

Flow modelling done for the Upper Bega–Bemboka Water Source

The Water Sharing Plan for the Bega River Area Regulated, Unregulated and Alluvial Water Sources 2023 will replace the previous 2011 plan for Bega and Brogo rivers and the 2010 plan for the Murrah–Wallaga. This document summarises the results of modelling the NSW Department of Planning and Environment did as part of this replacement process.

The department has developed models to understand and assess the behaviour of many river systems in NSW. We maintain and use these models for rivers such as the Brogo, Bega and Bemboka. They help us predict what will happen in a variety of scenarios. By running different scenarios, we can understand how current and future water management policy affect water users and the environment. We can also identify the best solutions for managing water.

The surface water models we use to help make water sharing and management decisions reproduce the average long-term behaviour of river systems for planning purposes. **They do not reproduce individual daily flow behaviour in any particular year or forecast any future year.** They are also calibrated for most flow ranges, so do not perfectly represent extreme flow (high and low).

It is also difficult for models to perfectly represent user behaviour. In real-time, users can adjust their behaviour (for example, they can stop pumping water to prevent river flows dropping to a level where cease-to-pump rules will apply). Models cannot always capture this behaviour well.

Despite these limitations, models, where they are available, are an important source of information when we test and compare management options.

Modelling results for the Upper Bega–Bemboka Water Source

We modelled varying cease-to-pump rules based on flows at the Bega River at Kanoona (gauge 219032), over a 130-year period (simulation 1891–2021).¹ This ranged from the current rule at 2 ML/day up to 10 ML/day. It included a 2 ML/day cease-to-pump rule and 3 ML/day recommence-to-pump rule.

The results, outlined in Table 1, compare the numbers of years, frequency and length of cease-to-pump (CTP) and cease-to-flow (CTF) events. A cease-to-pump event happens when river flows drop to a level where water users must stop pumping to comply with the rules of a water sharing plan.

¹ model version: Bega_Master_Stochastic_Model_instrumental_v15.rsproj

Table 1. Modelled outcomes under different cease-to-pump scenarios (ML/day) for 130 years

Comparisons	Current	2*	3	4	5	7	10
No. years with a CTP 'day'	54	54	54	55	58	61	72
No. of CTP 'days' for a 130-year period	1,007	1,007	1,255	1,607	1,925	2,273	2,369
No. of times CTP 'days' are greater than 7 consecutive days	0	0	0	0	2	55	93
Median length of event of more than 7 consecutive days	0	0	0	0	8	12	14
No. of times CTP 'days' are more than 30 consecutive days	0	0	0	0	0	2	13
Median length of event of more than 30 consecutive days	0	0	0	0	0	34	39
No. years with a CTF 'day'	46	46	45	46	40	4	0
Average no. days with a CTF day each year	5	5	4	3	2	0	0

CTP = no pumping or the CTP flow. CTF = no flow or 0 ML/day.

* CTP 2 ML/day with recommence-to-pump of 3 ML/day

The modelled results showed a cease-to-pump rule at 5 ML/day would have a mild effect on users but give a better environmental outcome. This was because it would protect the lowest 10% of daily flows (a flow of 5 ML/day is the current 90th percentile daily flow at the Bega River at Kanoona – gauge 219032).

Cease-to-pump rules of either 7 ML/day or 10 ML/day would protect low-flows more but the modelling showed a much greater effect (moderate to severe) on users' overall access. There would be more cease-to-pump events and they would last longer.

When we compared the 5 ML/day cease-to-pump rule to the current 2 ML/day one, the model showed there would be:

- an extra 4 years where a cease-to-pump event would happen
- an extra 918 cease-to-pump days over that 4-year period
- two cease-to-pump events that would be longer than 7 days
- the median length of those 2 cease-to-pump events would be 8 days
- a reduction by 4 years of where a cease-to-flow event would happen
- an average reduction of 3 days in the length of cease-to-flow events.

Summary

We considered the modelling results for increasing the cease-to-pump levels in the Upper Bega–Bemboka Water Sources. Our key observations were:

- increased low-flows in the unregulated Bega–Bemboka rivers
- reduced usage in the unregulated Bega–Bemboka rivers, which would be more noticeable in dry years
- no significant effect on the flows or usage in the regulated Bega–Brogo rivers
- no significant difference between the a 2 ML/day cease-to-pump rule, and a 2 ML/day cease-to-pump rule coupled with a 3 ML/day recommence-to-pump rule (this may not be representative of real conditions and the change may be too small for the model to pick up).

More information

To read the draft *Water Sharing Plan for the Bega River Area Regulated, Unregulated and Alluvial Water Sources 2023* and related fact sheets, visit [the Water pages of the department's website](#).