



early stage to prevent an increase in sewer flooding and/or spills from combined sewer overflows (CSOs) further down the wastewater system as a result of the development.

The impact of an increased volume of foul water discharge on watercourses should also be considered for large sites, or where several sites are likely to be developed in the same Sewage Treatment Works (STW) catchment, particularly where the receiving STW discharges into the same watercourse as the surface water runoff from the site.

The Cotswold Water Cycle Study should be referred to for more information on wastewater capacity.

6.6 Making development safe

6.6.1 Basements

Basement dwellings are classified as 'Highly Vulnerable' according to the National Planning Policy Framework - Planning Practice Guide (Table 2)⁴². As such basement dwellings should not be permitted within Flood Zone 3a and must pass the Exception Test should they be proposed within Flood Zone 2. Basements dwellings should be discouraged within areas at risk of fluvial, surface water or groundwater flooding.

Where basements are permitted however, basement access points should be situated at a minimum of 300 mm above the 100 year plus climate change flood level. The basement must have unimpeded access and waterproof construction to avoid seepage during flooding conditions. In addition, it is important with proposals for subterranean development that there is no adverse impact on the groundwater regime. Therefore where basement developments are proposed, an assessment of existing and potential groundwater levels at the site should be undertaken, including monitoring of groundwater levels from the conception to the completion of a proposed development. Groundwater levels should also be monitored for a year post development.

6.6.2 Flood resistance and resilience

Resistance and resilience measures are measures which reduce the impact of flooding or increase the ability of people or buildings affected to recover from flooding. However these measures should not be used to justify development in inappropriate locations. These measures are particularly relevant where minor developments (such as domestic extensions) are allowed in flood risk areas. Further useful guidance is provided in the [Planning Practice Guidance for Flood Risk and Coastal Change](#), which describes the possible measures:

- Flood resistance measures are used to prevent water from entering a building, e.g. flood barriers across doorways and airbricks; non-return valves and raising flood levels.
- Flood resilience measures are used when water is designed to enter the building, but cause minimal damage and can be quickly returned to use after a flood, e.g. raising electrical sockets, tiled floors.

The measures chosen will depend on the nature of the flood risk, and obviously development vulnerable to sewer flooding will require a different approach to one, for example at risk from flooding of the River Thames.

Further guidance is available in the Department of Communities and Local Government's document, [Improving the flood performance of new buildings](#)⁴³.

6.6.3 Safe access and egress

For development in Flood Zone 3 it is necessary to provide safe access and egress during a flood. Within Flood Zone 3, 'safe' access should remain dry for 'more vulnerable' uses. Dry escape for residential dwellings should be up to the 1% annual probability event (100 year return period) taking into account climate change for fluvial flood risk.

Access should preferably be dry for 'less vulnerable' land use classifications, but if this is not possible the FRA needs to demonstrate that depths and velocities of flood water will be no greater than the 'risks to some' category of the 'Flood Risk to People' FD 2320 calculator.

⁴² Department for Communities and Local Government (March 2012) Technical Guidance to the National Planning Policy Framework available at <http://www.communities.gov.uk/documents/planningandbuilding/pdf/2115548.pdf>

⁴³ Department of Communities and Local Government (2007) Improving the Flood Performance of New Buildings: Flood Resilient Construction http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf



Within Flood Zone 2, people (including those with restricted mobility) should be able to remain safe inside a new development in the 1 in 1000-year; and rescue and evacuation of people from a development should be practicable up to a 1 in 1000-year event. Where safe access and egress cannot be achieved a Flood Emergency Plan needs to be produced (and be assessed by Cotswold DC Emergency Planners).

6.7 Water quality and biodiversity

All development should assess the impact of site drainage on the Water Framework Directive (WFD) status of the waterbody the water will drain into. The assessment should consider both water quality and quantity as a change to one or both of these may have a detrimental impact on the waterbody which will need to be mitigated for. For example SuDS schemes can alter the discharge runoff rate into watercourses and consideration needs to be given to the impact of this change on the physical structure of the watercourse and its ecology.

An impact assessment should also be carried out if the floodplain habitat currently depends on periodic inundation, for example water meadows.

The Cotswold Water Cycle Study should be referred to for more information on water quality.

6.8 River restoration and enhancement

All new development close to rivers and culverts should consider the opportunity presented to improve and enhance the river environment. As a minimum, CDC and developers should aim to set back development 8m from the river, providing a buffer strip to 'make space for water' and allow additional capacity to accommodate climate change. The 8m buffer should not contain any built environment including roads, lighting and fencing.

Developments should look at opportunities for river restoration, de-culverting and river enhancement as part of the development. Restoration can take place on various scales, from small enhancement measures to full river restoration. Options include backwater creation, in-channel and bank habitat enhancement, removal of structures e.g. weirs, removal of toe-boarding, restoration of banks and reinstatement of meanders.

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. Advice on river restoration, de-culverting and providing other environmental enhancements on development sites is available from the Environment Agency⁴⁴. Early consultation is recommended.

Any modifications made as part of a proposed opening up and/ or restoration of river channels and corridors should be designed by suitable professionals and a full flood risk assessment of the impact of the modifications will be required to be carried out.

6.9 Existing watercourses, defences and assets

Permanent or temporary works within or adjacent to a watercourse require a Flood Defence Consent from the Environment Agency (in the case of Main rivers) or from CDC who act on behalf of the LLFA for ordinary watercourses.

Proposed developments which are adjacent to Environment Agency assets must demonstrate a minimum clearance of 8m from these assets to permit maintenance and renewal.

Developers should consult Map 1 to determine the location of defences. The FRA should consider the mechanisms of potential failure, the standard of protection, the worst case scenario breach and the residual risk. Parameters for the breach should be discussed with the Environment Agency prior to the building of a hydraulic model.

Where developers are riparian owners, they should also assess existing assets (e.g. bridges, culverts, river walls, embankments) and renew them to last the lifetime of the development. Enhancement opportunities should be sought when renewing assets, e.g. bioengineered river walls, raising bridge soffits to account for climate change. Any works should be designed to be

⁴⁴ Environment Agency (2006). Building a better environment. A guide for developers [http://www.environment-agency.gov.uk/static/documents/1_GETH1106BLNE-e-e\(1\).pdf](http://www.environment-agency.gov.uk/static/documents/1_GETH1106BLNE-e-e(1).pdf)
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maintenance free, but there is an obligation to the riparian owner to undertake maintenance when required.

There should be a presumption against further culverting and building over culverts. All new developments with culverts running through the site should seek to de-culvert rivers for flood risk management and conservation benefit. Wherever possible, existing watercourses and drainage channels should be retained, offering risk management authorities benefits in terms of maintenance, future upgrading, biodiversity and pollution prevention. The CIRIA (2010) Culvert Design and Operation Guide provides guidance in this area⁴⁵.

Where a culvert is present, the FRA must consider risk from the culvert being both 0% blocked and 75% blocked.

6.10 Safeguarding land for future flood storage

The Environment Agency is currently undertaking a 5 year review of the Churn Flood Risk Management Strategy. One of the flood risk management options discussed by the Strategy is a flood storage area (FSA) just upstream of Cirencester on land between Baunton and the Abbey Way bridge.

The review shows that implementation of this proposed scheme only becomes economically viable if the predicted impacts of climate change are recognised, so this option is currently due to be reviewed with a view of potential implementation in 2030 (beyond the plan period of the Local Plan). The existing floodplain in this area is already classed as Functional Floodplain (Flood Zone 3b) and therefore most forms of development would not be permitted currently. Planners should be aware however that the land required for a FSA in the future would extend beyond the existing floodplain. There are various other areas on the River Churn currently under discussion for use as water meadows and flow control.

CDC and the Environment Agency have agreed that the findings of the Strategy review should be taken into account and that any land highlighted as a potential flood storage area in the future should be 'safe-guarded' from development.

6.11 Developer contributions to flood risk improvements

Major development offers a unique opportunity to reduce the level of flood risk, both to the development area, and also to existing communities downstream. Changes to legislation mean that it is now much easier for developers to contribute towards the cost of flood risk improvements.

Without allocated sites, location specific recommendations on developer contributions or strategic options cannot be made at this stage. In the case of CDC, there are no large strategic alleviation schemes planned, but improvements tend to be small scale channel and culvert improvements works, generally funded at the moment by FCRMGiA. Developers can be asked to make direct contributions to flood alleviation schemes affecting the communities close to developments.

7 Summary and conclusions

The scope of the Cotswold District SFRA has been increased to reflect changes in policy and legislation, to bring the planning context and flood risk information up to date and to aid the development of the Local Plan.

The SFRA provides general advice for planners and developers on:

- Sources of flood risk mapping and other evidence to inform the Sequential Test
- Flood risk from each source of flooding in the Districts
- What is required from a Flood Risk Assessment
- Other issues that need to be considered when carrying out development close to watercourses.

It also provides more specific flood risk information and advice for each of the strategic sites and key settlements under consideration by the Council as potential development areas at the time of writing.

⁴⁵ CIRIA (2010) Culvert Design and Operation Guide. CIRIA report C689
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It is important to remember that information on flood risk is being updated continuously. This is particularly true now that the Council have taken responsibility for carrying out and recording flood investigations under the FWMA. The Environment Agency has a rolling programme of flood modelling and mapping studies, and updates to the Flood Map are made quarterly. Where new mapping studies are carried out, this will also affect the definition of the functional floodplain (Flood Zone 3b) and the climate change outline (see section 3.2.5).

As CDC move forward with their Local Plan which includes site allocations, they must use the most up to date information in the Sequential Test, and developers should be aware of the latest information for use in Flood Risk Assessments.

The Flood and Water Management Act (2010), the Localism Act (2011) and the National Planning Policy Framework (2012) all offer opportunities for a more integrated approach to flood risk management and development. As it is in the relatively early stages of the site allocation process, CDC have a real chance to make sure development provides improvements to flood risk overall and enhancements to the river environment.



8 Useful documents and links

District Council planning policy documents (including Local Plan and Core Strategy)

Cotswold Planning Website

http://www.cotswold.gov.uk/nqcontent.cfm?a_id=4714&tt=cotswold

Cotswold Neighbourhood Plans

http://www.cotswold.gov.uk/nqcontent.cfm?a_id=14210&tt=cotswold

Cotswold Review of Summer 2007 floods Phase 1 (Hyder)

http://www.cotswold.gov.uk/nqcontent.cfm?a_id=3131&cx=012408004195912917261%3Aamu9ei-rrcq&cof=FORID%3A11&ie=UTF-8&q=Cotswold+Review+of+Summer+2007+floods+Phase+1+%28Hyder%29&sa=Search

Lead Local Flood Authority flood risk management documents

Gloucestershire County Council Local Flood Risk Management Strategy website

<http://www.gloucestershire.gov.uk/CHttpHandler.ashx?id=56202&p=0>

Gloucestershire County Council (November 2011) Preliminary Flood Risk Assessment

<http://www.gloucestershire.gov.uk/extra/article/109983/Preliminary-Flood-Risk-Assessment>

Legislation and government guidance

Localism Act (2011) Section 110: Duty to cooperate in relation to planning of sustainable development

<http://www.legislation.gov.uk/ukpga/2011/20/section/110>

Flood and Water Management Act (2010)

<http://www.legislation.gov.uk/ukpga/2010/29/contents>

National Planning Policy Framework, Department of Communities and Local Government (2012)

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf

Planning Practice Guidance for Flood Risk and Coastal Change, Department of Communities and Local Government (2014)

<http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/>

Defra (March 2010) Surface Water Management Plan Technical Guidance

<http://www.defra.gov.uk/publications/files/pb13546-swmp-guidance-100319.pdf>

Department of Communities and Local Government (2009) Planning Policy Statement 25: Development and Flood Risk Practice Guide

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/7772/pps25guideupdate.pdf

Department of Communities and Local Government (2007) Improving the Flood Performance of New Buildings: Flood Resilient Construction

http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf

Environment Agency resources and guidance

Environment Agency website, Flood information

<https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather><http://www.environment-agency.gov.uk/homeandleisure/floods/default.aspx>

Environment Agency, Flood Map for Planning (Rivers and Sea)

http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683.0&y=355134.0&scale=1&layerGroups=default&ep=map&textonly=off&lang=_e&topic=floodmap&utm_source=Poster&utm_medium=FloodRisk&utm_campaign=FloodMonth13

Environment Agency, Risk of Flooding from Surface Water map



<http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=ufmfs#wx=357683&y=355134&scale=2>
Environment Agency, Risk of Flooding from Reservoirs map

<http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=reservoir#wx=357683&y=355134&scale=2>
Environment Agency Flood Risk Standing Advice

<https://www.gov.uk/flood-risk-standing-advice-frsa-for-local-planning-authorities>
Environment Agency, FRA Guidance Note 1

http://webarchive.nationalarchives.gov.uk/20140328084622/http://www.environment-agency.gov.uk/static/documents/Utility/FRAGuidanceNote1_v3.1.pdf
Environment Agency, FRA Guidance Note 3

http://webarchive.nationalarchives.gov.uk/20140328084622/http://www.environment-agency.gov.uk/static/documents/Utility/FRAGuidanceNote3_v3.1.pdf
Environment Agency (2012) Demonstrating the flood risk Sequential Test for Planning Applications version 3.1

http://webarchive.nationalarchives.gov.uk/20140328084622/http://www.environment-agency.gov.uk/static/documents/Business/SequentialTestProcess_v3.1.pdf
Environment Agency SUDS guidance

<http://webarchive.nationalarchives.gov.uk/20140328084622/http://www.environment-agency.gov.uk/business/sectors/39909.aspx>
Environment Agency (2006) Building a better environment: A guide for developers
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/289894/LIT_2745_c8ed3d.pdf

Environment Agency (2010) Oxford Flood Risk Management Strategy
<https://www.gov.uk/government/publications/oxford-flood-risk-management-scheme>

Environment Agency (2008) Thames Catchment Flood Management Plan
<http://webarchive.nationalarchives.gov.uk/20140328084622/http://cdn.environment-agency.gov.uk/geth1209bqyl-e-e.pdf>

Other resources and guidance

Association of British Insurers and National Flood Forum (April 2012) Guidance on Insurance and Planning in Flood Risk Areas for Local Planning Authorities in England
<http://www.planningofficers.org.uk/downloads/pdf/ABI%20%20NFF%20Guidance%20on%20Insurance%20and%20Planning%20for%20Local%20Planning%20Authorities.pdf>

CIRIA (2004) Development and Flood Risk: Guidance for the Construction Industry. Report C624
http://www.ciria.org/service/AM/ContentManagerNet/Search/SearchRedirect.aspx?Section=Search1&content=product_excerpts&template=/contentmanagernet/contentdisplay.aspx&contentfileid=1417

CIRIA (2007) The SuDS Manual (C697) (can be purchased at www.ciria.org)

CIRIA (2010) Culvert Design and Operation Guide. CIRIA report C689 (available free by registering at www.ciria.org)

Defra (2004) Strategy for Flood and Coastal Erosion Management: Groundwater Flooding Scoping Study (LDS23)

Defra/Environment Agency (2005) Preliminary rainfall runoff management for developments. R&D Technical Report W5-074/A/TR/1
<http://archive.defra.gov.uk/environment/flooding/documents/research/sc030219.pdf>

Defra/Environment Agency (2006) Flood Risks to People Phase 2. R&D Technical Report FD2321/TR2
<http://randd.defra.gov.uk/Default.aspx?Module=More&Location=None&ProjectID=12016>

National SuDS Working Group (2004) Interim Code of Practice for Sustainable Drainage Systems
http://www.environment-agency.gov.uk/static/documents/Business/icop_final_0704_872183.pdf

Susdrain website <http://www.susdrain.org/>



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UK Climate Change Impacts Programme, Identifying adaptation options
http://www.ukcip.org.uk/wordpress/wp-content/PDFs/ID_Adapt_options.pdf



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