



Cotswold District Council Level 1 SFRA Update

Appendix C - Functional Floodplain Delineation

Final

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Abbreviations

AEP	Annual Exceedance Probability
EA	Environment Agency
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
MFO	Modelled Flood Outline
SFRA	Strategic Flood Risk Assessment

1 Introduction

The [Flood Risk and Coastal Change Planning Practice Guidance](#) (FRCC-PPG) states that local planning authorities (LPA) should identify and assess, in their Strategic Flood Risk Assessments (SFRA), areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency (EA). The functional floodplain (Flood Zone 3b) extent for Cotswold has therefore been updated and delineated as part of this Level 1 SFRA using the most up-to-date data available from the EA. The previous functional floodplain extent, delineated for the 2023 Cotswold Level 1 SFRA, has been superseded by more up-to-date modelled outputs, and new national flood mapping, as updated by the EA as part of the Flood Map for Planning updates. This methodology note explains the delineation process.

Note that the functional floodplain (Flood Zone 3b) is not included in the Flood Map for Planning. Although the EA now publishes the Rivers and Sea 3.3% defended extent, the functional floodplain should also account for other available data indicating land where water has to flow, or which stores water, in times of flooding. This SFRA therefore subdivides Flood Zone 3 into Flood Zone 3a and Flood Zone 3b (functional floodplain). This distinction is for the use of the LPA and developers in development planning and management. Flood Zone 3a is Flood Zone 3 of the Flood Map for Planning that is not functional floodplain.

The LPA, Lead Local Flood Authority (LLFA) and the EA must all agree on the extent of the functional floodplain outline and the methodology used. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. The local knowledge of the LPA, LLFA and EA is therefore crucial in defining the functional floodplain as robustly and realistically as possible.

2 Functional floodplain definition

The EA's [SFRA guidance \(2025\)](#) states that the Level 1 SFRA should include the functional floodplain extent on maps with a detailed explanation of how the functional floodplain was defined. This methodology note provides this definition.

The guidance states that functional floodplain should show land that:

"Would flood from rivers or the sea with an annual probability of 1 in 30 (3.3%), with flood risk management features and structures operating effectively

Would normally form the river channel

Is designed to flood (such as flood attenuation schemes), even if it would only flood in more extreme events (such as 0.1% annual probability)"

How to Prepare an SFRA, Environment Agency, 2025

Regarding the impact of defences on the functional floodplain:

"In any modelling used to identify the functional floodplain, include existing defences and other flood risk management features and structures.

You may not need to designate the functional floodplain in locations where evidence shows flooding would be prevented by existing flood defences, flood risk management features or structures, or buildings"

How to Prepare an SFRA, Environment Agency, 2025

Regarding the impact of existing buildings on the functional floodplain:

"The footprints of existing buildings may be removed from functional floodplain extents. However, it may be simpler to include existing buildings and use local policies to control the redevelopment or changes of use that may be acceptable.

Use local policies or guidance to explain the approach you will take when buildings are demolished in functional floodplain. It may be reasonable to assume that sites revert to functional floodplain when buildings have been demolished for more than a year."

How to Prepare an SFRA, Environment Agency, 2025

If there is not enough detailed modelled information available to identify the functional floodplain, this should be made clear on the Level 1 SFRA maps to ensure risk isn't underestimated. In these areas, site-specific flood risk assessments should determine whether a site is affected by functional floodplain through additional modelling. If sites are proposed for development in such areas in the local plan, a Level 2 SFRA will be required to robustly map the functional floodplain extent.

3 Available datasets

3.1 EA detailed flood modelling

Areas within the modelled defended 3.3% Annual Exceedance Probability (AEP) extent should be considered as functional floodplain, which is defined as land having a 3.3% or greater annual probability of flooding with consideration of flood defence infrastructure.

Based on the guidance outlined in Section 2, the modelled flood outlines (MFO) listed in Table 3-1 below were provided by the EA to assist in the update of the 2023 functional floodplain outline. Where possible, direct modelling of the present day 3.3% AEP defended event has been used to delineate the functional floodplain in areas where there are up to date and finalised models. Where the present day 3.3% AEP defended event was not included within a detailed model, the next available defended event was used where available, as agreed with the EA.

The Daglingworth Stream (2016) model was provided, however the EA have advised this has now been superseded by the Flood Map for Planning. Therefore, this watercourse has been represented by the EA Rivers and Sea 3.3% defended flood risk extent in the functional floodplain.

Table 3-1: Available EA detailed models and modelled flood outlines

Model	Year	Annual Exceedance Probability	Defended?
Churn (Baunton to Siddington)	2011	3.3%	Yes
Thames (St Johns to Shifford)	2011	1%	Yes
Bledlington Brook	2012	1%	Yes
Thames (MRL to St Johns)	2014	2%	Yes
Windrush (Bourton-on-the-Water)	2018	2%	Yes
Where no defences exist, it indicates that there are no defences present along the watercourse. The defended event would be used in preference to the undefended event where available.			

3.2 EA Rivers and Sea 3.3% defended flood risk extent

The EA has published the Rivers and Sea 3.3% defended event extent for both present day and accounting for climate change. The defended scenario considers the presence of flood defences and assumes that they operate in the way they were designed to function. This scenario does not include any asset failure or removal scenarios.

The River and Sea 3.3% defended event extent has been used to represent the functional floodplain in areas where no suitable detailed modelling is available, as agreed with the EA.

3.3 Additional datasets

- EA Statutory Main River Map
 - To define areas of the functional floodplain that are designated as main river by the EA.
 - This dataset includes both open channel and culverted watercourses.
 - The dataset has been buffered by 8m either side of the channel line to broadly represent the width of the river across the area. It is recognised that this is an approximation. Policy relating to functional floodplain applies to the actual location of the river and not the buffered channel within the functional floodplain mapping in locations where they may differ.
- EA Flood Map for Planning - Water Storage Areas
 - To define areas of land which store water during a flood event.
 - Water Storage Areas should be consulted on for appropriateness with the EA.
 - The Water Storage Area dataset has been reviewed, and it was found that there is one EA defined Water Storage Area within Cotswold, located in Dowdeswell Nature Reserve.

4 Functional floodplain delineation methodology

4.1 GIS methodology

The below steps summarise the methodology used to delineate the functional floodplain:

- All EA detailed models (Table 3-1) supplied for consideration within this assessment were included within the functional floodplain extent where appropriate outputs were available.
- The EA Rivers and Sea 3.3% defended extent was used to define the functional floodplain in areas not subject to detailed modelling.
- All main river channels, including culverted sections of river, were added to the functional floodplain outline. This is required by the EA SFRA guidance to define areas that would normally form the river channel and where water has to flow in times of flooding. At a local scale, this may lead to some inaccuracies, especially in hydrologically complex areas where there are man-made interactions or interactions with other bodies of water such as reservoirs or canals.
- Recognising this, functional floodplain policy relates to the river and not the mapping where they are different. For main rivers, the functional floodplain should include for an 8m buffer either side of the channel to allow for access to the channel for maintenance and to avoid the requirement for environmental permits.
- Each polygon within the functional floodplain GIS outline has been attributed with the source dataset so it is possible to easily ascertain which dataset each polygon within the outline is based on.
- Checks on the geometry of the functional floodplain outline were carried out to ensure geometric correctness in GIS.

4.2 Methodology hierarchy

The hierarchy of methods used to define the functional floodplain is outlined below:

1. Use of the 3.3% AEP defended event (or next available defended event) MFO's where available in detailed local models
2. Use of the or next available defended event MFO's where available in detailed local models
3. Use of the EA Rivers and Sea 3.3% defended flood risk extent (downloaded December 2025)
4. Use of the EA Water Storage areas dataset
5. Use of the buffered EA Statutory Main River Map (8 metres either side of the channel).

Table 4-1 provides a description of each source attribute within the functional floodplain dataset.

Table 4-1: Functional floodplain source attribute definitions

Source attribute	Description
Churn (Baunton to Siddington) 2011 3.3% AEP Defended Extent	Detailed model output from the Churn (Baunton to Siddington) 2011 model.
Thames (St Johns to Shifford) 2011 1% AEP Defended Extent	Detailed model output from the Thames (St Johns to Shifford) 2011 model.
Bledlington Brook 2012 1% AEP Defended Extent	Detailed model output from the Bledlington Brook 2012 model.
Thames (MRL to St Johns) 2014 2% AEP Defended Extent	Detailed model output from the Thames (MRL to St Johns) 2014 model.
Windrush (Bourton-on-the-Water) 2018 2% AEP Defended Extent	Detailed model output from the Windrush (Bourton-on-the-Water) 2018 model.
EA Rivers and Sea 3.3% AEP Defended Extent	Areas of the functional floodplain defined by the EA's Rivers and Sea 3.3% defended flood risk extent dataset. This has only been used in areas where suitable detailed modelling is unavailable.
EA Flood Storage Areas	Areas of the functional floodplain defined by the EA Water Storage Area dataset.
EA Main River	8m buffered polygon of the Statutory Main River map indicating areas of fluvial river channel.

4.3 Culverted rivers

The EA Statutory Main River Map includes a high-level and approximate representation of culverted sections of watercourses. These sections are subject to a higher degree of uncertainty as it is more challenging to identify and verify below ground alignments. Within culverted sections, functional floodplain policy relates to the actual confirmed alignment of culverted sections, as identified through site investigation, rather than the alignment shown in the functional floodplain where it differs. The EA or LLFA may be able to advise on the culverted sections in the functional floodplain for main rivers and ordinary watercourses respectively.

It is recommended that investigations of onsite culverted watercourses to establish their full route, condition and capacity are carried out through a site-specific flood risk assessment and incorporated into the surface water sustainable drainage strategy, as required.

4.4 Waterbodies

The EA Statutory Main River Map contains open river channels and culverted sections of channel only and do not include other types of waterbody such as reservoirs, canals, lakes or ponds. Waterbodies are only included in the delineated functional floodplain where they are present within the EA Rivers and Sea 3.3% defended extent or detailed model outputs. There is no reliable dataset to identify waterbodies that can be used to delineate the functional floodplain.

4.5 Unmodelled watercourses

The functional floodplain extent does not map the flood risk from unmodelled watercourses. Watercourses have only been included in the functional floodplain extent where they have been designated as main river by the EA. Functional floodplain policy applies to all watercourses within the Cotswold authority area. Site-specific FRA's could consider modelling the 3.3% AEP event to define the functional floodplain for sites situated within the vicinity of an unmodelled watercourse. As a conservative proxy, the 1% AEP surface water event could be considered as functional floodplain in the absence of suitable detailed modelling.

4.6 Buildings and infrastructure

Buildings and infrastructure within the functional floodplain have been retained within the outline, i.e. they have not been removed on the assumption that floodwater ingress may occur. The EA's SFRA guidance states that you do not need to designate functional floodplain in locations where evidence shows flooding would be prevented by existing buildings, however it is considered simpler to include existing buildings and use local policies to control the redevelopment or changes of use that may be acceptable. Such policies could include no increase in development footprint for buildings within the functional floodplain, converting disused buildings to greenspace or the installation of resilience measures.

4.7 Dry islands

Areas of higher land shown as 'dry islands' within the functional floodplain should also be considered undevelopable, where safe access and escape routes are unachievable. The only exception to this is for water compatible or essential infrastructure uses. It has been assumed that any 'dry islands' within the functional floodplain outlines should be considered as functional floodplain where these areas are located within Flood Zone 3 of the EA's Flood Map for Planning.

5 Future functional floodplain

In addition to the present day functional floodplain outline, a future functional floodplain outline, as advised in EA guidance, has been delineated. Table 5-1 outlines the available climate change model outputs that have been used to delineate the future functional floodplain.

Table 5-1: EA detailed model climate change allowances

Model	Year	Annual Exceedance Probability	Climate change allowance
Churn (Baunton to Siddington)	2011	3.3%	30%
Thames (MRL to St Johns)	2014	2%	30%

Suitable outputs were only available for two models. No suitable 3.3% AEP defended event climate change modelling was available within the other supplied EA detailed models, therefore the Rivers and Sea 3.3% defended event plus climate change extent has been used to represent the future functional floodplain in all other areas. The climate change allowances used to produce this dataset are based on the latest UK Climate Projections (UKCP18) from the Met Office, using the Representative Concentration Pathway (RCP) 8.5.

The future functional floodplain indicates areas likely to be within the functional floodplain in the future. The future functional floodplain extent should not be included in the functional floodplain designation and is not included in any policy for planning decisions.

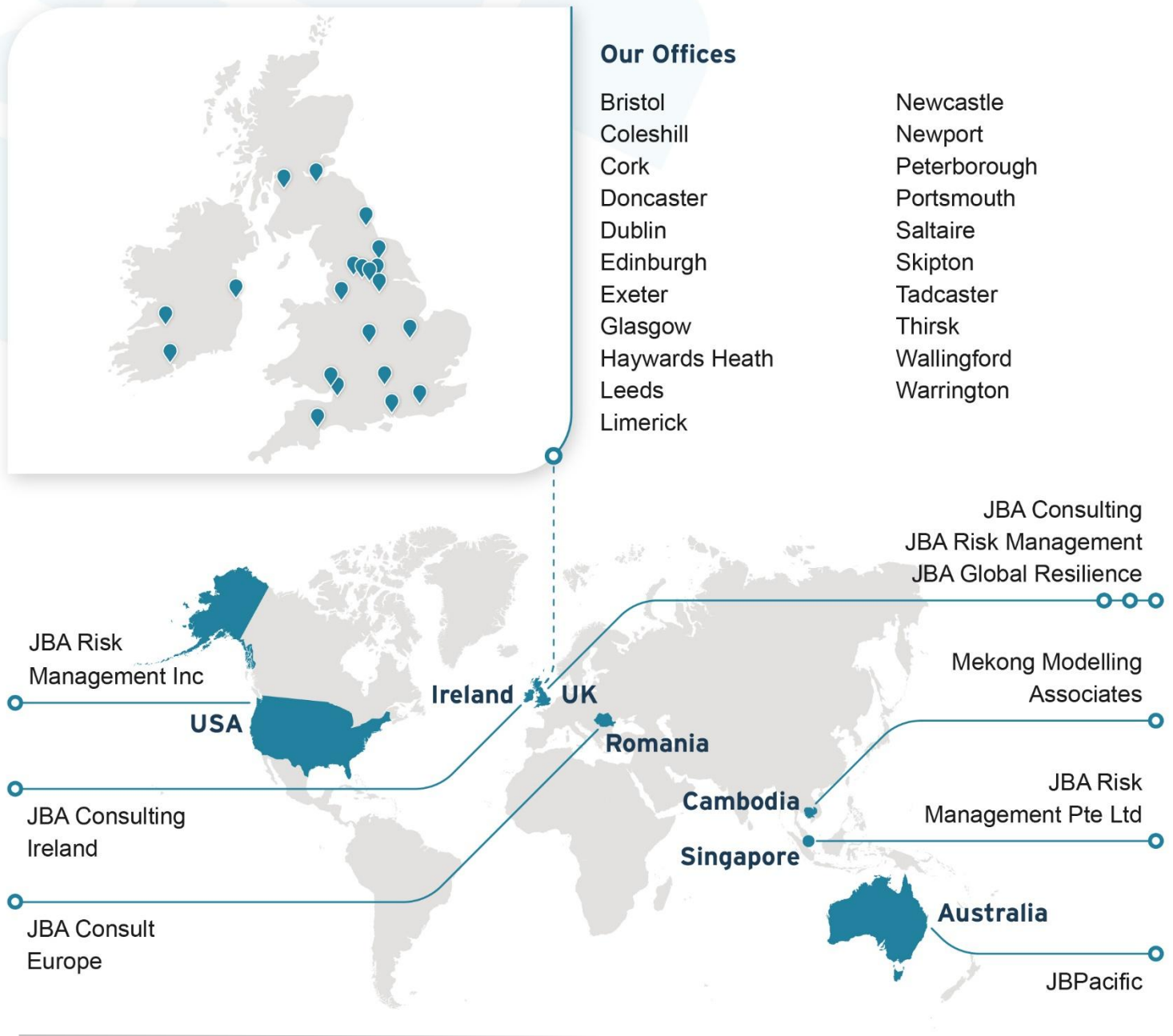
6 Conclusions

The draft functional floodplain outline should be assessed and agreed upon by the LPA, LLFA and the EA. The extent of both the present day and future functional floodplain outlines produced from this Level 1 SFRA should always be assessed in greater detail where any more detailed study such as a Level 2 SFRA or site-specific FRA are undertaken. The future functional floodplain extent should not be included in the functional floodplain designation as it is not included in national policy.

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