Breckland District Council Level 1 Strategic Flood Risk Assessment

Final Report

September 2024

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Breckland District Council

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This report describes work commissioned by Breckland District Council by an instruction dated 15th September 2024. The Client's representative for the contract was Martin Craddock of Breckland District Council. Georgie Troy and Finn Goodman of JBA Consulting carried out this work.

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Acknowledgements

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Abbreviations

AEP	Annual Exceedance Probability
AIMS	Asset Information Management System
AONB	Area of Outstanding Natural Beauty
BGS	British Geological Survey
BNG	Biodiversity Net Gain
CIRIA	Company providing research and training in the construction industry
DEFRA	Department of the Environment, Food and Rural Affairs (formerly MAFF)
DWMP	Drainage and Wastewater Management Plan
EA	Environment Agency
FCERM	Flood and Coastal Erosion Risk Management (R&D programme)
FRA	Flood Risk Assessment
FRM	Flood Risk Management
FRMP	Flood Risk Management Plan
FWA	Flood Warning Area
FWS	Flood Warning Service
GS	Gauging Station
GSPZ	Groundwater Source Protection Zone
IDB	Internal Drainage Board
ISIS	Hydrology and hydraulic modelling software
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
NFM	Natural Flood Management
NPPF	National Planning Policy Framework
PFR	Property Flood Resilience
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Policy Guidance
RBMP	River Basin Management Plan
SFRA	Strategic Flood Risk Assessment
TUFLOW	Two-dimensional Unsteady FLOW (a hydraulic model)
uFMfSW	Updated Flood Map for Surface Water
UKCP18	United Kingdom Climate Projections 2018
WFD	Water Framework Directive

Executive Summary

This report provides a comprehensive and robust evidence base on flood risk issues to support the review and update of the Breckland Local Plan, using the best available information. This SFRA can be used to inform the Local Plan on the location of future development and the preparation of sustainable policies for the long-term management of flood risk, provided the potential implications of the proposed changes to the PPG are understood.

Introduction

The objectives of this assessment are:

- To update the Breckland District Local Plan taking into account the most recent policy and legislation in the National Planning Policy Framework (2023)
- To collate and analyse the latest available information and data for current and future (I.e. climate change) flood risk from all sources, and how these may be mitigated.
- To inform decisions in emerging Local Plans, including the selection of development sites and planning policies.
- To provide evidence for the application of the Sequential Test for the allocation of new development by Breckland District Council
- To highlight the role of local stakeholders/groups, the data and information they have available and how it can be used
- To provide a comprehensive set of maps presenting flood risk from all sources that can be used as an evidence base for use in the Local Plan.
- To provide advice for applicants carrying out site-specific Flood Risk Assessments and outline specific measures or objectives that are required to manage flood risk.

Summary of Flood Risk in Breckland District

- **Fluvial flooding:** Whilst there are a number of main rivers within Breckland that have significant flood extents associated with them, **most areas shown to be** affected **by fluvial flooding** are predominantly rural with very few properties at risk. There are however several towns where fluvial flood risk exists, notably Thetford (River Thet), Fakenham (River Wensum) Dereham (unnamed ordinary watercourse), There are a large number of ordinary watercourses within the district for which Flood Zones and/or fluvial modelling is unavailable- the risk from these watercourses should be assessed as part of a site-specific flood risk assessment for any proposed development in the vicinity of these watercourses**.**
- **Tidal flooding:** The Environment Agency's 'The Wash' Tidal Hazard Mapping (2016) indicates that there is no tidal flood risk to Breckland during an extreme event, using the current climate change projections.
- **Surface Water:** The Environment Agency Risk of Flooding from Surface Water (RoFSW) mapping shows that the risk of surface water flooding is widespread

across Breckland. The mapping shows that surface water tends to be channelled by topography into watercourses as well as forming flow paths along residential and main roads in urban areas. These flow paths are particularly prominent in Watton, Attleborough, New Buckenham, Thetford, Swaffham and Dereham. The worst affected urban areas shown to be affected during the 0.1% AEP surface water event include Watton, Attleborough, Thetford, Swaffham and Derham.

- **Groundwater:** Groundwater emergence mapping indicates that the majority of the Borough is at very low risk from groundwater flooding. There are some localised areas where groundwater levels are low-moderate and there is a risk to surface and subsurface assets, however groundwater flooding still remains unlikely.
- **Reservoirs:** There are 49 reservoirs that pose a risk of flooding to areas within the study area (although some reservoirs are located outside Breckland District). Defra's Risk of Flooding from reservoirs mapping (Appendix A) shows the areas within Breckland which are at risk from reservoir flooding. Whilst the risk of breach/uncontrolled release form reservoirs remains very low, this risk should be assessed as part of a site-specific flood risk assessment wherever development is proposed within an identified reservoir flood extent and the reservoir owner consulted to understand whether development downstream of the reservoir may impact its risk classification.

Development and Flood Risk

The Sequential and Exception Test procedures for both Local Plans and Flood Risk Assessments have been documented, along with guidance for planners and developers. Links have been provided for various guidance documents and policies published by other Flood Risk Management Authorities such as the Lead Local Flood Authority and the Environment Agency.

When necessary, development and redevelopment within Breckland District will require a Flood Risk Assessment appropriate to the scale of the development and to the scope as agreed with the Lead Local Flood Authority and/or Environment Agency. Flood Risk Assessments should consider flood risk from all sources including residual risk, along with promotion of Sustainable Drainage Systems to create a conceptual drainage strategy and safe access/egress at the development in the event of a flood. Latest climate change guidance should also be taken into account, for the lifetime of developments. Planners and developers must ensure that modelling in line with the most up to date Environment Agency climate change guidance has been run.

How to use this report

Planners

This Level 1 Strategic Flood Risk Assessment (SFRA) 2024 is published as part of the evidence base for the emerging Local Plan. The report has updated the content that was included in the previous SFRA to provide appropriate supporting evidence for the resubmission of the Local Plan.

This includes how the cumulative impact of development should be considered.

It provides the latest flood risk data and guidance to inform the Sequential Test and provides guidance on how to apply the Exception Test. The Council can use this information to apply the Sequential Test to strategic allocations and identify where the Exception Test will also be needed.

The SFRA provides guidance for developers, which can be used by development management staff to assess whether site-specific Flood Risk Assessments meet the required quality standard.

Developers

For sites that are not strategic allocations (where the Sequential Test has been applied by Breckland District Council as part of the Local Plan allocations process), developers will need to use this SFRA to help apply the Sequential Test. For sites which fall into the following categories, whether strategic allocations or windfall sites, developers will need to apply the Exception Test and undertake a site-specific Flood Risk Assessment to inform this test at planning application stage.

- Highly vulnerable and in Flood Zone 2
- Essential infrastructure in Flood Zone 3a or 3b
- More vulnerable in Flood Zone 3a

This is a strategic assessment and does not replace the need for site-specific Flood Risk Assessments. A Flood Risk Assessment is needed for developments:

- in Flood Zones 2 or 3
- more than 1 hectare in Flood Zone 1
- less than 1 hectare in Flood Zone 1, including a change of use in development type to a more vulnerable class, where they could be affected by sources of flooding other than rivers and sea (for example surface water or reservoir flooding)
- in an area within Flood Zone 1 which has critical drainage problems as notified by the Environment Agency
- land identified in an SFRA as being at increased risk in the future

In addition, a surface water drainage strategy will be needed for all major developments in any Flood Zone to satisfy Norfolk County Council, the Lead Local Flood Authority (LLFA).

Developers can use the information in this SFRA, alongside site-specific research to help scope out what additional work will be needed in a detailed Flood Risk Assessment. To do this, they should refer to Section 5, Section 7, and the attached Appendices (PDF mapping) A-F. At the planning application stage, developers may need to undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood extent (including latest climate change allowances, last updated in May 2022), inform master planning and demonstrate, if required, that the Exception Test is satisfied. As part of the Environment Agency's updated guidance on climate change, which must be considered for all new developments and planning applications, developers will need to undertake a detailed

assessment of climate change as part of the planning application process when preparing FRAs. In all cases it must be demonstrated that development of the site will not increase the risk of flooding elsewhere.

Developers need to ensure that new development does not increase flood risk elsewhere, increase surface water runoff from a site, or contribute to cumulative effects at sensitive locations, see Appendix F. Section 8 provides information on the surface water drainage requirements of the LLFA. Sustainable Drainage Systems should be considered early in the development process, helping to minimise costs and overcome any site-specific constraints.

Site-specific Flood Risk Assessments will need to identify how flood risk will be mitigated to ensure the development is safe from flooding. In high-risk areas, the site-specific Flood Risk Assessment will also need to consider emergency arrangements, including how there will be safe access and egress from the site.

Residual risk is the risk that remains after mitigation measures are considered. The residual risk includes the consideration of flood events that exceed the design thresholds of the flood defences or circumstances where there is a failure of the defences, e.g. flood banks collapse. Residual risks should be considered as part of site-specific Flood Risk Assessments.

Any developments located within an area protected by flood defences and where the standard of protection is not of the required standard (either now or in the future) should be identified and the use of developer contributions considered to fund improvements.

1 Introduction

1.1 Purpose of the Strategic Flood Risk Assessment

"Strategic policies should be informed by a strategic flood risk assessment, and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards."

(National Planning Policy Framework (2023), paragraph 166)

Breckland District Council (BDC) Council commissioned JBA Consulting to prepare a Level 1 Strategic Flood Risk Assessment (SFRA) for the Council in November 2023. This study provides a comprehensive and robust evidence base to support the update of the Local plan. This SFRA is the Level 1 report and replaces the previous Level 1 report, which was last updated in 2017. This SFRA will inform the council's Sequential Test, which will determine whether there is the need for a further Level 2 SFRA.

This 2024 SFRA will be used to inform decisions on the location of future development and the preparation of sustainable policies for the long-term management of flood risk.

1.2 Local Plan

Breckland District Council are updating the **current Local Plan,** adopted in 2019. The aim of the Local Plan is to establish a planning framework for future development, identifying how much land is available and where such land should be provided for new homes and employment, alongside associated infrastructure.

1.3 Levels of SFRA

The **Planning Practice Guidance (PPG)** identifies the following two levels of SFRA:

- Level 1 (L1): where flooding is not a major issue in relation to potential site allocations and where development pressures are low. The assessment should be of sufficient detail to enable application of the Sequential Test. The L1 should be used to attempt to allocate sites in areas of lowest overall flood risk (including other sources of risk).
- Level 2 (L2): where allocations are proposed in flood risk areas (i.e., from any source now and in the future), or where future windfall pressures in flood risk areas are expected. The L2 SFRA should be detailed enough to identify which development sites have the least risk of flooding and the application of the Exception Test, if relevant. The above text suggests that the L2 SFRA will only be used to assess whether the Exception Test can be passed, and not the Sequential Test.

This L1 SFRA is intended to provide a robust assessment of the District's strategic flood risk and to aid the council in applying the Sequential Test for their site allocations and identifying where the application of the Exception Test may be required as part of any future L2 SFRA.

1.4 Level 1 SFRA outputs

The outputs of this SFRA include:

- Identification of policy and technical updates.
- Identification of any strategic flooding issues which may have cross boundary implications.
- Appraisal of all potential sources of flooding, including main river, ordinary watercourse, surface water, sewers, groundwater, reservoirs and canals.
- Review of recorded historic flooding incidents.
- Reporting on the standard of protection provided by existing flood risk management infrastructure.
- Mapping showing distribution of flood risk across all Flood Zones from all sources of flooding including climate change allowances.
- Assessment of the potential increase in flood risk due to climate change.
- Flood Risk Assessment guidance for developers.
- Assessment of surface water management issues, how these can be addressed through development management policies and the application of Sustainable Drainage Systems.
- Recommendations of the criteria that should be used to assess future development proposals and the development of a Sequential Test and sequential approach to flood risk.
- Assessment of strategic flood risk solutions that can be implemented to reduce risks.

1.5 SFRA study area

The study area encompasses the entirety of Breckland. This covers an area of approximately 130,000 ha and has a population of approximately 141,500 **(Census, 2021).** The district is predominantly rural, with the largest towns comprising of Thetford (population 24300), Dereham (population 18600), Attleborough (population 10400) and Swaffham (population 7300).

As of 2021, Breckland is the eighth least densely populated of East England's 45 local authority areas. Breckland has the ninth fastest growing population in East England, increasing by 8.4% between 2011 and 2021.

Figure 1-1 shows the study area and the neighbouring authorities. There are six authorities that border Breckland. These authorities are:

- North Norfolk District

- Broadland District
- South Norfolk District
- Mid Suffolk District
- West Suffolk District
- Kings Lynn and West Norfolk District
- Breckland is covered by Anglian Water as the main water and sewerage provider.

Breckland is covered by Norfolk County Council as the Lead Local Flood Authority (LLFA).

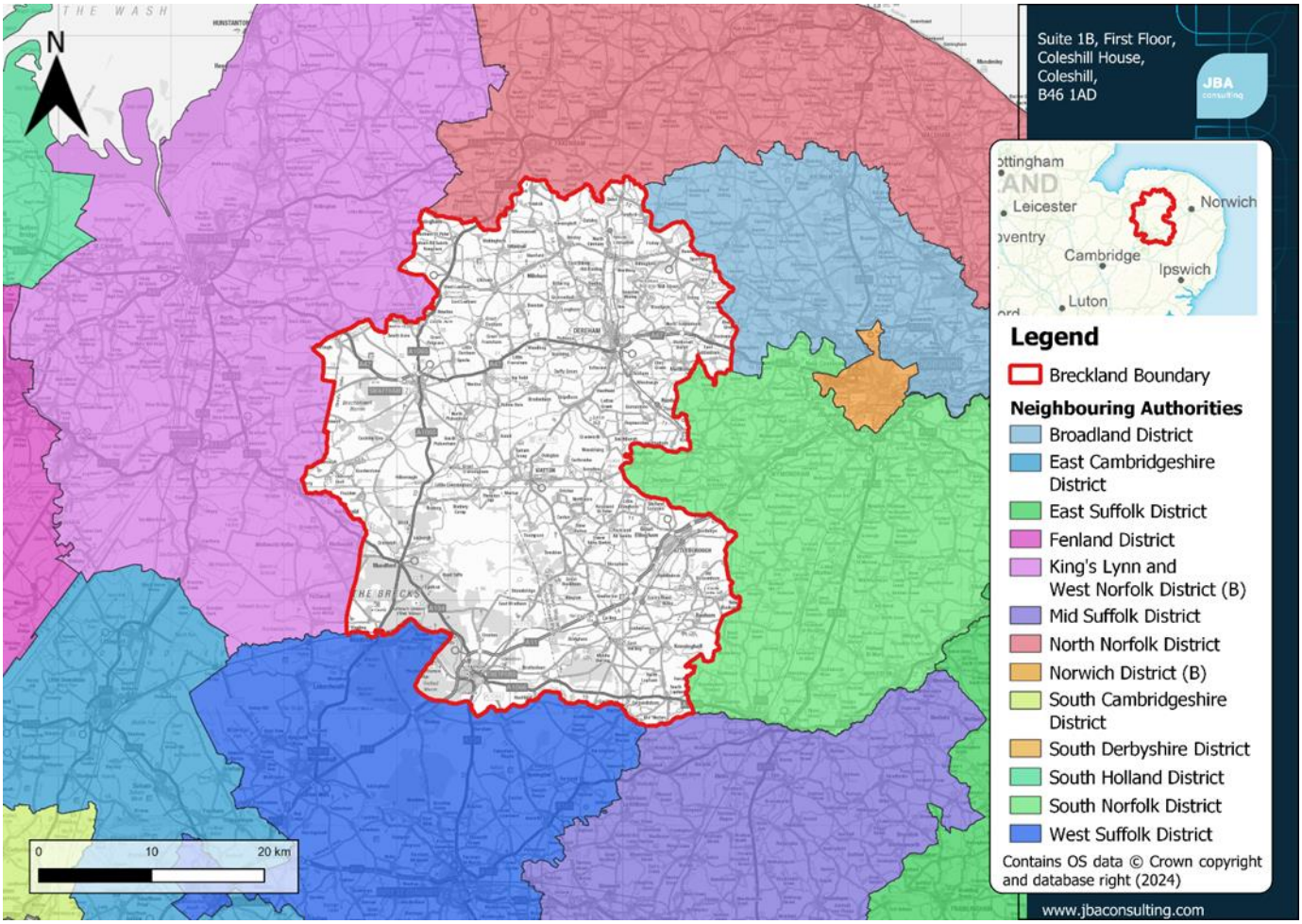


Figure 1-1 Breckland District study area and neighbouring authorities

The principle watercourses within Breckland are shown

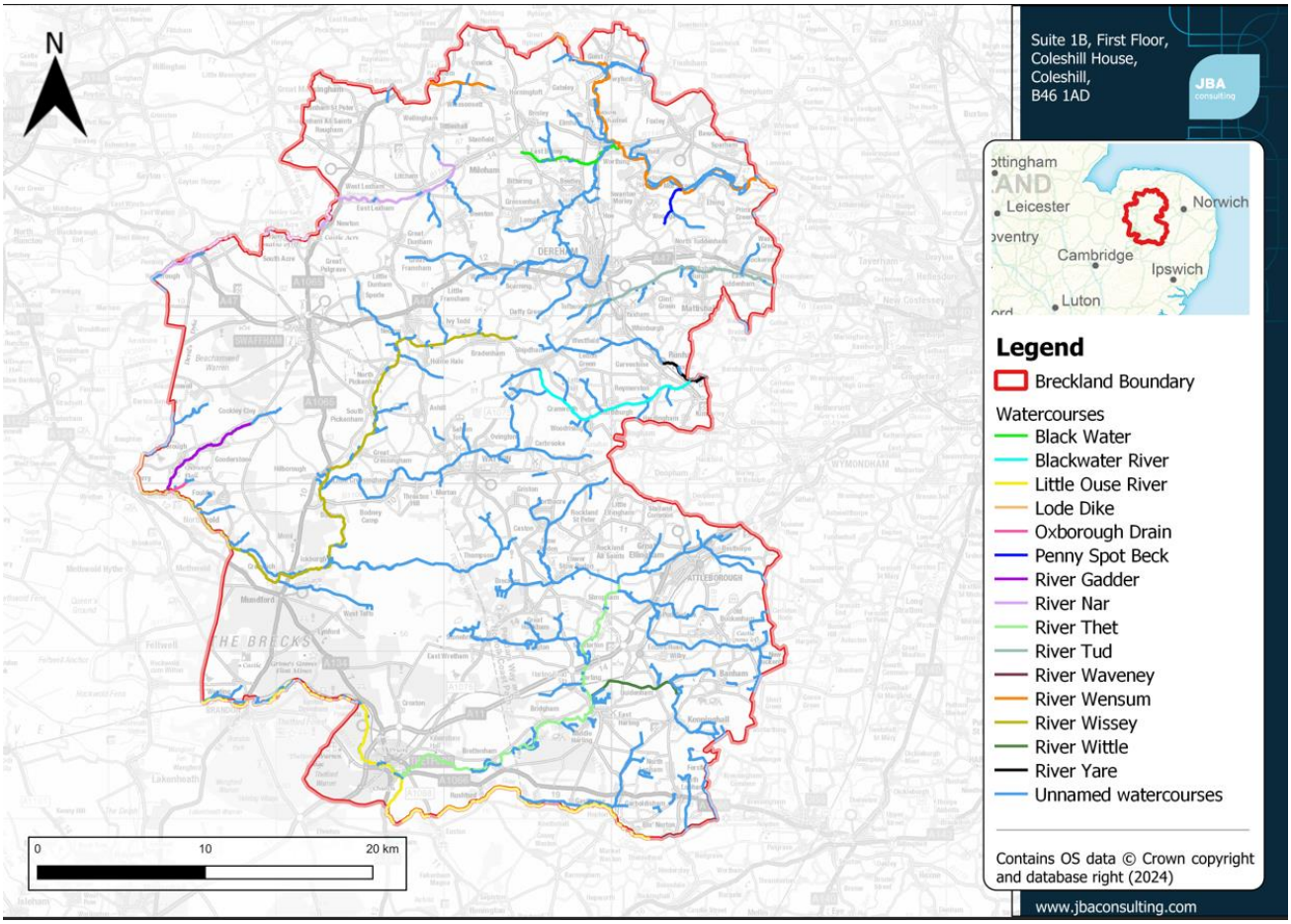


Figure 1-2 Environment Agency Main Rivers and Ordinary Watercourses within Breckland District

1.6 Consultation

The following parties (external to Breckland District Council) were consulted to inform the SFRA:

- Environment Agency
- Norfolk County Council (LLFA)
- Anglian Water
- Norfolk Rivers Internal Drainage Board (IDB)
- East Harling Internal Drainage Board (IDB)
- Neighbouring authorities:
  - North Norfolk District Council
  - Broadland District Council
  - South Norfolk Council
  - Mid Suffolk District Council
  - West Suffolk District Council
  - King's Lynn and West Norfolk District Council

1.7 Use of SFRA data

L1 SFRAs are high-level strategic documents and do not go into detail on an individual site-specific basis. The primary purpose is to provide an evidence base to inform the preparation of Local Plans and any future flood risk policies.

Developers will still be required to undertake site-specific Flood Risk Assessments to support Planning Applications. Developers will be able to use the information in the SFRA to scope out the sources of flood risk that will need to be explored in more detail at site level.

Appendix C presents a SFRA User Guide, further explaining how SFRA data should be used, including reference to relevant sections of the SFRA, how to consider different sources of flood risk and recommendations and advice for Sequential and Exception Tests.

Key reference material such as external guidance documents/ websites are provided in bold throughout the SFRA.

On the date of publication, the SFRA contains the latest available flood risk information. Over time, new information will become available to inform planning decisions, such as updated hydraulic models (which then update the Flood Map for Planning), updated information on other sources of flood risk or evidence showing future flood risks, new flood event information, new defence schemes and updates to policy, legislation and guidance. Developers should check the online Flood Map for Planning in the first instance to identify any major changes to the EA's Flood Zones and the long term flood risk mapping portal for any changes to flood risk from surface water or inundation from reservoirs.

1.8 Structure of this report

The contents of the report are set out according to the structure set out in Table 1-1.

Table 1-1 The structure of the Level 1 SFRA Report

Section	Contents	How to use
Executive Summary	Focuses on how the SFRA can be used by planners, developers and neighbourhood planners	Summarises the Level 1 findings and recommendations.

Section	Contents	How to use
1. Introduction	Provides a background to the study, the Local Plan stage the SFRA informs, the study area, the roles and responsibilities for the organisations involved in flood management and how they were involved in the SFRA Provides a short introduction to how flood risk is assessed and the importance of considering all sources Includes this table of the contents of the SFRA	For general information and context.
2. Flood risk policy and strategy	Sets out the relevant legislation, policy and strategy for flood risk management at a national, regional and local level.	Users should refer to this section for any relevant policy which may underpin strategic or site-specific assessments.
3. Planning policy for flood risk management	Provides an overview of both national and existing Local Plan policy on flood risk management This includes the EA's Flood Zones, application of the Sequential Approach and Sequential/Exception Test process. Provides guidance for the Local Planning Authority and Developers on the application of the Sequential and Exception Test for both allocations and windfall sites, at allocation and planning application stages.	Users should use this section to understand and follow the steps required for the Sequential and Exception Tests.
4. Impact of climate change	Outlines the latest climate change guidance published by the Environment Agency and how this was applied to the SFRA. Sets out how developers should apply the guidance to inform site specific Flood Risk Assessments.	This section should be used to understand the climate change allowances for a range of epochs and conditions, linked to the vulnerability of a development.

Section	Contents	How to use
5. Understanding flood risk in the Breckland District	Provides an overview of the characteristics of flooding affecting the study area and key risks including historical flooding incidents, flood risk from all sources and flood warning arrangements.	This section should be used to understand all sources of flood risk in the Breckland District including where has flooded historically. This section may also help identify any data gaps, in conjunction with Appendix B.
6. Flood alleviation schemes and assets	Provides a summary of current flood defences and asset management and future planned schemes. Introduces actual and residual flood risk.	This section should be used to understand if there are any defences or flood schemes in a particular area, for further detailed assessment at site-specific stage.
7. Flood risk management for developers	Guidance for developers on Flood Risk Assessments (FRAs), considering flood risk from all sources.	Developers should use this section to understand requirements for FRAs and what conditions/ guidance documents should be followed, as well as mitigation options.
8. Surface water management and Sustainable Drainage Systems	An overview of Sustainable Drainage Systems, Guidance for developers on Surface Water Drainage Strategies, considering any specific local standards and guidance for Sustainable Drainage Systems (SuDS) from the Lead Local Flood Authority.	Developers should use this section to understand what national, regional and local SuDS standards are applicable. Hyperlinks are provided.
9. Summary and recommendations	Summarises sources of flood risk in the study area and outlines planning policy recommendations.	Developers and planners should use this as a summary of the SFRA. Developers should refer to the Level 1 SFRA recommendations when considering requirements for site-specific assessments.

1.9 Understanding flood risk

The following content provides useful background information on how flooding arises and how flood risk is determined.

1.9.1 Sources of flooding in Breckland

Flooding is a natural process and can happen in a wide variety of locations. It constitutes a temporary covering of land not normally covered by water and presents a risk when people and human or environmental assets are present in the area that floods.

Assets at risk from flooding can include housing, transport and public service infrastructure, commercial and industrial enterprises, agricultural land and environmental and cultural heritage. Flooding can occur from many different and combined sources and through many pathways. Major sources of flooding in the Breckland District include:

- Fluvial (rivers) - inundation of floodplains from rivers and watercourses; inundation of areas outside the floodplain due to influence of bridges, embankments and other features that artificially raise water levels; overtopping or breaching of defences; blockages of culverts; blockages of flood channels/corridors.
- Surface water - surface water flooding covers two main pathways including direct run-off from adjacent land (pluvial) and surcharging of piped drainage systems (public sewers, highway drains, etc).
- Sewer flooding- exceedance of sewer capacity, failure/blockage of sewer pipes, or surcharging of the sewer network by floodwaters from another source can all lead to sewer flooding. Anglian Water are the sewerage provider for Breckland District.
- Groundwater - water table rising after prolonged rainfall to emerge above ground level remote from a watercourse; most likely to occur in low-lying areas underlain by permeable rock (aquifers); groundwater recovery after pumping for mining or industry has ceased.
- Infrastructure failure - reservoirs; industrial processes; burst water mains; blocked culverts or failed pumping stations.

Other sources of flood risk not present in Breckland, but may affect other areas include:

- Coastal/tidal flooding- flooding caused by extreme tidal levels (including on tidal watercourses further inland), storm surges, or wave overtopping. The Environment Agency's 'The Wash Tidal Hazard Mapping' indicates that there is no tidal flood risk to Breckland during an extreme event, using the current climate change projections.
- Canal flooding- flooding associated with the breach or overtopping of canals. Most canals are operated by the Canals and Rivers Trust, who can provide advice on the risk from canals and development proposals near canals. There are no canals within Breckland that could pose a risk of flooding.
- Mine water- In areas where mining has occurred in the past, historic mineshafts and excavations can fill with water or channel groundwater flows. Water can then emerge at a different location, causing flooding. It can be very difficult to assess the risk from minewater at a strategic scale as it often requires an understanding of groundwater flows, the historic mine network, and geotechnical investigations

to determine where water is likely to emerge. There are no known significant current or historic mining operations within Breckland District that could cause a risk.

Different types and forms of flooding present a range of different risks and the flood hazards of speed of inundation, depth and duration of flooding can vary greatly. With climate change, the frequency, pattern and severity of flooding are expected to change and become more damaging.

1.10 Likelihood and consequence

Flood risk is a combination of the likelihood of flooding and the potential consequences arising. It is assessed using the source – pathway – receptor model as shown in Figure 1-3. This is a standard environmental risk model common to many hazards and should be the starting point of any assessment of flood risk. However, it should be remembered that flooding could occur from many different sources and pathways, and not simply those shown in the illustration below.

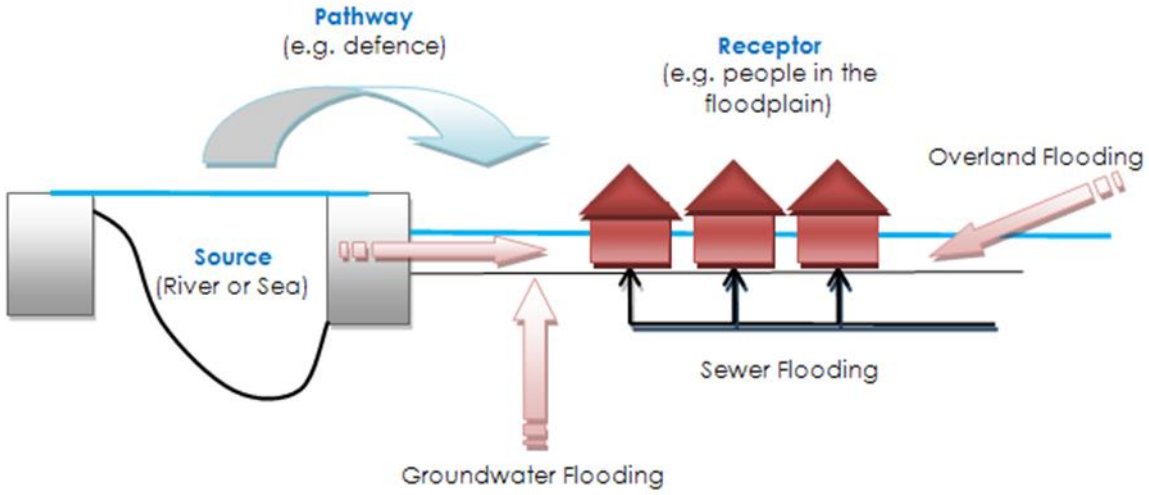


Figure 1-3 The source-pathway-receptor model

The principal sources affecting the study area are rainfall and rivers; the most common pathways are rivers themselves, drains, sewers, overland flows, floodplains and defence assets (for example through overtopping or breach). Receptors can include people, their property and the environment. All these elements must be present for flood risk to arise. Mitigation measures have little or no effect on the magnitude of the sources that cause flooding, but they can block or impede pathways, remove receptors or increase the resilience of receptors.

The planning process is primarily concerned with the appropriate location of receptors, taking appropriate account of potential sources and pathways that might put those receptors at risk. It is therefore important to define the components of flood risk to apply this guidance in a logical and consistent manner.

1.10.1 Likelihood

Likelihood of flooding is expressed as the percentage probability based on the average frequency measured or extrapolated from records over a large number of years. A 1% annual exceedance probability (AEP) indicates there is a 1 in 100 chance every year of the predicted flood level being experienced at a particular location i.e., it has a 1% chance of occurring in any one year, not that it will occur once every hundred years.

Considered over the lifetime of development, such an apparently low frequency or rare flood has a significant probability of occurring. For example, a 1% (1 in 100) flood:

- has a 26% (1 in 4) chance of occurring at least once in a 30-year period - the period of a typical residential mortgage; and
- a 49% (1 in 2) chance of occurring in a 70-year period - a typical human lifetime.

1.10.2 Consequence

The consequences of flooding include fatalities, property damage, disruption to lives and businesses, with severe implications for people (e.g. financial loss, emotional distress, health problems).

Consequences of flooding depend on the hazards caused by flooding (depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature (e.g. age-structure) of the population, presence and reliability of mitigation measures etc). Flood risk is then expressed in terms of the following relationship:

Flood risk = Probability of flooding x Consequences of flooding

1.11 Risk

Flood risk is not static; it cannot be described simply as a fixed water level that will occur if a river overtops its banks or from a high spring tide that coincides with a storm surge. It is therefore important to consider the continuum of risk carefully. Risk varies depending on the severity of the event, the source of the water, the pathways of flooding (such as the condition of flood defences) and the vulnerability of receptors as mentioned above.

2 Flood Risk Policy and Strategy

This section sets out the flood risk management roles and responsibilities for different organisations and relevant legislation, policy and strategy.

2.1 Roles and responsibilities for Flood Risk Management in the Breckland District

There are different organisations that cover Breckland District who have responsibilities for flood risk management, known as Risk Management Authorities (RMAs). These are displayed in Table 2-1, with a summary of their responsibilities.

It is important to note that land and property owners are responsible for the maintenance of watercourses either on or next to their properties. Property owners are also responsible for the protection of their properties from flooding as well as other management activities, for example by maintaining riverbeds/ banks, controlling invasive species and allowing the flow of water to pass without obstruction. More information can be found in the Environment Agency publication **'Your Watercourse: Rights and roles' (2024).**

When it comes to undertaking works to reduce flood risk, the Environment Agency and the Norfolk County Council as LLFA have permissive powers although limited resources are prioritised and targeted to where they can have the greatest effect. Permissive powers mean that Risk Management Authorities are permitted to undertake works on watercourses but are not obliged.

Table 2-1 Roles and responsibilities for Risk Management Authorities within Breckland

Risk Management Authority	Strategic Level	Operational Level	Planning role
Environment Agency	Strategic overview for all sources of flooding, national strategy, reporting and general supervision.	Main rivers, reservoirs and tidal flooding.	Statutory consultee for development in Flood Zones 2 and 3 for coastal and fluvial extents.
Norfolk County Council (LLFA)	Preliminary Flood Risk Assessment and Local Flood Risk Management Strategy.	Surface water, groundwater and ordinary watercourses (consenting, enforcement and works).	Statutory consultee for all major developments.
Breckland District Council as Local	Local Plans as LPA	Determination of Planning Applications	Determination of Planning

Risk Management Authority	Strategic Level	Operational Level	Planning role
Planning Authority (LPA)		and managing open spaces under Council ownership.	Applications and managing open spaces under Council ownership.
Anglian Water Ltd	Asset Management Plans, supported by Periodic Reviews (business cases) Develop Drainage and Wastewater Management Plans	Public sewers	Non-statutory consultee
Internal Drainage Board's (IDBs)	Water level/flood risk management within their Internal Drainage District	Permissive powers to undertake works to provide flood risk/water level management and ordinary watercourse/drainage regulation.	Consultee for developments within IDB areas
Highways Authorities: Highways England (for motorways and trunk roads) Norfolk County council as Local Highway Authority (for other adopted roads).	Highway drainage policy and planning.	Highway drainage Local Highway Authority can adopt some highway drainage features.	Internal planning consultee regarding highways and design standards and options.

2.1.1 Role of IDBs

Whilst not statutory consultees, IDB's are responsible for managing water Levels and reducing the risk from flooding within their drainage district boundaries. The IDB's therefore engage actively in the planning process and comment on development proposals to:

- Reduce flood risk to communities within their internal drainage district
- Promote sustainable development in sustainable locations by supporting sound planning decisions.

- Develop an understanding with other RMAs and third parties with an interest in flood risk/capacity issues within their internal drainage district to ensure these issues are considered throughput the planning process.
- Contribute towards the achievement of Sustainable Development, in line with Section 27 of the Flood and Water Management Act.

The Water Management Alliance (WMA) group of IDBs have published a **Planning and Byelaw Strategy** which contains information on their role in the planning process and byelaws which apply to development within IDB boundaries.

2.2 Relevant legislation

The following legislation is relevant to development and flood risk in Breckland District:

- **Flood Risk Regulations (2009)** - The Flood Risk Regulations (FRRs) 2009 translated the European Union (EU) Floods Directive into UK law, setting the requirement for Member States to complete an assessment of flood risk, known in England as a Preliminary Flood Risk Assessment (PFRA). This information was then used to identify areas where there is a significant risk of flooding (Flood Risk Areas), where States had to undertake Flood Risk and Hazard Mapping and produce Flood Risk Management Plans (FRMPs). This cycle was repeated on a six-yearly basis.
  As of 1 January 2024, the Retained EU Law (Reform and Revocation) Bill automatically repealed any retained EU law (REUL) not otherwise preserved or replaced in UK law before the end of 2023, including the FRRs 2009 which transposed the EU Floods Directive into legislation. This is because much of the FRRs is duplicated in existing domestic legislation, namely the Flood and Water Management Act 2010. The EA and LLFAs in England will therefore no longer be required to comply with a third cycle of planning, however the government expects to see continued implementation of the FRMPs 2021-2027. The objectives and measures from the second cycle FRMPs are presented in the EA Flood Plan Explorer (gov.uk).
- **Town and Country Planning Act (1990), Water Industry Act (1991), Land Drainage Act (1991), Environment Act (1995), Flood and Water Management Act (2010)** – as amended and implemented via secondary legislation. These set out the roles and responsibilities for organisations that have a role in FRM.
- The **Land Drainage Act (1991, as amended)** and **Environmental Permitting Regulations (2018)** also set out where developers will need to apply for additional permission (as well as planning permission) to undertake works to an Ordinary Watercourse, Main River, or within an IDB district. Local Land Drainage Bylaws are also applicable within IDB areas.
- **The Water Environment Regulations (2017)** – these transpose the European Water Framework Directive (2000) into law and require the Environment Agency to produce River Basin Management Plans (RBMPs). These aim to ensure that

the water quality of aquatic ecosystems, riparian ecosystems and wetlands reaches 'good' status.

- Other environmental legislation such as the Habitats Directive (1992), Environmental Impact Assessment Directive (2014) and Strategic Environmental Assessment Directive (2001) also apply as appropriate to strategic and site-specific developments to guard against environmental damage.

2.3 Relevant flood risk policy and strategy documents

Table 2-2 (overleaf) summarises relevant national, regional and local flood risk policy and strategy documents and how these apply to development and flood risk. Hyperlinks are provided to external documents. These documents may:

- Provide useful and specific local information to inform Flood Risk Assessments within the local area.
- Set the strategic policy and direction for Flood Risk Management (FRM) and drainage – they may contain policies and action plans that set out what future flood mitigation and climate change adaptation plans may affect a development site. A developer should seek to contribute in all instances to the strategic vision for FRM and drainage in the district.
- Provide guidance and/or standards that informs how a developer should assess flood risk and/or design flood mitigation and SuDS.

Table 2-2 Summary of relevant national, regional, and local flood risk policy and strategy documents

Scale	Document, lead author and date	Information	Policy and measures	Development
National	**National Flood and Coastal Erosion Risk Management Strategy** (Environment Agency) 2020)	No	Yes	No
National	**National Planning Policy Framework** and **Planning Practice Guidance** (Gov.uk) 2021	No	Yes	Yes
National	**Building Regulations Part H** (MHCLG) 2010	No	No	Yes
National	**Climate Change Guidance for development and flood risk** (Environment Agency 2022)	No	No	Yes
Regional	**Great Ouse Catchment Flood Management Plan (2011)**	Yes	No	Yes
Regional	**Broadland Rivers Catchment Flood Management Plan (2009)**	Yes	Yes	No
Regional	**River Nene Catchment Flood Management Plan (2009)**	Yes	Yes	No
Local	**Norfolk Local Flood Risk Management Strategy (2015)** and **Policy Review and Update (2021)**	Yes	Yes	No
Local	**Preliminary Flood Risk Assessment 2011 (Norfolk County Council)**	Yes	No	No
Local	**Breckland Local Plan 2023**	Yes	Yes	Yes
Local	**King's Lynn and West Norfolk Settlements**	Yes	No	Yes

Scale	Document, lead author and date	Information	Policy and measures	Development
	Surface Water Management Plan (2010)			

2.4 Key legislation for flood and water management

2.4.1 The Water Resources Act (1991)

The Water Resources Act consolidated various pieces of prior legislation to effectively govern the quality and quantity of water. It sets out the functions of the Environment Agency, and defines criminal offences relating to water quality and discharges into watercourses. With regard to flood risk, the act gives the Environment Agency a role of general supervision over all flood defence provisions. It also sets out their responsibilities regarding the maintenance of main watercourses.

2.4.2 The Land Drainage Act (1991)

The **Land Drainage Act** consolidated various pieces of prior legislation regarding Internal Drainage Boards (IDBs) and sets out the roles and responsibilities of IDBs and Local Authorities in managing land drainage. It sets out that IDBs shall be responsible for defined internal drainage districts and will exercise general supervision over all matters relating to land drainage within their district.

2.4.3 Flood and Water Management Act (2010)

The **Flood and Water Management Act (FWMA)** was passed in April 2010. It aims to improve both flood risk management and the way water resources are managed.

The FWMA has created clearer roles and responsibilities and helped to define a more risk-based approach to dealing with flooding. This included the creation of a lead role for LAs, as LLFAs, designed to manage local flood risk (from surface water, ground water and ordinary watercourses) and to provide a strategic overview role of all flood risk for the EA.

The content and implications of the FWMA provide considerable opportunities for improved and integrated land use planning and flood risk management by LAs and other key partners. The integration and synergy of strategies and plans at national, regional, and local scales, is increasingly important to protect vulnerable communities and deliver sustainable regeneration and growth.

2.4.4 The Water Framework Directive and Water Environment Regulations

The purpose of the Water Framework Directive (WFD), which was transposed into English Law by the Water Environment Regulations (2003), is to deliver improvements across Europe in the management of water quality and water resources through a series of plans

called River Basin Management Plans (RBMP), which were last published in October 2022 and last updated in December 2022.

Breckland is located within the Anglian River Basin District.

2.5 Key national, regional and local policy documents and strategies

2.5.1 The National Flood and Coastal Erosion Risk Management Strategy for England (2020)

The **National Flood and Coastal Erosion Risk Management Strategy (FCERM)** for England provides the overarching framework for future action by all risk management authorities to tackle flooding and coastal erosion in England. The new Strategy has been in preparation since 2018. The Environment Agency brought together a wide range of stakeholders to develop the strategy collaboratively. The Strategy is much more ambitious than the previous one from 2011 and looks ahead to 2100 and the action needed to address the challenge of climate change.

The Strategy has been split to describe three high level ambitions:

- Climate resilient places: working with partners to bolster resilience to flooding and coastal change across the nation, both now and in the face of climate change.
- Today's growth and infrastructure resilient in tomorrow's climate: making the right investment and planning decisions to secure sustainable growth and environmental improvements, as well as infrastructure resilient to flooding and coastal change.
- A nation ready to respond and adapt to flooding and coastal change: ensuring local people understand their risk to flooding and coastal change and know their responsibilities and how to take action.

The Strategy was laid before Parliament in July 2020 for formal adoption and published alongside a **new National Policy Statement for Flood and Coastal Erosion Risk Management**. The statement sets out five key commitments which will accelerate progress to better protect and better prepare the country for the coming years:

1. upgrading and expanding flood defences and infrastructure across the country,
2. managing the flow of water to both reduce flood risk and manage drought,
3. harnessing the power of nature to not only reduce flood risk, but deliver benefits for the environment, nature, and communities,
4. better preparing communities for when flooding and erosion does occur, and
5. ensuring every area of England has a comprehensive local plan for dealing with flooding and coastal erosion.

The Flood and Coastal Erosion Risk Management Strategy Roadmap to 2026 published in 2022 describes how the strategy, its objectives and measures will be translated into practical action over the next 4 years.

2.5.2 Updated Strategic Flood Risk Assessment guidance

There was an update to the **'How to prepare a Strategic Flood Risk Assessment guidance' in August 2019**, which had some key additions to both Level 1 and Level 2 assessments. There were also minor updates to the guidance in September 2020.

The most recent update was in March 2022 when a new section was added on setting up governance arrangements for preparing SFRAs. The Level 1 assessment is undertaken in accordance with this guidance.

2.5.3 Catchment Flood Management Plans

Catchment Flood Management Plans (CFMPs) are a high-level strategic plan providing an overview of flood risk across each river catchment. The Environment Agency use CFMPs to work with other key decision makers to identify and agree long-term policies for sustainable flood risk management.

Breckland is situated within the **Great Ouse Catchment Flood Management Plan, Broadland Rivers Catchment Flood Management Plan** and **River Nene Catchment Flood Management Plan** areas.

2.5.4 Norfolk Local Flood Risk Management Strategy (2015)

The **Norfolk Local Flood Risk Management Strategy** aims to inform all groups and individuals who may have an interest in, or an ability to influence or manage flood risk, including householders, businesses, landowners, developers and risk authorities.

The Local Flood Risk Management Strategy seeks to:

- explain what flooding is, its dangers, and how flood risk can be managed;
- inform about the extent and characteristics of flood risk in Norfolk and signpost other sources of information about flood risk in the county;
- clarify which Risk Management Authorities are responsible for which flood risk management activities;
- indicate the objectives of the strategy and make commitments in respect of the actions that will be taken by the Lead Local Flood Authority and other Risk Management Authorities;
- establish a framework of policies that will ensure that riparian owners, businesses, developers and authorities apply a consistent and strategic approach to flood management;
- outline a series of proactive measures which will increase understanding of local flood risk and identify further measures to manage those risk
- clarify how flood risk management is to be funded in Norfolk
- indicate how flood risk management activities will be monitored and how the strategy will be reviewed

2.5.5 Norfolk County Council Preliminary Flood Risk Assessment (PFRA) (2011)

The Norfolk County Council **Preliminary Flood Risk Assessment (2011)** identified 'flood risk areas' within the county based on the Environment Agency's updated Flood Map for Surface Water (uFMfSW) (now the Environment Agency **Risk of Flooding from Surface Water dataset).**

Ten indicative Flood Risk Areas (FRAs) have been identified nationally where flooding could affect over 30,000 people. Whilst no indicative FRAs have been identified in Norfolk, the PFRA process has acknowledged that there is a high risk of flooding from local sources across the county.

2.5.6 Breckland Local Plan 2023

Breckland Local Plan aims to set a spatial vision and strategy for the District, with clear economic, social and environmental objectives and meet the needs and aspirations of Breckland's residents. The current plan was released in 2023 and contains a number of objectives. The Breckland Local Plan has a number of policies relevant to this SFRA, including:

GEN 01 - Sustainable Development in Breckland

The Local Plan will seek and enable development that improves the economic, social and environmental objectives of Breckland through the application of the following national and locally distinctive sustainable development principles:

- Mitigate and adapt to climate change;
- Protect and enhance the natural, built and historic environment;
- Allocate and facilitate developable land that seeks to provide access to homes, employment, retail, leisure and other facilities;
- Assist in the creation and maintenance of inclusive, environmentally sustainable communities making the best and most efficient use of previously developed land, buildings and natural resources; Support Breckland's wider rural economy helping to sustain local services and assist in helping rural communities adapt and grow proportionately to enhance their social and economic sustainability;
- Direct jobs and growth towards the most sustainable locations contributing towards the economy and jobs in rural areas, helping to achieve the right balance throughout the District;
- Co-ordinate development with transport provision ensuring good access to existing community facilities, services and open space, together with new facilities and services where necessary.
- Consideration of the cumulative impact of development, in particular, the impact on the environment.

Where there are no development plan policies relevant to the application, or the policies of most importance are out of date, the Council will grant permission, unless taking into account whether any adverse impacts of granting permission would significantly and demonstrably outweigh the benefits when assessed against the National Planning Policy

Framework, or if policies in the Framework that protect areas or assets of particular importance provides a clear reason for refusing the development proposed.

Policy ENV 09 Flood Risk & Surface Water Drainage

All new development will:

- be located to minimise the risk of flooding, mitigating any such risk through design and implementing sustainable drainage (SuDS) principles.
- incorporate appropriate surface water drainage mitigation measures to minimise its own risk of flooding and should not materially increase the flood risk to other areas. Particular care will be required in relation to habitats designated as being of international importance in the area and beyond which are water sensitive, as well as habitats designated of regional or local importance.

Developers will be required to show that the proposed development would:

- not increase green field run off rates and vulnerability of the site, or the wider catchment, to flooding from surface water run-off from existing or predicted water flows;
- wherever practicable, have a positive impact on the risk of surface water flooding in the surrounding area adjacent to the development; and
- address potential impact of infiltration upon groundwater Source Protection Zones and/or Critical Drainage Catchments.

This will be minimised through the installation of infiltration and attenuation measures to dispose of surface water in accordance with sustainable drainage system (SuDS) principles and the refinements to, and evolution of, the technical evidence base and guidance (as may be updated and superseded over the life of this Plan).

Proposals for vulnerable development in medium (zone 2) and higher flood risk areas (zones 3a and 3b) must be accompanied by a site-specific flood risk assessment, clearly identifying whether the development will be safe for its lifetime, taking account of the vulnerability of its users, and whether there may be any potential increase or reduction in flood risk elsewhere. In line with the sequential test, areas of functional floodplain should be protected from development. Where possible, through proposals for re-development, opportunities to reinstate areas of functional flood plain should be taken (e.g. reducing building footprints or relocating to lower flood risk zones).

2.5.7 Surface Water Management Plans

A Surface Water Management Plan (SWMP) is a study to understand the flood risks that arise from local flooding, which is defined by the Flood and Water Management Act 2010 as flooding from risk of surface runoff, groundwater, and ordinary watercourses. SWMPs are led by a partnership of flood risk management authorities who have responsibilities for aspects of local flooding, including the LLFA, Local Authority, Sewerage Undertaker and other relevant authorities. The purpose of a SWMP is to identify what the local flood risk issues are, what options there may be to prevent them or the damage they cause and who

should take these options forward. This is then presented in an Action Plan that the stakeholders and partners agree.

There is no current Surface Water Management Plan covering Breckland District.

3 Planning Policy and Flood Risk Management

This section summarises national planning policy for development and flood risk.

3.1 National Planning Policy Framework and Guidance

The revised **National Planning Policy Framework (NPPF)** was published in July 2021, replacing the 2019 version and was last updated in December 2023. The NPPF sets out Government's planning policies for England. It must be considered in the preparation of local plans and is a material consideration in planning decisions. The NPPF defines Flood Zones, how these should be used to allocate land and flood risk assessment requirements. The NPPF states that:

"Strategic policies should be informed by a strategic flood risk assessment and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards."

Planning Practice Guidance (PPG) on flood risk was first published in March 2014 and sets out how the policy should be implemented. **Diagram 1 of the PPG** sets out how flood risk should be considered in the preparation of Local Plans. It was updated on the 25 August 2022.

3.2 The risk-based approach

The NPPF takes a risk-based approach to development in flood risk areas. Since July 2021 the approach has adjusted the requirement for the Sequential Test (as defined in Para 168 of the NPPF) so that all sources of flood risk are included in the consideration.

The updated PPG further states in Paragraph 23 of the Flood risk and coastal change guidance: "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".

The general implications of these are summarised as follows:

- The Sequential Test must be based on mapping that enables decision making according to a prioritisation based on a risk-based sequence (for river and sea flooding national mapping is available that describes low, medium and high-risk flood zones but comparable mapping of this specific type and quality is not available for other sources; for river and sea flooding the risk zones are based on the assumption that no flood risk management features are present).

- The other sources of flood risk that can potentially be included in the Sequential Test are surface water, groundwater, sewer flooding and reservoir flooding (or other water impounding features such as canals).
- It follows that proposed new development placed in locations at high or medium risk from flooding from other sources now and in the future (note that the explicit requirement to include climate change in the test, as set out in the August 2022 PPG will require the preparation of additional modelling and mapping or use of proxies) should be accompanied by evidence that the Exception Test can be satisfied (in a Level 2 SFRA).
- 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”.

Appendix H 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. To inform the completion of the Sequential Test, the SFRA uses the best available data to assess fluvial, tidal and surface water flood risk. It also provides an assessment of the implications of reservoir, sewer and groundwater flood risk. This will help the LPA to establish whether sites with a lower risk of flooding are available, and therefore more appropriate for development.

Decisions on the selection of preferred sites for allocation must consider all sources of flooding, and the potential implications of groundwater, reservoir and sewer flooding and where necessary identify sites where consideration should be given to satisfying the requirements of the Exception Test. Wherever required, the Exception Test must be demonstrated to be passed before a site can be allocated.

3.2.1 Flood Zones from the EA’s Flood Map for Planning - rivers and sea flood risk

Flood Zones are discrete areas of land identified to be at risk from flooding from rivers and sea. They represent the undefended scenario. Table 3-1 outlines the definition of Flood Zones as per the PPG.

Table 3-1 Definition of the Flood Zones as per the Planning Practice Guidance

Flood Zone	Definition
Zone 1 – Low probability	Land having a less than 0.1% annual probability of river or sea flooding.
Zone 2 – Medium probability	Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding.

Flood Zone	Definition
Zone 3a– High probability	Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea.
Zone 3b- Functional Floodplain	Land having a 3.3% or greater annual chance of river or sea flooding, taking account of defences. This is land that either stores water or which allows water to flow through it during periods of flooding.

The Environment Agency has produced the **'Flood Map for Planning'** which identifies areas within Flood Zone 2 (0.1% AEP undefended chance of flooding from rivers and sea) and Flood Zone 3 (1% AEP undefended chance of flooding from rivers, or within a 0.5% chance of flooding from the sea) at a national scale. This information is based on broad scale modelling that has been refined with detailed hydraulic models in areas of higher risk. As a result, the information provided by this data is indicative, rather than specific, and is not sufficiently detailed to assess whether an individual property is at risk of flooding. Locations may also be at risk from other sources of flooding, such as high groundwater levels, overland run off from heavy rain, or failure of infrastructure such as sewers and storm drains. The Flood Zones (except 3b) do not take into account defences. This is important for planning long term developments as long-term policy and funding for maintaining flood defences over the lifetime of a development may change over time.

They also do not take into account surface water, sewer or groundwater flooding or the impacts of canal or reservoir failure or climate change. Hence there could still be a risk of flooding from other sources and the level of flood risk will change over time during the lifetime of a development.

Important note on Flood Zone information in this SFRA

The Flood Zones (Flood Zone 2 and 3a) in Appendix A are shown from the online Environment Agency's 'Flood Map for Planning' which incorporates modelled data where available.

The Environment Agency Flood Zones do not cover all catchments or ordinary watercourses with areas <3km2. As a result, whilst the Environment Agency Flood Zones may show an area is in Flood Zone 1, there may be a flood risk from smaller watercourse not shown in the Flood Zones.

Functional floodplain (Flood Zone 3b) is identified as land which would flood with an annual probability of 1 in 30 years (3.3% AEP), where detailed hydraulic modelling exists. The 1 in 30-year defended modelled flood extents have been used to represent Flood Zone 3b, where available from the Environment Agency. Where the 1 in 30-year extent was not available, the 1 in 50-year (2% AEP) has been used as a conservative proxy. For areas outside of the detailed model coverage, or where no outputs were available, Flood Zone 3a

has been used as a conservative indication. Further work should be undertaken as part of a detailed site-specific Flood Risk Assessment to define the extent of Flood Zone 3b where no detailed modelling exists.

3.2.2 Flooding from rivers – Fluvial modelling

The Environment Agency have provided fluvial modelling for the River Yare, River Tud and River Wensum as displayed in Table 3-2. No additional modelling has been undertaken to support the Level 1 SFRA. This detailed fluvial modelling provides a more accurate representation of actual flood risk within the District than the Environment Agency's Flood Map for Planning, as it accounts for the presence of flood defence structures along both rivers. Further information about the models used is available in Appendix B.

Table 3-2 Models used to inform the Breckland District Level 1 SFRA

Model name	Software
River Yare (2014)	ISIS-TUFLOW
River Tud (2017)	ISIS
River Wensum, Upper Wensum (2009)	ISIS
River Nar (2015)	ISIS-TUFLOW

The following Annual Exceedance Probability events for the defended fluvial scenarios have been assessed:

- 50 % AEP
- 20% AEP
- 10% AEP
- 3.3% AEP
- 2% AEP
- 1.33% AEP
- 1% AEP
- 0.1% AEP

Areas within the modelled 3.3% AEP defended extent should be considered as Flood Zone 3b. Where modelled results are not available, Flood Zone 3a should be considered as a proxy for Flood Zone 3b. Flood Zone 3b (the functional floodplain) is defined as Land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively, or land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events.

The models listed above represent the best available information at the time of writing however it is likely through time that models will be updated and/or superseded by the Environment Agency in future. Developers should consult the Environment Agency to ensure the latest modelling is used in any site-specific assessment of risk.

3.2.3 Surface water risk

To address the requirement that flood risk from all sources is included in the Sequential Test, the Environment Agency's Risk of Flooding from Surface Water (RoFSW) mapping has been used to assess surface water flood risk in the District.

Modelling outputs show the extent, depth, velocity and hazard of flooding from surface water during the 3.3%, 1% and 0.1% AEP events.

The Environment Agency publishes **peak rainfall allowances** for each Management Catchment. These allowances can be applied to modelling to assess impacts of climate change on surface water flood risk.

The south of the Breckland District lies within the Cam and Ely Ouse management catchment. The north-east of the District lies within the Broadland Rivers management catchment, and the small north-western part of the District lies within the North West Norfolk management catchment. Relevant climate Change Allowances for each catchment can be found in Section 4.3.2 Surface water uplifts have not been applied to the Environment Agency's RoFSW dataset as part of this assessment.

3.2.4 Groundwater flood risk

Groundwater flooding is different to other types of flooding in that it can last for days, weeks or even months and is much harder to predict and warn for. Monitoring does occur in certain areas, for example where there are major aquifers or when mining stops. Flood Zones have not been prepared for groundwater flooding. The readily available datasets for groundwater flooding do not provide the confidence or certainty required to undertake the Sequential Test. The available mapping provides an indication of where the risk of groundwater emergence might be higher, but competent sequential decisions cannot be appropriately made based on the available mapping. It is therefore assumed that all sites are potentially susceptible to groundwater flood risk in the Sequential Test as a precautionary approach.

To assess groundwater flooding within the Breckland, the Groundwater Emergence Map 5m Resolution GW5 V2.3. has been used. The Groundwater Emergence Risk Map shows areas of potential groundwater emergence, however it does not indicate where water may flow to and cause flooding after emergence. This map can be compared to the Environment Agency's surface water mapping and topography to identify areas that may be affected by groundwater away from areas of emergence. Whilst this data should be used as part of the Sequential Test, it is not directly comparable to other datasets (e.g. Flood Zones) and therefore cannot categorise an area as high, medium or low risk on its own. The map should be interpreted as an initial indicative tool to assess groundwater flood risk at preliminary stages of planning/site allocation.

3.2.5 Sewer flood risk

According to Anglian Water the main causes of sewer flooding are:

- Blockages in sewers and drains
- Extreme weather

Heavy rain can overwhelm the sewer system causing water to back up through pipes and drains, flooding properties, roads and streets with foul and surface water. With the increase in intense rainfall events due to climate change, this type of flooding could become more common.

It is the responsibility of Anglian Water to maintain and repair the public sewer system in Breckland. However, burst pipes, sewer collapse and pumping station failure can all cause flooding to the borough.

Historic sewer flood data is only available at a postcode level, and does not define spatial extents or location of sewer flooding (although some of this information is held by Anglian Water, it is only made available at this level). The Anglian Water Drainage and Wastewater Management Plan (DWMP) does identify catchments where there is concern, however there is no information available at a site scale and therefore it is not possible to take a sequential, risk based approach using this data and it is not directly comparable to the risk of flooding from rivers, sea and surface water datasets. On this basis Flood Zones for sewer flooding and the available information have been used to inform the SFRA, however it cannot be used in the sequential test in the same way as established Flood Zones.

3.2.6 Reservoir flood risk

The latest available Environment Agency reservoir flood mapping now shows “wet day” and “dry day” reservoir inundation extents.

The “wet day” is a reservoir breach at the same time as a 0.1% AEP fluvial flood event (as this is a likely time when a reservoir might fail).

The “dry day” shows the failure just from the water retained by the dam.

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”. There are 41 reservoirs with flood extents that affect Breckland during the “dry day” scenario and 49 which affect Breckland during the “wet day” scenario. The failure of a reservoir has the potential to cause catastrophic damage due to the sudden release of large volumes of water. Breckland District Council will need to evaluate the potential damage to buildings or loss of life in the event of dam failure, compared to other risks, when considering development downstream of a reservoir. Local planning authorities are also advised to consult with the owners/operators of raised reservoirs, to establish constraints upon safe development. If sites selected through a comparative process of assessing the risk of flooding from all sources have a residual risk of flooding from reservoirs it is important to consider the consequences of this flooding. Development downstream of a reservoir may change the risk designation of that reservoir. There may, therefore, be a need for different flood risk management measures. For example, emergency plans will be needed wherever

emergency flood response is an important component of making a development safe **(PPG paragraph 043).**

3.2.7 The Sequential Test

Firstly, land at the lowest risk of flooding from all sources should be considered for development. The 'Sequential Test' is applied to do this. Figure 3-1 summarises the Sequential Test. The LPA will apply the Sequential Test to strategic allocations. For all other developments, developers must supply evidence to the LPA, with a Planning Application, that the development has passed the test.

The LPA should work with the Environment Agency to define a suitable area of search for the consideration of alternative sites in the Sequential Test. The Sequential Test can be undertaken as part of a Local Plan Sustainability Appraisal. Alternatively, it can be demonstrated through a free-standing document, or as part of Strategic Housing Land or Employment Land Availability Assessments.

Whether any further work is needed to decide if the land is suitable for development will depend on both the vulnerability of the development and the Flood Zone for which it is proposed. **Table 2 of the PPG** defines the flood risk vulnerability and flood zone 'incompatibility' of different development types to flooding.

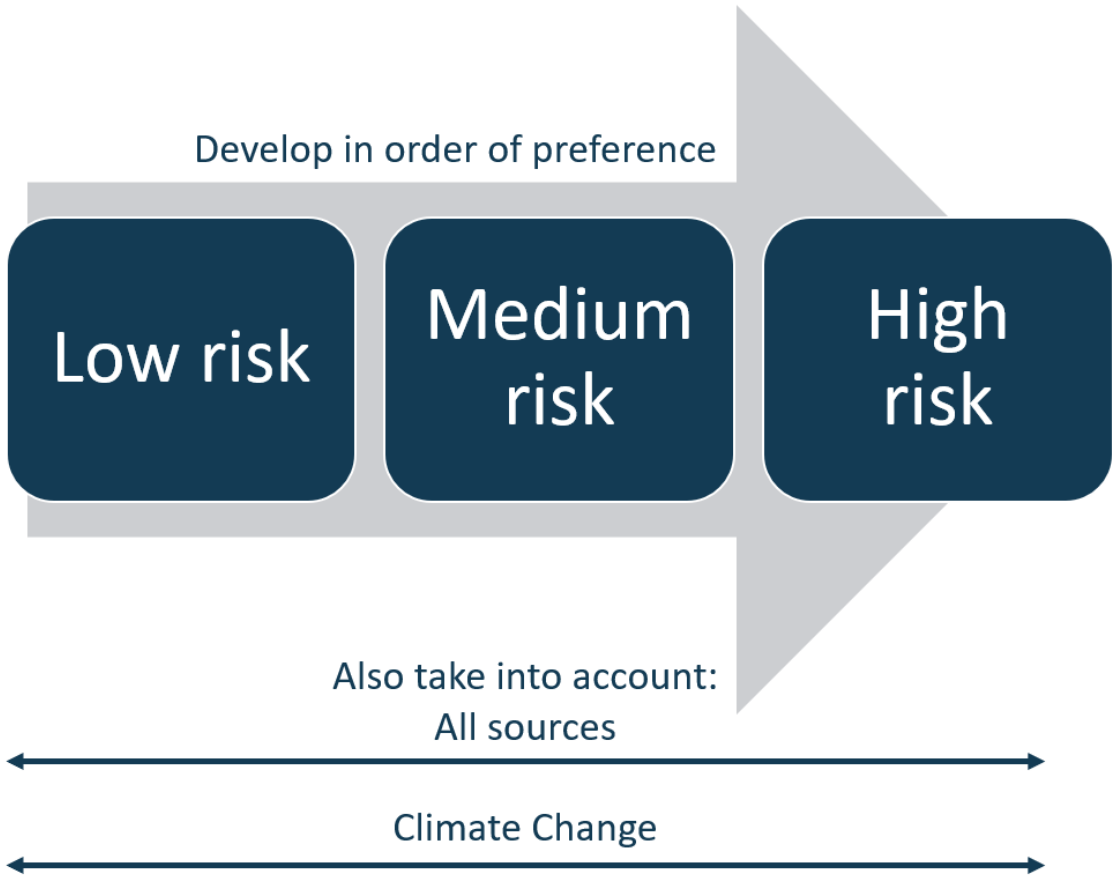


Figure 3-1 Conceptual diagram of the Sequential Test

Figure 3-2 illustrates the Sequential and Exception Tests as a process flow diagram (**Diagram 2 of the PPG**) using the information contained in this SFRA to assess potential development sites against flood risk information and development vulnerability compatibilities.

This is a stepwise process, but a challenging one, as a number of the criteria used are qualitative and based on experienced judgement. The process must be documented, and evidence used to support decisions recorded. In addition, the risk of flooding from all sources and the impact of climate change must be considered when considering which sites are suitable to allocate.

The SFRA User Guide in Appendix C shows where the Sequential and Exception Test may be required for the datasets assessed in the SFRA, and how to interpret different levels of concern with the datasets, recommending what proposed development sites should be assessed at Level 2 stage.

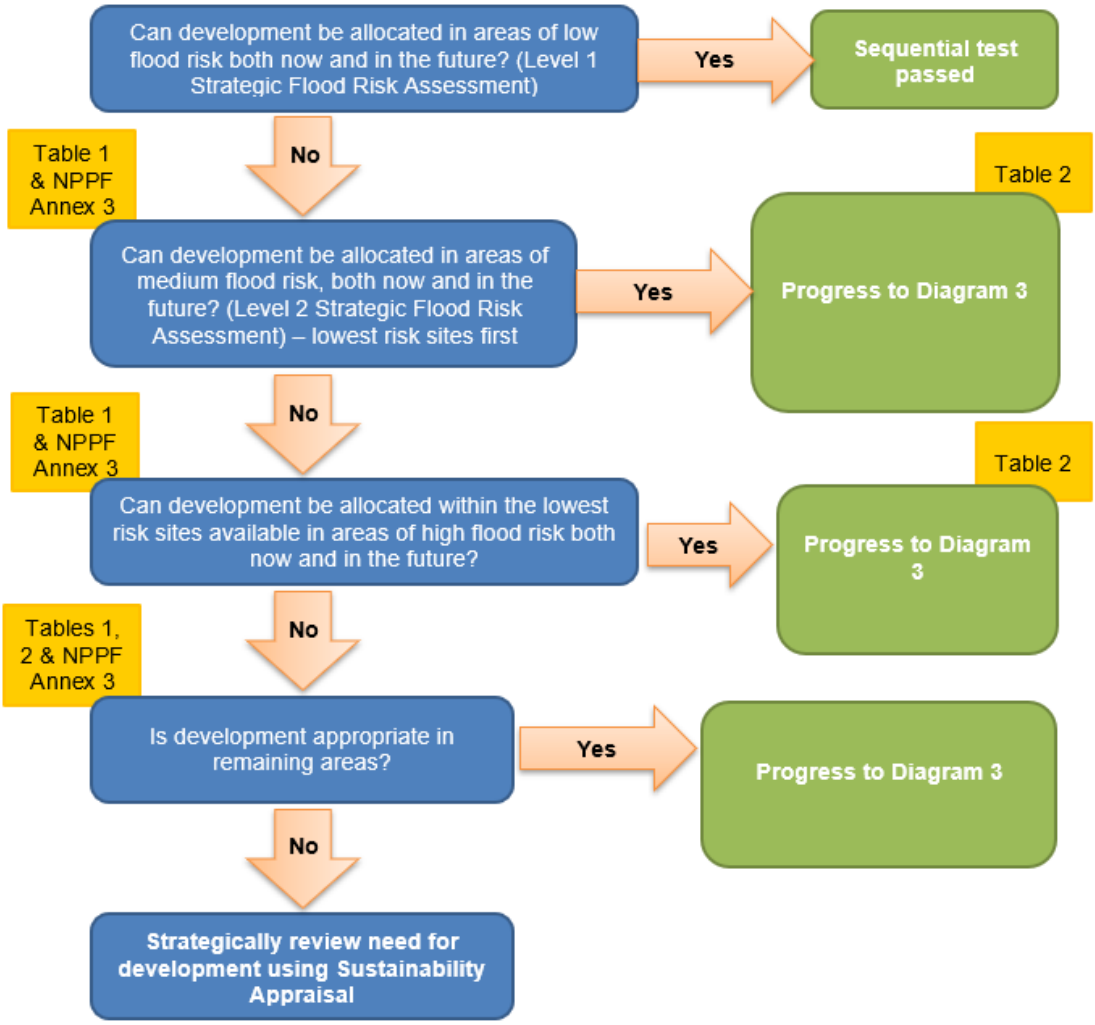


Figure 3-2 Application of the Sequential Test for plan preparation (Source: Planning Practice Guidance, 2022)

3.2.8 The Exception Test

It will not always be possible for all new development to be allocated on land that is at low risk from flooding. To further inform whether land should be allocated, or planning permission granted, a greater understanding of the scale and nature of the flood risks is required. In these instances, the Exception Test will be required.

The Exception Test should only be applied following the application of the Sequential Test. **Table 2 of the PPG** sets out the requirements for the Exception 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:

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

Whilst the Exception Test is not explicitly required for sites at risk from other sources of flooding, Breckland District Council 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.

Figure 3-3 summarises the Exception Test. For information relating to the application of the Exception Test to plan preparation, please see **Diagram 3 of the PPG.**

For sites allocated within the Local Plan, the Local Planning Authority (LPA) should use the information in this SFRA to inform the Exception Test. At planning application stage, the Developer must design the site such that it is appropriately flood resistant and resilient in line with the recommendations in National and Local Planning Policy and supporting guidance and those set out in this SFRA. This should demonstrate that the site will still pass the flood risk element of the Exception Test based on the detailed site level analysis.

For developments that have not been allocated in the Local Plan, developers must undertake the Exception Test and present this information to the Local Planning Authority for approval. The Level 1 SFRA can be used to scope the flooding issues that a site-specific FRA should look into in more detail to inform the Exception Test for windfall sites.

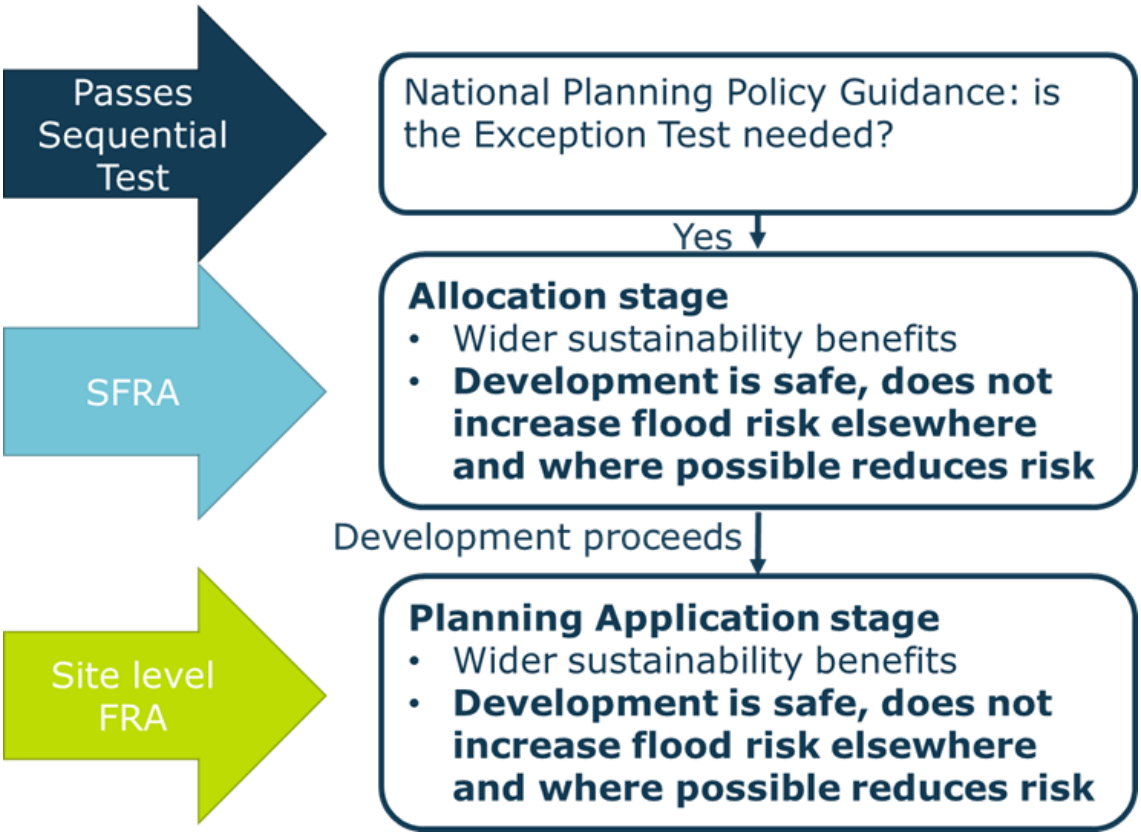


Figure 3-3 Conceptual diagram of the Exception Test

There are two parts to demonstrating a development passes the Exception Test:

1. Demonstrating that the development would provide wider sustainability benefits to the community that outweigh the flood risk.

Breckland District Council as Local Planning Authority will need to consider what criteria they will use to assess whether this part of the Exception Test has been satisfied and give advice to enable applicants to provide evidence to demonstrate that it has been passed. If the application fails to prove this, the Local Planning Authority should consider whether the use of planning conditions and / or planning obligations could allow it to pass. If this is not possible, this part of the Exception Test has not been passed and planning permission should be refused.

At the stage of allocating development sites, Local Planning Authorities should consider wider sustainability objectives, such as those set out in Local Plan Sustainability Appraisals. These generally consider matters such as biodiversity, green infrastructure, historic environment, climate change adaptation, flood risk, green energy, pollution, health, transport etc.

The Local Planning Authority should consider the sustainability issues the development will address and how doing so will outweigh the flood risk concerns for the site, e.g. by facilitating wider regeneration of an area, providing community facilities, infrastructure that benefits the wider area etc.

2. Demonstrating that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

In circumstances where the potential effects of proposed development are material, a Level 2 SFRA is likely to be needed to inform the Exception Test in these circumstances for strategic allocations to provide evidence that the principle of development can be supported. This will need to be determined by Breckland District Council using information from the Level 1 SFRA, once potential allocations are known. At Planning Application stage, at minimum a site-specific Flood Risk Assessment will be needed. Both would need to consider the actual and residual risk and how this will be managed over the lifetime of the development.

3.2.9 Making a site safe from flood risk over its lifetime

Local Planning Authorities will need to consider the actual and residual risk of flooding and how this will be managed over the lifetime of the development:

- The actual risk is the risk to the site considering existing flood mitigation measures. The fluvial 1% annual probability flood event is a key event to consider because the National Planning Policy Guidance refers to this as the 'design flood' against which the suitability of a proposed development should be assessed and mitigation measures, if any, are designed.
- Safe access and egress should be available during the design flood event. Firstly, this should seek to avoid areas of a site at flood risk. If that is not possible then access routes should be located above the design flood event levels. Where that is not possible, access through shallow and slow flowing water that poses a low flood hazard may be acceptable.
- Residual risk is the risk that remains after the effects of flood defences have been taken into account and/ or from a more severe flood event than the design event. The residual risk could be:
    - the effects of an extreme (greater than design flood) event which causes defences to be overtopped, or an intense storm which the designed drainage system cannot accommodate
    - structural failure of any flood defences, such as breaches in embankments or walls, or blockage of nearby structures/culverts.
    - failure of reservoirs/dams.

Flood resistance and resilience measures should be considered to manage any residual flood risk by keeping water out of properties and seeking to reduce the damage it does, should water enter a property. Emergency plans should also account for residual risk, e.g. through the provision of flood warnings and a flood evacuation plan where appropriate.

In line with the NPPF, the impacts of climate change over the lifetime of the development should be taken into account when considering actual and residual flood risk.

3.3 Applying the Sequential Test and Exception Test to individual planning applications

3.3.1 The Sequential Test

Breckland District Council, with advice from the Environment Agency and Norfolk County Council as LLFA, are responsible for considering the extent to which Sequential Test considerations have been satisfied.

Developers are required to apply the Sequential Test to all development sites, unless the site is:

- a strategic allocation and the test has already been carried out by the LPA, or
- a change of use (except to a more vulnerable use), or
- a minor development (householder development, small non-residential extensions with a footprint of less than 250m2), or
- a development in Flood Zone 1 unless there are other flooding issues in the area of the development (i.e. surface water, groundwater, sewer flooding).

It should be noted that residential sub-divisions are exempted from the definition of minor development and by default should be subject to the Sequential Test.

The SFRA contains information on all sources of flooding and taking into account the impact of climate change. This should be considered when a developer undertakes the Sequential Test, including the consideration of reasonably available sites at lower flood risk. Further details on the available data and how this should be applied in the Sequential Test are included in Appendix H.

Local circumstances must be used to define the area of application of the Sequential Test (within which it is appropriate to identify reasonably available alternatives). The criteria used to determine the appropriate search area relate to the catchment area for the type of development being proposed. For some sites this may be clear e.g. school catchments, in other cases it may be identified by other Local Plan policies. For some sites e.g. regional distribution sites, it may be suitable to widen the search area beyond LPA administrative boundaries.

The sources of information on reasonably available sites may include:

- site allocations in Local Plans
- site with Planning Permission but not yet built out
- Strategic Housing and Economic Land Availability Assessments (SHELAAs)/ five-year land supply/ annual monitoring reports
- locally listed sites for sale

It may be that a number of smaller sites or part of a larger site at lower flood risk from a suitable alternative to a development site at high flood risk.

Ownership or landowner agreement in itself is not acceptable as a reason not to consider alternatives.

3.3.2 The Exception Test

If, following application of the Sequential Test it is not possible for the development to be located in areas with a lower probability of flooding, the Exception Test must then be applied if required (as set out in Table 3 of the PPG). Developers are required to apply the Exception Test to all applicable sites (including strategic allocations).

The applicant will need to provide information that the application can pass both parts of the Exception Test:

- Demonstrating that the development would provide wider sustainability benefits to the community that outweigh the flood risk.
- Applicants should refer to wider sustainability objectives in Local Plan Sustainability Appraisals. These generally consider matters such as biodiversity, green infrastructure, historic environment, climate change adaptation, flood risk, green energy, pollution, health, transport etc.
- Applicants should detail the suitability issues the development will address and how doing it will outweigh the flood risk concerns for the site e.g., by facilitating wider regeneration of an area, providing community facilities, infrastructure that benefits the wider area etc.
- Demonstrating that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.
- The site-specific Flood Risk Assessment (FRA) should demonstrate that the site will be safe, and the people will not be exposed to hazardous flooding from any source. The FRA should consider actual and residual risk and how this will be managed over the lifetime of the development, including:
    - - the design of any flood defence infrastructure
    - - access and egress
    - - operation and maintenance
    - - design of the development to manage and reduce flood risk wherever possible
    - - resident awareness
    - - flood warning and evacuation procedures, including whether the developer would increase the pressure on emergency services to rescue people during a flood event; and
    - - any funding arrangements required for implementing measures.

4 Impact of Climate Change

The NPPF sets out that flood risk should be managed over the lifetime of a development, taking climate change into account. This section sets out how the impact of climate change should be considered.

4.1 Revised climate change guidance

Climate change projections show an increased chance of warmer, wetter winters and hotter, drier summers with a higher likelihood of more frequent and intense rainfall. This is likely to make severe flooding happen more often. It can be expected that there will also be an increased frequency of events with a magnitude that would have been experienced much less frequently in the past. The **Climate Change Act 2008** creates a legal requirement for the UK to put in place measures to adapt to climate change and to reduce carbon emissions by at least 80% below 1990 levels by 2050.

In 2018, the Met Office published new **UK Climate Projections** (UKCP18). The Environment Agency has since updated their **guidance on climate change allowances** for river flow (in 2021) and rainfall intensity (in 2022) for new developments. This includes information on how these allowances should be included in both SFRAs and FRAs. The guidance adopts a risk-based approach considering the vulnerability of the development and considers risk allowances on a management catchment level, rather than a river basin level.

Developers should check the government website for the latest guidance before undertaking a detailed Flood Risk Assessment.

4.2 Applying the climate change guidance

To apply the climate change guidance, the following information must be established:

- The vulnerability of the development – as per the **NPPF.**
- The likely lifetime of the development – in general 75 years is used for commercial development and 100 for residential, but this needs to be confirmed in an FRA. It should be noted that in both these cases, the 2080's epoch allowances should be used.
- The Management Catchment that the site is within. Breckland District is within three different Management Catchments: the Cam and Ely Ouse Management Catchment, the Broadland Rivers management Catchment and the North West Norfolk Catchment.
- Likely depth, speed and extent of flooding for each allowance of climate change over time considering the allowances for the relevant epoch (2020s, 2050s and 2080s).
- The ‘built in’ resilience measures used, such as raised floor levels for example.

- The capacity or space in the development to include additional resilience measures in the future, using a 'managed adaptive' approach.

4.3 Relevant allowances for Breckland

4.3.1 Fluvial flooding

Table 4-1 displays the updated peak river flow allowances that apply in Breckland for fluvial flood risk for the Broadland Rivers Management Catchment, Cam and Ely Ouse Management Catchment and North West Norfolk Management Catchment (last updated in July 2021). These allowances supersede the previous allowances by River Basin District. In agreement with the Environment Agency, it may be appropriate to use the previous climate allowances where they lie within +/- 10% of the updated guidance.

In some instances, the allowance for a later epoch may be lower than that for a previous epoch- in these cases, the larger allowance should be used regardless of the lifetime of the development, indicated in italics below.

Table 4-1 Peak River Flow Allowances for the Broadlands Rivers, Cam and Ely Ouse, and North West Norfolk Management Catchments

Management Catchment	Allowance category	Total potential change anticipated for '2020s' (2015 to 39)	Total potential change anticipated for '2050s' (2040 to 2069)	Total potential change anticipated for '2080s' (2070 to 2115)
Broadland Rivers	Upper end	27%	27%	44%
	Higher central	14%	*10%*	20%
	Central	8%	*3%*	11%
Cam and Ely Ouse	Upper end	21%	22%	45%
	Higher central	7%	*5%*	19%
	Central	2%	*-2%*	9%
North West Norfolk	Upper end	30%	34%	57%
	Higher central	18%	18%	33%
	Central	13%	*11%*	23%

4.3.2 Surface water flooding

Table 4-2 displays the updated rainfall intensity allowances that apply in Breckland for surface water flood risk for the three different Management Catchments (as of May 2022). These allowances supersede the previous country wide allowances.

Table 4-2 Peak rainfall intensity allowances for the Broadland Rivers, Cam and Ely Ouse, and North West Norfolk Management catchments

Management Catchment	Allowance Category	Total potential change anticipated for the '2050s' (2022 to 2060)		Total potential change anticipated for the '2070s' (2061 to 2125)	
		3.3% AEP event -	1% AEP event	3.3% AEP event	1% AEP event
Broadland Rivers	Upper end	40%	45%	40%	*40%**
	Central	20%	20%	20%	20%
Cam and Ely Ouse	Upper end	35%	40%	35%	40%
	Central	20%	20%	20%	25%
North West Norfolk	Upper end	35%	40%	35%	40%
	Central	20%	20%	20%	25%

* In some locations the allowance for the 2050s epoch is higher than that for the 2070s epoch. If so, and development has a lifetime beyond 2061, use the higher of the two allowances.

4.3.3 Residual Risk - Tidal breach

For tidal flooding, allowances are given in the form of total sea level rise based on a 1981 to 2000 baseline. shows the relevant sea level allowances considered in this study. There is currently no tidal risk to Breckland, although parts of the District are very low lying and could potentially be at tidal flood risk in future..

Table 4-3 Sea level rise allowances

River Basin district	Cumulative Rise to 2125 (m)
Higher Central	1.2
Upper end	1.6
H++	1.9

4.4 Representing climate change in the Level 1 SFRA

Representation of climate change within this SFRA was based on those applied in existing EA models. The following model outputs were used to represent climate change:

- River Yare model (2014) – 1% and 0.5% AEP events (+20%).

- Upper Wensum model (2009) – 1% and 0.5% AEP events (+20%,+35%,+65%)., 0.1% AEP (+20%, 25%)

Climate change allowances have not been applied to the Environment Agency's Risk of Flooding from Surface Water dataset, however the difference in extents velocities and hazards between the 1% and 0.1% AEP events can be used to understand the sensitivity of an area to increased surface water risk as a result of climate change. Where an area that is at lower risk in the 1% AEP event is shown to be at significantly increased risk in the 0.1% AEP event, either due to a significant increase in flood extents, or an increase in the depth, velocity, and/or hazard of flooding it can be inferred that that area is sensitive to the impacts of climate change.

This proxy approach is appropriate for a strategic level assessment, however flood risk assessments for sites at surface water risk will need to consider the latest allowances. It is expected that the Environment Agency's **National Flood Risk Assessment 2 (NaFRA2)** will be published early in 2025, which will include national surface water mapping including climate change, which would quickly supersede any additional modelling done as part of this assessment. Further details on the impacts of climate change on all sources of flooding can be found in Section 5.9

5 Understanding Flood Risk in Breckland

This is a strategic summary of the risk in Breckland of Breckland District Council's administrative area. Developers should use this section to scope out the flood risk issues they need to consider in greater detail in a site-specific Flood Risk Assessment to support a Planning Application.

Appendix B contains a list of the sources of data used in the SFRA and the approach to using hydraulic model data to inform the mapping. Appendix E contains more detailed information on the flood risk across Breckland District.

5.1 Historic flooding

The Environment Agency's **Historic Flood Map** (HFM) displays areas of land that have been previously subject to fluvial flooding, tidal flooding and flooding from groundwater springs. The Historic Flood Map and Recorded Flood outlines for Breckland area are displayed in the Appendix A Mapping.

Norfolk County Council as LLFA holds records of flooding within Breckland District (although it should be noted that not all occurrences of flooding are reported to the Council, and as records are property based some records are likely to relate the same event, or single properties which have flooded multiple times). They also conduct investigations into any flood in the area that the LLFA deems necessary or appropriate, under **Section 19 of the Flood and Water Management Act (2010)**. Norfolk County Council publishes **Flood Investigation Reports** for significant flood events within Norfolk County. Table 5-1 summarises flood investigation reports covering areas within Breckland. It should be noted that are numerous reports available covering county wide events which also contain information relevant to Breckland that are available on the council's website, but not included in the summary here.

Table 5-1Summary of Flood Investigation Reports available

Report Title	Area(s) Covered	Incident Date	Source of Flooding
Attleborough - Ellingham Road (FIR059)	Attleborough, Ellingham Road	May-June 2019	Surface Water
Breckland Various 1 -2016 (FIR028)	Thetford, Wretham, Croxton, Banham, Attleborugh, Thompson, Ashill, Shipdham, Garvestone, Bradenham	Throughout 2016	Surface Water/drainage system blockage

Report Title	Area(s) Covered	Incident Date	Source of Flooding
Breckland Various 2 -2017/18	Swaffham, Attleborough, Rocklands, Dereham, Mundford	June 2017-January 2018	Surface water/drainage system blockage/failure
Breckland Various 2014-17 (FIR039) and Addendum (FIR039A)	Attleborough, Dereham, Scarning, Watton	Various from 2014-17	Surface water/drainage system blockage/failure
Breckland Winter Flood Report 2020/21 (FIR066)	Attleborough, Banham, Beesthorpe, Beetley, Billingford, Blo'Norton, Carbrooke, Foulden, Garboldisham, Harling, Hoe, Kenninghall, Mattishall, Necton, Lopham, Quidenham, Rocklands, Saham Toney, Shipdham, Shropham, Thetford, Watton	Winter 202/21	Predominantly surface water/drainage system blockage/failure, some fluvial flooding
Dereham - South Green	South Green, Dereham	August 2012	Ordinary watercourse/drainage ditch blocakge
Dereham 2016	Dereham	June 2016	Surface water
South Norfolk and Breckland 2nd June 2018	Upper Besthrope, Dyke Beck, Morley, Mulbarton, Silfield	June 2018	Predominantly surface water/drainage system blockage/failure, some fluvial flooding
Rockland St Mary FIR047 -	Rockland St Mary	September 2019	Surface water, associated with unauthorised infill of a land drain.

Report Title	Area(s) Covered	Incident Date	Source of Flooding
Watton- 2016	Watton, Saham Toney, Olvington Cross, South Moor, Hembeck, Merton Common, King Row	June 2016	Surface water, fluvial

Norfolk County Council holds records of 400 internal property flooding incidences in the district since 2012, with the settlements of Attleborough, Besthorpe, Dereham, Kenninghall and Watton comprising more than half of the records.

Local community groups also hold records which can be valuable to understanding the risk to within Breckland. In particular, Watton and Saham Flood Action Group have provided their records to inform the study. Full details of the records provided can be found in Appendix G.

It can be seen from the records that there are certain communities which have a long history of frequent flooding within Breckland (in particular Watton, Saham Toney, Attleborough, Besthorpe). It is also apparent that the majority of historic flooding within Breckland is associated with surface water, and is often noted in Section 19 reports that changes to the drainage network including infilling/blockage of drainage ditches and culverting of watercourses has often exacerbated flooding. This highlights the need for development to be undertaken carefully in areas where there is a history of flooding. Developers must demonstrate that proposed development will not increase flood risk off-site, and wherever there is a history of flooding locally, developers should seek opportunities to provide flood risk benefit off-site through measures such as over-sized SuDS.

Developers should seek out flood history from the LLFA, LPA and any local flood groups to inform site-specific flood risk assessments and inform their site layout and designs to ensure that new development does not increase risk off the site, and wherever possible takes steps to reduce risk off site wherever possible, e.g. through the implementation of oversized SuDS, on-site flood storage, or improvements to the surface water drainage network.

It should be noted that absence of historic records of flooding does not in itself mean that an area is not at risk or has not experienced flooding in the past, as not all events will be reported to the relevant authorities or recorded. This is particularly likely to be the case for undeveloped land, as flood records tend to focus on flooding to properties and developed areas. Flood records should therefore be used to inform site-specific assessments or risk e.g. identifying mechanisms of flooding, calibration of flood models, and informing design of mitigation measures or emergency plans, but should not be solely relied on as a complete picture of risk.

5.2 Topography, geology, soils and hydrology

Topography, geology and soils all influence how a catchment responds to rainfall events:

- Topography affects rainfall run-off rates. In steeper valleys, rainfall generally runs off to the river faster than in a flatter valley.
- Geology and soils influence how water runs off the ground surface. This is mainly due to the permeability of the surface material and bedrock stratigraphy. For example, clay rich (low permeability) soils promote rapid surface runoff, whereas more permeable rocks (e.g., limestone and sandstone) may result in a more subdued response.

5.2.1 Topography

Breckland is a relatively low-lying area with the elevation varying from 0.5mAOD, south-west of Swaffham in the east of Breckland, to 98mAOD at an area of high ground in the centre and north-east in Breckland.

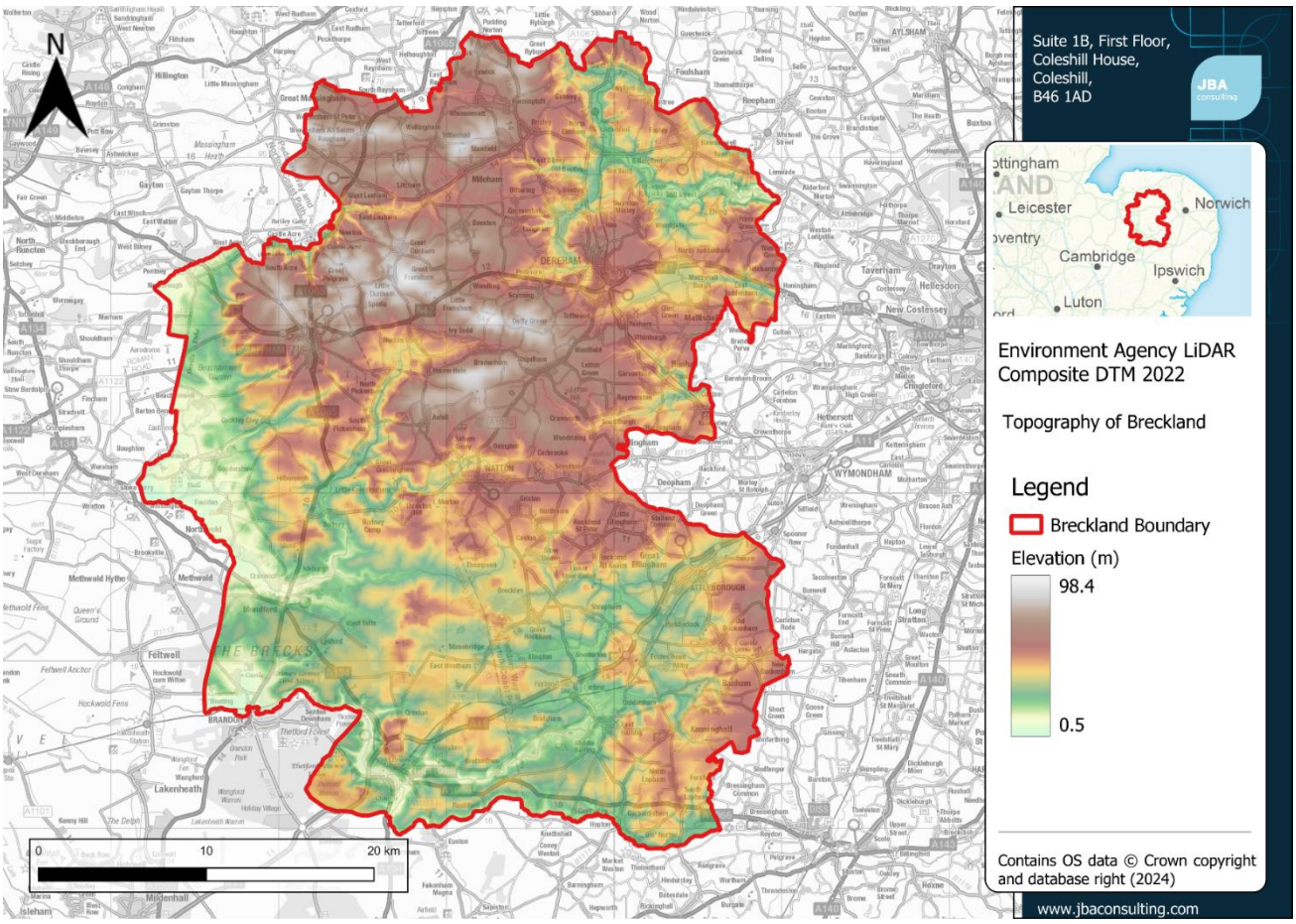


Figure 5-1 Topography of Breckland District

5.2.2 Geology

British Geological Survey (BGS) 50K mapping was used to assess Breckland geology.

Breckland's bedrock is primarily White chalk in the centre of the borough. However, small portions of the west of Breckland have Grey chalk and Gault formation and Upper Greensand formation (mudstone, sandstone and limestone) bedrock.

This bedrock is overlain by different superficial deposits. Whilst the majority of the borough is covered by Till, parts of the north of the district, south of Fakenham, are Glacial Sand and Gravel. Additionally, parts of the south are overlain by Clay, Silt and Sand.

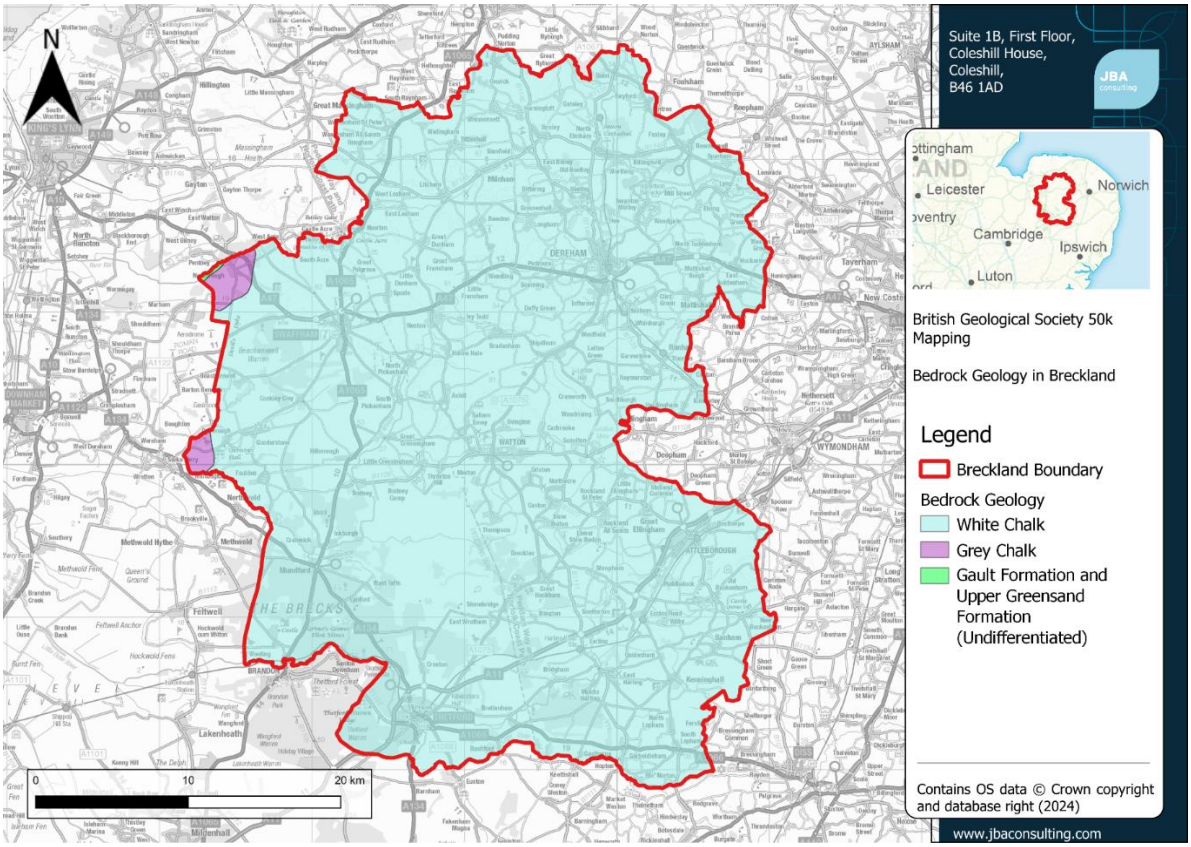


Figure 5-2 Bedrock Geology of Breckland District

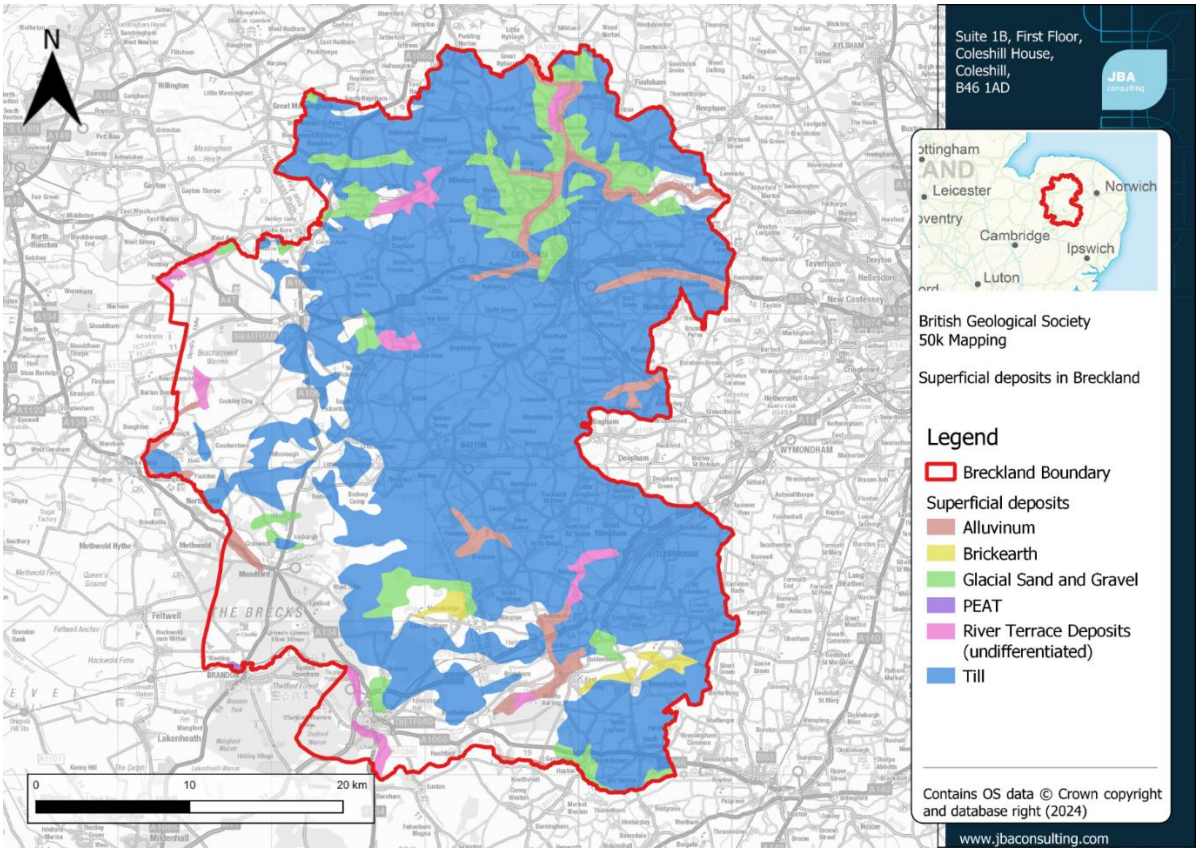


Figure 5-3 Superficial deposits within Breckland District

5.2.3 Soils

Cranfield University Soilscapes mapping has been used to assess the Breckland's soil types. It should be noted Soilscapes must only be used at strategic level and is not intended as a means for supporting detailed assessments, such as land planning applications or site investigations. For the detailed assessment of soils at a specific site, a ground investigation needs to be conducted.

In the north (south of Fakenham) and east of the Breckland (near Swaffham), there are loamy and clayey soils of coastal flats with impeded and slightly impeded drainage. In the south and east of the Breckland, soils are sandy and loamy and are freely draining.

5.3 Hydrology

The principal watercourses flowing through Breckland are the:

- River Tud;
- River Thet;
- River Wensum;
- River Wissey;
- River Nar

Tributaries of these watercourses include smaller main rivers and ordinary watercourses. There are also a number of ponds and lakes within the study area. A map of the primary watercourses is shown in Figure 1-2 and static mapping in Appendix A.

5.4 Fluvial and tidal flood risk

Fluvial flood risk in the District is from the Rivers Nar, Wensum, Tud, Wissey, Thet, Waveney, Yare, Little Ouse River, and Blackwater River, and their associated tributaries.

There is currently no tidal risk to Breckland according to the Environment Agency's 'The Wash' Tidal Hazard Mapping Model (2016), including in the 0.1% AEP including an allowance for climate change.

The Environment Agency's Flood Map for Planning uses undefended detailed modelling, or broadscale modelling where detailed modelling does not exist to define Flood Zone 2 (the 0.1% AEP event) and Flood Zone 3a (the 1% AEP event). Flood Zone 3b (the functional floodplain) is defined as the 3.3% AEP modelled extent, or areas where water will need to be stored in times of flood. Wherever modelled extents do not exist for the 3.3% AEP event, Flood Zone 3a should be considered as Flood zone 3b. Areas at the highest risk of fluvial flooding within Breckland include:

- River Wensum:
  - Lyng Road, Mill Street and Fustyweed (Lyng)
  - Church Road (Worthing)
  - Dereham Road (south of North Elmham)
  - Mid-Norfolk Railway Line (north of Hoe Road)
  - Rushmeadow Road, Riverside and Bushy Common (west of Dereham)
  - Beeston Lane (Great Fransham)
- River Nar:
  - Swaffham Road, Lexham Road and Dunham Road (West and East Lexham)
  - Church Street, Dereham Road, Litcham Road and Beeston Road (Litcham)
  - Main Road (Narborough)
- River Tud:
  - Mill Road (Clippings Green)
- Blackwater River:
  - Dereham Road (south-east of Reymerston)
  - Southburgh Road (south of Reymerston)
- Middle Wissey:
  - Eastmoor Road (north of Oxborough)
  - Oxborough Road (Oxborough)
  - Foulden Road (south of Foulden)
- Upper Wissey:
  - Swaffham Road (Mundford)

- Watton Road, Great Cressingham Road, Saham Toney Road (south of Great Cressingham)
- Station Road (North Pickenham)
- Elizabeth Drive (Necton)
- Mill Street (Bradenham)
- Swaffham Road and Saham Road (Watton)

- Little Ouse River:
  - Roads near Little Ouse River in Thetford
- River Thet:
  - Sallow Lane (south of Larling)
  - New Buckenham Road (New Buckenham)
- Little Ouse:
  - Knettishall Road (south of Lodge Covert)
  - The Street (Gasthorpe)

This study used the defended 3.3% AEP fluvial extents to define Flood Zone 3b where available, shown in Appendix A.

5.5 Surface water flooding

Surface water runoff (or 'pluvial' flooding) is normally caused by intense rainfall e.g. thunderstorms. At times the amount of water falling can completely overwhelm the drainage network, which is not designed to cope with extreme storms. Flooding can also be exacerbated by blockages to drainage networks, sewers being at capacity and/ or high-water levels in watercourses that cause local drainage networks to back up.

The mapping shows that surface water tends to be channelled by topography into watercourses as well as forming flow paths along residential and main roads in urban areas. This means that the mapping can be used to understand the risk posed by smaller watercourses that are not modelled or represented in the Environment Agency's Flood Zones. These flow paths are particularly prominent in Watton, Attleborough, New Buckenham, Thetford, Swaffham and Dereham. The RoFSW mapping for Breckland can be found in the Geo-PDF mapping in Appendix A.

The Environment Agency's Risk of Flooding from Surface Water mapping (RoFSW) shows that a number of communities are at risk of surface water flooding. The areas worst affected during the 0.1% AEP surface water event include:

- Watton and Saham Toney, along Cley Lane and Saham Road
- Little Ellingham
- Besthorpe, between Mill Lane and Norwich Road
- Attleborough, around Station Road, Hargham Road, and Chapel Road
- Necton, between Watery Lane and Chantry Lane
- Thetford, between Croxton Road and the railway line, and between Norwich Road and the River Thet

- Swaffham, between Sandringham Way and Watton Road
- Dereham, between Kings Road, Swanton Road and Neatherd Road

This list is not exhaustive and focuses on the populated areas most at risk. Owing to the nature of surface water risk and the generally low-lying nature of Breckland, there are many undeveloped rural areas shown to be at risk of surface water flooding. Developers should consult the latest available surface water mapping for their specific site.

5.6 Sewer flooding

Sewer flooding occurs when intense rainfall/ river flooding overloads sewer capacity (surface water, foul or combined), and/or when sewers cannot discharge to watercourses due to high water levels.

Sewer flooding can also be caused by blockages, collapses, equipment failure or groundwater leaking into sewer pipes.

Since 1980, the Sewers for Adoption guidelines mean that new surface water sewers have been designed to have capacity for a rainfall event with a 3.3% AEP (1 in 30) chance of occurring in any given year, although until recently this did not apply to smaller private systems. This means that sewers will be overwhelmed in larger rainfall and flood events. Existing sewers can also become overloaded as new development adds to the surface water discharge to their catchment, or due to incremental increases in roofed and paved surfaces at the individual property scale (urban creep). Sewer flooding is therefore a problem that could occur in many locations across the study area.

Anglian Water is the water company responsible for the management of the sewer drainage networks across Breckland. Sewer flooding data was available for use in the study, and is summarised in Table 5-2. This information was available at postcode level, therefore some records may lie outside Breckland District where postcode areas straddle district boundaries. Not all records were distinguished between internal property flooding and external flooding (e.g. to highways and curtilage).

Towns associated with large numbers of reported sewer flooding incidents include:

- Thetford, IP24 3 (particularly Aug 2013, 13 records)
- Watton, IP25 6 (particularly October-Jan 2023, 30 records)
- Dereham, IP19/NR20 (no notable grouping, but consistent flooding across period of record)

Table 5-2 Summary of Historic Sewer Flooding in Breckland District

	Recorded Sewer Flooding Incidents per Year (20XX)																			
Postcode	**05**	**06**	**07**	**08**	**09**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**Total**
1P222																		1	3	**4**
IP24 1	1		1															5	4	**11**
IP24 2		1							2		1								2	**6**
IP24 3								30	3	6	1				2	2	1	6		**51**
IP25 6		4	7						2	1	3				5	2		20	12	**56**
IP25 7							1	3			7			1	1			4	11	**28**
IP26 5																		3	5	**8**
NR161								1							1					**2**
NR162																		11		**11**
NR171									1									5	15	**21**
NR172				4			2						1		4			2	1	**14**
NR191					4					2	5				1	1		6	9	**28**
NR192					1				1	1	1									**4**
NR20			4	7	4	1	8	5	7			1			8			2	2	**49**

	Recorded Sewer Flooding Incidents per Year (20XX)																			
3																				
NR204															1			1		**2**
NR205							1					2		1				6	1	**11**
NR210		1		1				1							1	4	2	4		**14**
NR217																1		1	6	**8**
NR9 4			2	2			1				2	5	3	4	3	1		3	5	**31**
NR9 5							1	1	3		4								1	**10**
PE321							16	2	1		2		1		5	3	1	1		**32**
PE322								2	3	1		1			4		1	3	4	**19**
PE339															1	1		4	2	**8**
PE377											1				1			8	8	**18**
PE378														1	3	3		3	9	**19**
Total	**1**	**6**	**14**	**14**	**9**	**1**	**30**	**45**	**23**	**11**	**27**	**9**	**5**	**7**	**41**	**18**	**5**	**99**	**100**	**465**

n

5.7 Groundwater flooding

In general, less is known about groundwater flooding than other sources. Groundwater flooding can be caused by:

- High water tables, influenced by the type of bedrock and superficial geology.
- Seasonal flows in dry valleys, which are particularly common in areas of chalk geology.
- Rebounding groundwater levels, where these have been historically lowered for industrial or mining purposes.
- Long culverts that prevent water easily getting into watercourses.

Groundwater flooding is different to other types of flooding in that it can last for days, weeks or even months and is much harder to predict and warn for. Monitoring does occur in certain areas, for example where there are major aquifers or when mining stops.

To assess groundwater flooding within the Breckland, the Groundwater Flood Map 5m Resolution GW5 V2.3. has been used. The Groundwater Flood Risk Map shows areas of potential groundwater emergence and highlights areas where there is sufficient evidence to suggest that flooding could occur. The RoFSW map and topographic mapping can be used to infer areas where groundwater may flow towards and cause flooding after emerging. Whilst this data should be used as part of the Sequential Test, it is not directly comparable to other datasets (e.g. Flood Zones) and therefore cannot categorise an area as high, medium or low risk on its own. The map should be interpreted as an initial indicative tool to assess groundwater flood risk at preliminary stages of planning/site allocation.

The V2.3. model categorises five different classes (0-5). A detailed description of each individual class is given below in Table 5-3.

Table 5-3 Groundwater Flood Hazard Classifications

Groundwater head difference (m)	Class	Class Label
0 to 0.25	4	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.

Groundwater head difference (m)	Class	Class Label
0.025 to 0.5	3	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	2	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event. There is a risk of flooding to subsurface assets but surface manifestation of groundwater is unlikely.
>5	1	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	0	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits

Groundwater risk within Breckland is generally limited to the southwest of the district, and the vicinity of the River Wensum in the northeast.

Areas where groundwater is closest to the surface, and most likely to emerge are:

- The immediate vicinity of the River Wissey, River Gadder, River Thet, River W and River Wensum
- Saham toney and west of Watton
- South and west of Necton
- Gressenhall

5.8 Flooding from reservoirs

Reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoir Act 1975 and are on a register held by the Environment Agency. The level and standard of inspection and maintenance required by a Supervising Panel of Engineers under the Act means that the risk of flooding from reservoirs is very low.

Flooding from reservoirs occurs following partial or complete failure of the control structure designed to retain water in the artificial storage area. Reservoir flooding is very different from other forms of flooding; it may happen with little, or no warning and evacuation will

need to happen immediately. The likelihood of such flooding is difficult to estimate but is extremely low compared to flooding from other sources. It may not be possible to seek refuge upstairs from floodwater as buildings could be unsafe or unstable due to the force of water from the reservoir breach or failure.

The Environment Agency hold mapping showing what might happen if reservoirs fail. Developers and planners should check the Long-Term Risk of Flooding website before using the reservoir data shown in this SFRA to make sure they are using the most up to date mapping. The Environment Agency provide two flooding scenarios for the reservoir flood maps: a “dry day” and a “wet day”. The “dry day” scenario shows the predicted flooding which would occur if the dam or reservoir fails when rivers are at normal levels. The “wet day” scenario shows the predicted worsening of the flooding which would be expected if a river is already experiencing an extreme natural flood.

The current mapping indicates that there are 49 reservoirs with extents that affect Breckland (Table 5-4). Section 7.4.3 provides further considerations for developing in the vicinity of reservoirs. The reservoir flood mapping for both the “dry day” and “wet day” scenarios in Breckland has been provided in Appendix A. The Environment Agency maps represent a credible worst-case scenario. In these circumstances it is the time to inundation, the depth of inundation, the duration of flooding and the velocity of flood flows that will be most influential.

Table 5-4 Reservoirs with flood extents that have the potential to impact Breckland District

Reservoir	Northings and eastings	Reservoir owner	Local Authority Area	Within the study area?	Affects Breckland in the X day scenario	
					Dry	Wet
Battles East	573853, 310398	Queensquare Farming Limited	Norfolk	Yes	Yes	Yes
Bridgham Reservoir	595692, 286523	Paul Rackham Ltd	Norfolk	Yes	Yes	Yes
Buckenham Tofts Upper	582293, 294770	Ministry of Defence	Norfolk	Yes	Yes	Yes
Caldecote Farm	575964, 303951	Heygate Farms Swaffham Ltd	Norfolk	Yes	Yes	Yes
Canada Farm	577914, 276360	Elveden Farms Ltd	Suffolk	No	Yes	Yes
Cley Breck North	577050, 303709	OW Wortley & Sons Limited	Norfolk	Yes	Yes	Yes

Reservoir	Northings and eastings	Reservoir owner	Local Authority Area	Within the study area?	Affects Breckland in the X day scenario	
					Dry	Wet
Battles East	573853, 310398	Queensquare Farming Limited	Norfolk	Yes	Yes	Yes
Dodds 2 Reservoir	575490, 320199	Heronhill Water LLP	Norfolk	No	Yes	Yes
Dolphin Farm Reservoir	595296, 282497	Paul Rackem Ltd	Norfolk	Yes	Yes	Yes
Eldon Cottages	579857, 279598	Elveden Farms Ltd	Suffolk	Yes	Yes	Yes
Elveden Forest Lake	579873, 280308	Center Parcs Limited	Suffolk	No	Yes	Yes
Feltwell Anchor Reservoir	565557,290044	G C Field & Sons	Norfolk	No	Yes	Yes
Fourteen Acre Field	580301, 307614	Heygate Farms Swaffham Ltd	Norfolk	Yes	Yes	Yes
Grafham Water	514621, 268013	Anglian Water Services Ltd	Cambridgeshire	No	No	Yes
Grange Farm Reservoir	572774, 292083	EW Porter & Son	Norfolk	No	Yes	Yes
Further Fen Farm Reservoir	560903, 295186	A.L. Legge & Son	Norfolk	No	No	Yes
Golder Hill	568936, 323665	Mr Micheal Rae	Norfolk	No	No	Yes
Hadler's Hole, Croxton Hall Farm Reservoir	588024, 286485	Mr G Goucher	Norfolk	Yes	Yes	Yes
Hall Farm Reservoir Herringswell	573140, 268681	Taylor Farms	Suffolk	No	No	Yes

Reservoir	Northings and eastings	Reservoir owner	Local Authority Area	Within the study area?	Affects Breckland in the X day scenario	
					Dry	Wet
Battles East	573853, 310398	Queensquare Farming Limited	Norfolk	Yes	Yes	Yes
Hall Farm Reservoir Illington	594479, 289251	Richard Johnston Limited	Norfolk	Yes	Yes	Yes
Hamrow Farm	591119, 323786	Stangroom Bros Limited	Norfolk	Yes	Yes	Yes
Highmoor Drove	576876, 298080	JW Spencer Farms Limited	Norfolk	Yes	Yes	Yes
Honey Pots (field 6)	577275, 300483	OW Wortley & Sons Limited	Norfolk	Yes	Yes	Yes
Kirk Hill Farm	599273, 295137	Kirk Hill Farms	Norfolk	Yes	Yes	Yes
Lakenheath	567686, 285427	RSBP	Suffolk	No	Yes	Yes
Larkshall 25M Gallon	592289, 289226	RG Abrey Farms	Norfolk	Yes	Yes	Yes
Magpie Farm	572041, 314620	Davison & Co Limited	Norfolk	No	Yes	Yes
Manor Farm Reservoir (Bury St Edmunds)	592158, 272897	Fredrick Hiam Ltd	Suffolk	No	Yes	Yes
Manor Farm Reservoir (Wells)	581357, 316499	Holkham Farming Company Ltd	Norfolk	Yes	Yes	Yes
Manor Farm Reservoir (West Bilney)	572063, 314626	OW Wortley & Sons Limited	Norfolk	No	Yes	Yes
Narford Lake	576094, 313923	Trustees of the Fountaine Settlement	Norfolk	Yes	Yes	Yes
New Barn Reservoir	560963, 295162	Waldersey Farms Ltd	Norfolk	No	No	Yes

Reservoir	Northings and eastings	Reservoir owner	Local Authority Area	Within the study area?	Affects Breckland in the X day scenario	
					Dry	Wet
Battles East	573853, 310398	Queensquare Farming Limited	Norfolk	Yes	Yes	Yes
Piggeries Field, Ikburgh	580410, 296450	JW Spencer Farms Limited	Norfolk	Yes	Yes	Yes
Pioneer and Severalls Farm Reservoir	567284, 297380	GS Shropshire & Sons Limited	Norfolk	No	Yes	Yes
Reaches Farm	573559, 298353	OW Wortley & Sons Limited	Norfolk	No	Yes	Yes
Redgrave Park	605374, 276571	Mrs Ann Topham	Suffolk	No	Yes	Yes
Rosedene Reservoir No.1	568003, 295168	GS Shropshire & Sons Ltd	Norfolk	No	Yes	Yes
Shadwell Park Lane	591795, 282854	Shadwell Estate Company Limited	Norfolk	Yes	Yes	Yes
Stanford Water	586054, 294950	Ministry of Defence	Norfolk	Yes	No	Yes
South Pickenham	585701, 303350	The South Pickenham Estate Company Limited	Norfolk	Yes	Yes	Yes
Spring Lodge Methwold	575414, 294791	OW Wortley & Sons Limited	Norfolk	No	Yes	Yes
Stow Bardolph No.1	563691, 305521	Stow Estate Trust	Norfolk	No	No	Yes
Stanford Water	586019, 294991	Ministry of Defence	Norfolk	Yes	Yes	Yes

Reservoir	Northings and eastings	Reservoir owner	Local Authority Area	Within the study area?	Affects Breckland in the X day scenario	
					Dry	Wet
Battles East	573853, 310398	Queensquare Farming Limited	Norfolk	Yes	Yes	Yes
Stradsett Lake	566763, 306080	Stradsett Estate Trustees	Norfolk	No	Yes	Yes
Top Strong Land	575811, 302974	Oxborough Farms Ltd	Norfolk	Yes	Yes	Yes
Warren Farm Beachamwell	577679, 306353	Heygate Farms Swaffham Ltd	Norfolk	Yes	Yes	Yes
Warren Gun Breck	579824, 302705	Hilborough Farms Limited	Norfolk	Yes	Yes	Yes
Warren Lodge Farm	575601, 293882	EW Porter & Son	Norfolk	Yes	Yes	Yes
Wissington No.1 (Duck) Pond	566022, 298336	British Sugar Plc	Norfolk	No	No	Yes
Wissington No.2 Pond (Storage Lagoon)	566195, 298339	British Sugar Plc	Norfolk	No	No	Yes

5.9 Impact of climate change in Breckland

This section explores which areas of Breckland are most sensitive to increases in flood risk due to climate change. It should be noted that areas that are already at high risk will also become at increasing risk in future and the frequency of flooding will increase in such areas.

It is recommended that Breckland Council work with other Risk Management Authorities (RMAs) to review how existing and new development in these areas are to be protected from flood risk when developing climate change plans and strategies for the District. For example, SuDS and blue-green infrastructure can help manage and even improve surface water flood risk.

5.9.1 Impact of climate change on fluvial flood risk

Whilst there are many watercourses within Breckland where flood extents are predicted to increase as a result of climate change, owing to the rural nature of the District there are very few areas where properties not currently at risk are shown to be at risk in future. The only area where there is a significant sensitivity to climate change affecting properties is the River Thet through Thetford, where flood extents are shown to increase significantly and affect properties in the east of the town.

5.9.2 Impact of climate change on surface water flood risk

The 0.1% AEP surface water event from the RoFSW dataset has been used in this study as a proxy for the 1% AEP plus an allowance for climate change uplift to provide a conservative indication of the impact of climate change on surface water risk (as well as for smaller watercourses).

It is expected that the Environment Agency's **NaFRA2** will be published early in 2025, which will include national surface water mapping including climate change, which would quickly supersede any additional modelling done as part of this assessment.

In general, surface water is modelled to follow similar paths and patterns in the future as present day, just with significantly greater extents and associated depths, velocities and hazards.

Areas in Breckland Council's Administrative Area particularly sensitive to climate change impacts on surface water flooding are:

- Massingham Road and Swaffham Road in Weasenham.
- High Street and Peak Hall in Tittleshall.
- Station Road in Holme Hale.
- The Street, Hillview and Latimer Way in North Pickenham.
- The majority of roads of Thetford.

5.9.3 Impact of climate change on groundwater flood risk

There is no technical modelling data available to assess climate change impacts on groundwater. It would depend on the flooding mechanism, historic evidence of known flooding and geological characteristics, for example prolonged rainfall in a chalk catchment. Flood risk could increase when groundwater is already high or emerged, causing additional overland flow paths or areas of still ponding.

A high likelihood of groundwater flooding may mean infiltration SuDS are not appropriate and groundwater monitoring may be recommended.

5.9.4 Impact of climate change on sewer flooding

Surface water and fluvial flooding with climate change have the potential to impact the sewerage system, so careful management of these is needed for development. Due to differing ages of settlements, there will be drainage systems consisting of different types of

sewers. Increasing pressures from climate change, urban creep and infill development could impact the performance of the sewerage system.

5.9.5 Adapting to climate change

The **PPG Climate Change guidance** contains information and guidance for how to identify suitable mitigation and adaptation measures in the planning process to address the impacts of climate change. Examples of adapting to climate change include:

- Considering future climate risks when allocating development sites to ensure risks are understood over the development's lifetime;
- Considering the impact of and promoting design responses to flood risk and coastal change for the lifetime of the development;
- Considering availability of water and water infrastructure for the lifetime of the development and design responses to promote water efficiency and protect water quality;
- Promoting adaptation approaches in design policies for developments and the public realm for example by building in flexibility to allow future adaptation if needed, such as setting new development back from watercourses;
- Identifying no or low-cost responses to climate risks that also deliver other benefits, such as green infrastructure that improves adaptation, biodiversity and amenity, for example by leaving areas shown to be at risk of flooding as public open space;
- Considering the standard of protection of defences and sites for future development, in relation to sensitivity to climate change. Breckland Council and developers will need to work with RMAs and use the SFRA datasets to understand whether development is affordable or deliverable. Locating development in such areas of risk may not be a sustainable long-term option, such as at the defence locations mentioned in Section 6; and
- It is recommended that the differences in flood extents from climate change are compared by Breckland Council when allocating sites, to understand how much additional risk there could be, where this risk is in the site, whether the increase is marginal or activates new flow paths, whether it affects access/ egress and how much land could still be developable overall. Recommendations for development are made for the levels of risk in the SFRA User Guide in Appendix C.

5.10 Flood Alert and Flood Warnings

The Environment Agency is the lead organisation for providing warnings of river flooding. Flood Warnings are supplied via the Flood Warning System (FWS) service, to homes and business within Flood Zones 2 and 3. There is currently one Flood Alert Area (FAA) and nine Flood Warning Areas (FWAs) covering the Breckland.

Flood Alerts are issued when there is water out of bank for the first time anywhere in the catchment, signalling that 'flooding is possible', and therefore Flood Alert Areas usually cover the majority of Main River reaches.

Flood Warnings are issued to designated Flood Warning Areas (i.e. properties within the extreme flood extent which are at risk of flooding), when the river level hits a certain threshold; this is correlated between the FWA and the gauge, with a lead time to warn that 'flooding is expected'.

A list of the Flood Alert and Flood Warning Areas is available in Appendix D. A map of the Flood Alert Areas and Flood Warning Areas is included in the flood risk mapping in Appendix A.

5.11 Summary of flood risk in Breckland

A table summarising all sources of flood risk to key settlements in Breckland District can be found in Appendix E. Static mapping is provided in Appendix A. These show the outlines from each source of flood risk in separate maps.

6 Flood Alleviation Schemes and Assets

This section provides a summary of existing flood alleviation schemes and assets in Breckland. Planners should note the areas that are protected by defences, where further work to understand the actual and residual flood risk through a Level 2 SFRA may be beneficial. Developers should consider the benefit they provide over the lifetime of a development in a site-specific Flood Risk Assessment.

6.1 Asset management

Risk Management Authorities (RMAs) hold databases of flood risk management and drainage assets:

- The Environment Agency holds a national database that is updated by local teams.
- The LLFA holds a database of significant local flood risk assets, required under **Section 21 of the Flood and Water Management Act (2010).**
- Highways Authorities hold databases of highways drainage assets, such as gullies and connecting pipes.
- Water Companies hold records of public surface water, foul and combined sewers, the records may also include information on culverted watercourses.

The databases include assets maintained by RMAs, as well as third-party assets. The drainage network is extensive and will have been modified over time. It is unlikely that any RMA contains full information on the location, condition and ownership of all the assets in their area. They take a prioritised approach to collecting asset information, which will continue to refine the understanding of flood risk over time.

Developers should collect the available asset information and undertake further survey as necessary to present an understanding of current flood risk and the existing drainage network in a site-specific FRA.

The databases include assets maintained by RMAs, as well as third-party assets. The drainage network is extensive and will have been modified over time. It is unlikely that any RMA contains full information on the location, condition and ownership of all the assets in their area. They take a prioritised approach to collecting asset information, which will continue to refine the understanding of flood risk over time.

Developers should collect the available asset information and undertake further survey as necessary to present an understanding of current flood risk and the existing drainage network in a site-specific FRA.

6.2 Standards of Protection

Flood defences are designed to give a specific Standard of Protection (SoP), reducing the risk of flooding to people and property in flood prone areas. For example, a flood defence

with a 100-year SoP means that the flood risk in the defended area is reduced to at least a 1% chance of flooding in any given year.

Over time the actual SoP provided by the defence may decrease, due to deterioration in condition or increases in flood risk due to climate change. The understanding of SoP may also change over time as RMAs collect more data, undertake more detailed surveys and flood modelling studies, or review SoP after a flood event.

It should be noted that the Environment Agency's on-going hydraulic modelling programme may revise flood risk datasets and, consequently, the standard of protection offered by flood defences in the area may differ from those discussed in this report.

Developers should consider the SoP provided by defences and residual risk as part of a detailed FRA.

6.3 Maintenance

The Environment Agency and local authorities have permissive powers to maintain and improve main rivers and ordinary watercourses, respectively. Permissive powers means that RMAs are permitted to undertake works on watercourses but there is no legal duty to maintain watercourses, defences or assets and maintenance and improvements are prioritised based on flood risk. The ultimate responsibility for maintaining watercourses rests with the landowner.

Highways authorities have a duty to maintain public roads, making sure they are safe, passable and the impacts of severe weather have been considered. They are also responsible for maintaining sections of watercourses where they are crossed by highways.

Water companies have a duty to effectually drain their area. What this means in practise is that assets are maintained to common standards and improvements are prioritised for the parts of the network that do not meet this standard e.g., where there is frequent highway or sewer flooding.

IDB's have permissive powers to undertake and regulate works on or affecting the watercourses within their district within their internal drainage district, and have a general power of supervision over all matters relating to water level management in their district.

Norfolk County Council as the LLFA have permissive powers and limited resources are prioritised and targeted to where they can have the greatest effect.

There is potential for the risk of flooding to increase in areas where flood alleviation measures are not maintained regularly. Breaches in raised flood defences are most likely to occur where the condition of a flood defences has degraded over time. Drainage networks in urban areas can also frequently become blocked with debris and this can lead to blockages at culverts or bridges.

Developers should not assume that any defence, asset or watercourse is being or will continue to be maintained throughout the lifetime of a development. They should contact

the relevant RMA about current and likely future maintenance arrangements and make future users of the development aware of their obligations to maintain watercourses.

Formal structural defences are given a rating based on a grading system for their condition. A summary of the grading system used by the Environment Agency for condition is provided in Table 6-1

Table 6-1 Grading system used by the Environment Agency to classify asset condition

Grade	Rating	Description
1	Very good	Cosmetic defects that will have no effect on performance
2	Good	Minor defects that will not reduce the overall performance of the asset.
3	Fair	Defects that could reduce the performance of the asset.
4	Poor	Defects that would significantly reduce the performance of the asset. Further investigation required.
5	Very Poor	Severe defects resulting in complete performance failure.

6.4 Major flood risk management assets in Breckland

'**Reduction in Risk of Flooding from Rivers and Sea due to Defences'** is a spatial dataset produced by the Environment Agency. It displays areas which have reduced flood risk from rivers and sea due to the presence of flood defences. The underlying model is run taking account of current flood defences to determine how much water would flood the land for a range of events (between 0.1% and 100% AEP events) with different combinations of defence breaching or overtopping.

The majority of Breckland has not been identified as having a reduced risk of river and sea flooding due to the presence of defences. However, there are small areas which are covered by this dataset. These predominantly remain along the Rivers Tud, Wensum, Wissey, Yare, Blackwater River, and Lode Dike. This is an indicative dataset and is not suitable for identifying risk at individual properties.

In addition, the Environment Agency's '**AIMS spatial flood defences'** dataset gives further information on flood defence assets within the Breckland council area. describes the locations which benefit from flood defences and the SoP offered.

Table 6-2 Areas where there is a reduction in risk of flooding form rivers and sea due to defences within Breckland District

Watercourse	Location	Type	Design SoP (AEP)	Condition Rating
River Wissey	550m between Whittington and River Gadder confluence	Embankment	5%	Fair

Watercourse	Location	Type	Design SoP (AEP)	Condition Rating
Blackwater River	South of Southburgh Road	Demountable Defence	Unknown	Unknown

6.5 Existing and future flood alleviation schemes

6.5.1 Breckland Flood Alleviation schemes

There are currently no known flood alleviation schemes within or affecting Breckland.

The **Environment Agency's Asset Management map** provides an updated indication of schemes that are under construction or have a forecast start date. There are no capital schemes within the extent of Breckland.

6.6 Natural Flood Management

Natural Flood Management (NFM) is used to protect, restore and re-naturalise the function of catchments and rivers to reduce flood risk. A wide range of techniques can be used that aim to reduce flooding by working with natural features and processes to store or slow down flood waters before they can damage flood risk receptors (e.g., people, property, infrastructure, etc.).

NFM has been identified as an important flood risk reduction tool in the Environment Agency's 2020 '**National Flood and Coastal Erosion Risk Management Strategy for England'** (see Section 2.5.1). NFM techniques which could be applied in Breckland include:

- SuDS including swales, wetlands in urban areas, green roofs, permeable pavements, detention ponds and filter strips.
- Targeted woodland planting.
- Improvements in land and soil management practices.
- Reconnection and restoration of functional floodplains.
- Re-meandering streams (creation of new meandering courses or reconnecting cut-off meanders to slow the flow of the river).
- Restoration of rivers and removal of redundant structures i.e., weirs and sluices no longer used or needed.
- Development of inland storage ponds and wetlands.
- Installation of in-stream structures e.g., woody debris.

In 2017, the Environment Agency published an **online evidence base** to support the implementation of NFM and maps showing locations with the potential for NFM measures. These maps are intended to be used alongside the evidence directory to help practitioners think about the types of measures that may work in a catchment and the best places in which to locate them.

NFM can be used to increase the benefit achieved from Biodiversity Net Gain (BNG) when implementing new development. New development can help to fund NFM works in the upper catchment that will potentially contribute to reducing flood risk. Developments such as solar farms can be a good opportunity for on-site NFM works that can potentially contribute to downstream improvements.

To maximise the benefits of NFM, it is important that land which is likely to be needed for NFM is protected by safeguarding land for future flood risk management infrastructure.

Norfolk County Council has a number of past and ongoing Natural Flood Management schemes within Breckland District, including the Wensum River Restoration Scheme undertaken in 2009, the Broadland Slow the Flow project in 2015-16, and the ongoing North Attleborough Flood Management project which received government funding in 2024.

Norfolk and Suffolk County Councils also run the **Reclaim the Rain** project, which is part of Defra's Flood and Coastal Resilience and Innovation programme. The project seeks to reduce flood risk and save water through a number of initiatives including nature-based solutions, retrofitting of blue and green roofing in developed areas, and increasing infiltration through permeable urban surfaces.

Developers should consult Norfolk County Council for more details of NFM schemes within Breckland and to identify opportunities for development to support NFM initiatives.

6.7 Actual and residual flood risk

A Level 2 SFRA (for strategic allocations identified as at risk following a screening exercise) or developer site-specific Flood Risk Assessment will need to consider the actual and residual flood risk due to the presence of flood and drainage assets in greater detail.

6.7.1 Actual flood risk

Actual flood risk is the risk to a site where there are no defences or mitigation measures in place, or where mitigation measures are functioning as designed (within the design SoP). Flood defence infrastructure and on site-mitigation measures can reduce the risk to a site, however there will always be some element of risk remaining, known as the residual risk (see Section 6.7.2 below). Any assessment of actual risk to a site should consider:

- The level of protection afforded by existing defences might be less than the appropriate standards and hence may need to be improved if further growth is contemplated.
- The flood risk management policy for the defences will provide information on the level of future commitment to maintain existing standards of protection. If there is a conflict between the proposed level of commitment and the future needs to support growth, then it will be a priority for this to be reviewed.
- The standard of safety must be maintained for the intended lifetime of the development. Over time the effects of climate change will erode the present-day SoP afforded by defences and so commitment is needed to invest in the

maintenance and upgrade of defences if the present-day levels of protection are to be maintained and where necessary, land secured and safe-guarded that is required for affordable future flood risk management measures.

- By understanding the depth, velocity, speed of onset and rate of rise of floodwater it is possible to assess the level of hazard posed by flood events from the respective sources.

6.7.2 Residual risk

Residual risk is the risk that remains after the impacts of flood risk infrastructure or site-specific mitigation measures have been considered. It is important that these risks are quantified to confirm that the consequences can be safely managed. The residual risk can be:

- The effects of a larger flood than defences were designed to alleviate (the 'design flood'). This can cause overtopping of flood banks, failure of flood gates to cope with the level of flow or failure of pumping systems to cope with the incoming amount of water.
- Failure of the defences or flood risk management measures, such as breaches in embankments or walls, failure of flood gates to open or close or failure of pumping stations.
- It is the responsibility of the developer to fully assess flood risk, propose measures to mitigate it and demonstrate that any residual risks can be safely managed.

This SFRA does not assess the probability of failure other than noting that such events are very rare. However, in accordance with NPPF, all sources of flooding need to be considered. If a breach or overtopping event were to occur, then the consequences to people and property could be high. Developers should be aware that any site that is at or below defence level, may be subject to flooding if an event occurs that exceeds the design capacity of the defences, or the defences fail, and this should be considered in a detailed FRA.

The assessment of residual risk should consider:

- The flood hazard, depth, and velocity that would result from overtopping or breach of defences. Flood gate or pumping station failure and/ or culvert blockage (as appropriate). The Environment Agency can provide advice at site-specific development level for advice on breach/ overtopping parameters for flood models.
- The design of the development to take account of the highest risk parts of the site e.g., allowing for flood storage on parts of the site and considering the design of the development to keep people safe e.g., sleeping accommodation above the flood level or raising finished floor levels above the breach flood levels.
- A system of warning and a safe means of access and egress from the site in the event of a flood for users of the site and emergency services.

- Climate change and/ or policy-dependent residual risks (such as those that may be created, if necessary, future defence improvements are required, or those associated with any managed adaptive strategies).

6.7.2.1 Overtopping

The risk from overtopping of defences is based on the relative heights of property or defence, the distance from the defence level and the height of water above the crest level of the defence. The Defra Flood Risks to People guidance document provides standard flood hazard ratings based on the distance from the defence and the level of overtopping.

Any sites located next to defences or perched ponds/ reservoirs, may need overtopping modelling or assessments at the site-specific FRA stage, and climate change needs to be taken in to account.

6.7.2.2 Defence breach

A breach of a defence occurs when there is a failure in the structure and a subsequent ingress of flood water.

Where defences are present, risk of breach events should be considered as part of the site-specific FRA. Flood flows from breach events can be associated with significant depths and flow velocities in the immediate vicinity of the breach location and so FRAs must include assessment of the hazards that might be present so that the safety of people and structural stability of properties and infrastructure can be appropriately taken into account. The Defra Flood Risks to People document provides standard flood hazard ratings based on the distance from the defence and the level of the breach. Whilst the area in the immediate vicinity of a breach can be subject to high flows, the whole flood risk area associated with a breach must also be considered as there may be areas remote from the breach that might, due to topography, involve increased depth hazards.

Considerations include the location of a breach, when it would occur and for how long, the depth of the breach (toe level), the loadings on the defence and the potential for multiple breaches. There are currently no national standards for breach assessments and there are various ways of assessing breaches using hydraulic modelling. Work is currently being undertaken by the Environment Agency to collate and standardise these methodologies. It is recommended that the Environment Agency are consulted if a development site is located near to a flood defence, to understand the level of assessment required and to agree the approach for the breach assessment.

7 Flood Risk Management Requirements for Developers

This section provides guidance on site-specific Flood Risk Assessments (FRAs). These are carried out by (or on behalf of) developers to assess flood risk to and from a site. They are submitted with Planning Applications and should demonstrate how flood risk will be managed over the development's lifetime, considering climate change and vulnerability of users.

The report provides a strategic assessment of flood risk within Breckland. Prior to any construction or development, site-specific assessments will need to be undertaken so all forms of flood risk and the actual and residual risk, SoP and safety at a site are considered in more detail. Developers should, where required, undertake more detailed hydrological and hydraulic assessments of watercourses to verify flood extents (including the latest climate change allowances), to inform the sequential approach within the site and prove, if required, whether the Exception Test can be satisfied.

A detailed FRA may show that a site, windfall or other, is not appropriate for development of a particular vulnerability or even at all. The NPPF defines windfall sites as:

"*sites which have not been specifically identified as available in the Local Plan process*".

The Sequential and Exception Tests in the NPPF apply to all developments and an FRA should not be seen as an alternative to proving these tests have been met.

7.1 Principles for new developments

7.1.1 Apply the Sequential and Exception Tests

Developers should refer to Section 3.3 for more information on how to consider the Sequential and Exception Tests. For allocated sites, Breckland Council should use the information in this SFRA to apply the Sequential Test. For windfall sites a developer must undertake the Sequential Test, which includes considering reasonable alternative sites at lower flood risk. Only if it passes the Sequential Test should the Exception Test then be applied if required.

Developers should also apply the sequential approach to locating development within the site. The following questions should be considered:

- can risk be avoided through substituting less vulnerable uses or by amending the site layout?
- can it be demonstrated that less vulnerable uses for the site have been considered and reasonably discounted? and
- can the site layout be varied to reduce the number of people, the flood risk vulnerability or the building units located in higher risk parts of the site?

7.1.2 Review standing advice and guidance from statutory consultees

Prior to consulting formally with statutory consultees, it is recommended that developers review advice and guidance provided by consultees online.

- Norfolk County Council (as LLFA)
  - **Information for Developers**
  - **Pre-Application Advice Service**
- Environment Agency
  - **Flood Risk Assessments for Planning Applications**
- Breckland District Council
  - **Planning Application Guide**
  - **Breckland Design Guide**
- Anglian Water
  - **Developer Guidance**
- Water Management Alliance (IDBs)
  - **Developer Guidance**

7.1.3 Consult with statutory consultees at an early stage to understand their requirements

Developers should consult with the Environment Agency, Breckland Council, Norfolk County Council as LLFA and Anglian Water at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling, drainage assessments and design. Where development is proposed within, or could reasonably affect a watercourse within, an IDB area, the relevant IDB should also be consulted. It should be noted that some of these consultees may need to charge for advice required by developers or landowners.

7.1.4 Consider the risk from all sources of flooding and that they are using the most up to date flood risk data and guidance.

The SFRA can be used by developers to scope out what further detailed work is likely to be needed to inform a site-specific FRA. At a site level, developers will need to check before commencing on a more detailed FRA that they are using the latest available datasets. Developers should apply the most up-to-date **Environment Agency climate change** guidance (last updated in May 2022) and consider climate change adaptation measures.

7.1.5 Ensure that the development does not increase flood risk elsewhere

Section 8 sets out the requirements for taking a sustainable approach to surface water management. Developers should also confirm mitigation measures do not increase flood risk elsewhere and that floodplain compensation is provided where necessary. Developers should refer to the **Environment Agency climate change guidance** (last updated in May

2022) for the appropriate allowances to calculate floodplain storage compensation. Section 7.3.2 gives more detail on modification of ground levels and compensatory storage.

7.1.6 Ensure the development is safe for others

Consideration should first be given to minimising risk by planning sequentially across a site. Once risk has been minimised as far as possible, only then should mitigation measures be considered. Developers should consider both the actual and residual risk of flooding to the site, as discussed in Section 6.7.

Further flood mitigation measures may be needed for any developments in an area protected by flood defences, where the condition of those defences is 'fair' or 'poor', and where the standard of protection is not of the required standard. Preference should normally be given to resistance measures before considering resilience measures. Resistance and resilience measures that should be considered are detailed in Sections 7.3 and 7.4.

7.1.7 Enhance the natural river corridor and floodplain environment through new development

Developments should demonstrate opportunities to create, enhance, and link green assets. This can provide multiple benefits across several disciplines including flood risk and biodiversity/ ecology and may provide opportunities to use the land for amenity and recreational purposes. Development that may adversely affect green infrastructure assets should not be permitted. Where possible, developers should identify and work with partners to explore all avenues for improving the wider river corridor environment. Developers should open up existing culverts and should not construct new culverts on site except for short lengths to allow essential infrastructure crossings.

7.1.8 Consider and contribute to wider flood mitigation strategy and measures in the area and apply the relevant local planning policy

Wherever possible, developments should seek to help reduce flood risk in the wider area, e.g. by contributing to a wider community scheme or strategy for strategic measures, such as defences or NFM or by contributing in kind by mitigating wider flood risk on a development site. Strategic solutions that development can directly or indirectly contribute towards include upstream flood storage, integrated major infrastructure/ flood risk management schemes, new defences, and watercourse improvements as part of regeneration and enhancing green infrastructure, with opportunities for Natural Flood Management (NFM) and retrofitting Sustainable Drainage Systems (SuDS).

Existing actions relevant to Breckland District are set out in the Norfolk Local Flood Risk Management Strategy (LFRMS). The LFRMS aims to set out how flood risk will be reduced and managed across the County.

The relevant River Basin District (RBD) Flood Risk Management Plan (FRMP) also sets out local measures relevant to Breckland District. Breckland District falls within the Anglian

RBD. Measures set out within the Anglian RBD FRMP that are applicable to Breckland District include:

- Consider the outputs of Broadland Futures Initiative in the Broadland Area.
- Work with Natural England, the Broads Authority, Broadland Catchment Partnership, the RSPB, and the Farming and Wildlife Advisory Group in the Broadland area.
- Work with Norfolk Rivers Trust, River Waveney Trust, water companies, landowners, Norfolk County Council, and Internal Drainage Boards (IDBs) (amongst others) in the Broadland Rivers Management Catchment.
- Work with landowners and a range of organisations in the Broadland Rivers Management Catchment.
- Work with other organisations to develop a long term strategy in the Broadland area.
- Work with partners to deliver a variety of integrated flood risk and wider benefits when looking at natural flood management measures in the River Cam and its tributaries.

There are also some measures applicable to specific areas within Breckland District:

- Continue to investigate and, if viable, progress NFM schemes in Besthorpe, Ovington, and Saham and Toney.
- Continue to investigate and, if viable, progress surface water flood risk management schemes in Crimplesham, Watton, and Thetford.

The Environment Agency (EA) Explorer Map provides further information on regional and national measures set out as part of the FRMPs.

Developers must demonstrate in an FRA how they are identifying and taking opportunities to contribute towards reducing flood risk and help achieve the aims of the LFRMS and RBD.

7.2 Requirements for site specific Flood Risk Assessments

7.2.1 When is an FRA required?

- Site-specific FRAs are required in the following circumstances:
- Proposals on sites of one hectare or greater in Flood Zone 1.
- Proposals for new development (including minor development such as non-residential extensions, alterations which do not increase the size of the building or householder developments and change of use) in Flood Zones 2 and 3.
- Proposals for new development (including minor development and change of use) in an area within Flood Zone 1 which has critical drainage problems (as notified to the LPA by the Environment Agency).
- Where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding.

- At locations where it is proposed to locate development in a high-risk surface water flood zone.
- Land identified in this SFRA as being at increased risk in the future.
- An FRA may also be required for some specific situations:
- If the site may be at risk from the breach of a local defence (even if the site is actually in Flood Zone 1)
- Where evidence of historical or recent flood events have been passed to the LPA

7.2.2 Objectives of a site-specific FRA

Site-specific FRAs should be proportionate to the degree of flood risk and the scale, nature, and location of the development.

Site-specific FRAs should establish:

- Whether a proposed development is likely to be affected by current or future flooding from any source.
- Whether a proposed development will increase flood risk elsewhere.
- Whether the measures proposed to deal with the effects and risks are appropriate.
- The evidence, if necessary, for the local planning authority to apply the Sequential Test; and
- Whether, if applicable, the development will be safe and pass the Exception Test.

FRAs should follow the approach recommended by the NPPF (and associated guidance) and guidance provided by the Environment Agency and Breckland Council administrative area. Guidance and advice for developers on the preparation of site-specific FRAs include:

- **Standing Advice on Flood Risk** (Environment Agency)
- **Flood Risk Assessment for Planning Applications** (Environment Agency); and
- **Site-specific Flood Risk Assessment: Checklist** (NPPF PPG, Defra)

Guidance for local planning authorities for reviewing FRAs submitted as part of planning applications has been published by Defra in 2015 – Reviewing individual flood risk assessments: standing advice for Local Planning Authorities.

7.3 Local requirements for mitigation measures

7.3.1 Site layout and design

Flood risk should be considered at an early stage in deciding the layout and design of a site to provide an opportunity to reduce flood risk within the development. It is recommended that there is early engagement with the EA, Norfolk County Council as LLFA, and Anglian Water.

The NPPF states that a sequential, risk-based approach should be applied to try to locate more vulnerable land use away from Flood Zones to higher ground, while more flood-compatible development (e.g., vehicular parking, recreational space) can be located in

higher risk areas. Whether parking in floodplains is appropriate will be based on the likely flood depths and hazard, evacuation procedures and availability of flood warning.

Waterside areas, or areas along known flow routes, can act as green infrastructure, being used for recreation, amenity, and environmental purposes, allowing the preservation of flow routes and flood storage, and at the same time providing valuable social and environmental benefits contributing to other sustainability objectives. Landscaping should ensure safe access to higher ground from these areas and avoid the creation of isolated islands as water levels rise. Only water compatible development is appropriate within waterside areas, to ensure flow routes and storage are preserved, and enhanced wherever possible.

7.3.2 Modification of ground levels and development within the floodplain

Any proposal for the modification of ground levels will need to be assessed as part of a detailed flood risk assessment.

Modifying ground levels to raise the land above the required flood level is an effective way of reducing flood risk to a particular site in circumstances where the land does not act as conveyance for flood waters. However, care must be taken as raising land above the floodplain could reduce conveyance or flood storage in the floodplain and could adversely impact flood risk downstream or on neighbouring land. Raising ground levels can also deflect flood flows, so analyses should be performed to demonstrate that there are no adverse effects on third party land or property.

Compensatory flood storage should be provided wherever ground level is raised, or the built footprint is increases. This should normally be on a level for level, volume for volume basis on land that does not currently flood but is adjacent to the floodplain (for it to fill and drain). It should be in the vicinity of the development and within the red line of the planning application boundary (unless the site is strategically allocated). Wherever possible, a net gain in floodplain storage should be provided to reduce flood risk overall. Guidance on how to address floodplain compensation is provided in Appendix A3 of the **CIRIA Publication C624**.

Where proposed development results in a change in building footprint, the developer should confirm that it does not impact upon the ability of the floodplain to store or convey water and seek opportunities to provide floodplain betterment.

Raising levels can also create areas where surface water might pond during significant rainfall events. Any proposals to raise ground levels should be tested to check that it would not cause increased ponding or build-up of surface runoff on third party land.

7.3.3 Raised floor levels

The raising of internal floor levels within a development avoids damage occurring to the interior, furnishings and electrics in times of flood.

If raised flood levels are proposed, these should be agreed with the Councils and the EA.

According to the government's guidance on 'Preparing a flood risk assessment: standing advice' minimum finished floor levels for vulnerable development should normally be a minimum of whichever is higher of the following:

- 600mm above average ground level of the site.
- 600mm above the adjacent road level to the building.
- 600mm above estimated fluvial or surface water (1% AEP including climate change) flood level.

The Environment Agency can ask for finished floor levels to be raised more than 600mm above the flood level. This is usually when there is low confidence in the flood model data and therefore low confidence in the flood level provided.

Construction materials that have low permeability up to at least the same height as finished floor levels should be used. If it is not practical to raise floor levels to those specified above justification will need to be provided as part of an FRA the Environment Agency may object to the application scheme. Consultation with the Environment Agency will be required to determine alternative approaches, particularly with respect to "change of use" proposals.

The above guidelines should also apply to replacement dwellings not solely the construction of new properties and in line with the August 2022 changes to the PPG thresholds should be set to provide appropriate freeboard above flooding from all sources of flooding, not just river and sea flooding.

The additional height that the floor level is raised above the maximum water level is referred to as the "freeboard". Additional freeboard may be required because of risks relating to blockages of channels, culverts or bridges and should be considered as part of an FRA.

Allocating the ground floor of a building for non-residential use which is not as vulnerable can be an effective way of raising living space above flood levels.

Single storey buildings such as ground floor flats or bungalows are especially vulnerable to rapid rise of water (such as that experienced during a breach). This risk can be reduced by use of multiple storey construction and raised areas that provide an escape route. However, access and egress would still be an issue, particularly when the flood duration covers many days.

Similarly, the use of basements should be avoided. Annex 3 of the NPPF states that basements are "highly vulnerable" development and in accordance with Table 2 of the PPG should not be located in Flood Zone 3a or in areas at high risk of flooding from other sources. Basement dwellings in Flood Zone 2 will be required to pass the Exception Test. Access should be situated 300mm above the design flood level and waterproof construction techniques used.

7.3.4 Development and raised defences

Construction of localised raised floodwalls or embankments to protect new development is not a preferred option, as a residual risk of flooding will remain if they are overtopped or breached. To account for residual risk, regardless of new flood defences being constructed,

it is understood that the Environment Agency advises that finished floor levels must still be raised above the design flood level, or the estimated breach flood level. Compensatory storage must be provided where raised defences remove storage from the floodplain. It would be preferable for schemes to involve an integrated flood risk management solution.

Where development is located behind, or in an area benefitting from defences, the residual risk of flooding must be considered. Breach analysis or modelling may need to be undertaken as part of an FRA.

Temporary or demountable defences are not acceptable forms of flood protection for a new development but might be appropriate to address circumstances where the consequences of residual risk are severe. In addition to the technical measures the proposals must include details of how the temporary measures will be erected and dismantled, responsibility for maintenance and the cost of replacement when they deteriorate.

7.3.5 Developer contributions

In some cases, and following the application of the Sequential Test, it may be necessary for the developer to make a contribution to the improvement of flood defence provision that would benefit both proposed new development and the existing local community. Developer contributions can also be made to maintenance and provision of flood risk management assets, flood warning, and the reduction of surface water flooding (i.e. SuDS).

DEFRA's Flood and Coastal Risk Management Grant in Aid (FCRM GiA)1 can be obtained by operating authorities to contribute towards the cost of a range of activities including flood risk management schemes that help reduce the risk of flooding and coastal erosion. Some schemes are only partly funded by FCRM GiA and therefore any shortfall in funds will need to be found from elsewhere when using Resilience Partnership Funding, for example local levy funding, local businesses or other parties benefitting from the scheme. Community Infrastructure Levy is a charge that can be levied by local authorities on new development in their area to help them deliver the infrastructure needed to support development in their area, and planning obligations including Section 106. The government website provides further information on the **Community Infrastructure Levy** and **planning obligations.**

For new development in locations without existing defences, or where the development is the only beneficiary, the full costs of appropriate risk management measures for the life of the assets proposed must be funded by the developer. However, the provision of funding by a developer for the cost of the necessary standard of protection from flooding or coastal erosion does not mean the development is appropriate as other policy aims must also be met. Funding from developers should be explored prior to the granting of planning permission and in partnership with the Council and the Environment Agency.

The appropriate route for the consideration of strategic measures to address flood risk issues is the **Local Flood Risk Management Strategy** (LFRMS) prepared by the Lead

[1] Principles for implementing flood and coastal resilience funding partnerships (Environment Agency, 2012)

Local Flood Authority and the **Flood Risk Management Plan** (FRMP) prepared by the Environment Agency. The LFRMS should describe the priorities with respect to local flood risk management, the measures to be taken, the timing and how they will be funded. It will be preferable to be able to demonstrate that strategic provisions are in accordance with the LFRMS and FRMP, can be afforded and have an appropriate priority.

The Environment Agency is also committed to working in partnership with developers to reduce flood risk. Where assets are in need of improvement or a scheme can be implemented to reduce flood risk, developers should consult with the Environment Agency at an early stage to discuss potential solutions.

7.3.6 Buffer strips

The provision of a buffer strip to 'make space for water', allows additional capacity to accommodate climate change and means access is maintained to the watercourse, structures, and defences for future maintenance purposes. It also enables the avoidance of disturbing riverbanks, adversely impacting ecology and having to construct engineered riverbank protection. A buffer strip of 8m is required from any main river (16m if the watercourse is tidally influenced) from the bank of the watercourse, in order to:

- allow for natural river function (such as erosion and meandering),
- allow for river maintenance,
- allow space for future flood alleviation schemes to be constructed (such as flood walls), and;
- ensure the natural river corridor is maintained for biodiversity reasons.

Where flood defences are present, these distances should be taken from the toe of the defence.

Building adjacent to riverbanks can cause problems to the structural integrity of the riverbanks and the building itself, making future maintenance of the river much more difficult. Any development in these areas will likely require a **Flood Risk Activity Permit** from the Environment Agency alongside any permission. There should be no built development within these distances from main rivers / flood defences (where present).

7.3.7 Making space for water

The **PPG** sets out a clear aim in Flood Zone 3 to create space for flooding by restoring functional floodplain. Generally, development should be directed away from these areas.

All new development close to rivers should consider the opportunity to improve and enhance the river environment. Developments should look at opportunities for river restoration and enhancement as part of the development. Options include backwater creation, de-silting, in-channel habitat enhancement, and removal of structures. When designed properly, such measures can have benefits such as reducing the costs of maintaining hard engineering structures, reducing flood risk, improving water quality, and

increasing biodiversity. Social benefits are also gained by increasing green space and access to the river.

7.3.8 Requirements specific to internal drainage districts

7.4 Resistance and resilience measures

The consideration of resistance and resilience measures should not be used to justify development in inappropriate locations. However, having applied planning policy, there may be some instances where developments, such as those that are water compatible and essential infrastructure are permitted in high flood risk areas.

In these cases, the measures set out in Section 7.3 should be considered before resistance and resilience measures are relied on. The effectiveness of these forms of measures are often dependent on the availability of a reliable forecasting and warning system and the use of back up pumping to evacuate water from a property as quickly as possible. Temporary/demountable defences/measures\ are not appropriate for new developments.. Available resistance and resilience measures are shown in Table 7-1.

Paragraph 068 of the PPG sets out that measures should preferably be passive, such as the use of resilient building materials or installation of flood doors, as opposed to active measures, and that temporary and demountable defences are not appropriate for new-build developments. Further guidance on improving the flood performance of new buildings is available in the **Department for Communities and Local Government guidance document**.

Table 7-1 Flood resistance and resilience measures

Measures	Description
Permanent Barriers	Permanent barriers can include built up doorsteps, rendered brick walls and toughened glass barriers
Temporary Barriers	Temporary barriers consist of moveable flood defences which can be fitted into doorways and/or windows. The permanent fixings required to install these temporary defences should be discrete and keep architectural impact to a minimum. On a smaller scale, temporary snap on covers for airbricks and air vents can also be fitted to prevent the entrance of flood water.
Community Resistant Measures	These include demountable defences that can be deployed by local communities to reduce the risk of water ingress to a number of properties. The methods require the deployment of inflatable (usually with water) or temporary quick assembly barriers in conjunction with pumps to collect water that seeps through the systems during a flood.

Measures	Description
Property flood resilience measures	Property Flood Resilience can reduce flood damage and speed up recovery after a flood. These measures are designed to keep as much water out of the property as possible. Measures include flood doors and barriers, self-closing air bricks and non-return valves as well as toilet bungs. Research carried out for the Department for Communities and Local Government (DCLG) and the Environment Agency has recommended that the use of protection measures should generally be limited to a nominal protection height of 600mm above Floor Level.
Flood Resilience Measures	These measures aim to ensure no permanent damage is caused, the structural integrity of the building is not compromised and the clean up after the flood is easier. Interior design measures to reduce damage caused by flooding can include electrical circuitry installed at a higher level and water-resistant materials for floors, walls and fixtures.

7.4.1 Property Flood Resilience

Property Flood Resilience (PFR) aims to help households and businesses reduce the damage caused by flooding, helping to speed up recovery and reoccupation. There are two main components of PFR: resistance measures and resilient adaption (sometimes referred to as recoverability).

Resistance measures can be fitted to the outside of a property, forming a physical barrier between the floodwater and the inside of the building. These measures aim to reduce the amount of water entering the building, reducing the damage caused internally.

Resilient adaptation can be used alongside the external resistance measures to adapt the internal property, aiming to limit the damage caused if water does enter a building to speed up recovery and reoccupation.

7.5 Reducing flood risk from other sources

7.5.1 Groundwater

Groundwater flooding has a very different flood mechanism to other sources of flooding and so many conventional flood mitigation methods are not suitable. The only way to fully reduce flood risk would be through building design (development form), ensuring floor levels are raised above the water levels caused by a 1% AEP plus climate change event. Site design would also need to preserve any flow routes followed by the groundwater overland so that flood risk is not increased downstream.

Infiltration SuDS can cause increased groundwater levels and subsequently may increase flood risk on or off a site. Developers should provide evidence that this will not be a

significant risk. Other underground works, such as basements, may also need to be assessed as part of a site-specific FRA in certain prone areas susceptible to groundwater issues.

7.5.2 Surface water and sewer flooding

Developers should discuss public sewerage capacity with the water utility company at the earliest possible stage. It is important that a Surface Water Drainage Strategy (often done as part of an FRA) shows that this will not increase flood risk elsewhere, and that the drainage requirements regarding runoff rates and SuDS for new development are met.

If residual surface water flood risk remains, the likely flow routes and depths across the site should be modelled. The site should be designed so that these flow routes are preserved and building design should provide resilience against this residual risk.

When redeveloping existing buildings, the installation of some permanent or temporary floodproofing and resilience measures could protect against both surface water and sewer flooding. Non-return valves prevent water entering the property from drains and sewers. Non-return valves can be installed within gravity sewers or drains within a property's private sewer upstream of the public sewerage system. These need to be carefully installed and must be regularly maintained.

Consideration must also be given to attenuation and flow ensuring that flows during the 1% AEP plus climate change event are retained within the site if any flap valves shut. This should be demonstrated with suitable modelling techniques.

7.5.3 Reservoirs

As discussed in Section 0, the risk of reservoir flooding is extremely low. However, there remains a residual risk to development from reservoirs which developers should consider during the planning stage:

Developers should contact the reservoir owner for information on:

- the Reservoir Risk Designation
- reservoir characteristics: type, dam height at outlet, area/volume, overflow location
- operation: discharge rates / maximum discharge
- discharge during emergency drawdown; and
- inspection / maintenance regime.

The **EA online Reservoir Flood Maps** contain information on the predicted extents following a reservoir breach both when rivers are at normal levels and in conjunction with rivers in flood conditions (note: only for those reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoir Act 1975). Consideration should be given to the extents shown in these online maps. Depths and velocities were also prepared as part of this study but have not been made publicly available.

The GOV.UK website on **Reservoirs: owner and operator requirements** provides information on how to register reservoirs, appoint a panel engineer, produce a flood plan and report an incident.

Developers should use the above information to:

- Apply the sequential approach to locating the development within the site.
- Consider the impact of a breach and overtopping, particularly for sites proposed to be located immediately downstream of a reservoir. This should consider whether there is sufficient time to respond, and whether in fact it is appropriate to place development immediately on the downstream side of a reservoir.
- Assess the potential hydraulic forces imposed by a sudden reservoir failure event and check that that the proposed infrastructure fabric could withstand the structural loads.
- Develop site-specific Emergency Plans and / or Off-site Plans if necessary and make the future users of the development aware of these plans. This may need to consider emergency drawdown and the movement of people beforehand.

Development downstream of a reservoir can also have implications on the reservoir. Consideration should be given to the potential implications of proposed development on the risk designation of the reservoir, as it is a requirement that in particular circumstances where there could be a danger to life that a commitment is made to the hydraulic capacity and safety of the reservoir embankment and spillway. The implications of such potential obligations should be identified and understood so that it can be confirmed that these can be met if proposed new development is permitted.

7.6 Emergency Planning

The Civil Contingencies Act 2004 lists Local Authorities, the Environment Agency and emergency services as Category 1 responders. Category 1 responders are responsible for reducing, controlling, and mitigating the effects of emergencies in both response and recovery phases.

The National Planning Policy takes this into account by seeking to avoid inappropriate development in areas of flood risk and considering the vulnerability of new developments to flooding.

The 2023 NPPF (Paragraph 173) requires site level Flood Risk Assessments to demonstrate that

“any residual risk can be safely managed; and safe access and escape routes are included where appropriate, as part of an agreed emergency plan.”

In accordance with the NPPF, SFRAs, PFRAs and SWMPs can be used in the preparation and execution of a flood emergency plan as they can indicate areas that may be at risk of flooding. These can be provided as part as an FRA or as a separate document. Decisions regarding whether an Emergency Plan is required sits with the Local Planning Authority, with advice from their Emergency Planning Teams, the Environment Agency and LLFA.

According to the PPG, an emergency plan is needed wherever emergency flood response is an important component of making a development safe, this includes the free movement of people during a 'design flood' and potential evacuation during an extreme flood.

Emergency plans are essential for any site with transient occupancy in areas at risk of flooding, such as holiday accommodation, hotels, caravan and camping sites (PPG Paragraph 043).

Emergency Plans should consider:

- The type of flood risk present, and the extent to which advance warning can be given in a flood event.
- The number of people that would require evacuation from the area potentially at risk.
- The vulnerability of site occupants.
- The impact of the flooding on essential services e.g., electricity, gas, telecommunications, water supply and sewerage.
- Safe access and egress for users and emergency services

Proposed new development that places an additional burden on the existing response capacity of Breckland Council will not normally be appropriate.

The Norfolk Resilience Forum provides Emergency Planning, resilience based, information that is both general and flood specific. This includes practical advice before, during, and after flooding has occurred including, preparation, understanding on warnings, actions to limit exposure to risk, and recovery.

Further information is available from:

- **The National Planning Policy Guidance**
- **2004 Civil Contingencies Act**
- **DEFRA (2014) National Flood Emergency Framework for England**
- **FloodRe**
- The Environment Agency and DEFRA's **Standing Advice for FRAs**
- Breckland Council's website **Flooding page**
- Environment Agency's '**How to plan ahead for flooding'**
- **Signing up for Flood Warnings with the Environment Agency**
- **The National Flood Forum**
- The UK Government's **'Personal flood plan'** guidance
- **ADEPT Flood Risk Plans for new development**

8 Surface Water Management and SuDS

This section provides guidance and advice on managing surface water runoff and flooding.

8.1 What is meant by surface water flooding?

Surface water flooding describes flooding from sewers, drains, and ditches that occurs during heavy rainfall.

Surface water flooding includes:

- **pluvial flooding**: flooding as a result of high intensity rainfall when water is ponding or flowing over the ground surface (overland surface runoff) before it either enters the underground drainage network or watercourse or cannot enter it because the network is full to capacity;
- **sewer flooding**: flooding that occurs when the capacity of underground water conveyance systems is exceeded, resulting in flooding inside and outside of buildings. Whilst sewer flooding is a mechanism distinct form surface water, the two are often intrinsically linked as surface water flooding can put pressure on sewer systems and impeded sewer drainage can exacerbate surface water issues. Normal discharge of sewers and drains through outfalls may be impeded by high water levels in receiving waters which may cause water to back up and flood around buildings or in built up areas. Sewer flooding can also arise from operational issues such as blockages or collapses of parts of the sewer network; and
- **overland flows entering the built-up area from the rural/urban fringe**: includes overland flows originating from groundwater springs.

8.2 Role of the LLFA and Local Planning Authority in surface water management

Norfolk County Council as LLFA are a statutory planning consultee on the management of surface water. They provide technical advice on surface water drainage strategies and designs put forward for major development proposals, to confirm that onsite drainage systems are designed in accordance with the current legislation and guidance.

When considering planning applications, Norfolk County Council will provide advice to the Planning Department on the management of surface water. As the LPA, Breckland Council should satisfy themselves that the development's proposed minimum standards of operation are appropriate and, using planning conditions or planning obligations, that there are clear arrangements for ongoing maintenance over the lifetime of the development.

The LLFA offers a paid pre-application advice service to developers, and has published guidance for developers to assist with informing developer proposals at all stages of the development process.

- **Information for Developers**

- **Pre-Application Advice Service**

It is essential that developers consider sustainable drainage at an early stage of the development process – ideally at the master-planning stage. To further inform development proposals at the master-planning stage, pre-application submissions are accepted by Breckland Council, dependent on the area. This will assist with the delivery of well designed, appropriate, and effective SuDS.

8.3 Sustainable Drainage Systems (SuDS)

SuDS are water management practices which aim to enable surface water to be drained in a way that mimics (as closely as possible) the run-off and drainage prior to site development. The primary benefits of SuDS can be categorised under four distinct themes. These are highlighted in Figure 8-1 and are referred to as the four pillars of SuDS design.

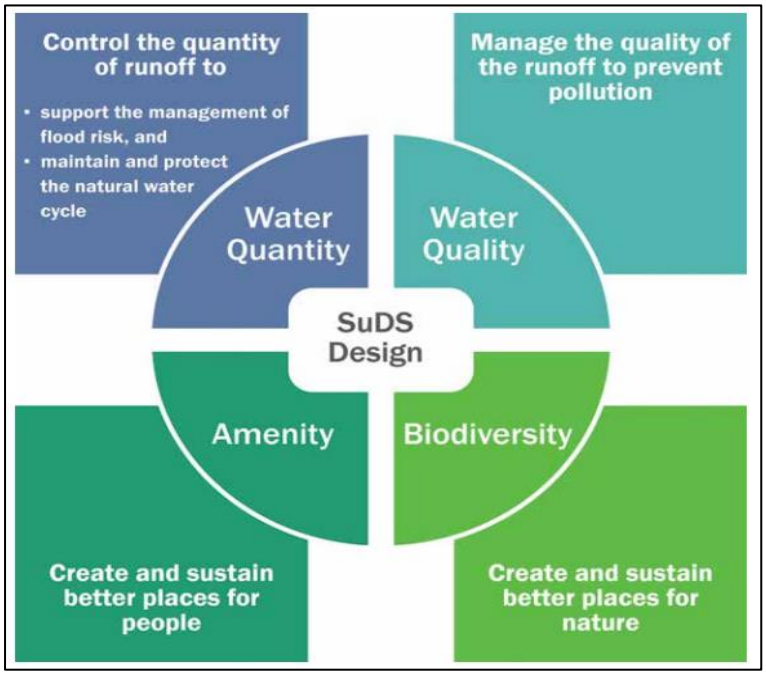


Figure 8-1 The four pillars of SuDS design

There are a number of ways in which SuDS can be designed to meet surface water quantity, water quality, biodiversity, and amenity goals. Given this flexibility, SuDS are generally capable of overcoming or working alongside various constraints affecting a site, such as restrictions on infiltration, without detriment to achieving these goals. As well as implelemnting SuDS within new developments, they can also often be retrofitted into existing developments.

The inclusion of SuDS within developments should also be seen as an opportunity to enhance ecological and amenity value as well as promote Green Infrastructure by incorporating above ground facilities into the landscape development strategy. SuDS must be considered at the outset and during preparation of the initial conceptual site layout to

ensure that enough land is given to design spaces that will be an asset to the development as opposed to an ineffective afterthought. For SuDS Management Trains to work effectively appropriate techniques need to be selected based on the objectives for drainage and site-specific constraints. Suds Management Trais are discussed further in Section 8.3.2. It is recommended that on all developments source control is implemented as the first stage of a management train allowing for improvements in water quality and reducing or eliminating runoff from smaller, more frequent, rainfall events.

It is a requirement for all new major development proposals that SuDS for management of runoff are put in place, unless there is clear evidence that this would be inappropriate (NPPF Paragraph 175). Where possible, SuDS that offer multiple benefits should be given priority. The developer is responsible for ensuring the design, construction, and future/ongoing maintenance of such a scheme is carefully and clearly defined, and a clear and comprehensive understanding of the existing catchment hydrological processes and existing drainage arrangements is essential.

8.3.1 Types of SuDS system

There are many different SuDS techniques that can be implemented in attempts to mimic pre-development drainage (Figure 8-1). Techniques can include soakaways, infiltration trenches, permeable pavements, grassed swales, green roofs, ponds, and wetlands and these do not necessarily need to take up a lot of space. The suitability of the techniques will be dictated in part by the development proposal and site conditions. Advice on best practice is available from the Environment Agency and the Construction Industry Research and Information Association (CIRIA) e.g. the **CIRIA SuDS Manual C753 (2015)**

Table 8-1 Example SuDS Techniques and potential benefits

SuDS Technique	Flood Reduction	Water Quality Treatment & Enhancement	Landscape and Wildlife Benefit
Over-sized pipes/tanks	Yes	No	No
Storm cells	Yes	No	No
Living roofs	Yes	Yes	Yes
Constructed wetlands	Yes	Yes	Yes
Balancing ponds	Yes	Yes	Yes
Detention basins	Yes	Yes	Yes
Retention ponds	Yes	Yes	Yes
Filter strips and swales	Yes	Yes	Yes

SuDS Technique	Flood Reduction	Water Quality Treatment & Enhancement	Landscape and Wildlife Benefit
Soakaways	Yes	Yes	Yes
Infiltration trenches and basins	Yes	Yes	Yes
Permeable surfaces and filter drains	Yes	Yes	No
Gravelled areas	Yes	Yes	No
Solid paving blocks	Yes	Yes	No
Porous pavements	Yes	Yes	No
Tanked systems	Yes	No	No

8.3.2 SuDS management

SuDS should not be used individually but as a series of features in an interconnected system designed to capture water at the source and convey it to a discharge location. Collectively this concept is described as a SuDS Management Train (see Figure 8-2). The number of treatment stages required within the Management Train depends primarily on the source of the runoff and the sensitivity of the receiving waterbody or groundwater. A drainage strategy will need to demonstrate that an appropriate number of treatment stages are delivered.

SuDS components should be selected based on design criteria and how surface water management is to be integrated within the development and landscaping setting. By using a number of SuDS features in series it is possible to reduce the flow and volume of runoff as it passes through the system as well as minimising pollutants which may be generated by a development.

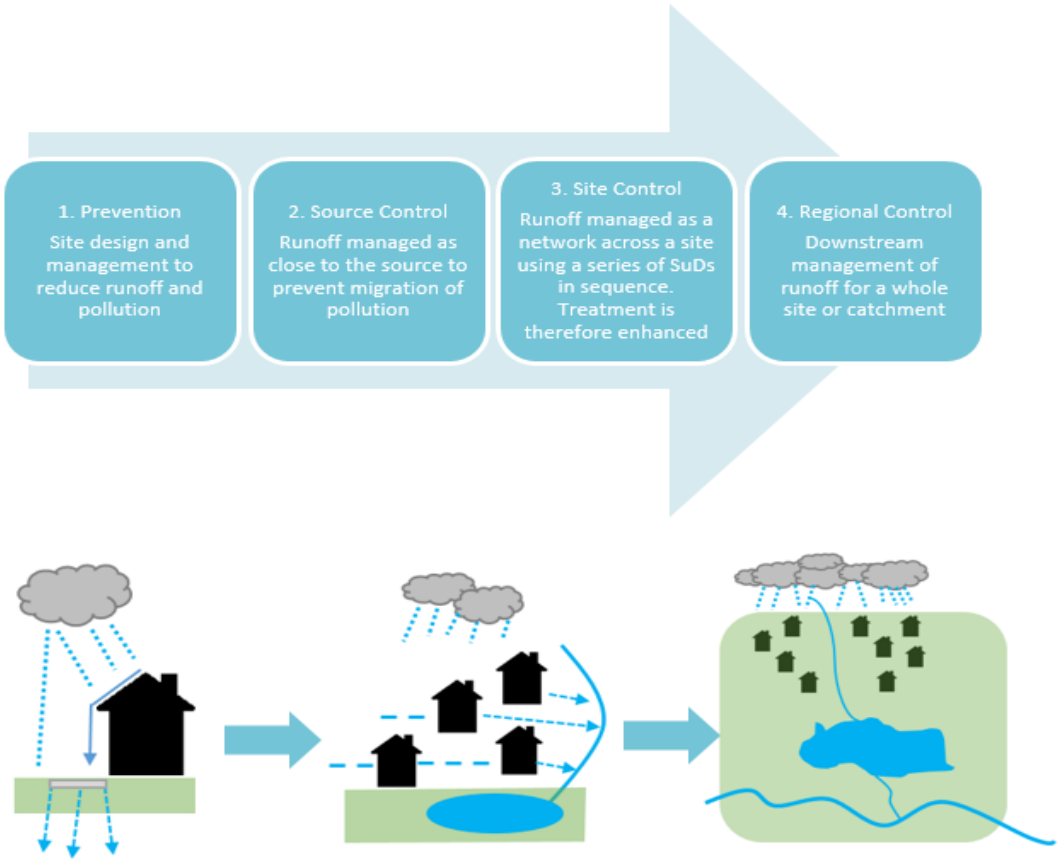


Figure 8-2 The SuDS management train

8.3.3 Treatment

A key part of the four pillars of SuDS is to provide the maximum improvement to water quality through the use of the "SuDS management train". To maximise the treatment within SuDS, CIRIA recommends the following good practice is implemented in the treatment process:

1. Manage surface water runoff close to source: This makes treatment easier due to the slower velocities and also helps isolate incidents rather than transport pollutants over a large area.
2. Treat surface water runoff on the surface: This allows treatment performance to be more easily inspected and managed. Sources of pollution and potential flood risks are also more easily identified. It also helps with future maintenance work and identifying damaged or failed components.
3. Treat a range of contaminants: SuDS should be chosen and designed to deal with the likely contaminants from a development and be able to reduce them to acceptably low levels.
4. Minimise the risk of sediment remobilisation: SuDS should be designed to prevent sediments being washed into receiving water bodies or systems during events greater than what the component may have been designed.

5. Minimise the impact of spills: SuDS should be designed to be able to trap spills close to the source or provide robust treatment along several components in series.

The number of treatment stages required depends primarily on the source of the runoff. A drainage strategy will need to demonstrate that an appropriate number of treatment stages are delivered. This involves determining a pollutant hazard score for each pollutant type. An index is then used to determine the treatment potential of different SuDS features for different pollutant types. This is known as the mitigation index. The Total SuDS mitigation index should be equal or greater than the pollution hazard score to deliver adequate treatment.

8.3.4 Overcoming SuDS constraints

The design of a SuDS system will be influenced by a number of physical and policy constraints. These should be taken into account and reflected upon during the conceptual, outline, and detailed stages of SuDS design. Table 8-2 details some possible constraints and how they may be overcome.

Table 8-2 Example SuDS design constraints and possible solutions

Considerations	Solution
Land availability	SuDS can be designed to fit into small areas by utilising different systems. For example, features such as permeable paving and green roofs can be used in urban areas where space may be limited.
Contaminated soil or groundwater below site	SuDS can be placed and designed to overcome issues with contaminated groundwater or soil. Shallow surface SuDS can be used to minimise disturbance to the underlying soil. The use of infiltration should also be investigated as it may be possible in some locations within the site. If infiltration is not possible linings can be used with features to prevent infiltration.
High groundwater levels	Non-infiltrating features can be used. Features can be lined with an impermeable lining or clay to prevent the ingress of water into the feature. Additional, shallow features can be utilised which are above the groundwater table.
Steep slopes	Check dams can be used to slow flows. Additionally, features can form a terraced system with additional SuDS components such as ponds used to slow flows.
Shallow slopes	Use of shallow surface features to allow a sufficient gradient. If the gradient is still too shallow, pumped systems may be considered as a last resort.
Ground instability	Geotechnical site investigation should be done to determine the extent of unstable soil and dictate whether infiltration would be suitable or not.
Sites with deep backfill	Infiltration should be avoided unless the soil can be demonstrated to be sufficiently compacted. Some features such as swales are more adaptable to potential surface settlement.

Considerations	Solution
Open space in floodplain zones	Design decisions should be done to take into consideration the likely high groundwater table and possible high flows and water levels. Features should also seek to not reduce the capacity of the floodplain and take into consideration the influence that a watercourse may have on a system. Factors such as siltation after a flood event should also be taken into account during the design phase.
Future adoption and maintenance	The Local Planning Authority should check that development proposals have clear arrangements for on-going maintenance over the development's lifetime, through the use of planning conditions or planning obligations.

For SuDS techniques that are designed to encourage infiltration, it is imperative that the water table is low enough and a site-specific infiltration test is conducted early on as part of the design of the development. Infiltration should be considered with caution within areas of possible subsidence or sinkholes. Where sites lie within or close to Groundwater Source Protection Zones (GSPZs) or aquifers, further restrictions may apply and guidance should be sought from the LLFA and the Environment Agency. GSPZs are detailed further in Section 8.5.2.

8.4 Sources of SuDS guidance

8.4.1 C753 CIRIA SuDS Manual (2015)

The **C753 CIRIA SuDS Manual (2015)** provides guidance on planning, design, construction and maintenance of SuDS. The manual is divided into five sections ranging from a high-level overview of SuDS, progressing to more detailed guidance with progression through the document.

8.4.2 Non-Statutory Technical Guidance, Defra (March 2015)

Non-Statutory Technical guidance provides non-statutory standards on the design and performance of SuDS. It outlines peak flow control, volume control, structural integrity, flood risk management and maintenance, and construction considerations.

8.4.3 Non-Statutory Technical Guidance for Sustainable Drainage Practice Guidance, LASOO (2016)

The Local Authority SuDS Officer Organisation (LASOO) produced their **practice guidance** in 2016 to give further detail to the non-statutory technical guidance.

8.4.4 Breckland Council Planning Policy

Breckland Council lead consultation on planning policy for any works within the District. The overarching policies are those based on the **Local Plan** and specific consultations can be made through the dedicated **Consultation Portal for Planning Policy**.

8.4.5 Norfolk County Council SuDS guidance

Norfolk County Council has a **webpage** dedicated to information regarding Planning Application requirements, including requirements for SuDS.

8.5 Other surface water considerations

8.5.1 Groundwater Vulnerability Zones

The Environment Agency published new groundwater vulnerability maps in 2015. These maps provide a separate assessment of the vulnerability of groundwater in overlying superficial rocks and those that comprise of the underlying bedrock. The map shows the vulnerability of groundwater at a location based on the hydrological, hydro-ecological, and soil properties within a one-kilometre grid square.

The groundwater vulnerability maps should be considered when designing SuDS. Depending on the height of the water table at the location of the proposed development site, restrictions may be placed on the types of SuDS appropriate to certain areas. Groundwater vulnerability maps can be found on **DEFRA's interactive MAGiC map.**

8.5.2 Groundwater Source Protection Zones (GSPZs)

The Environment Agency defines GSPZs near groundwater abstraction points. These protect areas of groundwater used for drinking water. The Environment Agency may object in principle to, or refuse to permit, some activities or developments if they have potential to adversely affect groundwater, through SuDS for example. The GSPZ requires attenuated storage of runoff to prevent infiltration and contamination. GSPZs can be viewed on DEFRA's interactive MAGiC map and also within Appendix A – Flood Risk Mapping.

The majority of Breckland is covered by Zone 1, Zone 2 and Zone 3 GSPZs. The following areas are not within GSPZs:

- Land to the west of Attleborough
- Gooderstone
- Foulden
- Hockering
- Cranworth
- Garvestone
- Mileham
- Wendling

More information about Groundwater Source Protection Zones can be found on the **UK Government's website.**

8.5.3 Nitrate Vulnerable Zones and nutrient neutrality

Nitrate Vulnerable Zones (NVZs) are areas designated as being at risk from agricultural nitrate pollution. Nitrate levels in waterbodies are affected by surface water runoff from

surrounding agricultural land entering receiving waterbodies. The level of nitrate contamination will potentially influence the choice of SuDS and should be assessed as part of the design process.

NVZs can be viewed on the **Environment Agency's website**. The majority of Breckland is within areas designated as pre-appeal NVZs (2021-2024). This excludes small areas in the northeast of the District. Currently, information on the 2021 to 2024 NVZs post-appeal is not available. Landowners can appeal an NVZ designation once notified if their land (or part of it):

- Does not drain into water that has been identified as polluted.
- Drains into water that should not be identified as polluted.

8.5.4 Nutrient neutrality

In March 2022, Natural England and the Department for Levelling Up Housing and Communities issued advice surrounding development that could cause adverse impacts on nutrient pollution. Such development includes, but is not limited to:

- Any development comprising overnight accommodation (such as new homes, tourist attractions etc).
- Any form of permitted development under planning legislation which would give rise to new overnight accommodation.
- Any development not involving overnight accommodation but which may have non-sewerage water quality implications
- In addition, the Habitats Regulation (2017) states that planning authorities are required to make sure development does not have adverse impacts on protected habitats before granting permission. Breckland Council have a **Nutrient Neutrality webpage**, which provides further information.

9 Summary and Recommendations

9.1 Summary of Flood Risk within Breckland

- **Fluvial flooding**: Whilst there are a number of main rivers within Breckland that have significant flood extents associated with them, the majority of the affected areas are predominantly rural with very few properties at risk. There are however several towns where fluvial flood risk exists, notably Thetford (River Thet), Fakenham (River Wensum) Dereham (unnamed ordinary watercourse), There are a large number of ordinary watercourses within the district for which Flood Zones and/or fluvial modelling is unavailable- the risk from these watercourses should be assessed as part of a site-specific flood risk assessment for any proposed development in the vicinity of these watercourses.
- **Tidal flooding:** The Environment Agency's 'The Wash Tidal Hazard Mapping' indicates that there is no tidal flood risk to Breckland during an extreme event, using the current climate change projections.
- **Surface Water:** The Environment Agency Risk of Flooding from Surface Water (RoFSW) mapping shows that the risk of surface water flooding is widespread across Breckland. The mapping shows that surface water tends to be channelled by topography into watercourses as well as forming flow paths along residential and main roads in urban areas. These flow paths are particularly prominent in Watton, Attleborough, New Buckenham, Thetford, Swaffham and Dereham. The worst affected urban areas during the 0.1% AEP surface water event include Watton, Attleborough, Thetford, Swaffham and Derham.
- **Groundwater:** Groundwater emergence mapping indicates that the majority of the Borough is at very low risk to groundwater flooding. There are some localised areas where groundwater levels are low-moderate and there is a risk to surface and subsurface assets, however groundwater flooding still remains unlikely.
- **Reservoirs:** There are 49 records of flooding from reservoirs in the study area. Defra's Risk of Flooding from reservoirs mapping (Appendix A) shows the areas within Breckland which are at risk from reservoir flooding. Whilst the risk of breach/uncontrolled release form reservoirs remains very low, this risk should be assessed as part of a site-specific flood risk assessment wherever development is proposed within an identified reservoir flood extent and the reservoir owner consulted to understand whether development downstream of the reservoir may impact its risk classification.

9.2 Recommendations

The following recommendations are made for the whole of Breckland. Policy recommendations related to managing the cumulative impacts of development are made in Appendix F.

9.2.1 Reduction of flood risk through site allocations and appropriate site design

- To locate new development in areas of lowest risk, in line with the Sequential Test, by steering sites Flood Zone 1 and avoiding where possible anything within the 1% AEP event with 40% climate change allowance surface water flood extent. If a Sequential Test is undertaken and a site at flood risk is identified as the only appropriate site for the development, both parts of the Exception Test should be satisfied.
- After application of the Exception Test, a sequential approach to site design will be used to reduce risk. Any re-development within areas of flood risk which provide other wider sustainability benefits will provide flood risk betterment and made resilient to flooding.
- Identification of long-term opportunities to remove development from the floodplain and safeguard the functional floodplain from future development to make space for water.
- To ensure development is 'safe', dry pedestrian egress from the floodplain and emergency vehicular access should be possible for all residential development. If at risk, then an assessment should be made to detail the flood duration, depth, velocity and flood hazard rating in the 1% AEP plus climate change flood event.
- Raise residential and commercial finished floor levels 600mm above the 1% AEP plus climate change flood level. Protect and promote areas for future flood alleviation schemes.
- Resist vulnerable development, including self-contained basement dwellings, in Flood Zone 3 and areas at high risk of surface water flooding
- Identify opportunities to help fund future flood risk management through developer contributions to reduce risk for surrounding areas.
- Seek opportunities to make space for water to accommodate climate change.

9.2.2 Promote SuDS to mimic natural drainage routes to improve water quality

- SuDS design should demonstrate how constraints have been considered and how the design provides multiple benefits e.g. landscape enhancement, biodiversity, recreation, amenity, leisure and the enhancement of historical features.
- Planning applications for phased developments should be accompanied by a drainage strategy, which takes a strategic approach to drainage provision across the entire site and incorporates adequate provision for SuDS within each phase.
- Use of the SuDS management train to prevent and control pollutants to prevent the 'first flush' polluting the receiving waterbody.
- SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.

9.2.3 Reduce surface water runoff from new developments and agricultural land

- Space should be provided for the inclusion of SuDS on all allocated sites, outline proposals and full planning applications.
- Promote biodiversity, habitat improvements and Countryside Stewardship schemes to help prevent soil loss and to reduce runoff from agricultural land.

9.2.4 Enhance and restore river corridors and habitat

- Assess condition of existing assets and upgrade, if required, to ensure that the infrastructure can accommodate pressures/flows for the lifetime of the development.
- Natural drainage features should be maintained and enhanced.
- Identify opportunities for river restoration/enhancement to make space for water.
- A presumption against culverting of open watercourses except where essential to allow highways and/or other infrastructure to cross, in line with CIRIA's Culvert design and operation guide, (C689) and to restrict development over culverts.
- There should be no built development within 8m from the top of a watercourse or Main River for the preservation of the watercourse corridor, wildlife habitat, flood flow conveyance and future watercourse maintenance or improvement.

9.2.5 Mitigate against risk, improved emergency planning and flood awareness

- Work with emergency planning colleagues and stakeholders to identify areas at highest risk and locate most vulnerable receptors.
- Exceedance flows, both within and outside of the site, should be appropriately designed to minimise risks to both people and property.
- For a partial or completely pumped drainage system, an assessment should be undertaken to assess the risk of flooding due to any failure of the pumps to be assessed. The design flood level should be determined if the pumps were to fail; if the attenuation storage was full, and if a design storm occurred.
- An emergency overflow should be provided for piped and storage features above the predicted water level arising from a 1% AEP rainfall event, inclusive of climate change and urban creep.
- Consideration and incorporation of flood resilience measures up to the 0.1% AEP event.
- Ensure robust emergency (evacuation) plans are produced and implemented for major developments.

Appendices (provided as separate Documents

A Flood Risk Mapping

B Data Sources Used in the SFRA

C SFRA User Guide

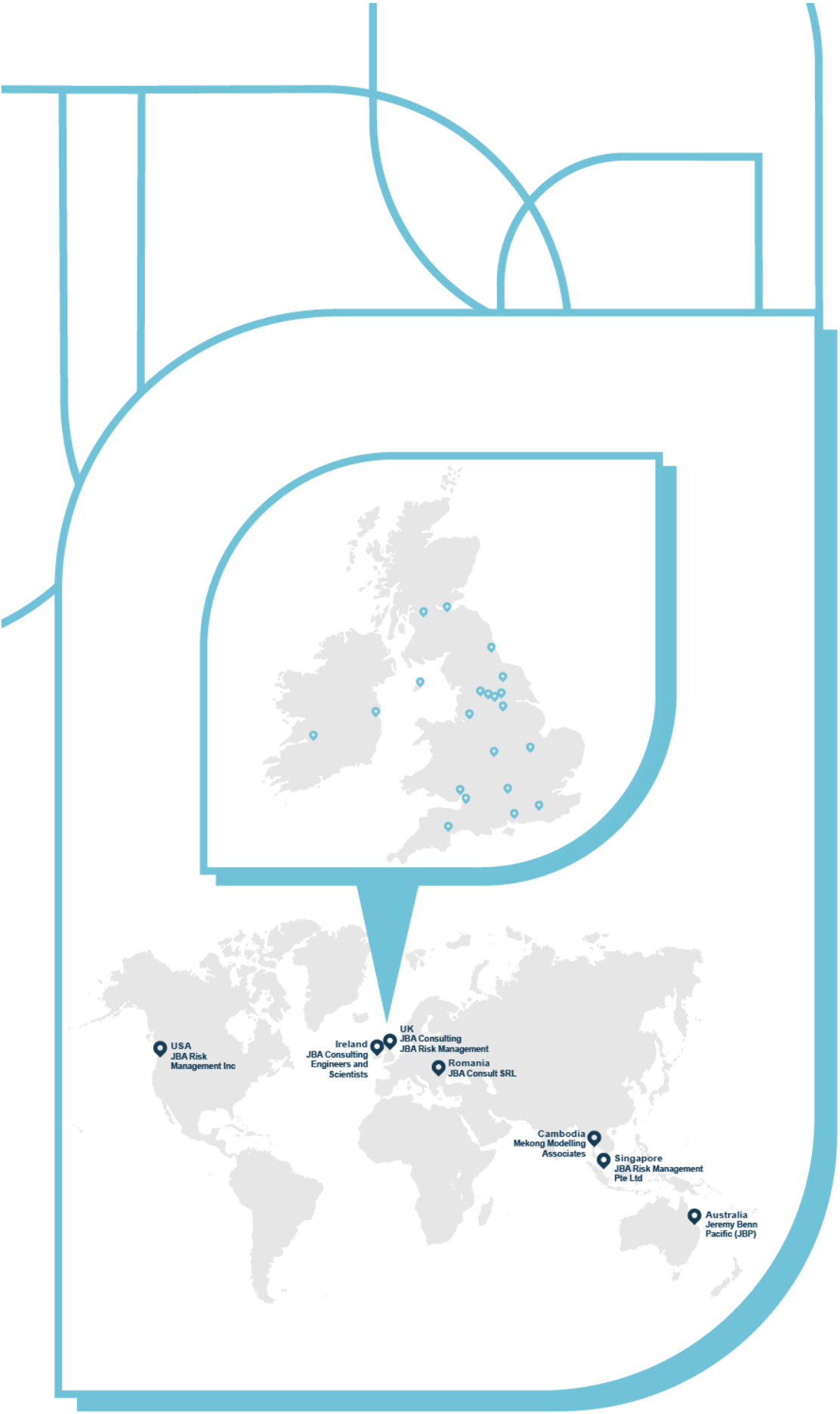
D Flood Alert and Flood Warning Areas

E Summary of Flood Risk across Breckland District

F Cumulative Impact Assessment and Strategic Solutions

G Saham and Watton Flood Action Group Records

H Sequential Test Methodology



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