Investigating an extreme drought event with the Bega River System Model

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Abstract: The Bega River catchment located in south coast New South Wales is a partly regulated coastal catchment with relatively small water storages, making it sensitive to extreme dry conditions. The extreme drought event in 2019 highlighted some water security issues which needed to be considered in the subsequent remake of the water sharing plan (WSP). To support the remake, the Department of Planning and Environment (DPE) further developed the existing Bega river system model. This model represents catchment-scale processes such as runoff, irrigation, environmental water releases and other management rules.

Cochrane Dam (CD), a 3GL hydro-electric dam located in an otherwise unregulated headwater of the Bega catchment, makes environmental flow releases and provides some drought security by reserving water in the storage. This abstract summarises the investigation completed of the CD drought reserve over the extreme drought event of 2019 to inform the WSP remake. Specifically, the adequacy of the drought reserve volume and releases required to meet specified flows targets at the end of the river system were investigated.

DPE river system models are usually used to assess long-term catchment behaviour. However, as the 2019 drought event was so severe, modifications were required to represent this significantly shorter period for scenario testing. To investigate this event, the previously developed model required improvements to make the modelled drought operation more robust, and event-specific updates (such as fixing the initial storage conditions, the extreme loss conditions and removing inflows downstream of CD). During the update, it was found that the long-term calibrated losses were too low compared to the observed losses over the event, which required recalibrating the in-stream loss models to match drought losses.

The scenarios investigated the impacts of increasing: (1) the size of the CD drought reserve (from 0.5 to 0.8GL) and (2) the drought release target. While Scenario 1 would extend the number of days of flow in the system, it was determined that it would be impractical to manage as it represented a large percent of CD operational volume. Figure 1 presents the daily flows at the end of the gauged Bega River due to setting a range of drought release targets. To maintain flows over 2ML/d, releases of 9ML/d would be required and would deplete the CD drought reserve of 0.5GL in 45 days. As expected, smaller releases could be made to prolong the total release period. For the previously recommended release rate of 3.5ML/d, 99 days of flow would be achieved.

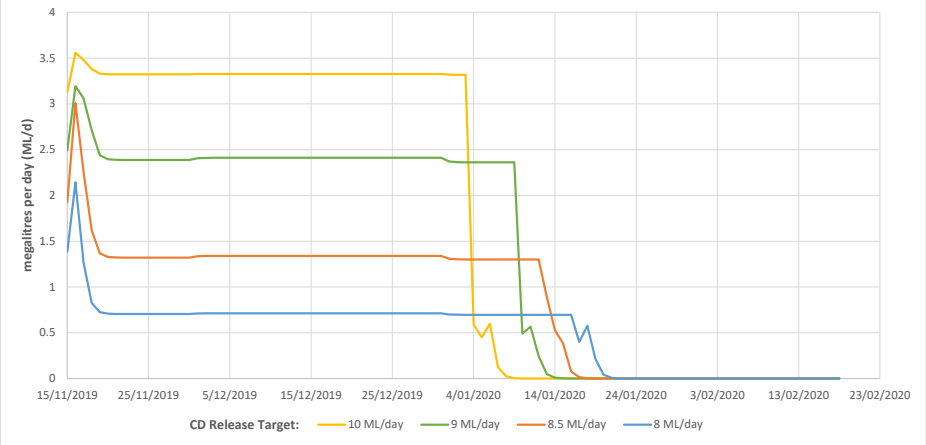

Figure 1. Daily flow time series at Kanoona (219032) for scenario with fixed releases

This modelling investigation provided a clearer understanding of the risks associated with drought in the Bega River catchment; the role that CD can play in drought mitigation and viable options for operational rules. Furthermore, improvements made for this study will be incorporated into future Bega River modelling work.

Keywords: *River system modelling, drought resilience, event based modelling, water sharing plan update*