

# Hydrological modelling and multicriteria assessments in reviewing headworks operations

Patrick Quaine and Kym Wilson

*Grampians Wimmera Mallee Water, Horsham, Victoria, Australia*  
*Email: patrick.quaine@gmwwater.org.au*

**Abstract:** The bulk entitlements (BEs) which define rights to water from the Wimmera-Glenelg headworks system contain a unique requirement for the Storage Manager (GWMWater) to periodically review headworks operations and compare performance against 11 prescribed storage management objectives (SMOs). This requirement was born out of a lack of operational data when entitlements were first issued following the completion of the Wimmera-Mallee Pipeline in 2010. This pipeline drastically reduced water demand from the headworks system by eliminating losses from the 17,500 km of earthen channels it replaced, culminating in new BE water sharing arrangements.

The 2019 Headworks Operations Review (2019 Review) was the second since the BEs were first issued in 2010, and followed an initial review in 2014 (2014 Review). The BEs required the review to support its findings using a hydrologic model. Guidance and precedence for the modelling methodology was limited to the approach used in the 2014 Review. The basic principle in this approach was model outputs were selected to be surrogates for measuring performance against particular SMOs. Proposed operating rules were then simulated using the hydrologic model, and the performance of each was measured by comparing changes from the baseline scenario results. This same basic principle was used for the 2019 Review, with key stakeholders engaged through a workshop to review the specific model outputs identified to represent performance of the SMOs. An additional 5 years of operational experience equipped the Storage Manager with greater insight to critically assess and enhance the review methodology, and address two main challenges.

Firstly, definitive quantitative results could not be determined for some SMOs as the selected surrogates were inherently self-competing; for example, volume allocated to entitlements in a given year, versus volume reserved in that year for future allocation. Secondly, some SMOs had no suitable model result to measure their performance, such as objectives of an administrative nature. By adapting the structure of the modelling analysis for the 2019 Review to be less reliant on quantitative changes in modelled results to determine the best performing option, a more holistic assessment of performance was achieved.

Modelling results were assessed in conjunction with a qualitative analysis completed in consultation with stakeholders. While the 2014 Review sought to rank the performance of all operating rules modelled in the project, the 2019 Review methodology opted not to rank scenarios at all. Despite this, modelling results were not any less important in the assessment of performance, rather, it saw stakeholders become engaged in the assessment analysis in a more meaningful way. Stakeholders were able to understand how results competed or in some cases changed very little. This drove important discussions between stakeholders about how the Storage Manager must balance objectives and how some operational changes have little influence over particular SMOs. The best performing results were then selected, after consultation with stakeholders determined which option achieved the most appropriate balance of SMOs, whilst meeting the operating rule objectives.

The assessment methodology of the 2019 Review built on the approach used for the 2014 Review and ultimately delivered a more holistic assessment of performance against the SMOs. It supported the presentation of results for multiple criteria in a clearer, more transparent and more engaging way. Overall, the project will lead to much needed changes that will both improve the Storage Manager's operation of the headworks and improve the region's hydrological modelling.

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