flood events are documented consistently and in accordance with the INSPIRE Directive -2007/2/EC-, European Directive transposed into UK Law in December 2009. The centralised database will be kept up to date by St Helens Council, who has the overall responsibility to manage flood data throughout the administrative area. This can be used as an evidence base to inform future assessments and reviews and for input into the mapping and planning stages.

9.3 Asset Register

9.3.1 Section 21 of FWMA 2010 state LLFAs have a duty to maintain a register of structures or features which, in the opinion of the authority, are likely to have a significant effect on a flood risk in its area, and a record of information about each of those structures or features, including information about ownership and state of repair. St Helens Council will continue to develop this database.

9.4 Review Procedures

9.4.1 Meeting quality standards is important in order to ensure that the appropriate sources of information have been used to understand flood risk and the most significant FRAs are identified. The review procedure will comprise two key steps, namely, Local Authority Review and Environment Agency Review. The Review Checklist in Annex 4 of this document is used by all LLFA's and the Environment Agency to review and ensure a consistent review process is applied. The review of the PFRA for St Helens Council will be undertaken by the Lead Local Flood Officer and the Executive Member for Environmental Protection.

9.5 Local Authority Review

9.5.1 The first part of the review procedure is through an internal Local Authority review of the PFRA in accordance with appropriate internal review procedures, quality assurance and resilience. The Council will then take it for approval in accordance to Corporate Procedures before being delivered to the Environment Agency to ensure national consistency. The PFRA must be reviewed and updated every 6 years. The first edition of the PFRA was submitted to the Environment Agency on 22nd June 2011. This report -the second edition- is the first review and is to be submitted to the Environment Agency on 22nd June 2017 under Sections 10 and 17 of FRR 2009.

9.6 Environment Agency Review

9.6.1 Under Section 10 of FRR 2009 the Environment Agency has been given a role in reviewing, collating and publishing all of the PFRAs once submitted. The Environment Agency will undertake a technical review -area review and national review- of the PFRA, which will focus on instances where FRAs have been amended and ensure the format of these areas meets the provide standard. Once satisfied, the Environment Agency EA will then recommend submission of the PFRA to the relevant Regional Flood Defence Committee -RFDC- for endorsement if satisfied.

9.6.2 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. All PFRAs obtained by the Environment Agency will then be collated, published and submitted to the European Commission by 22nd December 2017 under Section 16 of FRR 2009. Future review cycles, of no more than 6 years, will use the same procedure described above.

9.7 Spatial Developments

9.7.1 St Helens Council is a statutory consultee for major developments which have surface water implications. St Helens Council is to provide comments in relation to surface water drainage aspects of planning applications within 21 days. The PFRA, along with the SFRA and SWMP, will inform the Local Development Framework -LDF-. Strategic development will be approached through planning and development, appropriate design, situation and location of future development can all contribute to reducing the risk of flooding, including;

- Application of property and location specific flood protection measures;
- Application of sustainable urban drainage techniques for new developments;
- Identify river corridors and the natural flood plain to provide potential riverside storage and urban river corridors in built up areas.

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10. Appendices

- **Table 10a: PFRA Appendix A**

Name	
Figure 1	PFRA 2016 Method1 Clusters 100 with BS BS12 NW and Mids
Figure 2	PFRA 2016 Method1 Clusters 100 with Num People BS12 NW and Mids
Figure 3	PFRA 2016 People Sensitivity CC Proxy England
Figure 4	PFRA 2016 People Sensitivity CC Proxy LLFAs
Figure 5	DEFRA / EA Identified 1km2 Squares Above Flood Risk Threshold -Blue Squares-
Figure 6	Classification of Watercourses Within The Administrative Boundary of St Helens BC
Figure 7	Environment Agency Risk of Flooding from Surface Water Dataset -RoFSW-
Figure 8	Environment Agency Areas Susceptible to Groundwater Flooding Map -AStGWF-
Figure 9	Environment Agency Flood Map -Rivers & Sea-
Figure 10	St Helens Borough Council Spatial Distribution of Historic Flood Records
Figure 11	United Utilities Spatial Distribution of Historic Flood Records
Figure 12	Watercourses Network Hierarchy

- **Table 10b: PFRA Appendix B**

Name	
Data Limitations	Methods used to develop indicative FRAs for the second cycle

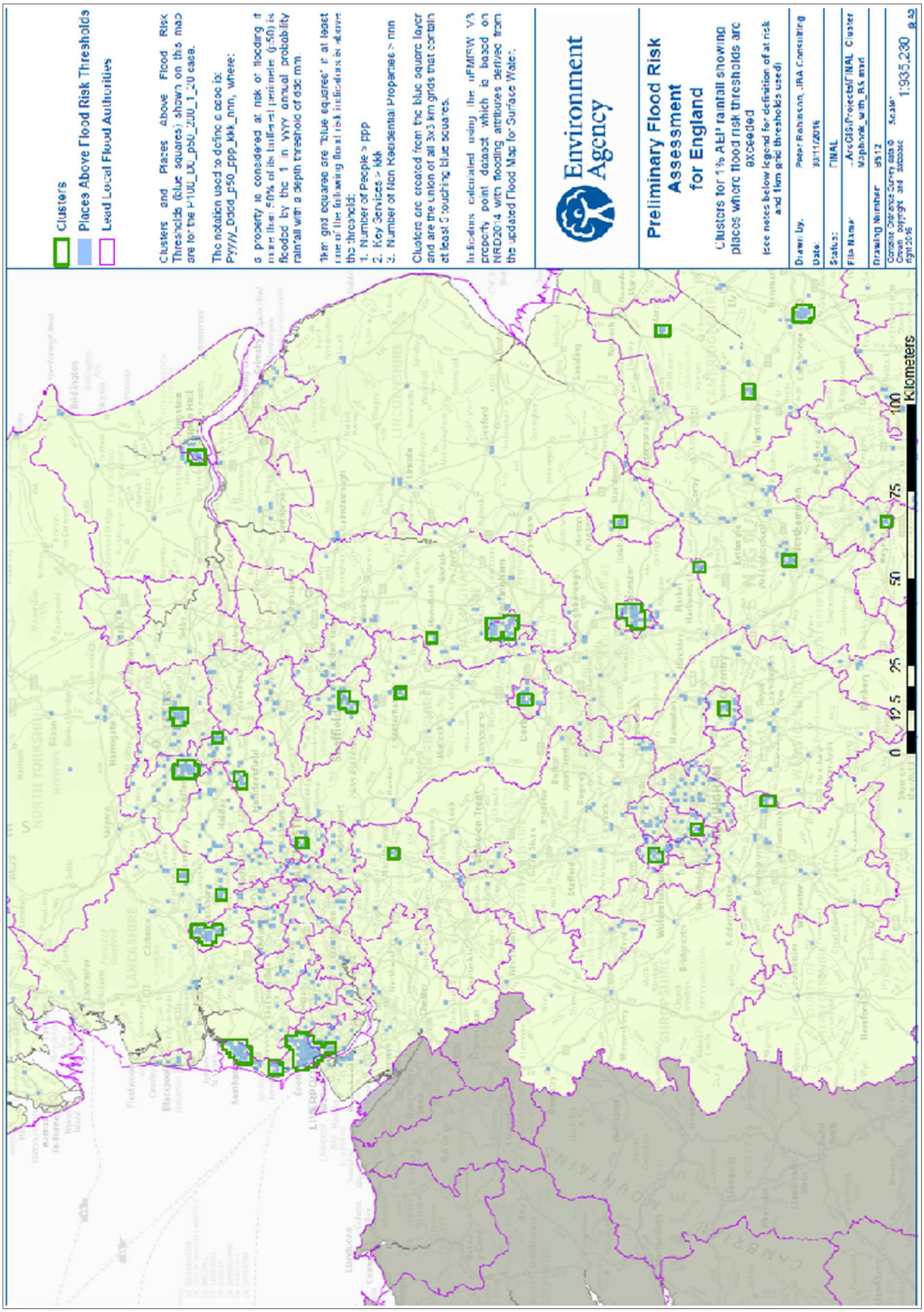
- **Table 10b: PFRA Appendix C**

*Annex's are within a separate spreadsheet documents.

Name Annex		
Annex 1	Past Floods	St Helens PFRA Annex 1-3 2017
Annex 2	Future Floods	
Annex 3	Flood Risk Areas	
Annex 4	PFRA Checklist Review	St Helens PFRA Annex 4 2017

11. Appendices A

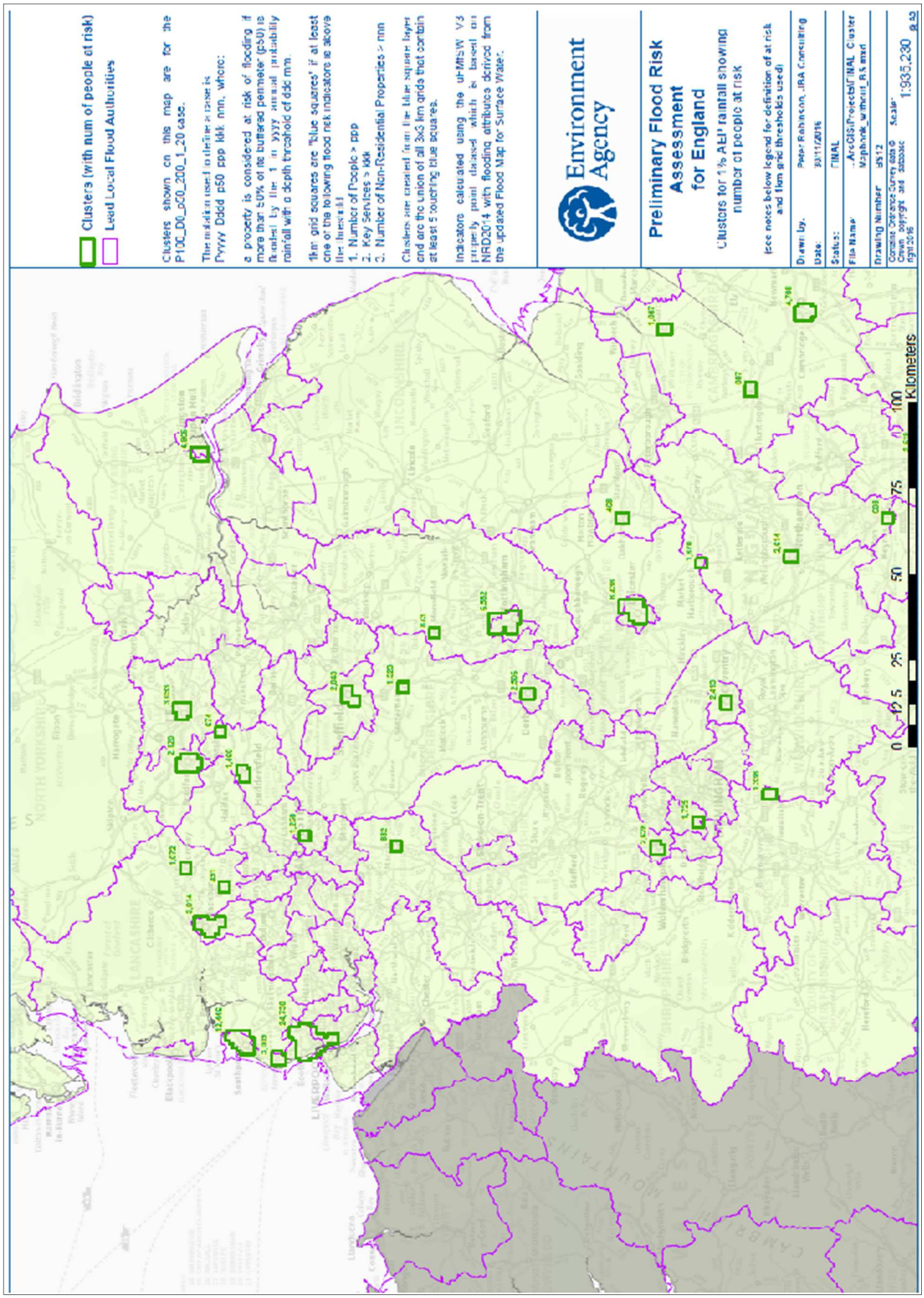
- **Figure 1 – PFRA 2016 Method1 Clusters 100 with BS BS12 NW and Mids**



Not to Scale within PFRA Report

11. Appendices A

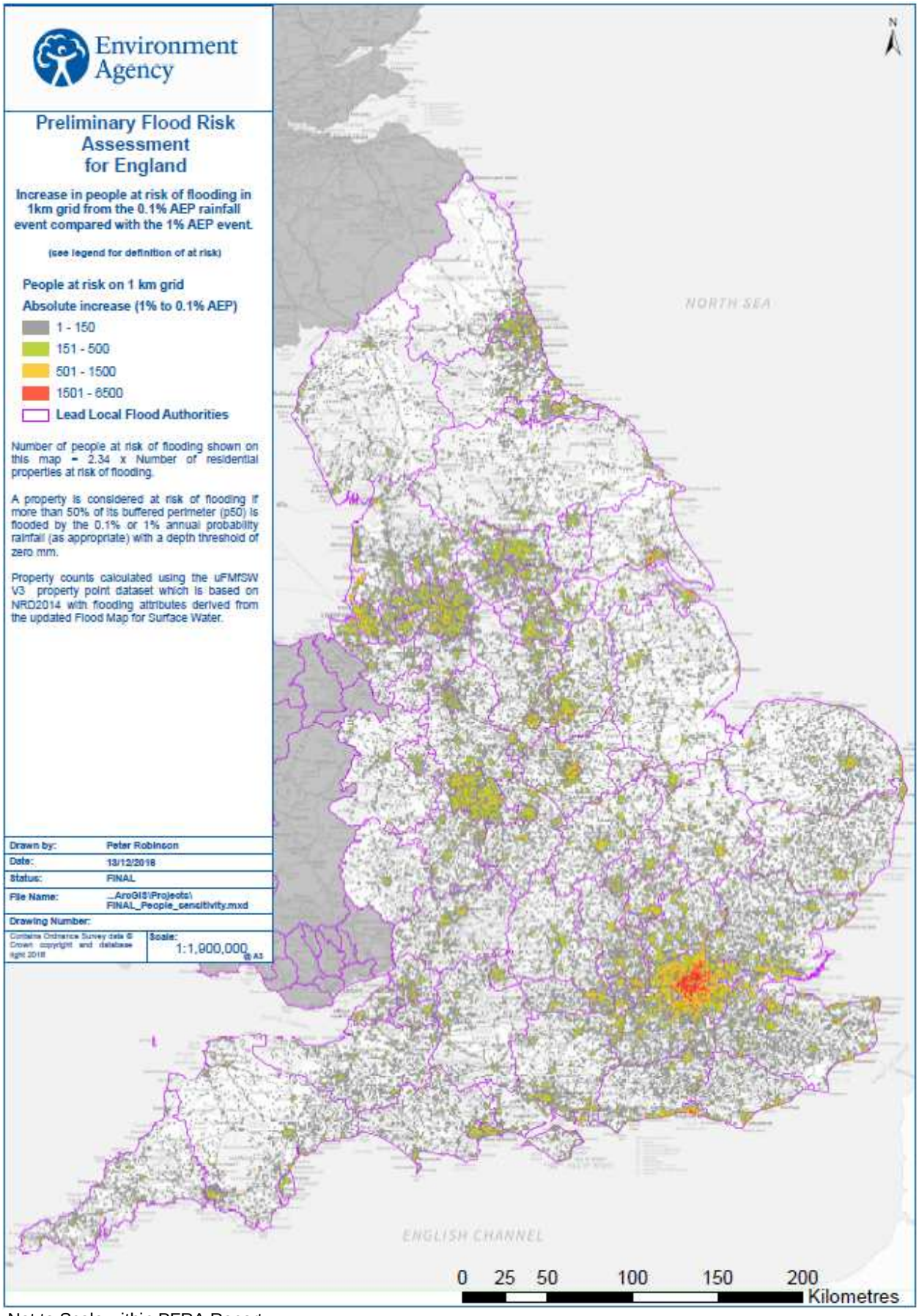
❖ **Figure 2 – PFRA 2016 Method1 Clusters 100 with Num People BS12 NW and Mids**



Not to Scale within PFRA Report

11. Appendices A

❖ **Figure 3 – PFRA 2016 People sensitivity CC proxy England**



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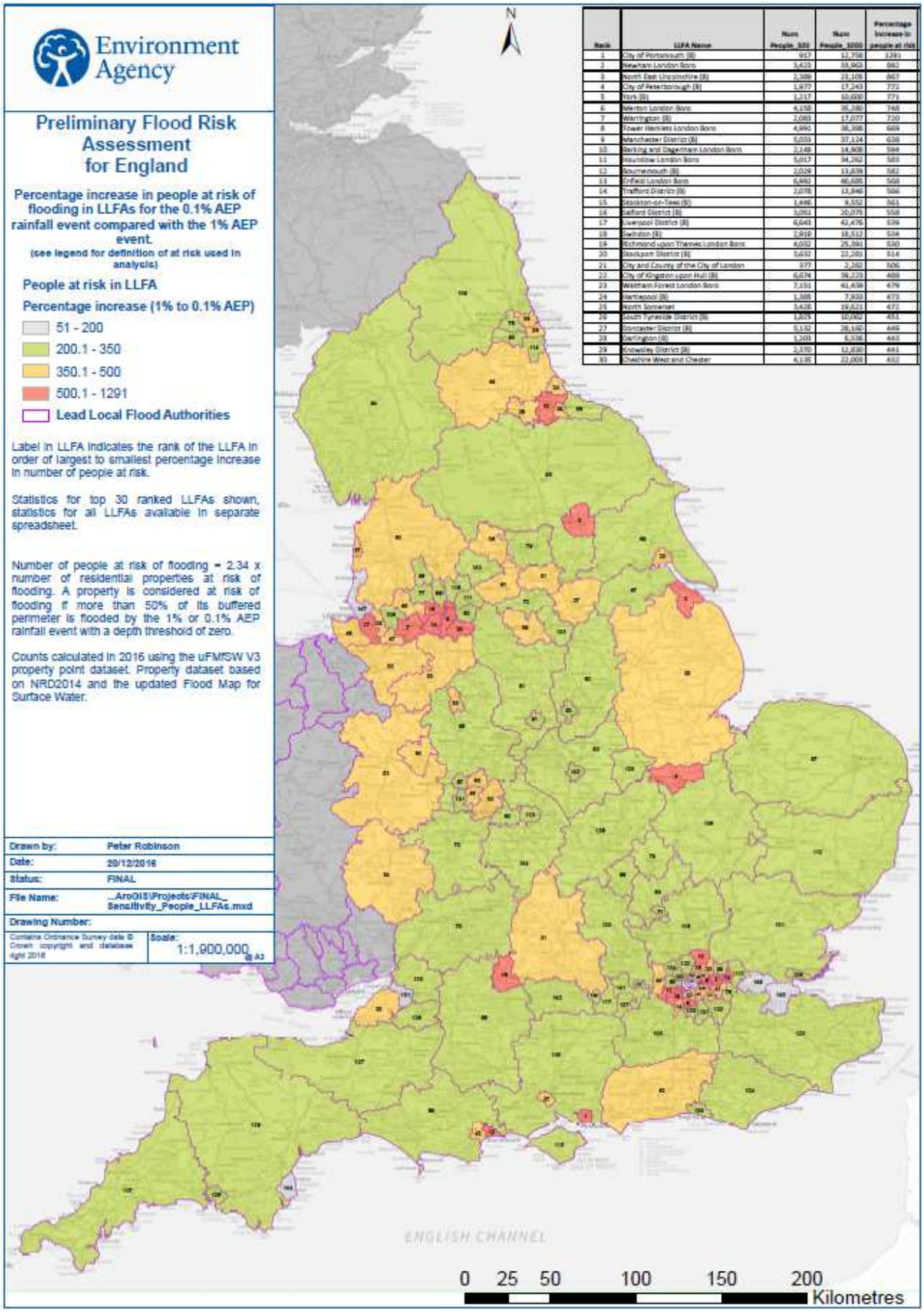
❖ **Figure 4 – PFRA 2016 People sensitivity CC Proxy LLFAs**



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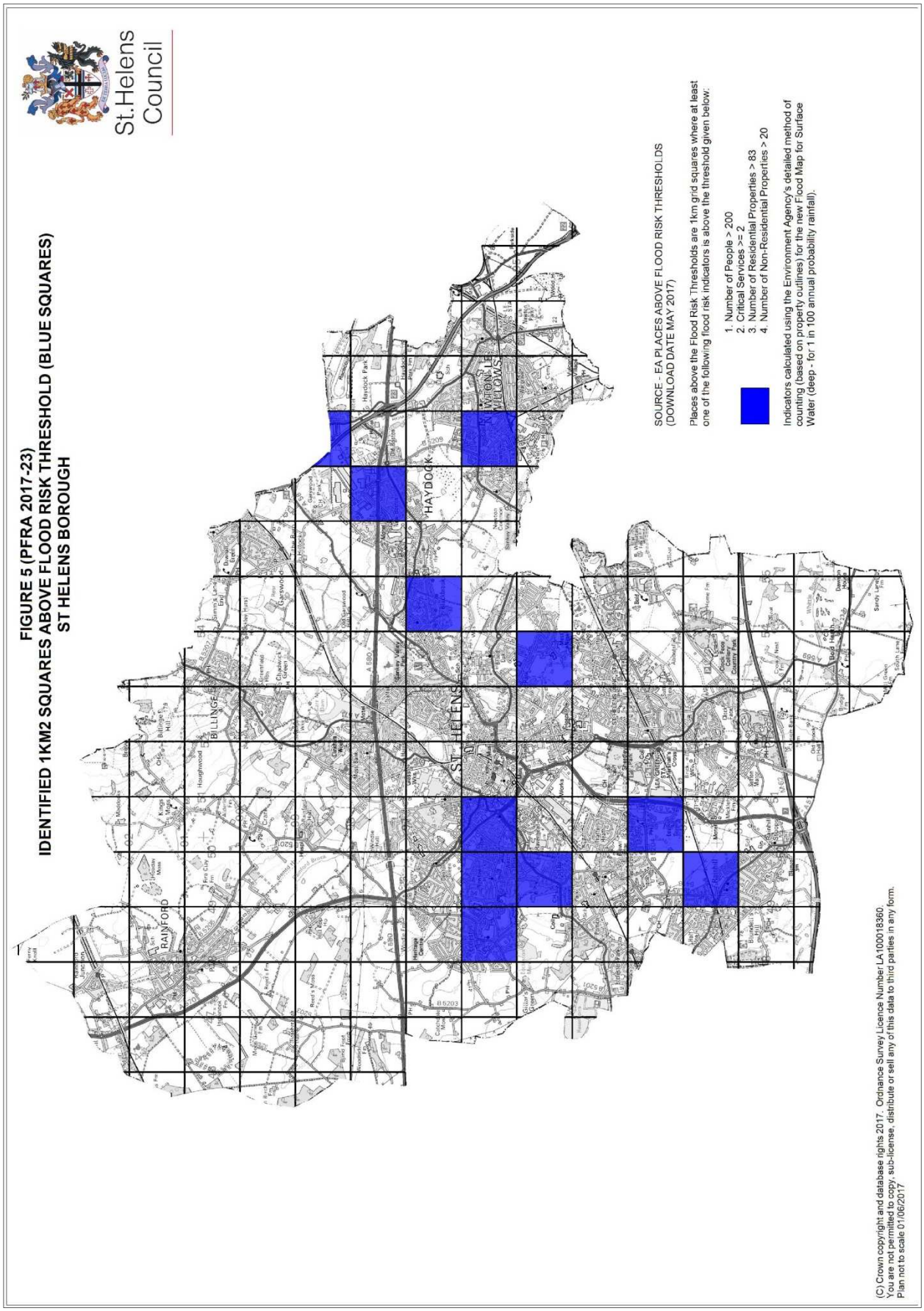
- **Figure 5 – DEFRA / EA Identified 1km2 Squares Above Flood Risk Threshold -Blue Squares-**



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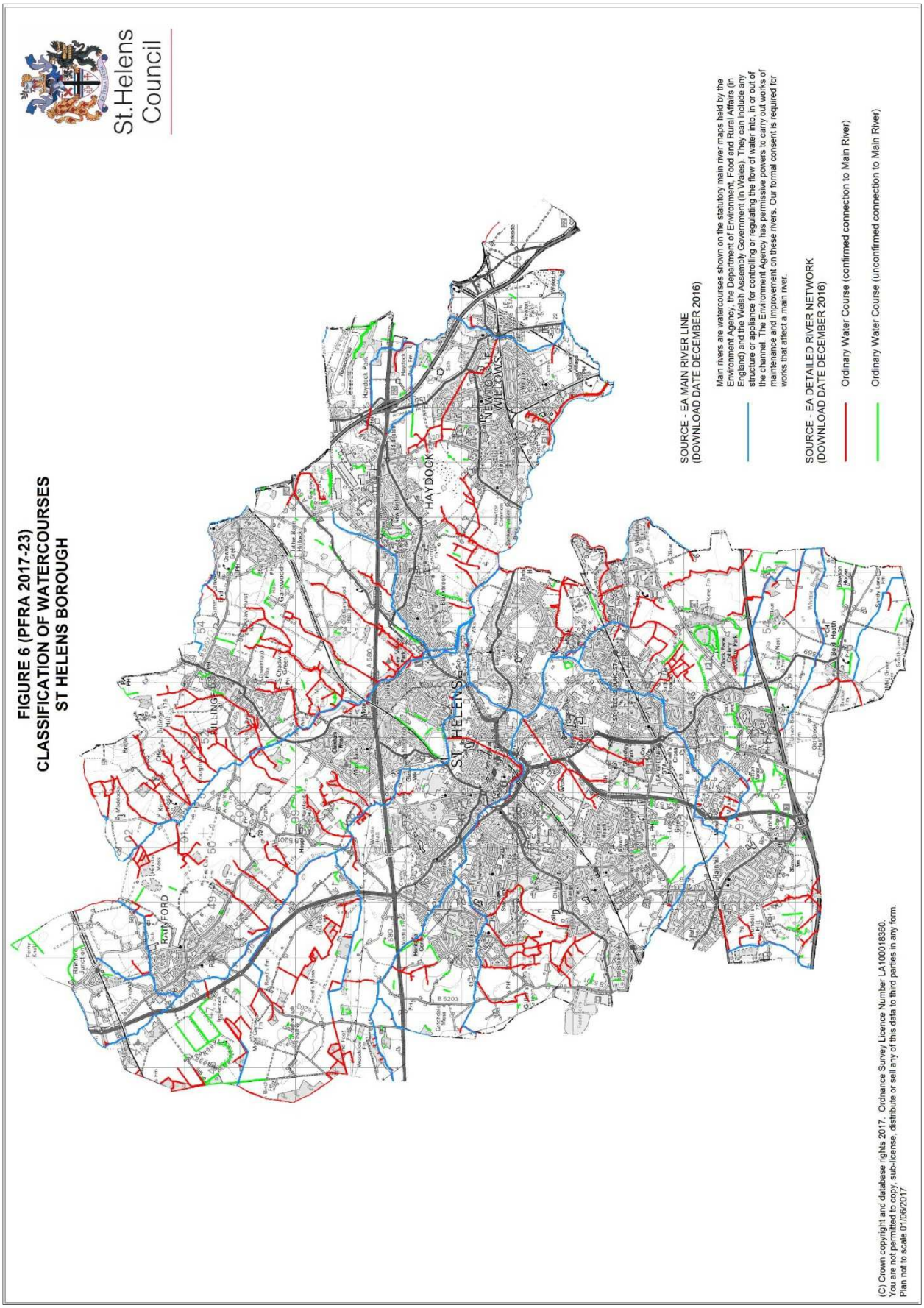
- **Figure 6 – Classification of Watercourses within the Administrative Boundary of St Helens BC**



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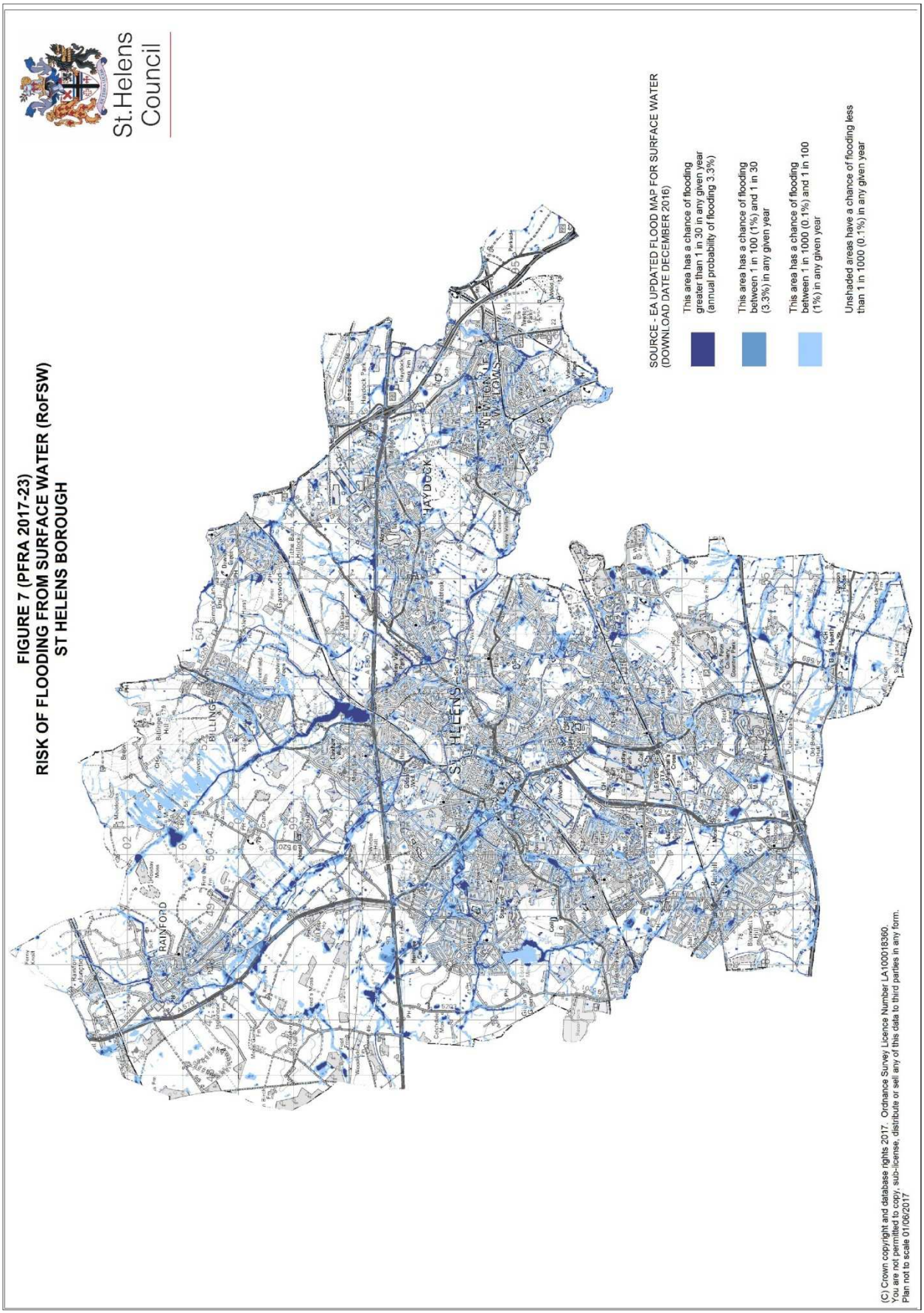
- **Figure 7 – Environment Agency Risk of Flooding from Surface Water Dataset -RoFSW-**



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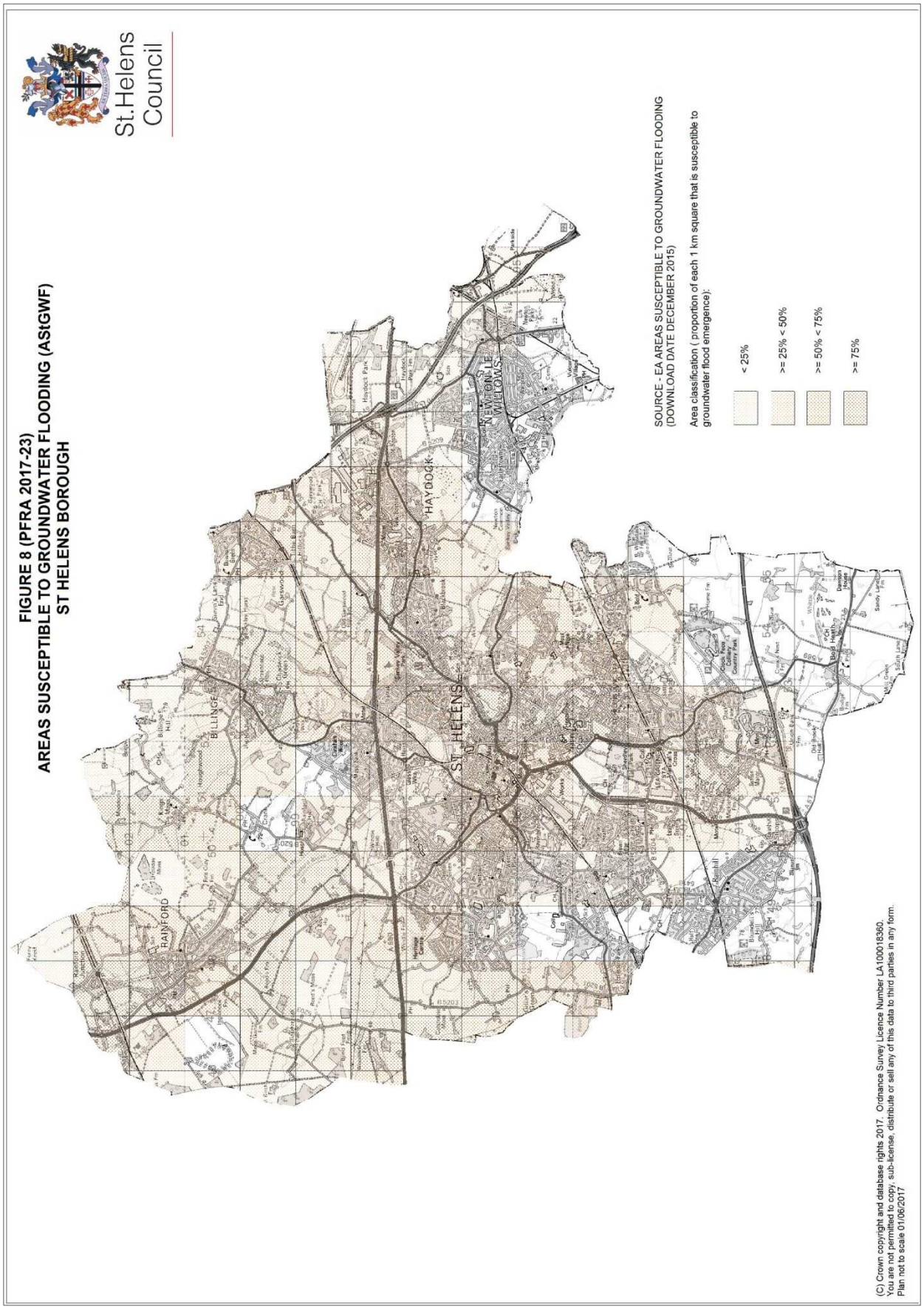
❖ **Figure 8 –Agency Areas Susceptible to Groundwater Flooding Map -AStGWF-**



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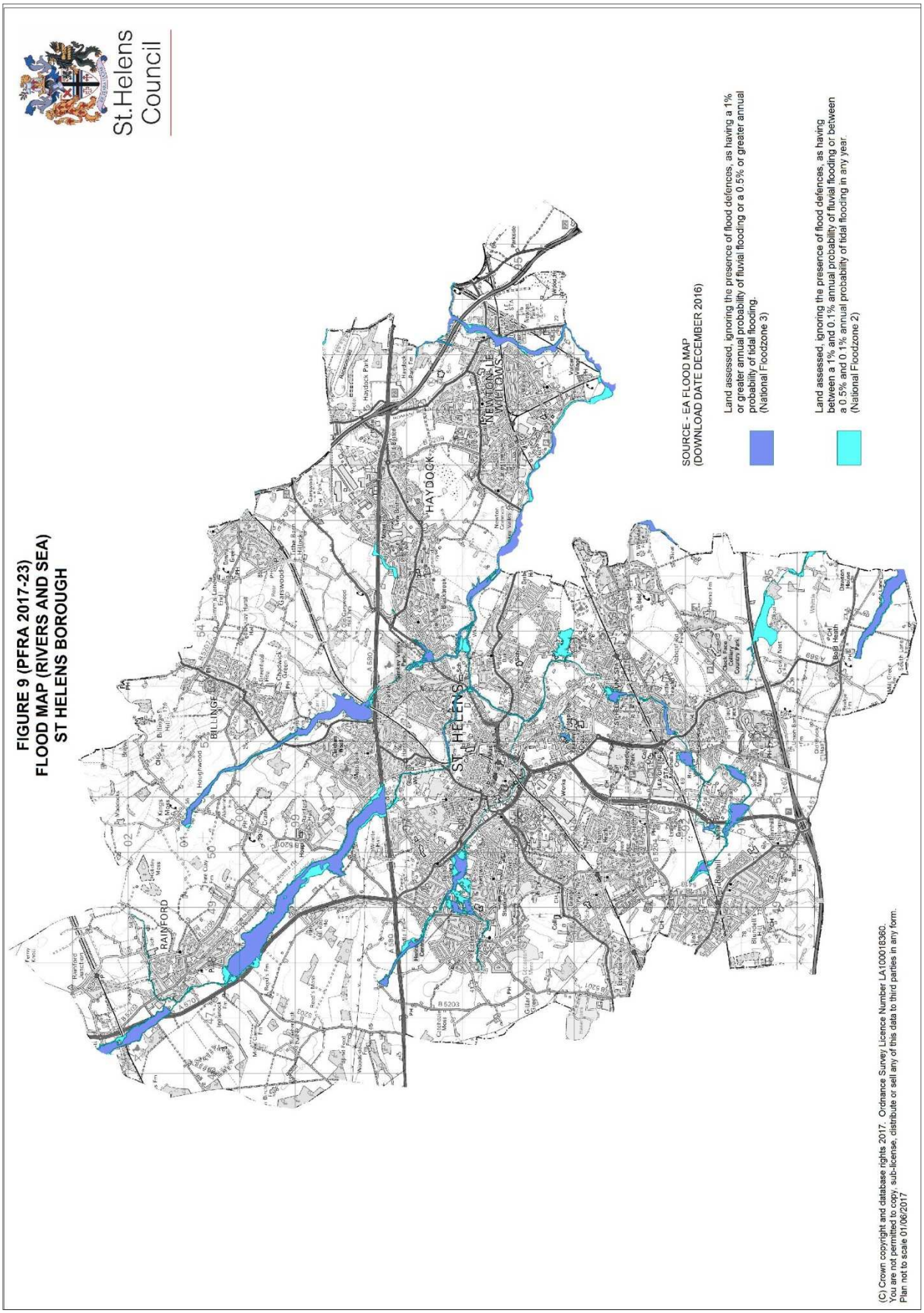
- **Figure 9 – Environment Agency Flood Map -Rivers & Sea-**



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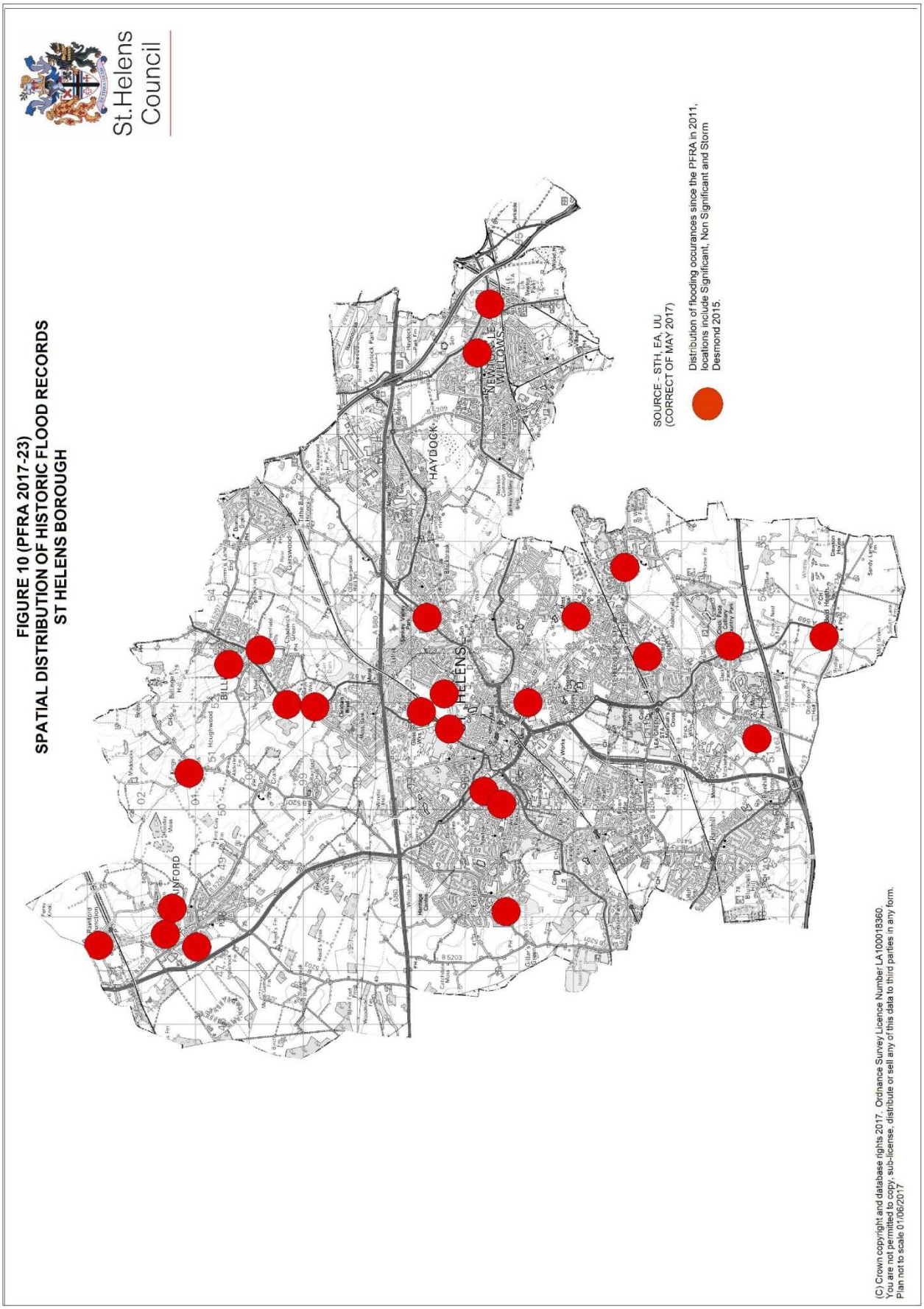
- **Figure 10 – St Helens Borough Council Spatial Distribution of Historic Flood Records**



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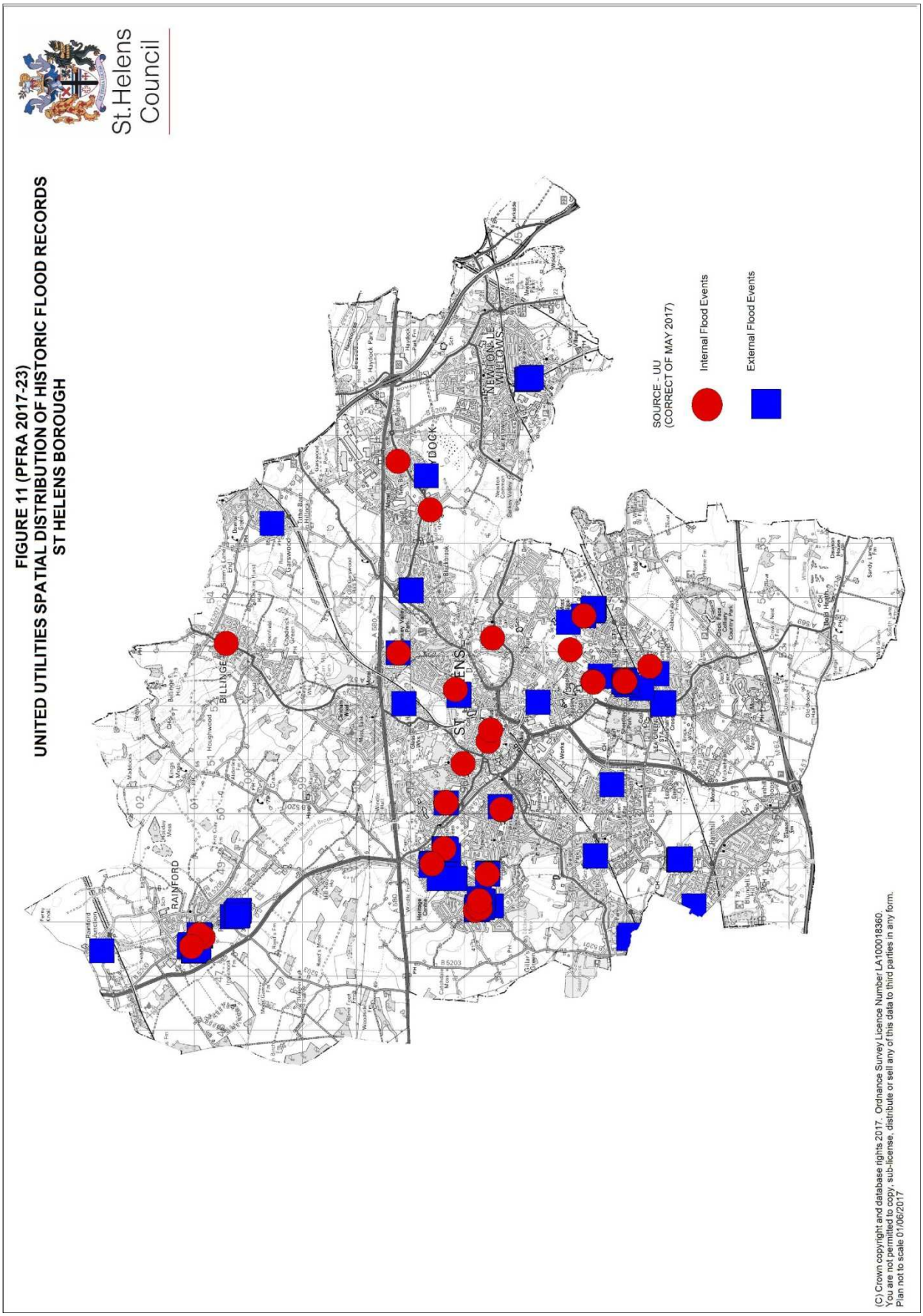
- **Figure 11 – United Utilities Spatial Distribution of Historic Flood Records**



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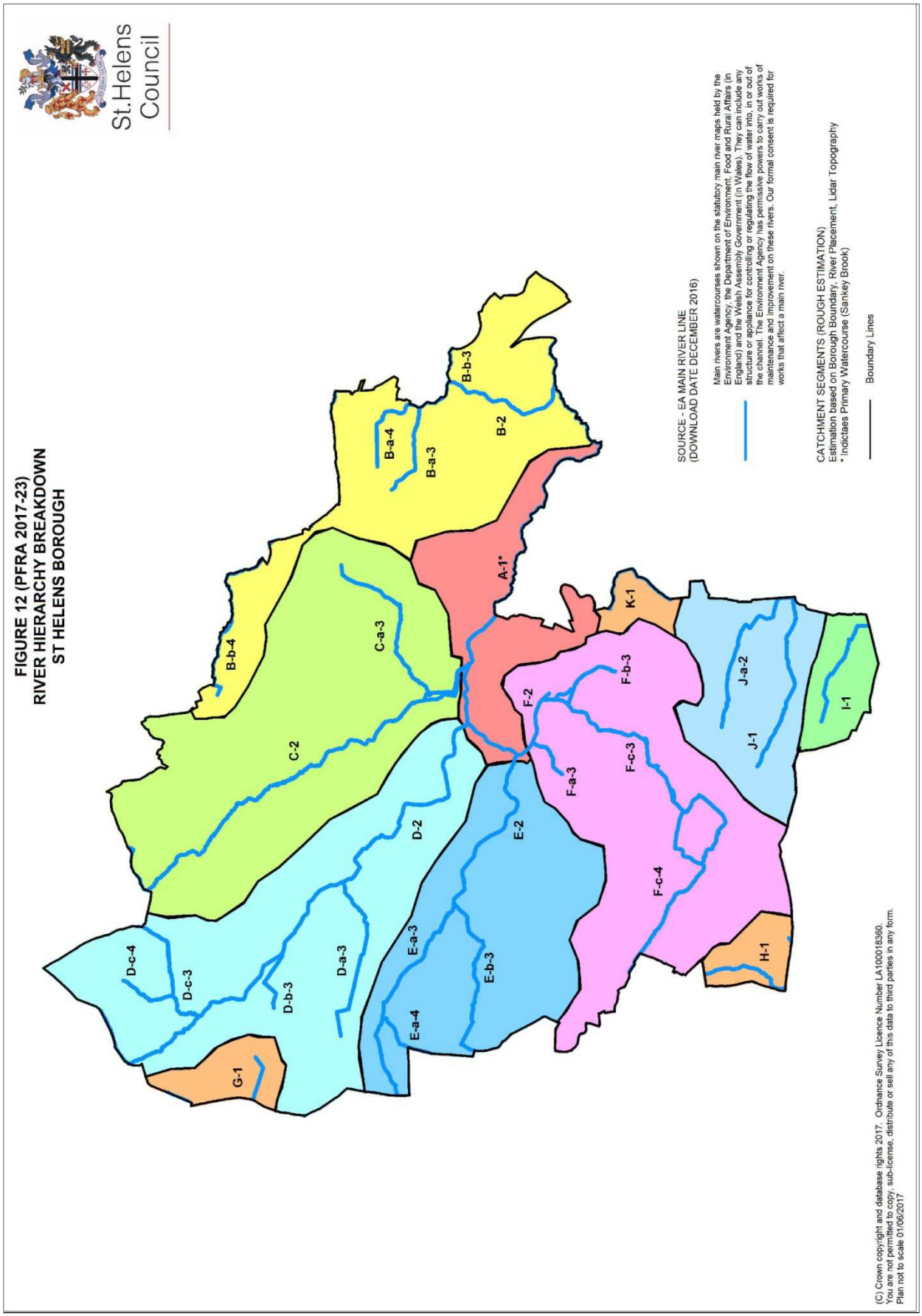
- **Figure 12 –River Hierarchy Breakdown**



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11. Appendices B

Figure 1 Methods used to develop indicative FRAs for the second cycle

Extract from Review of preliminary flood risk assessments -Flood Risk Regulations 2009: guidance for lead local flood authorities in England 25th January 2017 produced by the Environment Agency. We used two methods to identify areas of potentially significant risk as the basis for the indicative FRAs. In each case we used national information from the current 2016 Risk of Flooding from Surface Water RoFSW map previously known as the updated Flood Map for Surface Water uFMfSW and a rainfall event with a 1% chance of occurring in any year.

Method 1 - Cluster analysis for concentrations of people/property at risk

In this method, 1km grid squares of places where surface water flood risk is an issue "blue squares" were identified wherever at least 200 people or 20 non-residential properties or more than 1 key service might be flooded. In some areas these blue squares are densely packed together representing a concentration of high consequences from surface water flooding and providing a way of identifying areas where flood risk could be significant. Where many grid squares are close together clustered and the risk is most concentrated, these clusters form indicative FRAs. All clusters contain at least 5 adjacent blue squares. The flood risk indicators used in the identification of indicative FRAs are summarised in the table below. These are similar to those used to develop indicative FRAs in 2011, but using a rainfall event with a 1% chance of occurring in any year rather than 0.5% chance as in 2011. This is because current surface water risk products do not include the assessment of a 0.5% chance rainfall event.

Table 11a: Definition of flood risk indicators used in cluster analysis

Indicator	Definition	Threshold
People	Number of people at risk taken as 2.34 times the number of residential properties at risk of flooding	200 people or more per 1km grid square
Key Services	Number of key services at risk, for example utilities, emergency services, hospitals, schools	More than one per 1km grid square
Non-residential Properties	Number of non-residential properties at risk from flooding	20 or more per 1km grid square

Method 2 - Communities at risk C@R

Method 1 identifies locations where the density of flood risk is highest across the country. There are other locations where the total flood risk is high but not as concentrated as those areas identified in method 1. So, to complement method 1, we have used information from our C@R work. For C@R we have analysed the surface water flood risk for communities according to Office for National Statistics built up areas BUAs and built-up areas sub-divisions BUASDs. Built up areas BUAs are characteristic of settlements including villages, towns or cities. In 2011 across England and Wales 95 per cent of the usually resident population lived in BUAs. They include areas of built-up land with a minimum of 20 hectares -200,000m^2-. Any areas with less than 200 metres between them are linked to become a single BUA, with BUASDs identified.

Where available, we have used BUASDs to provide greater granularity of communities in large urban areas. Where this approach identifies 3,000 or more reportable properties at risk of surface water flooding, the BUA/BUASD forms an indicative FRA. As with method 1, this is for a rainfall event with a 1% chance of occurring in any year. The National Receptor Database -NRD2014- property point dataset with the uFMfSW Property Point v3 attributes was used to classify a property as ‘at risk’ of flooding from surface water. ‘At risk’ properties were counted by BUASD boundary -to exclude non-reportable property points e.g. telephone boxes, advertising hoardings.

Combining method 1 and method 2 and identifying indicative FRAs

In some locations, clusters of blue squares from method 1 and BUA/BUASDs from method 2 overlap. Where this is the case, the indicative FRA is the total extent of the two areas combined.

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