

The Impact of the “New FEH” Depth-Duration Frequency Curves on Extreme Floods for the Nant-y-Moch Reservoir in mid-Wales

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SYNOPSIS The Flood Estimation Handbook (FEH) method of flood estimation has undergone a number of reviews and updates following its publication in 1999. The first was the publication of the 'Revitalisation of the FSR/FEH rainfall-runoff method' (ReFH) by CEH in 2005. This refined the design flood hydrograph method for return periods of up to 1 in 150 years. More recently, CEH has undertaken research to further refine the Depth-Duration Frequency (DDF) Curves for long return period rainfall in excess of 1 in 100 years and including the 1 in 1,000 year and 1 in 10,000 year return period events for which reservoir spillways are typically designed.

CEH's latest research was prompted by work undertaken by MacDonald and Scott (2000) who compared 1 in 10,000 year rainfall depths derived using FEH DDF curves with Probable Maximum Precipitation (PMP) depths derived using Flood Studies Report (FSR) DDF curves for 12 reservoirs in England and Wales. They found that FSR and FEH rainfall depths diverge significantly at 1 in 10,000 year return periods and that at nine of the reservoirs studied, the 1 in 10,000 year FEH rainfall depths were greater than the PMP FSR depths.

Subsequent to this, the Babbie Group (2000) was commissioned by the Department for Environment, Food and Rural Affairs (Defra) to further investigate these findings. They found that 1 in 10,000 year FEH rainfall depths generally exceed PMP FSR depths by around 14%, emphasising the need for further research.

In the research to produce “New FEH” DDF curves for extreme rainfall events, CEH specifically considered:

- 1 in 100 year to 1 in 10,000 year rainfall events
- Storm durations from 1 hour to 192 hours (8 days).

This research that led to the development of the “New FEH” DDF model is complete but is awaiting further funding to generalise the results across the UK and to enable a suitable CD-based release to the wider industry.

This paper summarises the findings a flood study that has been undertaken for Nant-y-Moch Reservoir, owned by Statkraft, using the “New FEH” DDF curves to derive a range of design storms, including the 1 in 1,000 year and 1 in 10,000 year storms. The results of this flood study were compared to the results obtained using the FSR and FEH DDF curves for the same design storms.

The work discussed in this paper was undertaken by MWH using DDF data supplied by CEH specifically for the project and as part of their wider comparative check on results using the New FEH DDF data for existing UK reservoirs. The DDF data were derived by applying the “New FEH” model at a single point in the vicinity of Nant-y-Moch Reservoir and represent provisional results only.