Appendix B - Data sources used in the SFRA

1 Historical flooding

Section 19 flood investigation reports from Norfolk County Council are available from their website. Norfolk County Council also provided a database of locations of historic flood incidents across the District. The Environment Agency's Historic Flood Map is also presented in Appendix A: GeoPDF Mapping and the Environment Agency's Recorded Flood Outlines dataset has also been used to understand the flood history across the District.

Section 4.1 of the Main Report documents the historic flooding records obtained.

2 Fluvial flooding

2.1 Flood Zones 2 and 3a

The Environment Agency's Flood Map for Planning Flood Zones 2 and 3a, are shown in the Appendix A mapping. These show the same extent as the online Environment Agency's Flood Map for Planning (FMfP) (which incorporates latest modelled data).

For some watercourses additional modelling was available (shown on the Appendix A Mapping as Modelled Flood Zones)that has not been incorporated into the FMfP. In these cases the modelled extent was used in preference to the FMfP. These areas are as follows:

- Fluvial models:
  - River Tiffey
  - River Waveney
  - Bungay Tin
- 2D Strategic models:
  - Gillingham - fluvial and tidal outputs

The extents of the models used in this SFRA are shown in Figure 2-1. Over time, the online mapping is likely to be updated more often than the SFRA, so SFRA users should check there are no major changes in their area.

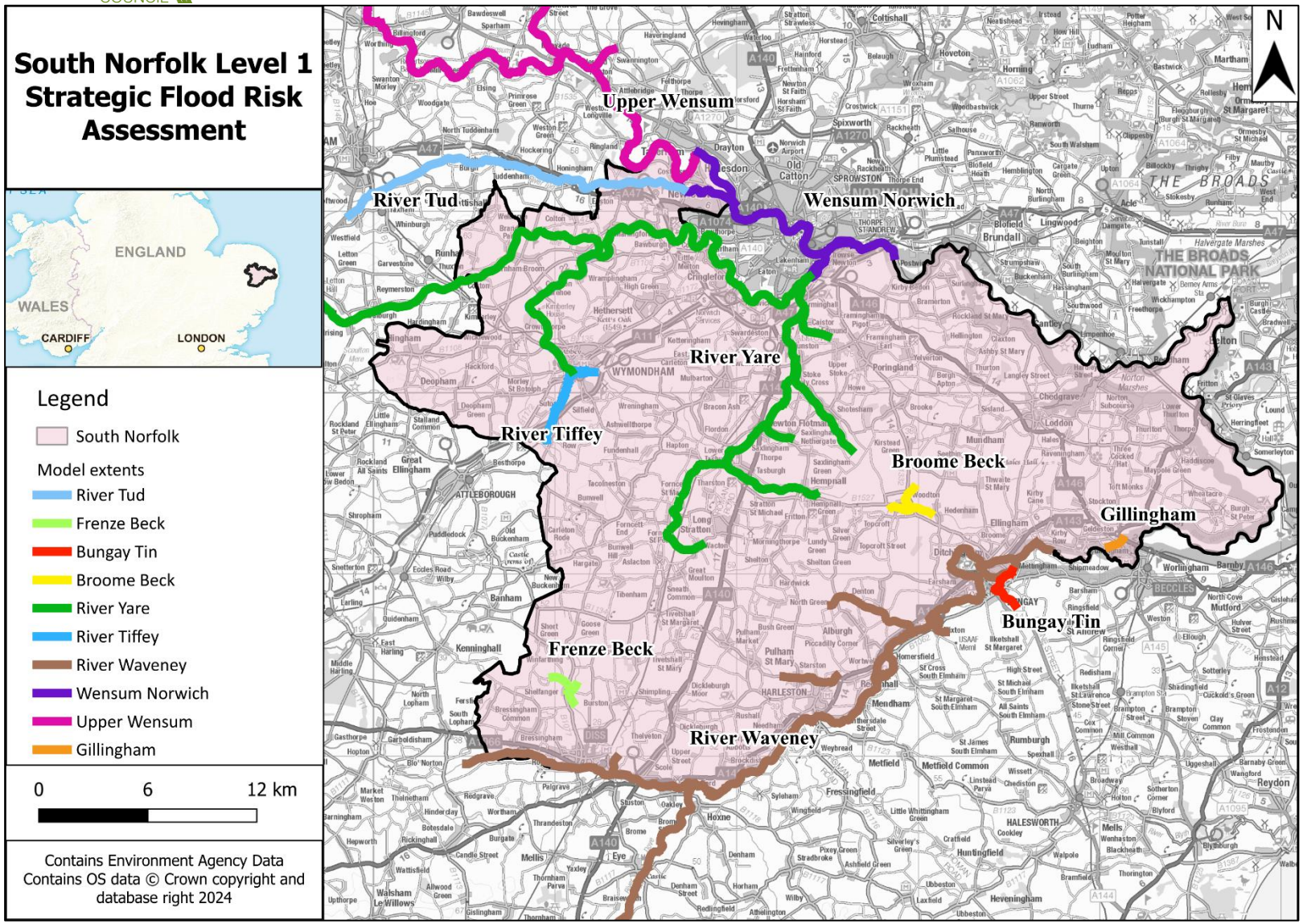

Figure 2-1: Extents of the hydraulic models used in this SFRA.

2.2 Flood Zone 3b (the Functional Floodplain)

Flood Zone 3b, as shown in Appendix A mapping, has been compiled for the study area as part of this SFRA and is based on the 3.3% AEP (1 in 30-year chance of flooding in any given year) extents produced from detailed hydraulic models, where available, which is in line with the recent updates to the Planning Practice Guidance (PPG). 3.3% AEP extents were available for the following models:

- River Waveney
- River Yare
- Upper Wensum and Wensum Norwich
- River Tud
- Broome Beck
- Bungay Tin
- Frenze Beck

For the River Tiffey, the 2% AEP output was used as a proxy.

For the Gillingham Strategic model, no 3.3% or 2% AEP output was available, so the 1% AEP output should be used as a proxy for Flood Zone 3b.

The extents of the models used in this assessment are shown in Figure 2-1.

For areas not covered by detailed hydraulic models, a precautionary approach should be adopted for Flood Zone 3b with the assumption that the extent of Flood Zone 3b would be equal to Flood Zone 3a (1% AEP). If development is shown to be in Flood Zone 3a, further work should be undertaken as part of a detailed site-specific Flood Risk Assessment to define the extent of Flood Zone 3b.

If the area of interest is located somewhere that shows major changes to the extent of the Flood Zones; having checked the online mapping, developers will also need to remap Flood Zone 3b as part of a detailed site-specific Flood Risk Assessment.

3 Surface water flooding

Mapping of surface water flood risk in the study area has been taken primarily from the Risk of Flooding from Surface Water (RoFSW) maps published online by the Environment Agency. These maps are intended to provide a consistent standard of assessment for surface water flood risk across England and Wales in order to help LLFAs, the EA, and any potential developers to focus their management of surface water flood risk.

The RoFSW is derived primarily from identifying topographical flow paths of existing watercourses or dry valleys that contain some isolated ponding locations in low lying areas. They provide a map which displays different levels of surface water flood risk depending on the annual probability of the land in question being inundated by surface water.

Table 3-1: RoFSW risk categories.

Category	Definition
High	Flooding occurring as a result of rainfall with a greater than 1 in 30 chance in any given year (annual probability of flooding 3.3%).
Medium	Flooding occurring as a result of rainfall of between 1 in 100 (1%) and 1 in 30 (3.3%) chance in any given year.
Low	Flooding occurring as a result of rainfall of between 1 in 1,000 (0.1%) and 1 in 100 (1%) chance in any given year.

Whilst the categories in Table 3-1 are used in the national RoFSW mapping, we have used the following approach to inform the Sequential Test within this SFRA. Surface water zones have been used to define locations at either lower or higher risk of surface water flooding based on the extent of the 1% AEP plus 40% climate change allowance surface water event:

- Zone A – lower risk of surface water flooding (lies outside the 1% AEP plus 40% climate change surface water extent)
- Zone B – higher risk of surface water flooding (lies within the 1% AEP plus 40% climate change surface water extent)

Although the RoFSW offers improvement on previously available datasets, the results should not be used to understand flood risk for individual properties. The results should be used for high level assessments such as SFRAs for local authorities. If a site is indicated in the EA mapping to be at risk from surface water flooding, a more detailed assessment should be considered to illustrate the flood risk more accurately at a site-specific scale.

4 Climate change

4.1 Fluvial

Detailed Environment Agency hydraulic models were obtained under licence for the SFRA.

Representation of climate change within the SFRA was discussed with the EA. Where previous climate change runs were within a marginal change of the updated climate change allowances, these were agreed with the EA and used. This is due to the marginal change in allowance and subsequent results.

Where there were no detailed models available, or the existing models could not be re-run with the updated climate change guidance, not available, Flood Zone 2 was used. This is appropriate given the 1% AEP plus Upper End climate change estimates are often similar to the 0.1% AEP/ Flood Zone 2 extents.

Table 4-1 details the climate change allowances used for each model, which are shown in Appendix A: GeoPDF mapping.

Table 4-1: Allowance used to represent central and higher central climate change for each modelled watercourse.

Model	1% AEP Central climate change allowance used	1% AEP Higher central climate change allowance used	0.1% AEP Higher central climate change allowance used
BKE3	None	25%	None
DIS3	None	25%	None
GNLP1055	None	25%	None
GNLP2168	None	25%	None
River Tiffey	None	25%	None
River Waveney	None	25%	25%
Upper Wensum and Wensum Norwich	None	20%	20%
River Yare	None	25%	25%
River Tud	None	20%	20%
Upper Wensum	None	None	
Gillingham Strategic Model (fluvial only)	11%	20%	20%
Broome Beck	None	25%	25%
Bungay Tin	None	25%	25%
Frenze Beck	None	25%	25%

4.2 Surface water

The 0.1% AEP surface water extent can be used as an indication of surface water risk, and risk to smaller watercourses, which are too small to be covered by the EA's Flood Zones. Modelled Climate Change uplifts for the 1% AEP event were available for use in this SFRA and are presented in in Appendix A: GeoPDFs as 'SW Climate Change Uplifts' for the 1% AEP plus 40% CC scenario.

5 Groundwater

Two datasets were used to assess potential areas that are likely to be at higher risk of groundwater flooding:

- The EA's Areas Susceptible to Groundwater Flooding 2010 (AStGWF) dataset, showing the degree to which areas are susceptible to groundwater flooding based on geological and hydrogeological conditions on a 1km square grid. It does not show the likelihood of groundwater flooding occurring, i.e., it is a hazard, not risk, based dataset. This dataset covers a large area of land, and only isolated locations within the overall susceptible area are likely to suffer the consequences of groundwater flooding.
- The JBA groundwater emergence map, showing the risk of groundwater flooding to both surface and subsurface assets, based on predicted groundwater levels on a 5m square grid. For each grid cell, a depth range is given for modelled groundwater levels in the 1% AEP event. It takes account of factors including topography, groundwater recharge volumes and spatial variations in aquifer storage and transmission properties.

Section 4.7 of the Main Report details the approach adopted in this SFRA to assess the risk of groundwater flooding:

6 Sewers

Anglian Water provided a record of flooding incidents relating to public foul, combined or surface water sewers including which properties suffered flooding. This was provided to cover incidents in the period from May 2013 until October 2023. For confidentiality, this data is only included within this SFRA on a 5-digit postcode basis.

Section 4.7 of the Main Report presents this data.

7 Reservoirs

The risk of inundation because of reservoir breach or failure of reservoirs within the area has been mapped using the outlines produced as part of the National Reservoir Flood Mapping (RFM) study and are shown online on the Long-Term Risk of Flooding website at the time of publication.

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.

Section 4.8 of the Main Report presents the reservoirs affecting South Norfolk District.

8 Flood defences

The Environment Agency supplied the location of all flood defences within the district in their AIMS database, including information relating to the type of flood defence and their standard of protection. Section 6 of the Main Report provides information on flood defences and schemes.

9 Overview of supplied data

Table 9-1 below provides an overview of the supplied data from stakeholders which has been used to inform the South Norfolk SFRA.

Table 9-1: Summary of supplied to inform the South Norfolk SFRA.

Source of flood risk	Data used to inform the assessment	Data supplier
Historic (all sources)	Historic flood map Recorded flood outlines	Environment Agency
Historic (all sources)	Historic flooding incident reports Section 19 Flood Investigation Reports	Norfolk County Council
Fluvial (including climate change)	River Tiffey (2014) 1D-2D ISIS-TUFLOW model River Yare (2014) 1D-2D ISIS-TUFLOW model River Waveney (2022) 1D-2D ISIS-TUFLOW model River Wensum (2017) 1D-2D ISIS-TUFLOW model Upper Wensum (2017) 1D-2D ISIS-TUFLOW model Gillingham Strategic Model (2022) TUFLOW model	Environment Agency
Fluvial	Flood Map for Planning	Environment Agency
Surface water (including climate change)	Risk of Flooding from Surface Water dataset	Environment Agency
Sewers	Internal and external historic drainage records	Anglian Water
Groundwater	Areas Susceptible to Groundwater Flooding dataset	Environment Agency
Groundwater	Groundwater emergence map	JBA
Reservoir	National Inundation Reservoir Mapping (Long term flood risk map)	Environment Agency

Source of flood risk	Data used to inform the assessment	Data supplier
Flood defences	AIMS Spatial Flood Defences dataset	Environment Agency
Cross-boundary impacts	Neighbouring authority sites and Local Plan information, to help assess cross-boundary impacts and the cumulative impact assessment	Planners at neighbouring authorities (Norwich City Council, Broadland District Council, Great Yarmouth Borough Council, East Suffolk Council, Mid Suffolk District Council, Breckland District Council)
Other datasets	Source Protection Zones Aquifer Designation maps (Bedrock Geology and Superficial Deposits) Detailed River Network Flood Alert and Flood Warning areas Groundwater Vulnerability Risk of Flooding from Rivers and Sea National Receptor Dataset	Environment Agency (via South Norfolk Council)