Appendix H

H Cumulative Impact Assessment Methodology

H.1 Historic Flood Risk

Historic flood risk was determined using historic internal flooding data from Thames Water, Severn Trent and Wessex Water. Each point within the datasets represents a location where it is known there has been at least one flood event (however, the nature and scale of these flood events varies significantly). The data was filtered down using descriptions of flooding incidents to rule out flooding from sources such as sewer flooding and water main bursts.

Attribute data for the Severn Trent flooding dataset includes the:

- Location of flood incident (street name, town and easting/northing)
- Date of incident

Attribute data for the Wessex Water flooding dataset includes the:

- Location of flood incident (street name, town and easting/northing)
- Date of incident

Thames Water historic flooding data was provided as postcode data with the number of historic flooding incidents occurring within each postcode area. In these cases, the postcodes were translated into grid references and the number of incidents at each point were counted.

Attribute data for the Thames Water flooding dataset includes the:

- Location of flood incident (postcode)
- Number of incidents occurring within the postcode

A count of each historical flood incident was conducted for each catchment to determine the historic flood risk of the catchments.

H.2 Sensitivity to increases in flows

This is a measure of the increase in the number of properties at risk of surface water flooding in a 1 in 100-year event to a 1 in 1000-year event. It is an indicator of where local topography makes an area more sensitive to increases in flood risk that may be due to any number of reasons, including climate change, new development etc. It is not an absolute figure or prediction of the impact that new development will have on flood risk.

The National Receptor Dataset 2014 was used to identify all the properties within Cotswold District Council's area.

This data was intersected with the 1000-year and 100-year surface water flood extents separately to determine the number of properties in each catchment, in each surface water flood extent.

The difference between the two was then taken as a percentage of the number of properties in the 100-year surface water flood extent, e.g., if 250 properties are in the 100-year surface water flood extent, and 500 properties are in the 1000-year surface water extent, this would be a 100% increase in properties at risk of flooding.

H.3 Development

This is a measure of the area development sites within Cotswold District Council administrative area that fall within each catchment. It is an indicator of where development is likely to impact on surface water drainage and how this could potentially affect flood risk downstream.

The development site boundaries provided by Cotswold District Council were intersected with each catchment boundary to provide an area of sites within the catchments. This value was taken as a percentage of the total area of each catchment.

Development data from West Oxfordshire, Stroud, Wychavon, Tewkesbury and Stratford-on-Avon districts was considered within the cumulative impact assessment as catchments within these districts drain into CDC. Only three potential development sites were identified as lying within a catchment that drains into CDC, with a combined area of 1.5 hectares. This area only occupies around 0.04% of the total catchment area, and therefore was deemed as low risk.

A summary of the datasets used to calculate the historic flood risk, the sensitivity to increases in flood flows and the potential impact of development for each catchment is shown in Table H-1.

A summary of the studies that were used to assess the nature of flood risk in regions downstream of catchment draining out of Cotswold District Council's area is shown in Table H-2.

Dataset	Coverage	Source of data	Use of data
Catchment boundaries	Cotswold District Council study area	Water Framework Directive (WFD) catchments	Defining catchment boundaries
Neighbouring Local Plan allocations	Neighbouring authorities	Neighbouring authorities	For identifying cross boundary issues with catchments that are shared by Cotswold District Council and neighbouring authorities
Historic flooding incidents	Cotswold District Council study area	Wessex Water Severn Trent Thames Water Cotswold District Council	Assessing the number of historic flooding records in each catchment
National Receptor Dataset 2014	Cotswold District Council study area	Environment Agency supplied by Cotswold District Council	Location of buildings within in the CDC boundary for assessing those at risk from surface water flooding
Risk of Flooding from Surface Water (RoFSW) map, 100-year and 1000-year extents	Cotswold District Council study area	Environment Agency	Assessing the number of properties within the 100-year and 1000-year surface water flooding extent, and to work out predicted increase in surface water flood risk to sites.

Dataset	Coverage	Source of data	Use of data
Development sites	Cotswold District Council study area	Cotswold District Council	Assessing the percentage of the area of development sites within each catchment covering CDC.

Table H-1: Summary of datasets used in the Cumulative Impact Assessment

Document	Local Authority	Catchment
South Worcestershire Level 1 Strategic Flood Risk Assessment (2009)	Wychavon District Council	Bretforton Brook Broadway-Badsey Brook Littleton Brook Noleham Brook
Wiltshire Council Level 1 Strategic Flood Risk Assessment (2019)	Wiltshire Council	Ampney and Poulton Brooks Cerney Wick Brook Churn Marston Meysey Brook Sherston Avon Swill Brook Tetbury Avon Thames - Churn to Coln, Kemble to Waterhay Bridge, Waterhay Bridge to Cricklade and Chelworth Brook
West Oxfordshire District Council Level 1 Strategic Flood Risk Assessment (2016)	West Oxfordshire District Council	Broadwell Brook Evenlode Hazelford and Coombe Brook Leach Littlestock Stream to tributary of Evenlode at Shipton Radcot Cut Shill Brook and Tributaries Westcote Brook Windrush and tributaries (Little Rissington to Thames)
Cheltenham Borough Council Level 1 Strategic Flood Risk Assessment (2008)	Cheltenham Borough Council	Chelt
Swindon Borough Council Level 1 Strategic Flood Risk Assessment (2019)	Swindon Borough Council	Coln
Stroud District Council Level 1 Strategic Flood Risk Assessment (2008)	Stroud District Council	Frome Horsley Stream Nailsworth Stream Ozleworth Brook

Document	Local Authority	Catchment
		The Cam and Sharpness Canal
Tewkesbury Borough Council Level 1 Strategic Flood Risk Assessment (2008)	Tewkesbury Borough Council	Horsebere Brook Isbourne
Stratford-on-Avon District Council Level 1 Strategic Flood Risk Assessment (2019)	Stratford-on-Avon District Council	Knee Brook Marchfont Brook Nethercote Brook Stour

Table H-2: Summary of studies used to assess the nature of flood risk downstream of Cotswold District

H.4 Ranking the results

The results for each assessment were ranked into high, medium and low risk as shown in Table H-3 below.

Flood risk ranking	% increase in properties within each catchment at risk of flood in a 1-100 year to 1-1000 year event	Total number of data points in Wessex Water, Seven Trent and Thames Water historic flooding datasets	% of development sites within each catchment
Low risk	<250%	0 to 2	<2%
Medium risk	250 to 500%	3 to 5	2 to 4%
High risk	>500%	>6	>4%

Table H-3: Ranking the results

The ranking results were combined from both assessments to give an overall high, medium and low ranking for all catchments within the borough. Specific policies are provided for each risk category. To enable a quantitative ranking of catchments, a score was assigned to each of the rankings.

- High = 3
- Medium = 2
- Low = 1

Predicted flood risk ranking	Historic flood risk ranking			
		High	**Medium**	**Low**
	High	High	High	Medium
	Medium	High	Medium	Low
	Low	Medium	Low	Low

Table H-4: Final combined rankings

H.5 Additional considerations

Skewed results

Due to the nature of the assessment, catchments with a very small number of properties within the surface water extents could see skewed results. This meant that this catchment had an overall ranking of high, however the catchment is largely outside of the study area. Incidences of this mainly occurred where only a small area of the catchment lies within Cotswold District Council administrative area and therefore the effect on the study area is minimal. For this reason, the following catchments were given a final ranking of low:

- Broadway-Badsey Brook
- Broadwell Brook
- Chelt
- Cornwell Brook and tributaries
- Evenlode
- Frome
- Horsebere Brook
- Isbourne
- Little Compton Brook and tributaries
- Littlestock Stream to tributary of Evenlode at Shipton
- Littleton Brook
- Marchfont Brook
- Nethercote Brook
- Noleham Brook
- Ozleworth Brook
- Radcot Cut
- Shill Brook and Tributaries
- Stour
- Swill Brook
- Thames (Churn to Coln)
- Thames (Waterhaybridge to Cricklade) and Chelworth Brook
- The Cam and Sharpness Canal
- Windrush and tributaries

Growth in neighbouring authorities

Development in neighbouring authorities can affect flood risk in Cotswold District Council, especially if the catchment is draining towards the study area. Development sites in neighbouring authorities were assessed to determine if any neighbouring development would affect flood risk in CDC. Only three potential development sites were identified as lying within a catchment that drains into CDC, with a combined area of 1.5 hectares. This area only occupies around 0.04% of the total catchment area, and therefore was deemed as low risk. However, it is recommended that Cotswold District Council works together with neighbouring authorities to ensure policies on flood risk and drainage are compatible.

Growth in CDC administrative area

Development within CDC has the potential to affect flood risk in the neighbouring authorities, especially if there are existing flood risk issues. Previous SFRA studies have

been used to identify if each of the catchments that drain into neighbouring Local Authorities have existing flood risk issues, summarised within Appendix E.

All catchments identified as having the potential to impact existing flood risk issues in neighbouring Local Authorities, due to channels draining out of CDC into other districts, were assigned a score of 2. This contributed to the final score of the catchment and the subsequent rating.

Neighbouring Local Planning Authorities should work alongside each other and the Lead Local Flood Authority to develop complementary Local Planning Policies for the Cotswold District and neighbouring authorities. Local Planning Policy should aim to include measures such as SuDS, natural flood management techniques and green infrastructure within development to contribute to a reduction of flood risk downstream.

H.6 Assumptions

The assumptions made when conducting the Cumulative Impact Assessment are shown below in Table H-5.

Assessment aspect	Assumption made	Details of limitation in method	Justification of method used
Sensitivity to increases in flood flows	Location of properties	Assumption that all properties have been included within the EA National Receptor Dataset 2014. It may not include all new build properties.	This was the most up to date and accurate data available.
Historic Flooding Incidents datasets (CDC, WW, ST, TW)	Severity of historic flooding	Each point represents a location where it is known there has been at least one flood event (however the nature and scale of these flood events varies significantly). The severity of the historic flooding event relating to the point has not been considered, just the total number of points within each catchment where there has been a historic flood event.	This is a conservative approach to consider the 'worst case' of flood risk.

Assessment aspect	Assumption made	Details of limitation in method	Justification of method used
Historic Flood Incidents datasets (CDC, TW)	Location of historic flooding incidents	Historic flooding data was provided as postcode data with the number of historic flood events occurring at each postcode attributed. These were converted to easting and northing's to be able to spatially query against the catchments. It was assumed that all flooding events within each postcode occurred at the central point of the postcode area.	The data was provided at postcode level to avoid breaching GDPR protocols so was the most up to date data available from CDC and TW.

Table H-5: Assumptions made within the CIA