



Water Resource Associates

A network of consultants in hydraulics, hydrology, groundwater & environmental issues

Project title: HYSIM Improvements for Drought Forward Planning

Summary: Updating of HYSIM modeling of the Sussex Ouse and Cuckmere basins, and enhancement of the HYSIM software to provide drought forward planning simulation module.

Client: South East Water Plc	Financed by: South East Water Plc
Period of assignment: Jul 2005 – Oct 2006	Location: East Sussex, UK
Project Value: £33,983	WRA services: £20 000
In co-operation with: Hydro-GIS Ltd.	Background
<p>Location of Sussex Ouse and Cuckmere basins</p>	<p>The Environment Agency introduced HYSIM in 1998 to the Sussex region, and commissioned WRA to prepare river flow data for the River Ouse, in South East Water's resource zone 2.</p> <p>As a result of the dry weather experienced in 2003, the need was acknowledged to be able to carry out predictive simulations of the surface water systems and reservoir storage into the following year, in order to judge whether drought permits and other demand constraints would be required.</p> <p>The simulated drought flows will be used by South East Water to populate the MISER water resource model, to carry out deployable output assessments.</p>
<p>Forecast drought flows for Ouse at Barcombe Mills</p>	<p>Scope of work by Water Resource Associates Ltd</p> <p>Updates and improvements to previous HYSIM modelling studies of the Sussex Ouse and Cuckmere basins were undertaken. Simulated flow records were provided for the period 1920-2007 at eight different locations in the Sussex Ouse basin, and four different locations in the Cuckmere basin.</p> <p>A drought forward planning simulation module was added to the existing HYSIM software. Potential future sequences of daily rainfall and potential evapotranspiration can be simulated based on either an historic or statistical drought, and then these sequences used as input to the calibrated model to determine the resulting flow sequence.</p>
<p>Results</p> <p>The drought forward planning simulation module was used to analyse 87-year records of daily rainfall and potential evapotranspiration from 1918 to 2007 over the subcatchments of each basin. A statistical drought commencing 01 July and lasting 28 months was determined for three return periods: an average year, 1 in 20 and 1 in 100 years. The resulting records were used as input to the HYSIM model to determine the likely flows for the period 01 July 2005 up to 31 Oct 2007, which included the effect of low rainfall on the flows at the end of three successive summer seasons. The flows found for each subcatchment were then combined to determine the drought flow sequences for the Sussex Ouse at Barcombe Mills, and for the Cuckmere river at Sherman Bridge; these are the naturalised flows, before any artificial influences are considered for inclusion.</p> <p>The results showed that it was not until the third summer that the 1 in 100 year return period low flows became markedly lower than those for a 1 in 20 year return period. After Oct 2007 average rainfall values were input to the model, to determine how quickly the subcatchments recovered from the prolonged drought period. After one winter of such average rainfall, the 1 in 20 year low flows have reached the same level as those for a return period of an average year, and after two such years all three categories of flow have recovered, and there is no detectable difference between them.</p>	

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Directors

Frank A K Farquharson
Paul A C Holmes
Dr A Nick Mandeville

Ronald E Manley
Dr Andrew J Wade
Professor Paul G Whitehead

Head Office:

PO Box 838
Wallingford
Oxon OX10 9XA

Tel: +44 (0) 1491 838190
E-mail: info@watres.com