

## Cheltenham SWMP – Guidance for using mapping outputs

### How have the maps been produced?

For the Cheltenham Surface Water Management Plan (SWMP) a hydraulic model has been produced using the InfoWorks Integrated Catchment Modelling (ICM) software. The model represents all runoff into and within the urban area, and includes a representation of all watercourses within Cheltenham. For the SWMP a two-staged modelling approach has been adopted.

The first stage was to produce an 'intermediate' model of the entire urban area to identify areas within Cheltenham which were more vulnerable to surface water flooding and should be examined in greater detail. The 'intermediate' model does not include roads, buildings or walls which can have a significant impact on the conveyance of flood water within an urban environment

The subsequent stage of the SWMP was to produce 'detailed' sub-models in a number of areas ('detailed assessment areas') in Cheltenham which were identified as being vulnerable to surface water flooding. The 'detailed' model was an enhancement of the 'intermediate' model and included buildings, roads and walls to more precisely predict the conveyance of flood water within an urban environment.

The 'intermediate' model was simulated for three rainfall events:

- July 2007 flood event;
- 1 in 30 year (0.33% annual probability) rainfall event for 60 minute duration, and;
- 1 in 200 year (0.33% annual probability) rainfall event for 60 minute duration.

The 'detailed model' was simulated for the July 2007 rainfall event and 8 'design storms' (e.g. 1 in 30 (0.33% annual probability) rainfall event) for the critical duration<sup>1</sup>. For the mapping outputs, three rainfall events were mapped:

- July 2007 flood event;
- 1 in 30 year (0.33% annual probability) rainfall event, and;
- 1 in 100 year (0.1% annual probability) rainfall event.

Maximum flood depths and flood hazard ratings<sup>2</sup> were extracted from the models for the purposes of the mapping. For the purposes of the mapping composite layers have been created, which combine the 'intermediate' and 'detailed' models into one layer. Three flood depth and three flood hazard layers have been created:

- July 2007 flood event;

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<sup>1</sup> The critical duration is the duration of the rainfall event which causes the maximum flooding

<sup>2</sup> Flood hazard ratings are calculated using the standard Defra calculations, more information is available at <http://www.rpalt.co.uk/documents/J429-RiskstoPeoplePh2-Guidance.pdf>

- 1 in 30 year (0.33% annual probability) rainfall event, and;
- 'Extreme' storm event (which represents the 1 in 200 year rainfall event for the 'intermediate' model and the 1 in 100 year for the 'detailed' models).

### What maps have been produced?

A summary of the maps produced for the Cheltenham SWMP are shown in Table 1.

Name of map	Description
<b>Cheltenham-wide maps</b>	
Cheltenham SWMP – Interactive Map.pdf	An interactive PDF which contains the composite flood depth and flood hazard layers across Cheltenham for three rainfall events: July 2007, 1 in 30 (0.33% annual probability) rainfall event, and 'extreme' storm event (which represents the 1 in 200 year rainfall event for the 'intermediate' model and the 1 in 100 year + climate change rainfall event for the 'detailed' models)
WBCHEL001 – Cheltenham-wide July 2007 Verification Event (Depth).png	Flood depth map across Cheltenham which contain the composite layer for the July 2007 rainfall event
WBCHEL002 – Cheltenham-wide 1 in 30 year event (Depth).png	Flood depth map across Cheltenham which contain the composite layer for the 1 in 30 (0.33% annual probability) rainfall event
WBCHEL003 – Cheltenham-wide Extreme rainfall event (Depth).png	Flood depth map across Cheltenham which contain the composite layer for the extreme rainfall event (which represents the 1 in 200 year rainfall event for the 'intermediate' model and the 1 in 100 year + climate change rainfall event for the 'detailed' models)
WBCHEL004 – Detailed Assessment Areas.png	Location of detailed assessment areas for Cheltenham SWMP
<b>Maps of detailed assessment areas</b>	
WBCHEL005 & WBCHEL006	Flood depth map for detailed assessment area A, B, C (Whaddon, Lynworth and Prestbury) under the 'do nothing' scenario for the 1 in 30 (0.33% annual probability) and 1 in 100 (0.1% annual probability) rainfall events
WBCHEL007 – WBCHEL012	Flood depth map for detailed assessment area A, B, C (Whaddon, Lynworth and Prestbury) under the different modelled options for the 1 in 30 (0.33% annual probability) and 1 in 100 (0.1% annual probability) rainfall events
WBCHEL013 & WBCHEL014	Flood depth map for detailed assessment area E, F (Southfield Manor Park and Sandy Lane, and Pilley) under the 'do nothing'

	scenario for the 1 in 30 (0.33% annual probability) and 1 in 100 (0.1% annual probability) rainfall events
WBCHEL015 & WBCHEL016	Flood depth map for detailed assessment area E, F (Southfield Manor Park and Sandy Lane, and Pilley) under the modelled option scenario for the 1 in 30 (0.33% annual probability) and 1 in 100 (0.1% annual probability) rainfall events
WBCHEL017 & WBCHEL018	Flood depth map for detailed assessment area G (Tivoli and The Park) under the 'do nothing' scenario for the 1 in 30 (0.33% annual probability) and 1 in 100 (0.1% annual probability) rainfall events
WBCHEL019 & WBCHEL020	Flood depth map for detailed assessment area G (Tivoli and The Park) under the modelled option scenario for the 1 in 30 (0.33% annual probability) and 1 in 100 (0.1% annual probability) rainfall events
WBCHEL021 – WBCHEL023	Location of detailed assessment areas
WBCHEL024 – WBCHEL026	Flood depth map for detailed assessment areas for July 2007 verification event

Table 1 Summary of mapping outputs from Cheltenham SWMP

### What should the maps be used for?

The surface water maps are suitable to identify broad areas within Cheltenham which are more likely to be vulnerable to surface water flooding. This allows GCC and its partners to undertake more detailed analysis in areas which are most vulnerable to surface water flooding. The maps can be used in spatial planning as part of the evidence base to ensure that surface water flooding is appropriately considered when allocating land for housing development. **However, they should not be used as the sole evidence base for any specific planning decision without other supporting evidence or studies.** The maps can also be used to assist emergency planners in preparing their Multi-Agency response plans

The surface water maps **should not be used to identify if individual properties or businesses are vulnerable to surface water flooding.** This is because the modelling only provides an indication of areas more vulnerable to surface water flooding, and does not take into account floor levels, construction characteristics (e.g. presence or absence of dropped kerbs) or property design which significantly influences whether an individual property will flood. In particular the 'intermediate' model does not include roads, buildings or walls which have a significant effect on the conveyance of flood water in the urban environment. Roads often convey significant flood water within the carriageway which is not represented within the 'intermediate' model.

### How to use the interactive PDF

As part of the mapping outputs an Interactive PDF has been produced. The interactive PDF contains all of the Cheltenham-wide flood depth and flood hazard

layers within one document, allowing users to toggle layers on and off to display different results. Initially, when the user opens the PDF all of the layers within the PDF will be displayed.



To toggle layers on and off users should click on the 'layers' tab on the left hand side of the screen to unhide the list of layers stored within the interactive PDF. If users do not have a 'layers' tab displayed on their screen they should go to View > Navigation Panels > Layers to displays the layers. Users can subsequently press the + or - signs to unhide or hide the list of sub-layers which are stored within PDF.



To toggle layers on and off users should press the 'eye' icon for the layers they wish to display. If the eye icon is unselected the layer will not appear on the map, and vice versa. It is recommended that users only toggle the 'Flood Outlines – Depth' and 'Flood Outlines – Hazard' on and off as these are the model outputs. All other layers are background layers within the PDF.

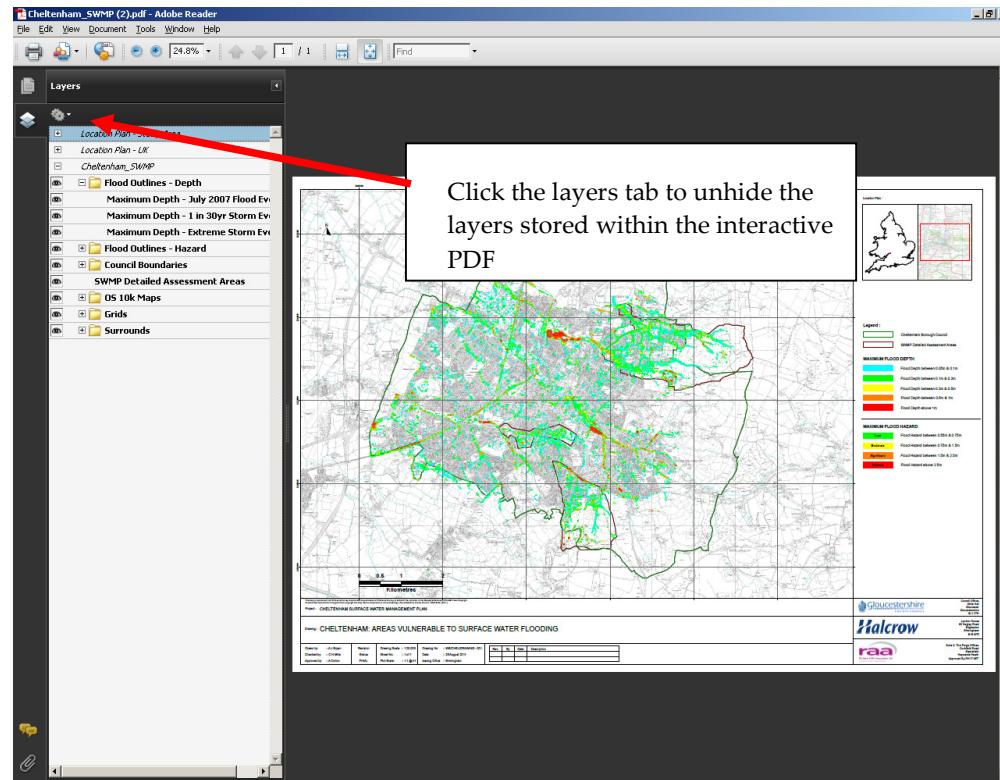


Figure 1 Hiding and unhiding layers in the interactive PDF

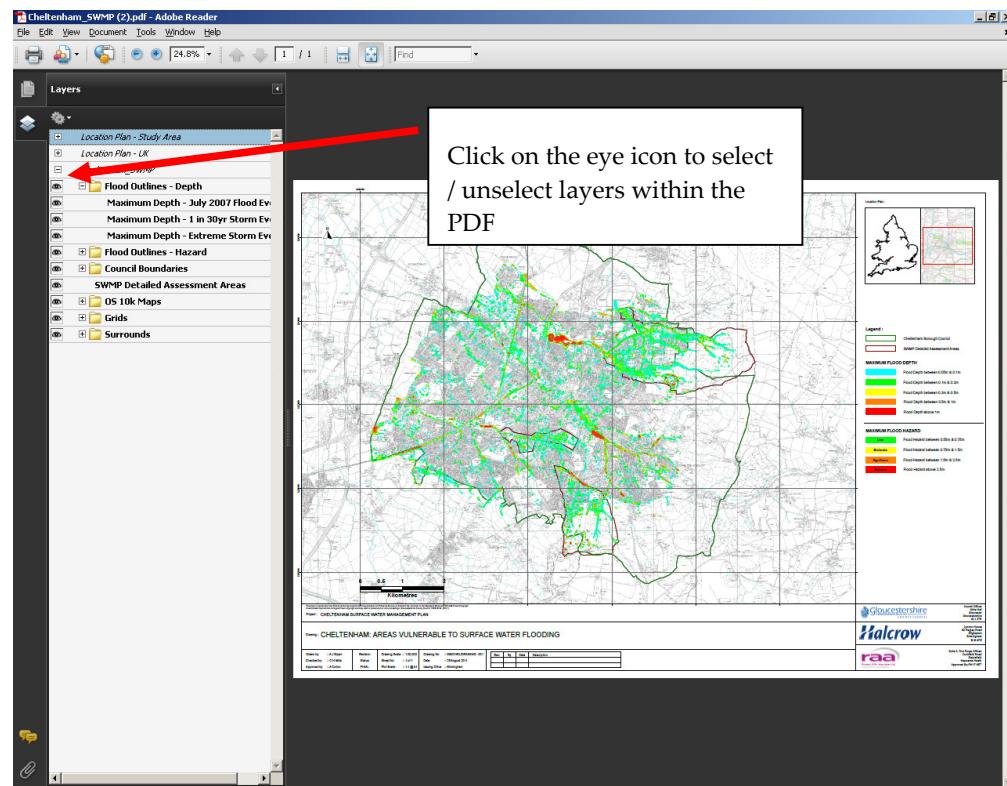


Figure 2 Selecting and unselecting layers in the interactive PDF