Appendix B: Guide for using available flood risk data in applying the Sequential Test

1 Introduction

The aim of this appendix is to discuss the availability and limitations of data for assessing the risk from different sources of flooding both now and in the future within the Sequential Test. It includes a user guide for the Council to use the data supplied in the SFRA through the application of the Sequential Test for different sources of risk.

1.1 Policy requirements

The need to apply the Sequential Test is set out within the National Planning Policy Framework (NPPF) which was last updated in December 2024 and the Planning Practice Guidance - Flood Risk and Coastal Change (PPG) which was last updated in September 2025.

Paragraph 172 of the NPPF states that *"All plans should apply a sequential, risk-based approach to the location of development – taking into account **all sources of flood risk** and the **current and future impacts of climate change** – so as to avoid, where possible, flood risk to people and property"*

Paragraph 174 states that *"the aim of the sequential test is to steer new development to areas with the lowest risk of **flooding from any source**.[…] The strategic flood risk assessment will provide the basis for applying this test."*

Finally, Paragraph 175 of the NPPF states that *"the sequential test should be used in areas known to be at risk now or in the future from any form of flooding, except in situations where a site-specific flood risk assessment demonstrates that no built development within the site boundary, including access or escape routes, land raising or other potentially vulnerable elements, would be located on an area that would be at risk of flooding from any source, now and in the future (having regard to potential changes in flood risk)"*

Therefore, in summary the NPPF sets out the requirement for considering all sources of flood risk, now and in the future when applying the Sequential Test. It also identifies certain circumstances where the Sequential Test would not be required where vulnerable elements are shown (through a site-specific Flood Risk Assessment) to be outside of areas at risk of flooding from any source.

Paragraph 017 of the PPG states that *"Where the Strategic Flood Risk Assessment, or other available flood risk maps or information, indicates that part or parts of a neighbourhood plan area may be at risk of flooding, the qualifying body should have regard to the National Planning Policy Framework's policies on flood risk. Where they are*

considering proposing development, they will need to show that this would be consistent with the local planning authority's application of the Sequential Test".

Paragraph 023 of the PPG states that *"The approach is designed to ensure that areas at little or no risk of flooding from* ***any source*** *are developed in preference to areas at higher risk. This means avoiding, so far as possible, development in* ***current and future medium and high flood risk areas*** *considering* ***all sources of flooding including areas at risk of surface water flooding****.[…] Other forms of flooding need to be treated consistently with river and tidal flooding in mapping probability and assessing vulnerability, so that the sequential approach can be applied across all areas of flood risk."*

Paragraph 024 of the PPG states *"Where it is not possible to locate development in low-risk areas, the Sequential Test should go on to compare reasonably available sites within medium risk areas; and then, only where there are no reasonably available sites in low and medium risk areas, within high-risk areas. […] Initially, the presence of existing flood risk management infrastructure should be ignored, as the long-term funding, maintenance and renewal of this infrastructure is uncertain."*

Paragraph 027 states that *"In applying paragraph 175 a proportionate approach should be taken. Where a site-specific flood risk assessment demonstrates clearly that the proposed layout, design, and mitigation measures would ensure that occupiers and users would remain safe from current and future surface water flood risk for the lifetime of the development (therefore addressing the risks identified e.g. by Environment Agency flood risk mapping), without increasing flood risk elsewhere, then the sequential test need not be applied."*

Therefore, in summary the PPG requires all sources of flooding to be considered within the Sequential Test, now and in the future. In cases where a site-specific Flood Risk Assessment shows a development at risk of surface water flooding can be made safe for its lifetime without increasing flood risk elsewhere then the surface water flood risk would not need to be considered within the Sequential Test. Therefore, reference within this document to application of the Sequential Test for surface water flooding is predominantly concerned with the application of this as part of the Local Plan where site-specific Flood Risk Assessments have not been prepared.

The PPG also makes clear that sources of flood risk other than river and tidal (also known as sea) flooding need to be treated consistently with tidal and river (fluvial) flooding, in terms of mapping probability and vulnerability.

In addition, the PPG also notes that where Neighbourhood Plans are considering proposing development, they should address how this would be consistent with the local planning authority's application of the Sequential Test and if necessary, the Exception Test. If not, these tests will need to be re-visited on a local authority-wide basis.

1.2 Requirements for the Sequential Test

A basic requirement for the Sequential Test to be performed is that appropriate, competent mapping can be prepared to enable logical comparison of the flood risk from different sources at alternative locations, both now and in the future, as this is fundamental to establishing a logical “risk sequence”.

Section 2 describes the implications of including different sources of flooding both now and in the future in the Sequential Test. It also highlights matters to be considered and identifies a preferred approach. Table 4-1 and Table 4-2 provide a user guide for the Council to use to apply the Sequential Test for each source of flood risk and signposts to relevant sections of the SFRA.

1.3 The Exception Test

In circumstances where the Sequential Test has been performed and it is not possible for development to be located in areas with a lower risk of flooding, the Exception Test may be required. The Exception Test is a two-part process that requires preparation of evidence to demonstrate that development proposals at risk of flooding deliver wider sustainability benefits and can be made safe for the intended lifespan (thus it is a requirement to demonstrate that proposed development will be safe under climate change conditions).

Table 2 of the PPG sets out the requirements for the Exception Test but does not reflect the need to avoid flood risk from sources other than rivers and the sea. There is no guidance on how to consider other sources of flood risk. The Exception Test should only be applied, following the application of the Sequential Test, in the following instances:

- 'Essential infrastructure' in Flood Zone 3a or 3b
- 'Highly vulnerable' development in Flood Zone 2 (this is NOT permitted in Flood Zone 3a or 3b)
- 'More vulnerable' development in Flood Zone 3a (this is NOT permitted in Flood Zone 3b)

While the Exception Test is not explicitly required for sites at risk from other sources of flooding, the Local Planning Authority should follow a similar principle where sites are proposed that are at risk from other sources of flooding, carefully weighing up the wider benefits of development against the risk, ensuring that site users can be kept safe through the lifetime of the development and ensuring residual risk can be safely managed.

2 Sources of flooding in the Sequential Test

2.1 River (fluvial) risk

2.1.1 Recommendations for using river flood risk in the Sequential Test

The Environment Agency Flood Map for Planning and any available detailed hydraulic models should be used to consider river flood risk in the Sequential Test.

It is recommended that the Sequential Test considers river (fluvial) flood risk as follows:

- The Sequential Test can be carried out using the river (fluvial) Flood Zones for present day low (Flood Zone 1), medium (Flood Zone 2) and high risk (Flood Zone 3a).
- In considering the impact of climate change, the 1% AEP and 0.1% AEP events should be used with appropriate allowances for climate change. For river (fluvial) flooding, the dataset uses the 2080s epoch (2070-2125) Central allowance. These are provided for the 1% AEP, and 0.1% AEP events which are suitable for considering future flood risk to all development types other than essential infrastructure.

2.2 Tidal (sea) risk

2.2.1 Recommendations for using river flood risk in the Sequential Test

The Environment Agency Flood Map for Planning and any available detailed hydraulic models should be used to consider tidal flood risk in the Sequential Test.

It is recommended that the Sequential Test considers tidal/sea flood risk as follows:

- The Sequential Test can be carried out using the tidal/sea Flood Zones for present day low (Flood Zone 1), medium (Flood Zone 2) and high risk (Flood Zone 3a).
- In considering the impact of climate change, the 0.5% AEP and 0.1% AEP events should be used with appropriate allowances for climate change. For tidal/sea flooding the dataset uses the Upper End allowance accounting for sea level risk to 2125. These are provided for the 0.5% AEP, and 0.1% AEP events and are suitable for all development types.

2.3 Surface water flood risk

2.3.1 Available data to assess surface water flood risk

The Environment Agency's Flood Map for Planning Surface Water Spatial Planning mapping is available to assess surface water flood risk. The following points should be considered when using this mapping:

- The mapping based on a generalised modelling methodology. It is generally suitable for showing surface water flow routes at different probability flood events (3.3% AEP, 1% AEP and 0.1% AEP), although the uncertainty associated with the predicted outlines for the respective probabilities is high.
- It does not always include allowance for drainage features such as culverts and can over or underestimate flooding where there are linear features such as embankments.
- Unlike the Zone maps for river flooding the surface water mapping makes an allowance for the assumed performance of a local drainage system.

The nature of surface water flooding differs from that of river flooding:

- Normal profile of extent and shape of surface water flooding is a “dendritic” pattern that follows low lying topography and is not an extensive blanket, as is most often the case for river flooding.
- Surface water flood risk is normally more likely to be relatively short lived and much more localised than would be the case for river flooding (most likely being caused by local high intensity short duration rainfall events).

It is likely that in many circumstances surface water flood risk zones based on the surface water mapping could affect a relatively small proportion of a proposed allocation site, but in practical terms this might not in itself be a factor that demonstrates that the principle of development could not be supported.

2.3.2 Recommendations for using zone maps for surface water flooding

Note, changes to the PPG in September 2025 mean that the surface water does not need to be considered within the Sequential Test where a site-specific Flood Risk Assessment demonstrates clearly that the proposed layout, design, and mitigation measures would ensure that occupiers and users would remain safe from current and future surface water flood risk for the lifetime of the development. It is anticipated that as part of the Local Plan allocation, the application of the Sequential Test for surface water flood risk would still be required as the majority of sites will not have a site-specific Flood Risk Assessment at this stage.

It is recommended that the Sequential Test considers surface water flood risk as follows:

- The Sequential Test can be carried out using the Flood Map for Planning Surface Water Spatial Planning data for present day low (between 0.1% AEP and 1% AEP events), medium (between 1% AEP and 3.3% AEP events) and high risk (greater than 3.3% AEP event) areas.

- The Flood Map for Planning Surface Water Spatial Planning dataset also includes climate change outputs for the 3.3%, 1%, and 0.1% AEP events for the 2070s Upper End epoch which can be used to represent climate change in applying the Sequential Test.

The use of these surface water events should be done with caution due to the highlighted uncertainties in the surface water modelling and mapping.

Surface Water mapping does not strictly describe the same conceptual risk zone as defined for river and sea flooding (even though it is associated with the same probability) as the mapping is based on different assumptions and is filtered to remove shallow depths of water. However, it does create a product that can accommodate sequential testing, as it would facilitate strategic decisions that directed development to land in lower risk areas.

2.4 Groundwater flood risk

2.4.1 Available data to assess groundwater flood risk

The JBA Groundwater Emergence Map has been made available for use within this SFRA.

The following points should be considered when using the available groundwater mapping datasets:

- Whilst the JBA Groundwater Emergence Map enables a risk-based approach to be taken as it depicts different levels of risk, this is based on the risk of emergence of groundwater and not surface flooding due to groundwater. The location of highest risk of emergence might not be coincident with the location at highest risk of flooding. Five zones are defined to describe the risk of groundwater emergence:
  - at or very near ground surface;
  - between 0.025m and 0.5m below the ground surface;
  - between 0.5m and 5m below the ground surface;
  - at least 5m below the ground surface; and
  - negligible risk of groundwater flooding.

  The mapping provides an indication of where risk of elevated groundwater levels might be higher but is high level and should be supported by more detailed local studies.
- There is no climate change mapping available for groundwater.

2.4.2 Recommendations for using zone maps for groundwater flooding

The JBA Groundwater Emergence map has been used in the SFRA to identify areas with a higher likelihood of groundwater emergence and compared with surface water flow paths and topography to indicate where flooding from groundwater could occur. This information can aid development planning and Local Plan policies, however there is not sufficient data

available for zoning in the same way as fluvial and surface water data, therefore it is not suitable for informing the Sequential Test.

JBA groundwater emergence mapping should therefore be used in conjunction with other relevant sources of flooding such as historical records so that areas can be identified that are unlikely to be affected by groundwater flooding (low potential) and also areas where groundwater flooding is potentially a material consideration can be identified (high potential). At the Level 2 SFRA stage (or for a site-specific Flood Risk Assessment), a site-specific assessment should be performed where the potential for groundwater flooding is high.

2.5 Sewer flood risk

2.5.1 Available data to assess sewer flood risk

The following data was available for use within this SFRA to assess sewer flood risk:

- Anglian Water's historic flooding incidences
- Anglian Water's Drainage and Wastewater Management Plan (DWMP)

Mapping within the DWMP does not enable execution of risk based sequence.

2.5.2 Recommendations for using zone maps for sewer flooding

Historic sewer flood risk information has been used in the SFRA to identify areas with a higher likelihood of sewer flood risk. This information can aid development planning and Local Plan policies, however there is not sufficient data available for zoning in the same way as fluvial and surface water data, therefore it is not suitable for informing the Sequential Test.

The data resolution provided in the DWMP is catchment scale and not applicable across the entire district. Consequently, it is not possible to take a risk-based approach using this data and it is not considered to be comparable to the river and tidal/sea flooding information.

Where possible the historic flooding incidences and DWMP information should be used to inform the scope of site specific FRAs.

2.6 Reservoir flood risk

2.6.1 Available data to assess reservoir flood risk

The following data was available for use within this SFRA to assess reservoir flood risk:

- Environment Agency "wet day" and "dry day" reservoir inundation extents

The “wet day” mapping shows the predicted extent of a reservoir breach at the same time as a 0.1% AEP river flood (as this is a likely time when a reservoir might fail) and the "dry day" shows the failure just from the water retained by the dam. The fluvial contribution shows where the impact of "wet day" reservoir flooding affects the fluvial flood extent.

Neither set of mapping describes a risk-based scenario as they do not provide the probability of a dam failure but are intended to describe a “worst credible case”.

More detailed information on flood velocities and depths have been prepared as part of the modelling and mapping study, but this is not publicly available and can only be viewed by those with appropriate security classifications. The flood extents are publicly available.

The mapping does not provide climate change information on future flood risk and provision of such mapping is unlikely based on the existing methodology.

2.6.2 Recommendations for using zone maps for reservoir flooding

It is recommended that the available reservoir flood mapping is not included in the Sequential Test as the available data is inappropriate to be used alongside risk mapping from other sources when performing the Sequential Test.

An assessment of those sites identified to be at risk of inundation during the 'dry day' and 'wet day' breach events should be included in the Level 2 SFRA.

The available information is not conceptually similar to the risks pertaining to river and tidal/sea flooding as it shows the worst credible case and not the risk of flooding and so does not support a logical spatial comparison of risk that can be substantiated by appropriate evidence.

More detailed assessment in the Level 2 SFRA will identify locations where proposed development could result in a change to the risk designation of a reservoir. If proposed sites are located in a zone at reservoir risk, it will be necessary to understand the extent to which the flooding could be made worse and to report on the implications with respect to allocating the land for development. On that basis such an approach is recommended. If proposed development is located in a high hazard zone in the vicinity of an existing dam structure the implications should be considered in a Level 2 SFRA or site-specific FRA and where appropriate an assessment made of whether alternative sites should be considered in accordance with the Sequential Test.

3 Sequential approach at a site level

The Environment Agency's Flood Risk Assessment guidance was updated in July 2024. The guidance states that "*you may not need a sequential test if development can be laid out so that only elements such as public open space, biodiversity and amenity areas are in areas at risk of any source of current or future flooding*." The premise of this was subsequently included within Paragraph 175 of the NPPF which was updated in December 2024.

Therefore, in cases where the proportion of the site at flood risk is small, a sequential approach at the site level would be appropriate and enable development to be located in areas of low risk of flooding (by avoiding high risk areas that might exist at a particular site). This involves incorporating the less vulnerable aspects of the development (such as public open space, biodiversity and amenity areas) in the areas at risk of flooding. The more vulnerable aspects would be incorporated within areas at lower risk, and a Sequential Test would not be required.

As this is a strategic assessment, the area required for public open space, biodiversity and amenity areas at each of the sites is not known. It is therefore appropriate to assume that a "small" proportion of the sites will be set aside for these purposes. As such, if a "small" proportion of the site is at risk, the Sequential and Exception Tests would not be required. The definition of "small" will be agreed with Southend-on-Sea City Council, based on any open space policies within the Emerging Local Plan.

4 Summary of the Sequential Test methodology

Table 4-1: Summary of the Sequential Test methodology for fluvial, tidal and surface water flooding.

Source of Flooding	High Risk	Medium Risk	Low Risk	Present Day Data	Future Risk Data	Relevant sections of the SFRA
Fluvial	Greater than 1% AEP (1 in 100 year) (FZ3)	Between 1% and 0.1% AEP (1 in 100 and 1 in 1000 year) (FZ2)	Less than 0.1% AEP (1 in 1000 year) (FZ1)	EA's Flood Zones 1, 2 and 3 use a risk-based approach.	Use the Rivers and Sea undefended flood risk extents - climate change dataset for the 1% AEP and 0.1% AEP events. The Central Allowance should be used for the 2080s (2070-2121) epoch for all development other than Essential Infrastructure.	4.4 – Fluvial Flood Risk 5.2 – Peak river flow allowances Appendix A – Data sources used in this SFRA Appendix C Mapping – Flood Zones Appendix E Mapping – Fluvial and Tidal Climate Change
Tidal / sea	Greater than 0.5%	Between 0.5% and	Less than 0.1%	EA's Flood Zones 1, 2 and 3 use a risk-based approach	Use the Rivers and Sea undefended flood risk extents - climate change dataset for	4.4.3 – Tidal Flood Risk

Source of Flooding	High Risk	Medium Risk	Low Risk	Present Day Data	Future Risk Data	Relevant sections of the SFRA
	AEP (1 in 200 year) (FZ3)	0.1% AEP (1 in 200 and 1 in 1000 year) (FZ2)	AEP (1 in 1000 year) (FZ1)		the 0.5% AEP and 0.1% AEP events. The Upper End Allowance should be used. The development lifetime guidance in the PPG should be used to work out the appropriate epoch to be considered. The 2125 epoch has been provided within the SFRA mapping.	4.4.4 – Wave overtopping 4.4.5 – Tide locking 4.5 – Coastal erosion risk 5.4 – Sea level rise Appendix A – Data sources used in this SFRA Appendix C Mapping – Flood Zones Appendix E Mapping – Fluvial and Tidal Climate Change

Source of Flooding	High Risk	Medium Risk	Low Risk	Present Day Data	Future Risk Data	Relevant sections of the SFRA
Surface Water	Greater than 3.3% AEP (1 in 30-year)	Between 3.3% AEP (1 in 30-year) and 1% AEP (1 in 100-year)	Less than 1% AEP (1 in 100-year)	Environment Agency's Flood Map for Planning Surface Water Spatial Planning data for the 3.3% (1 in 30-year) and 1% AEPs (1 in 100-year). Different assumptions are used to derive surface water risk than is the case for fluvial and tidal/sea flood zones. Care should be taken using this dataset as in some areas it potentially does not provide the confidence or certainty required (for example where there is a risk of linear features impacting on flood extents).	Use the Environment Agency's Flood Map for Planning Surface Water Spatial Planning climate change dataset for the 3.3%, 1%, and 0.1% AEP events. The Upper End Allowance should be used for the 2070s (2061-2125) epoch for all development with a lifetime beyond 2100.	4.6 – Surface water flood risk 5.3 – Peak rainfall intensities Appendix A – Data sources used in this SFRA Appendix F Mapping - Surface Water

Table 4-2: Summary of the Sequential Test methodology for other sources of flooding.

Source of Flooding	Assessing Risk	Present Day Data	Future Risk Data	Relevant sections of the SFRA
Groundwater	Screening to be undertaken to assess the potential susceptibility of all sites to groundwater flooding. Additional information required via a Level 2 SFRA or site-specific FRA where susceptibility is considered to be high.	Datasets potentially do not have the confidence or certainty required to provide mapping that enables a comparative assessment to be made of the risk of flooding of land from groundwater. Therefore, a precautionary approach should be taken, and all sites where groundwater flooding potential is identified to be high should be identified and assessed in a Level 2 SFRA or site-specific Flood Risk Assessment. The implications for sequential selection of alternative locations should be considered at that stage.	(not available)	4.8 – Groundwater flood risk 5.5 - (Impacts of climate change) Groundwater Appendix A – Data sources used in this SFRA Appendix G Mapping - Groundwater Emergence
Sewer	Assessment of potential susceptibility of sites to sewer flooding to be undertaken via a Level 2 SFRA or site-specific FRA utilising available data from historic flood records and DWMP.	Datasets potentially do not have the confidence or certainty required to provide mapping that enables a comparative assessment to be made of the risk of flooding of land from sewers. Therefore, further assessment will be undertaken at a Level 2 SFRA where significant risk from sewers is noted. This may be through historical sewer flood records and additional information from water companies. The implications for	(not available)	4.7 – Sewer flood risk Appendix A – Data sources used in this SFRA

Source of Flooding	Assessing Risk	Present Day Data	Future Risk Data	Relevant sections of the SFRA
		sequential selection of alternative locations should be considered at that stage.		
Reservoir	Screening to be undertaken to identify sites where development is proposed in a high hazard zone. Additional information required via a Level 2 SFRA or site-specific FRA where susceptibility is considered to be high.	Datasets potentially do not have the confidence or certainty required to provide mapping that enables a comparative assessment to be made of the risk of flooding of land from reservoirs. In addition, the reservoir flood map identifies the consequence of a reservoir breach rather than risk, so applying high, medium and low 'risk' is not possible using this dataset. Therefore, a precautionary approach should be taken and sites where development is proposed in a high hazard zone will be identified and assessed in a Level 2 SFRA or site specific FRA. The implications for sequential selection of alternative locations should be considered at that stage.	(not availabl e)	4.10 – Reservoir flood risk Appendix A – Data sources used in this SFRA