

1 APPENDIX MAPPING: SUPPORTING INFORMATION

Appendix B: River networks

Main Rivers are represented by the Environment Agency's Statutory Main River layer. Ordinary Watercourses are represented by the Environment Agency's Detailed River Network Layer.

Appendix C: Bedrock Geology

Bedrock geology is mapped using the British Geological Survey 625k Bedrock Geology data. The bedrock data is created sing generalisation of 1: 50,000 data which was used to make the 2007 5th edition Bedrock Geology map.

Appendix D: Superficial Geology

The superficial geology data is taken from the British Geological Survey 625k superficial deposits dataset. The superficial deposit mapping is based upon the 1977 first edition Quaternary Map.

Appendix E: Groundwater Source Protection Zones (SPZs)

The data used here is provided by the Environment Agency. The SPZs provide additional protection to safeguard drinking water quality by restricting the proximity of certain activities which may impact upon drinking water supply. The zones are defined by the groundwater travel time to an abstraction point. SPZs are given the following divisions:

- Zone 1 (Inner Protection Zone): a travel time of 50 days or less from any point within the zone or below the water table. Additionally, the zone has a 50m (or less) radius. Principally based upon biological decay bacteria and aims to protect water supply from the spread of toxic chemicals and waterborne disease.
- Zone 2 (Outer Protection Zone): a travel time of 400 days from a point below the water table. Travel time is based upon the minimum time required to provide delay, dilution and attenuation of slowly degrading pollutants.
- Zone 3 (Total Catchment): defined as the total area required to support the abstraction or discharge from the protected groundwater source.

Appendix F: Flood History

The EA's Recorded Flood Outlines layer shows all the records of historic flooding from rivers, the sea, groundwater and surface water. The layer also provides information about the flood event including the date, flood source and flood cause. Recording officially began in 1946 however some details are held prior to this. The mapping accounts for the presence of structures and defences, and it should be noted that, the absence of flooding does not mean an area has not flooded but records may not be held.

The flood incident data within the maps is provided by Gloucestershire County Council. The data is presented at post code level, rather than at exact property scale.

Appendix G: Flood Zones

The data used to prepare the fluvial mapping for this study is based on Flood Zones and the results from hydraulic models either provided by the Environment Agency or prepared for the purposes of this Strategic Flood Risk Assessment (SFRA).

Flood Zones 2 and 3a

Flood Zones 2 and 3a have been taken from the Environment Agency's Flood Zone 2 and 3, as shown on their long term flood risk information [website](#).

Flood Zone 3b

Flood Zone 3b has been identified as land which would flood with an annual probability of 1 in 20 years (5% AEP). It has been derived from the 20-year defended modelled flood extent where detailed hydraulic models exist.

These are:

- Cam and Wickster's Brook
- River Frome
- Dimore Brook
- Daniel's Brook
- Little Avon

Where detailed hydraulic models do not exist for watercourses, the 1 in 100-year modelled flood extent (Flood Zone 3) has been used.

Appendix H: EA Flood Defences

The flood defence data is sourced from the Spatial Flood Defence data provided by the EA. It shows the flood defences which are able to protect against river floods with a 1% chance of occurrence, and sea flood with a 0.5% chance. There are some additional defences included which will protect against smaller flood events.

The flood storage areas included in the mapping are shown using the Flood Map for Planning (Rivers and Sea) – Flood Storage Areas data source. The data included shows areas that act as a balancing reservoir, storage basin or balancing pond.

The areas shown to benefit from flood defences is based upon the EA Flood Map for Planning (Rivers and Sea): Areas Benefiting from Flood Defences layer. The data shows those areas which could benefit from the presence of defences in a 1 in 100-year fluvial event and a 1 in 200-year coastal event. These years correlate to Flood Zone 3 as described in the Planning Practice Guidance. When mapping the areas that would benefit, it is assumed that the defences are in the same condition as when they were built. It is stated that the mapping does not show all areas that benefit from flood defences.

Appendix I: Flood Warning Areas

The Flood Warning Area dataset is provided by the EA. It typically includes properties that are expected to flood from rivers, the sea, and in some cases groundwater. Flood Warning Areas define areas that are within the Flood Warning Service limit that represents a named geographical community (urban area, suburb, hamlet, large city). The purpose of the system is to provide alerts to people when flooding is expected, and they should take actions to protect themselves and property.

The Flood Alert area is also provided by the EA. Flood Alert Areas related to geographical areas which have the potential to be flooded by rivers, the sea and in some cases groundwater. Flood alerts are issued in order to make people aware of potential flooding and take low impact actions. These are issued before flood warnings to provide advanced warnings.

Appendix J: Climate change

The 'higher central' (35% or 40%) and 'upper end' (70% or 85%) climate change allowances were modelled by re-running the following Environment Agency detailed models:

- Cam and Wickster's Brook
- River Frome
- Dimore Brook

- Daniel’s Brook

The following models had already been re-run for the latest climate change allowances:

- Nailsworth Stream
- Little Avon
- River Severn

The mapping provides a strategic assessment of climate change risk – developers should undertake detailed modelling of climate change allowances as part of a site-specific FRA, following the guidance set out in the SFRA main report.

Appendix K: Risk of Flooding from Surface Water

Mapping of surface water flood risk in Stroud District has been taken from the updated Risk of Flooding from Surface Water (RoFSW) published by the Environment Agency.

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.
Very Low	Flooding occurring as a result of rainfall with less than 1 in 1,000 (0.1%) chance in any given year.

The RoFSW is derived primarily from identifying natural drainage channels, rivers, low points on the floodplain and flow paths between buildings. The data incorporates locally held models provided by Lead Local Flood Authorities.

The dataset has been modelled on a 2m square grid and so provides a high-resolution map for identifying areas at risk.

Appendix M: Areas Susceptible to Groundwater

Mapping of groundwater flood risk has been based on the Areas Susceptible to Groundwater (AStGWF) dataset. The AStGWF dataset is a strategic-scale map showing groundwater flood areas on a 1km square grid. It shows the proportion of each 1km grid square, where geological and hydrogeological conditions indicate that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring and does not take account of the chance of flooding from groundwater rebound. This dataset covers a large area of land, and only isolated locations within the overall susceptible area are actually likely to suffer the consequences of groundwater flooding.

The AStGWF data is indicative and should only be used in combination with other information, for example local data or historical data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. However, the data can help to identify areas for assessment at a local scale where finer resolution datasets exist.

Appendix N: Reservoir Flood Risk

The risk of inundation as a result of reservoir breach or failure of a number of reservoirs within the area has been identified from the Environment Agency’s Reservoir Flood Extent mapping (available on the Long Term Flood Risk Information [website](#)). The risks are mapped from all ‘Category A’ reservoirs, which hold 25,000m³ of more of water above ground level.

Appendix O: Recorded Sewer Flooding Incidents

Wessex Water and Severn Trent Water provided details of sewer flooding at a postcode level. The number of incidents within each postcode was totalled.

Appendix P: WFD Catchments and NFM Mapping

The WFD catchments are defined for the implementation of the Water Framework Directive. The catchments are delineated using WFD River Waterbody Catchments.

The natural flood mapping opportunities is provided by the EA as part of the Working with Natural Processes research project. The datasets included are:

- Runoff attenuation features (1% AEP): shows the locations of high flow accumulation, on the land surface, whereby it may be possible to temporarily store water and attenuate flooding during high flows. The data is based upon the RoFSW dataset and identifies areas of high flow accumulations in the 1% AEP surface water maps. The areas of ponding are between 100 and 5000m² and fall on a slope of 6% or greater.
- Runoff attenuation features (3.3% AEP): shows the locations of high flow accumulation, on the land surface, whereby it may be possible to temporarily store water and attenuate flooding during high flows. The data is based upon the RoFSW dataset and identifies areas of high flow accumulations in the 3.3% AEP surface water maps. The areas of ponding are between 100 and 5000m² and fall on a slope of 6% or greater.
- Tree planting (floodplain): shows the locations whereby tree planting on the floodplain would be possible and would be effective in alleviating flooding.
- Tree planting (wider catchment): the data shows locations whereby there are slowly permeable soils whereby scrub and tree planting would be most effective in increasing infiltration and hydrological losses.
- Tree planting (riparian): this data shows areas whereby tree planting may be possible on smaller floodplains, close to flow pathways, and effective in attenuating flooding.