

Appendix B - Data sources used in the SFRA

1 Historical flooding

Wokingham Borough Council provided a database of locations of historic flood incidents across the Borough. 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 Borough.

Section 5.1 of the Main Report documents the historic flooding records obtained.

2 Fluvial flooding

2.1 Flood Zones 2 and 3a

Flood Zones 2 and 3a, as shown in the Appendix A mapping, show the same extent as the online Environment Agency's Flood Map for Planning (FMfP) (which incorporates latest modelled data) other than for the watercourses listed below. In these instances, where additional detailed modelling was available that has not been incorporated into the FMfP, the modelled extent was used in preference to the FMfP:

- Blackwater (in the west of the area where the 2007 model extent is wider than the 2009 extent, only the 1% AEP output was available for Flood Zone 3a, so the Flood Zone 2 output remains the same as the FMfP).
- River Loddon (hydrology was updated as part of this SFRA)
- Arborfield (a new detailed hydraulic model was developed for the unnamed watercourse through Arborfield as part of this SFRA)
- Emm Brook (a detailed hydraulic model was provided by WSP for use within this SFRA)

The extents of these models 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.

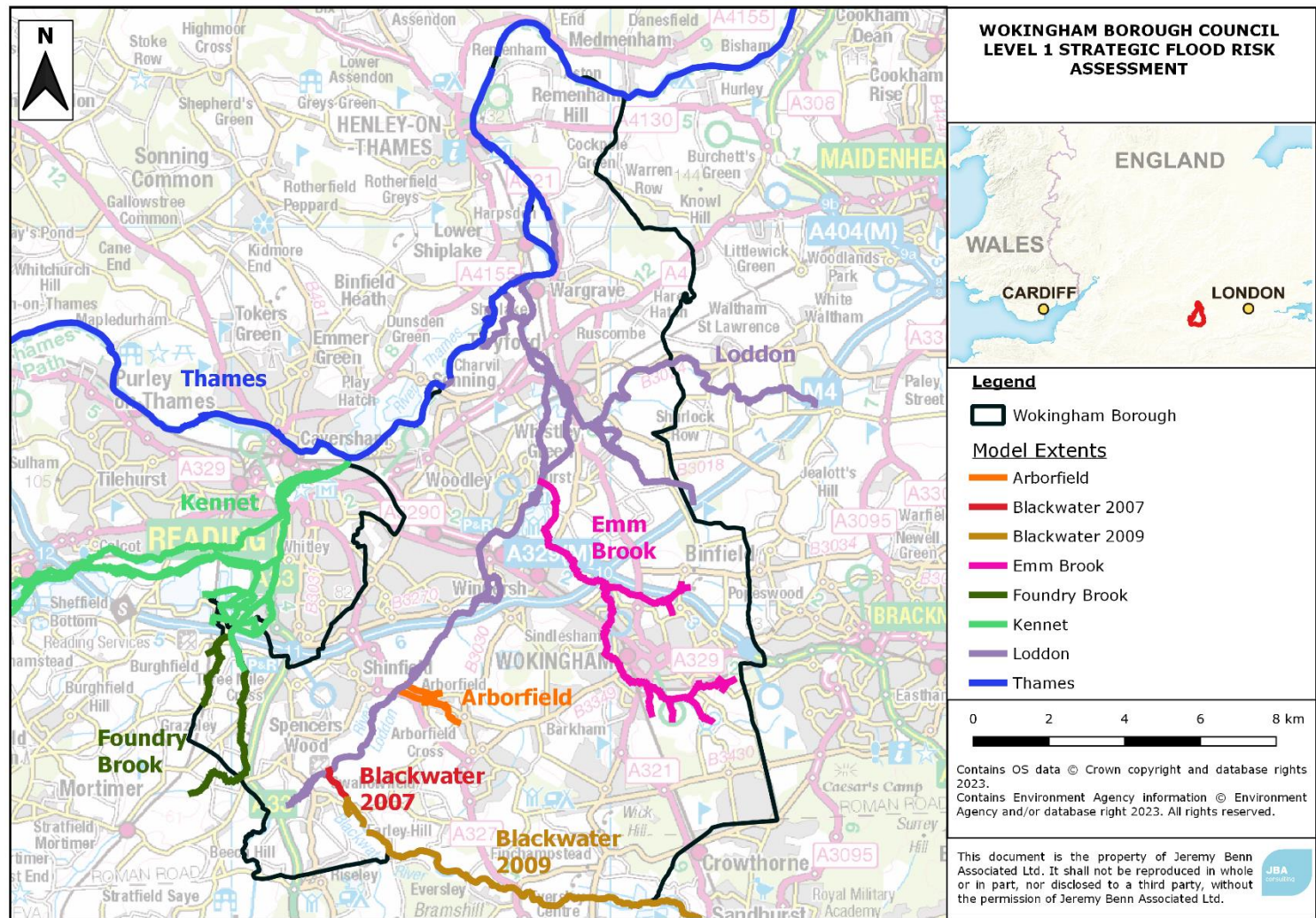


Figure 2-1: Extents of the hydraulic models used in this SFRA.

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:

- Kennet
- Loddon
- Arborfield
- Thames (Hurley to Teddington)
- Thames (Pangbourne to Sonning)
- Thames (Sonning to Hurley)

For areas covered by detailed models, but with no 3.3% AEP output available, the 1% AEP outputs were used as a proxy. This was the case for the following models:

- Blackwater (2007)
- Blackwater (2009)
- Foudry Brook
- Emm Brook

As this is quite a conservative approach, the 5% AEP outputs have been used to identify areas where the Flood Zone 3b extent is likely to be similar/considerably different from the 1% AEP output and this has been used to inform the site screening process.

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 (**Error! Reference source not found.**).

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.

To inform the Sequential test for 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. A hydraulic model for the Emm Brook was also provided under licence for the SFRA.

Where climate change simulations undertaken for the past projects were within approximately +/- 5% of the updated climate change allowances, these were deemed suitable to use following discussions with the EA taking into account the practicalities of re-running models and the associated time and cost versus a marginal change in allowance. As the Wokingham Borough falls across four different Management Catchments which each have different climate change allowances the central and higher central allowances for the 2080s epoch vary for the different watercourses. This is detailed further in Section 4 of the Main Report.

Where there were no detailed models available, or the existing models could not be re-run with the updated climate change guidance, Flood Zone 2 has been used as an indication of climate change.

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

For the Thames models no suitable allowances were available for higher central climate change so the upper end (70%) allowance will be used to inform the potential impacts of climate change in areas where this is considerably larger than the 35% extent. No suitable allowance for higher central climate change was available for Foudry Brook, and no allowance for central climate change for Emm Brook was available. If development is proposed in areas where suitable climate change runs are not available, these may need to be run as part of a site-specific Flood Risk Assessment.

The Arborfield model was developed as a pluvial model and was therefore run for the appropriate rainfall intensity allowances for the 2070s epoch for the Loddon and tributaries management catchment. There are 25% for the central climate change estimate and 40% for the upper end climate change. These have been included separately in the Appendix A: GeoPDF mapping where appropriate.

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

Model	Management Catchment	Central climate change allowance used	Higher central climate change allowance used
Blackwater 2007	Loddon and tributaries	15%	25%

Model	Management Catchment	Central climate change allowance used	Higher central climate change allowance used
Blackwater 2009	Loddon and tributaries	15%	25%
Foudry Brook	Kennet and tributaries	20%	None
Kennet	Kennet and tributaries	25%	35%
Loddon Lower	Loddon and tributaries	14%	23%
Thames (Hurley to Teddington)	Thames and South Chilterns	35%	None
Thames (Pangbourne to Sonning)	Thames and South Chilterns and Loddon and tributaries	35%	None
Thames (Sonning to Hurley)	Thames and South Chilterns and Loddon and tributaries	35%	None
Emm Brook	Loddon and tributaries	None	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 3.3% and 1% AEP events were included as part of this SFRA and are presented in in Appendix A: GeoPDFs as 'SW Climate Change Uplifts' for the following events and scenarios:

- 3.3% AEP plus 35% CC
- 1% AEP plus 40% CC

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

6 Sewers

Thames 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 January 2000 until May 2022. For confidentiality, this data is only included within this SFRA on a 5-digit postcode basis.

Section 5.6 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 5.8 of the Main Report presents the reservoirs affecting Wokingham Borough.

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 Wokingham Borough SFRA.

Table 9-1: Summary of supplied to inform the Wokingham Borough 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	Wokingham Borough Council
Fluvial (including climate change)	Blackwater (2007) 1D ISIS model (with 2017 climate change re-runs) Blackwater (2009) 1D-2D ISIS-TUFLOW model (with 2017 climate change re-runs) Foudry Brook (2017) 1D-2D ISIS-TUFLOW model Kennet (2018) 1D-2D ESTRY-TUFLOW model Loddon Lower (2022) 1D-2D ESTRY-TUFLOW model Thames (Hurley to Teddington) (2019) 1D-2D ISIS-TUFLOW model Thames (Pangbourne to Sonning) (2019) 1D-2D Flood Modeller-TUFLOW Thames (Sonning to Hurley) (2019) 1D-2D Flood Modeller-TUFLOW	Environment Agency
Fluvial (including climate change)	Emm Brook (2020) 1D-2D ESTRY-TUFLOW model	Wokingham Borough Council
Fluvial (including climate change)	Arborfield (2023) 1D-2D ESTRY-TUFLOW model	Developed by JBA for Wokingham Borough Council as part of this SFRA
Fluvial (including climate change)	Flood Map for Planning	Environment Agency

Source of flood risk	Data used to inform the assessment	Data supplier
Surface water (including climate change)	Risk of Flooding from Surface Water dataset	Environment Agency
Sewers	Internal and external historic drainage records	Thames 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
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 (Basingstoke and Deane Borough Council, Bracknell Forest Council, Buckinghamshire Council, Hart District Council, Reading Borough Council, South Oxfordshire District Council, West Berkshire Council and the Royal Borough of Windsor and Maidenhead)
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 Wokingham Borough Council)