Recalibrating Barwon-Darling water models using more accurate water metering records

What is the problem?

The introduction of new water metering standards has highlighted important differences in the accuracy of different types of meters used to measure water take in the Barwon-Darling Unregulated River Water Source.

Older 'time and event' and older flow meters provided less accurate water take data than the pattern-approved flow meters currently used to measure water take. The accuracy of those older meters also varied between users.

A problem has arisen because the analytical water model used to set water extraction limits in the Barwon-Darling river system relies on water measurement and accounting based on data from the old meters. This water model (the cap model) is also used to assess whether current water take complies with extraction limits.

Essentially, the difference in accuracy between old and new meters means the values reported by the current more accurate meters do not align with the data being used to assess compliance. That is, we are not comparing like with like.

What are we doing to rectify this issue?

The Barwon-Darling is the only valley in inland NSW where the cap/Baseline Diversion Limit (BDL) limit is equal to the volume of entitlement. Due to the metering issue, the model used to define the limit is out of step with the metered information. Therefore, changing the models based on the most up to date and accurate information will ensure that the entitlements and limits are realigned. We are undertaking a recalibration project to:

- more accurately quantify and describe the existing individual and total extraction limits in the Barwon-Darling river system based on recent and more accurate water meter measurements
- recalibrate the analytical water model used to assess compliance with various limits to ensure reported water take volumes and the permitted take volumes against which they are assessed are based on the same information.

Key steps are to:

- compare water take under old (time and event) and the newer pattern-approved flow meters to calculate a ratio for each pump site
- use these ratios to recalibrate the historical take data on which extraction limits are based
- recalibrate all the relevant models to the corrected historic data
- identify what value the current extraction limits represent on the new (recalibrated) scale
- amend the Barwon-Darling water sharing and water resource plans with updated extraction limit values based on the new, more accurate, scale. This includes the Barwon-Darling Long-

term Average Annual Extraction Limit, the BDL and, consequently, the Sustainable Diversion Limit (SDL).

- Where required, re-issue entitlements in volumes based on the new information and amend the water sharing and water resource plans.

What will the outcome be?

There will be **no change** to the physical volume of water allowed to be extracted from the system when compared with the cap and the Basin Plan baseline diversion limit. There will be a more accurate number being used to describe the volumes of water that may be extracted by users, both individually and in total.

The models used to set and assess compliance with extraction limits will also be more accurate.

Any changes needed to the licensed entitlement volumes will apply to all of the unregulated river access licences, which includes licenses for irrigation and held environmental water.

After the change the assessments of NSW compliance with the Barwon-Darling Cap and the Basin Plan SDL will be based on like for like figures.

How is system-wide accounting and compliance affected?

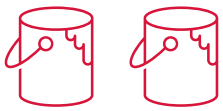
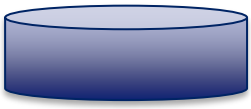
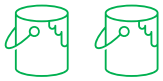
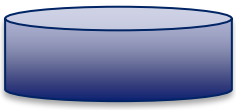
Table 1 uses four simplified water user scenarios to show why we need make changes for reporting take and assessing compliance. It uses an analogy of filling water tanks using buckets rather than on-farm storages and metered extraction. It shows the number of 'buckets' each user needs to fill their water tank based on whether they are using 'old' buckets or a new 'standardised pattern-approved' bucket. Different users have different sized old buckets, representing different levels of accuracy of their old meters. Each user's tank size, representing the physical volume of the water they may take (their entitlement), does not change.

What does this mean?

A user's entitlement is set in the number of old 'buckets' it took to fill their tank. If they must use pattern-approved buckets to report take and they each fill their tank, then:

- Users 1 and 3 would (on paper) exceed their entitlement
- User 2 would fill their tank and (on paper) would be allowed to pump until they record three full buckets, meaning there is a risk they may pump more than they are entitled.
- User 4's old bucket happened to be as accurate as the pattern-approved bucket and remains largely unaffected
- it would (erroneously) appear that more water has been taken in total (9.8 buckets) than permitted on paper (9 buckets).

Table 1 Accounting for differences in meter accuracy

User	Old buckets	Tank	Pattern-approved buckets
User 1		=  =	
User 2		=  =	
User 3 (Env. water holder)		=  =	
User 4		=  =	
Total limit	9 old buckets to fill all tanks	Constant total capacity	9.8 new standard buckets to fill all tanks

How does recalibration help?

In this scenario, the recalibration project would work out the relationship between the size of each users' old and new buckets and adjust the number of buckets used to describe individual's and total limits from old to new buckets. During compliance assessments, this would mean actual take and permitted take volumes would both be described in pattern-approved buckets. If each user filled their tank:

- Users 1 and 3 would be compliant
- The risk of user 2 pumping more than they are entitled would be reduced
- No change for user 4
- Total reported take (9.8 buckets) would reflect the physical volume allowed to be taken, with no system-wide exceedance reported unless some users were actually taking more than they are entitled to.

Supporting information

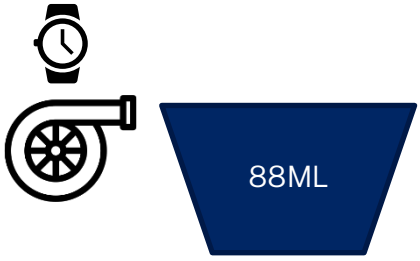
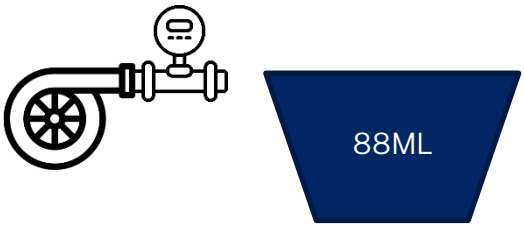
Why do the accuracy of old and new meters differ?

The 'time and event' (T&E) meters did not directly measure extracted volumes. Rather they recorded the times when a pump was operating. The volume of water taken was estimated by multiplying the length of time the pump was operating by an 'agreed rate' of take[1]. This method is less accurate compared to direct measurement using pattern-approved flow meters. The accuracy of time and event meters also varied between users according to their pumping equipment, meter installation and their agreed rate.

Why do the differences matter?

Generally, T&E meters under-reported the physical amount of water pumped. Table 2 outlines an example of T&E and new meters reporting different volumes of take for the same physical amount of water pumped.

Table 2 Conceptual example of differences in reporting accuracy of old and new meters

	Pre-2012 **Time and event meter**	**2022** **Pattern-approved meter**
Reported and accounted as pumped	Agreed rate = 4ML/hr (estimated) 4 ML/hr for 20 hours **= 80ML**	Calibrated meter 20 hours pumping = **88ML**
Actual pumped	Agreed pump rate has an error – pump rate is actually 4.4ML/hr 20 hours pumping = **88ML** 	Record of flow 20 hours pumping = **88ML** 

If T&E meter records were used to set entitlement (80ML in this example) but the user must record and report water take using pattern-approved meters, the consequence is that the user will either need to stop pumping 8ML short of the physical volume they were legally allowed to take when using their T&E meter OR an 8ML exceedance of their permitted take will be recorded and compliance action could be taken.

[1] The agreed rate was based on information from the pump manufacturer and the speed (RPMs) of the pump.