



Critical Needs Analysis

September 2021

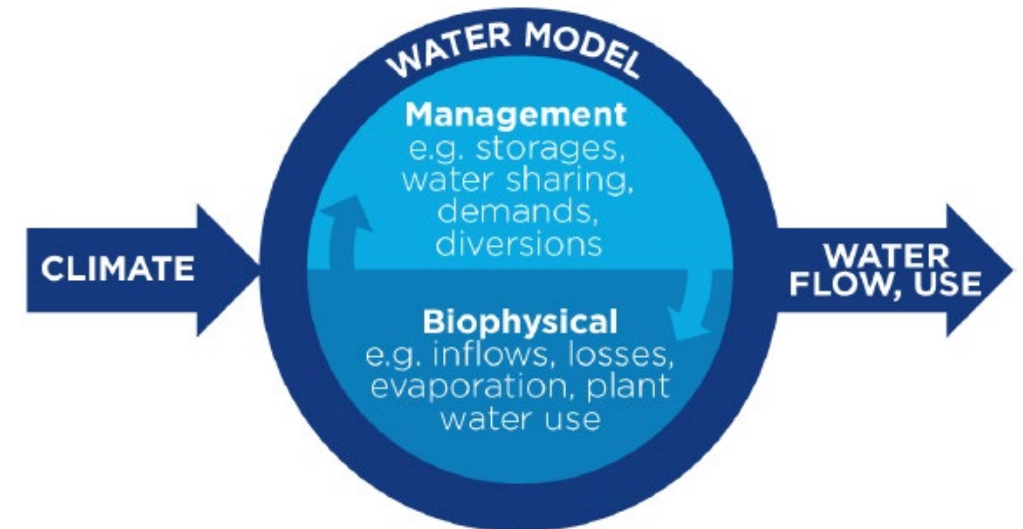
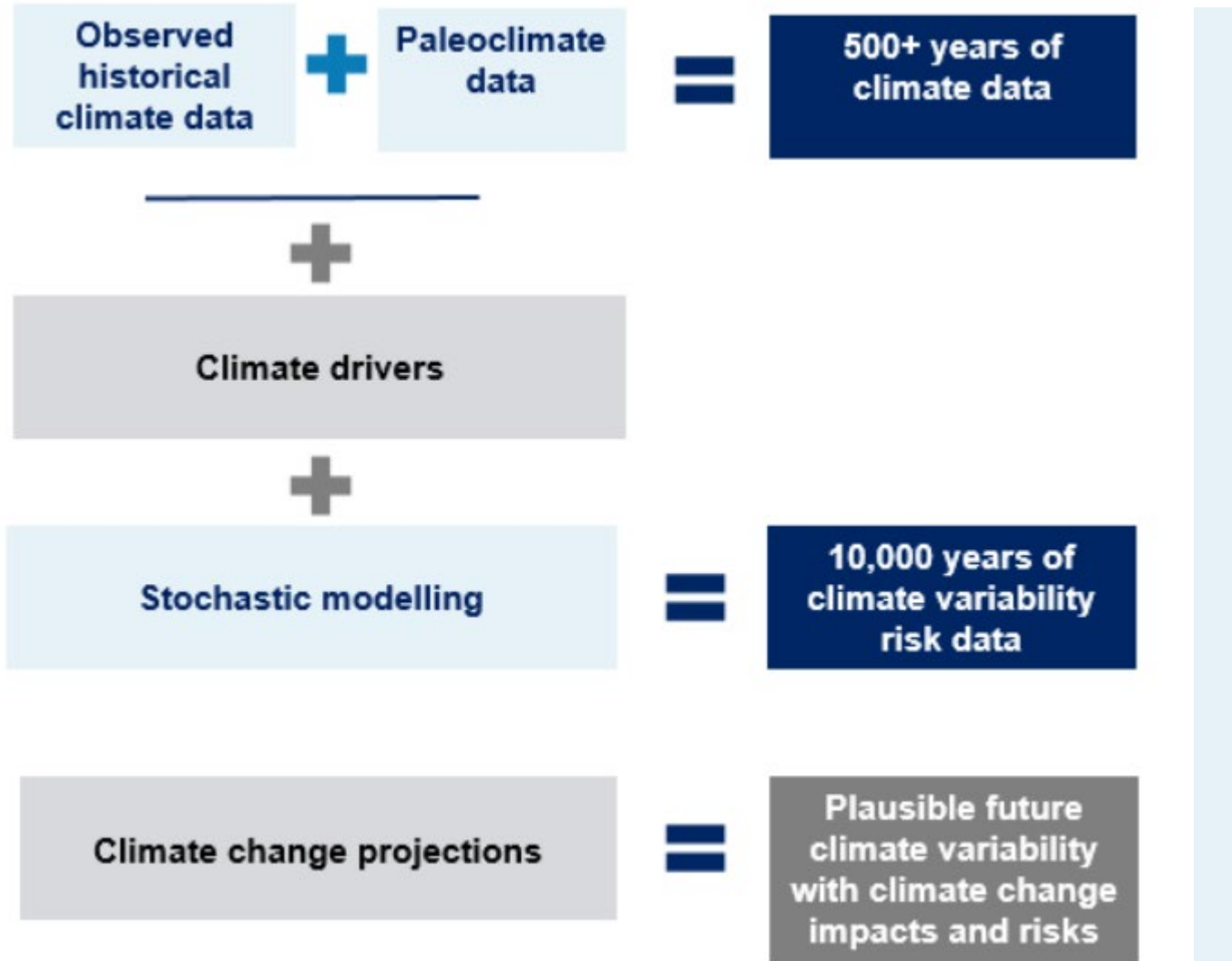
Approach to today

- Impact of a more variable climate
- Critical needs and temporary water restrictions

Question 4

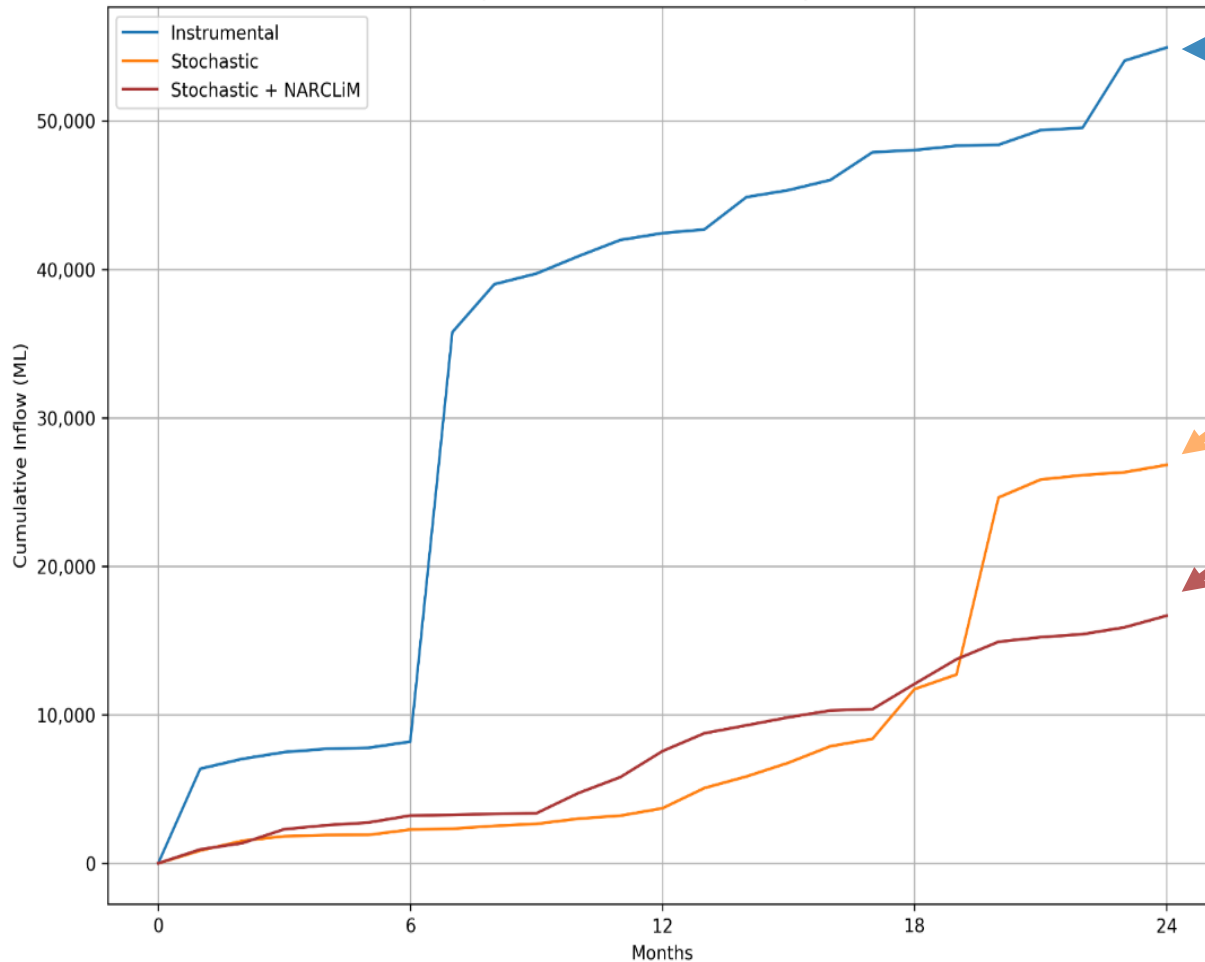
How will climate change impact on extended droughts?

Climate modelling method and steps



There could be lower flows into upstream catchments

Worst case inflows (prior to the most recent drought) into Copeton Dam modelled under different climate scenarios



The lowest inflow into Copeton Dam approx. 50 GL

Under a worst-case scenario:

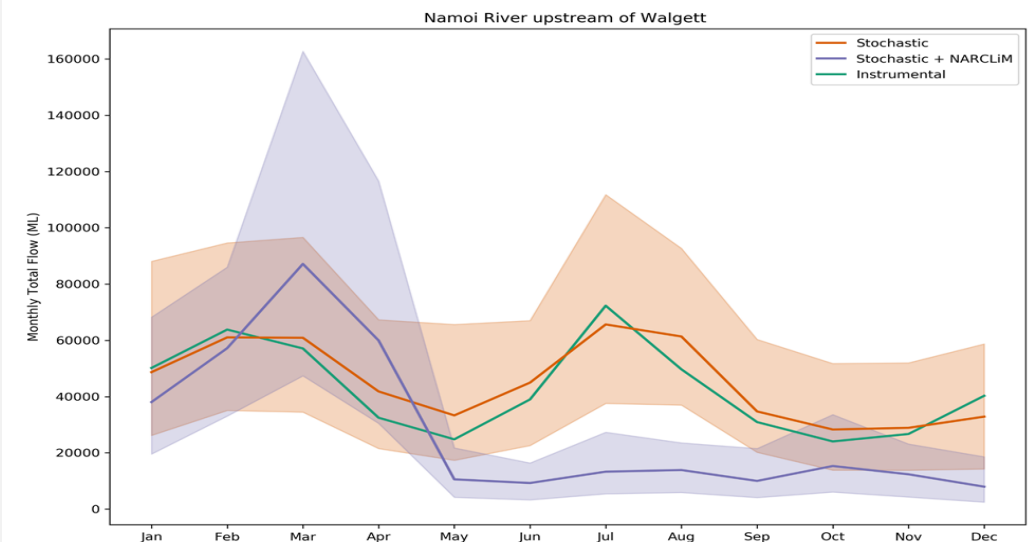
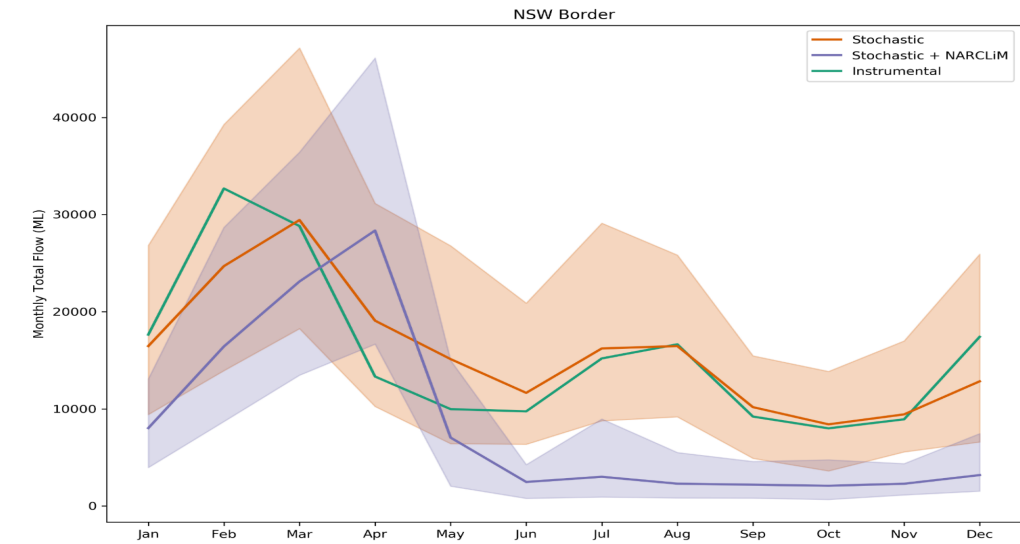
- inflows could be half that volume (27 GL over 24 months)
- a dry climate change scenario reduces this to 17 GL.

- These volumes are not able to run the Gwydir River
- The probability of this is very small but these results are consistent across the Northern Valleys.

Note that we have deliberately used the driest, most conservative climate change scenario. These might not eventuate, and if they do, we don't expect to see the impacts for another 40 years

What could this mean for the Barwon-Darling?

- There will still be wet and dry periods
- Overall long-term decline in tributary inflows.
- More frequent events when the northern tributaries do not connect with the Barwon-Darling.
- Longer cease to flow events under a worst case scenario
- Seasonal changes to tributary flows:
 - reduction in winter and spring flows
 - delay in peak flows from summer to autumn.



Inflows into the Barwon-Darling

	Barwon-Darling
Catchment	Major tributary flow contributions (MDBA 2011)*
Border Rivers	18.5
Castlereagh, Macquarie and Bogan Rivers	20.8
Namoi River	23.5
Gwydir River	6.3
Warrego	2.1
Condamine-Balonne	8.7
Moonie	2.6

*Figures adjusted post meeting to reflect the MDBA 2011 report

- **Inflows:** Around 95% of the flows come from upstream catchments.
- **River system:**
 - 1900km long and unregulated until Menindee Lakes
 - Menindee Lakes connects the northern and southern parts of the Murray Darling Basin and is the link for water management between the two.
- **Population:** 36,600 people - 0.5% of the state's population.

What does this mean and what next?

Given these results, how and when do we focus on critical needs?

Should we be focusing on the shorter cease to flow / low flow periods that are more affected by development?

Or the longer dry periods which are driven by the climate but have greater impacts on critical needs?

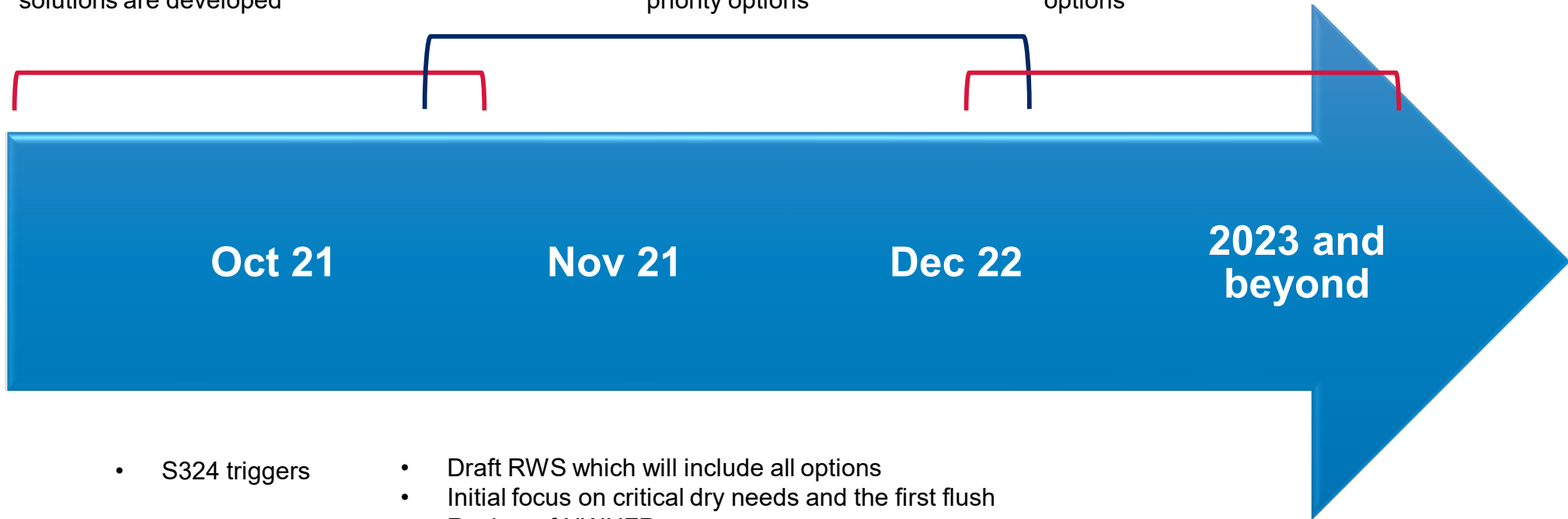
How do we address critical needs in extended dry periods, particularly in the face of a drier future climate?

Connectivity program

Immediate options while enduring solutions are developed

Assessing all options and progressing highest priority options

Consider longer term options



- S324 triggers



- Draft RWS which will include all options
- Initial focus on critical dry needs and the first flush
- Review of NWUFP
- Healthy Floodplain Program reforms

- Consider additional options coming out of RWS

Implementing the recommendations of the independent panel

- Ensure the evidence base and methodology for first flush management is:
 - quantified,
 - science-based and
 - made publicly available, including estimated requirements to meet critical water needs
- Improve flow forecasting modelling and real-time monitoring capability
- Review the objectives, principles and targets used to manage the 2020 event and seek feedback
- Establish a water reform engagement group which includes the full spectrum of interests and impacted parties, including irrigator, Indigenous, environmental, local government, floodplain graziers and riparian water users from both the Northern and Southern basin.

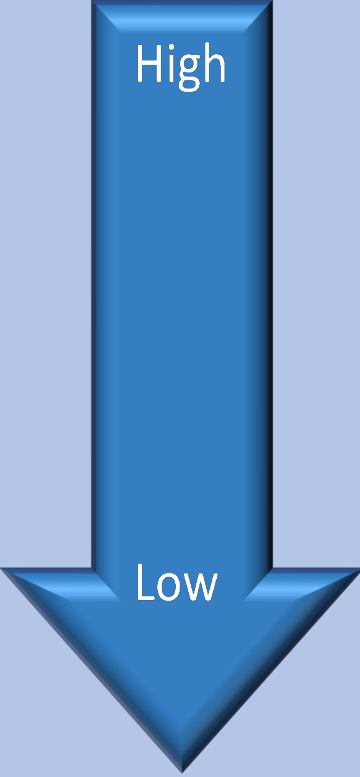
Background to Section 324 Orders

Section 324 orders under the *Water Management Act* are:

- not "business as usual" normal river operations
- only considered when it is deemed in the public interest to do so. For example, when there is a severe water shortage and critical needs are at risk
- part of the package of options to improve connectivity. They won't address connectivity under "normal" conditions.

The slides presented today outline possible triggers to consider enacting a s324 temporary water restriction.

Hierarchy of priorities

Priority	Extreme events	Normal circumstances
Highest	<ul style="list-style-type: none"> • Critical human water needs- domestic and essential town water supply 	<ul style="list-style-type: none"> • Needs of the environment
	<ul style="list-style-type: none"> • Needs of the environment 	<ul style="list-style-type: none"> • Basic landholder rights
	<ul style="list-style-type: none"> • Stock • High security licences • Commercial and industrial activities authorised by local water utility 	<ul style="list-style-type: none"> • Local water utility access licences • Stock and domestic access licences
	<ul style="list-style-type: none"> • General security licences • Unregulated river access 	<ul style="list-style-type: none"> • Regulated river (high security) access licences
	<ul style="list-style-type: none"> • Supplementary licences 	<ul style="list-style-type: none"> • General security licences • Unregulated river access

What do we already have in place?

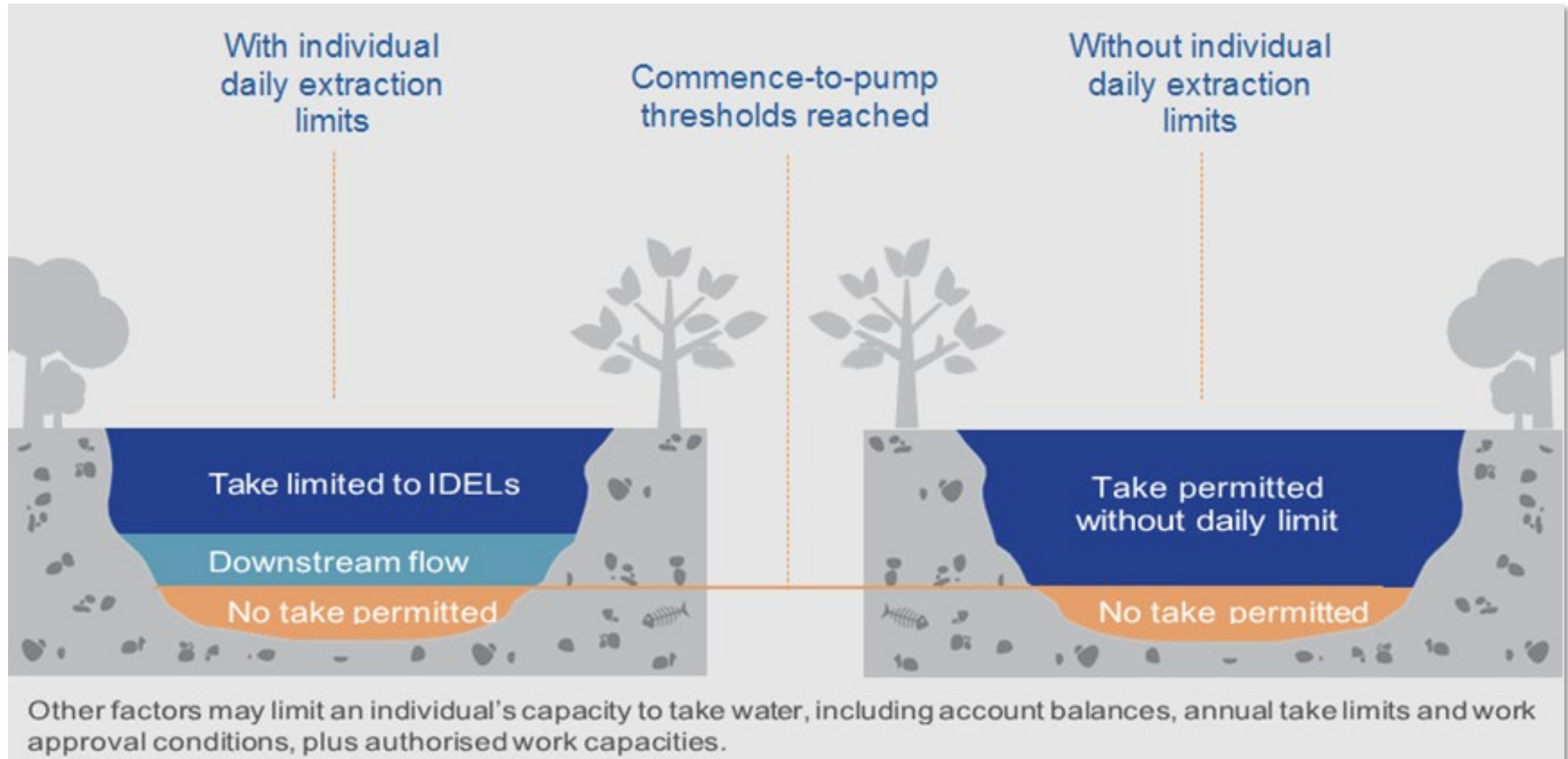
The Department has already implemented four key reforms to address connectivity issues in the Barwon-Darling:

- individual daily extraction components (IDECs)
- active management to protect held environmental water
- revised A-class access
- resumption of flows rule.

These reforms also address Natural Resources Commission, Vertessy and Matthews report recommendations.

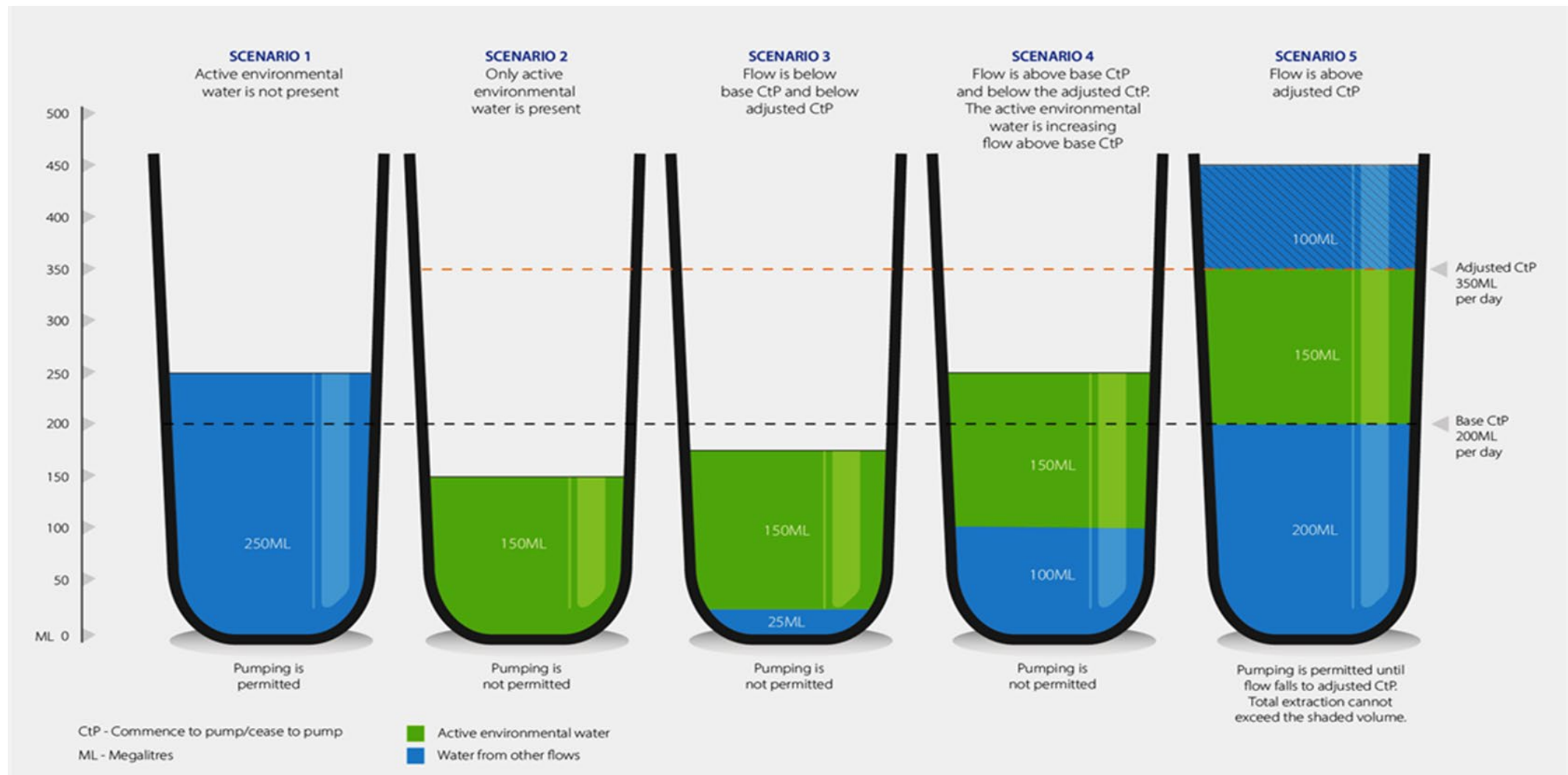
What do we already have in place?

Individual Daily Extraction Components



What do we already have in place?

Active management of held environmental water



What do we already have in place?

Revised A-class access

- A-class cease-to-pump thresholds across the 12 management zones were revised to prevent extraction of critical low flows
- The A-class cease-to-pump at Walgett Weir Pool Management zone and at Mogil Mogil didn't change according to NRC recommendations (due to water quality risks to town water supplies (Walgett) and encroaching into B-class (Mogil Mogil))
- No changes were made to B- and C-class access thresholds

What do we already have in place?

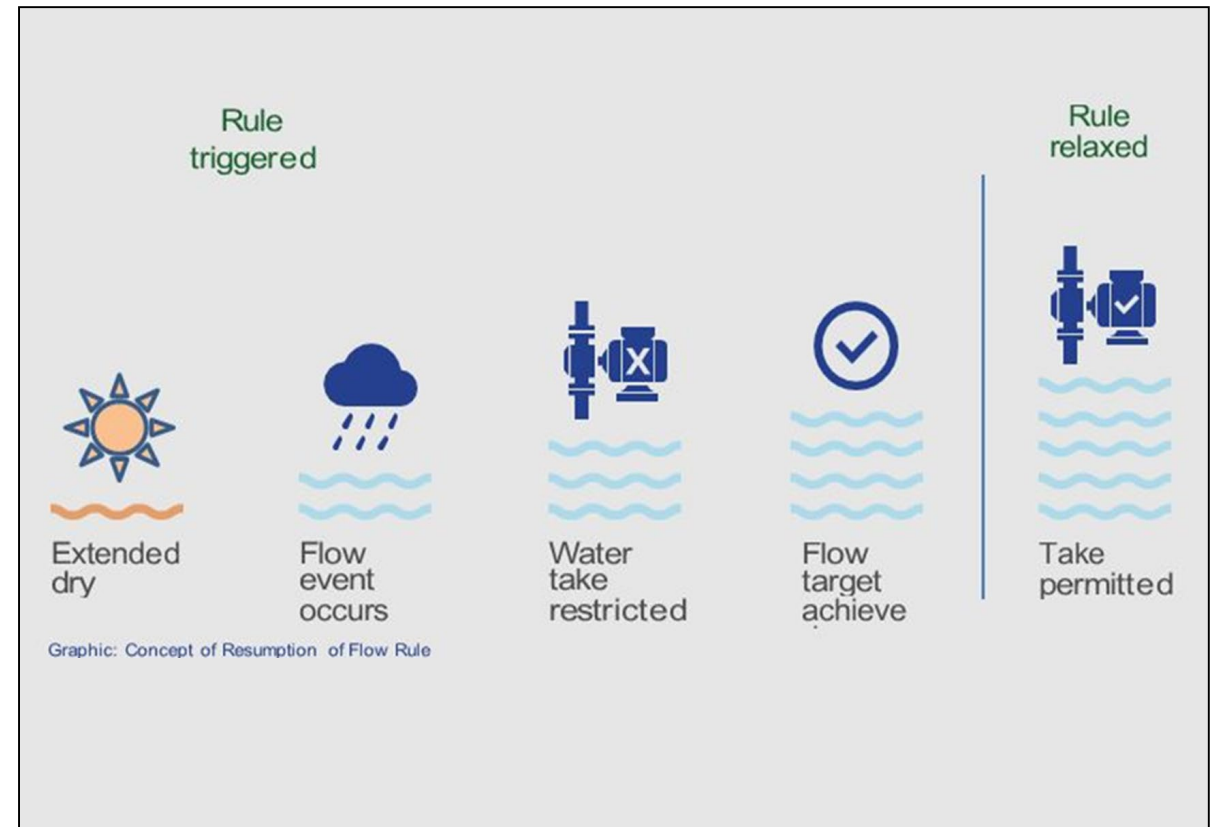
Revised A-class access

Gauge	Current (ML/day)	Previous (ML/day)	Gauge	Current (ML/day)	Previous (ML/day)
Mungindi	198	230	Brewarrina	550	460
Boomi confluence	176	220	Culgoa (Beemery gauge)	570	400
Mogil Mogil	220	190	Culgoa (Warraweena gauge)	645	400
Collarenebri	317	165	Bourke town	605	350
Tara gauge	100	100	Louth	555	260
Walgett weir pool	600-900	600-900	Tilpa	505	215
Boorooma	400	530	Wilcannia	455	123
Boorooma (Geera gauge)	465	530	U/S Lake Wetherell	850	850

What do we already have in place?

Resumption of flow rule

Location	Resumption of flows dry thresholds flow (ML/d)	Resumption of flows relaxation (ML/d)
Walgett	Below 326 ML/d for 150 days	Forecast greater 706 ML/d for 10 days
Brewarrina	Below 468 ML/Day for 150 days	1008 for 10 days
Bourke	Below 450 ML/day for 120 days	970 for 10 days OR 30 GL past Bourke
Wilcannia	Below 200 ML/day for 90 days	400 for 10 days



What do we already have in place?

Economic analysis of water sharing plan changes

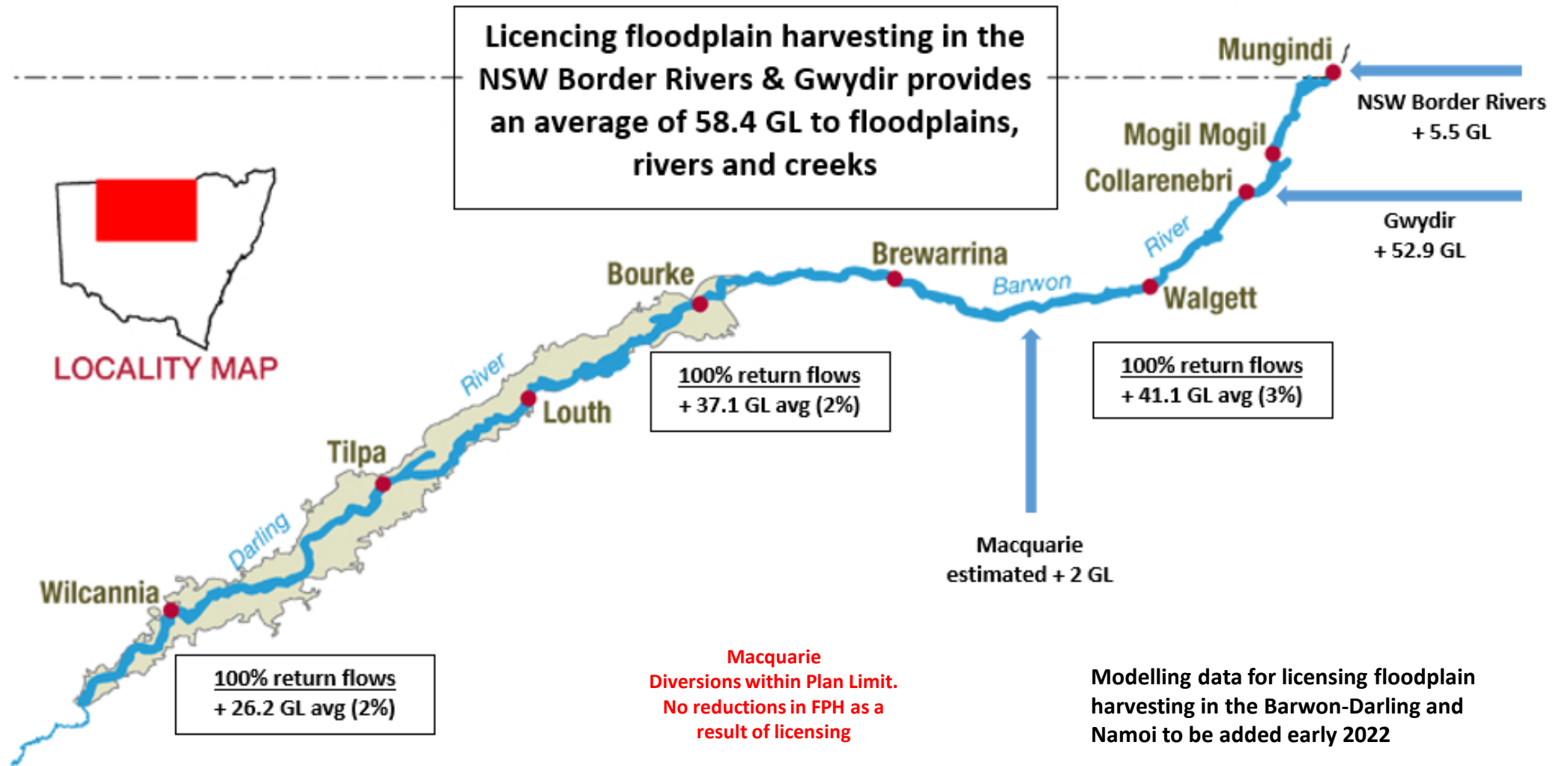
- Potential economic costs of introducing the resumption of flows rule and IDECs were analysed during the Water Reform Taskforce
- Impacts are expressed as percentage loss of hectares planted:
 - IDECs – less than 1 % (0.02-0.18 %)
 - Resumption of flows – less than 1 % (0.21-0.48 %)

What do we already have in place?

Change to no flow and low flow event frequency

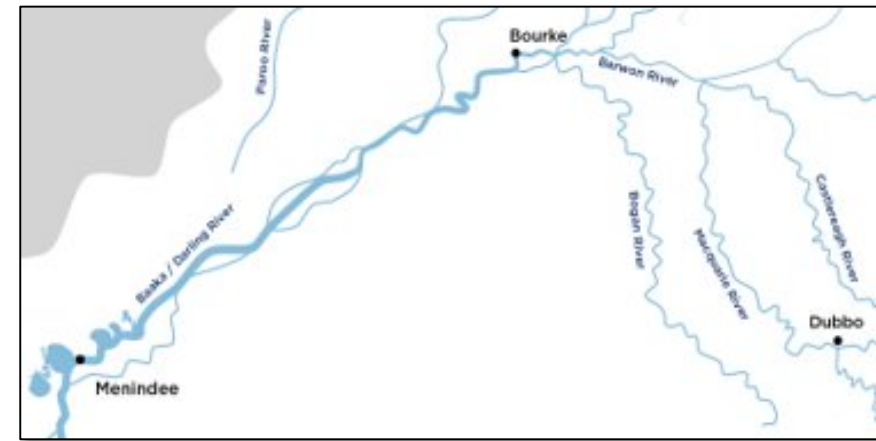
- Modelling of the changes to the water sharing plan indicate the new rules reduce the total number of no flow and low flow periods in the Barwon-Darling
- Before the rules were introduced the number of no flow events in the modelled historic period was 208; after it was 134 – a 36 % change
- Before the rules were introduced the number of low flow events in the modelled historic period was 498; after it was 442 – an 11 % change

What else are we working on? Floodplain harvesting



Draft Critical Dry Condition Triggers - Barwon-Darling, Lake Wetherell, and Northern tributaries

*Triggers for restricting upstream take –based on critical human
and environmental needs*



	Draft Trigger	Benefits
Barwon-Darling River at Wilcannia	Flows below 20 ML/day for 120 days at Wilcannia flow gauge	<ul style="list-style-type: none"> • Lower risk of severe damage to the environment • Lower risk of severe water shortage to water users
Lake Wetherell	Storage is below 195 GL	
Northern Tributaries	Northern tributary (Macquarie, Namoi, Gwydir, Border Rivers) is in Drought Stage 4	

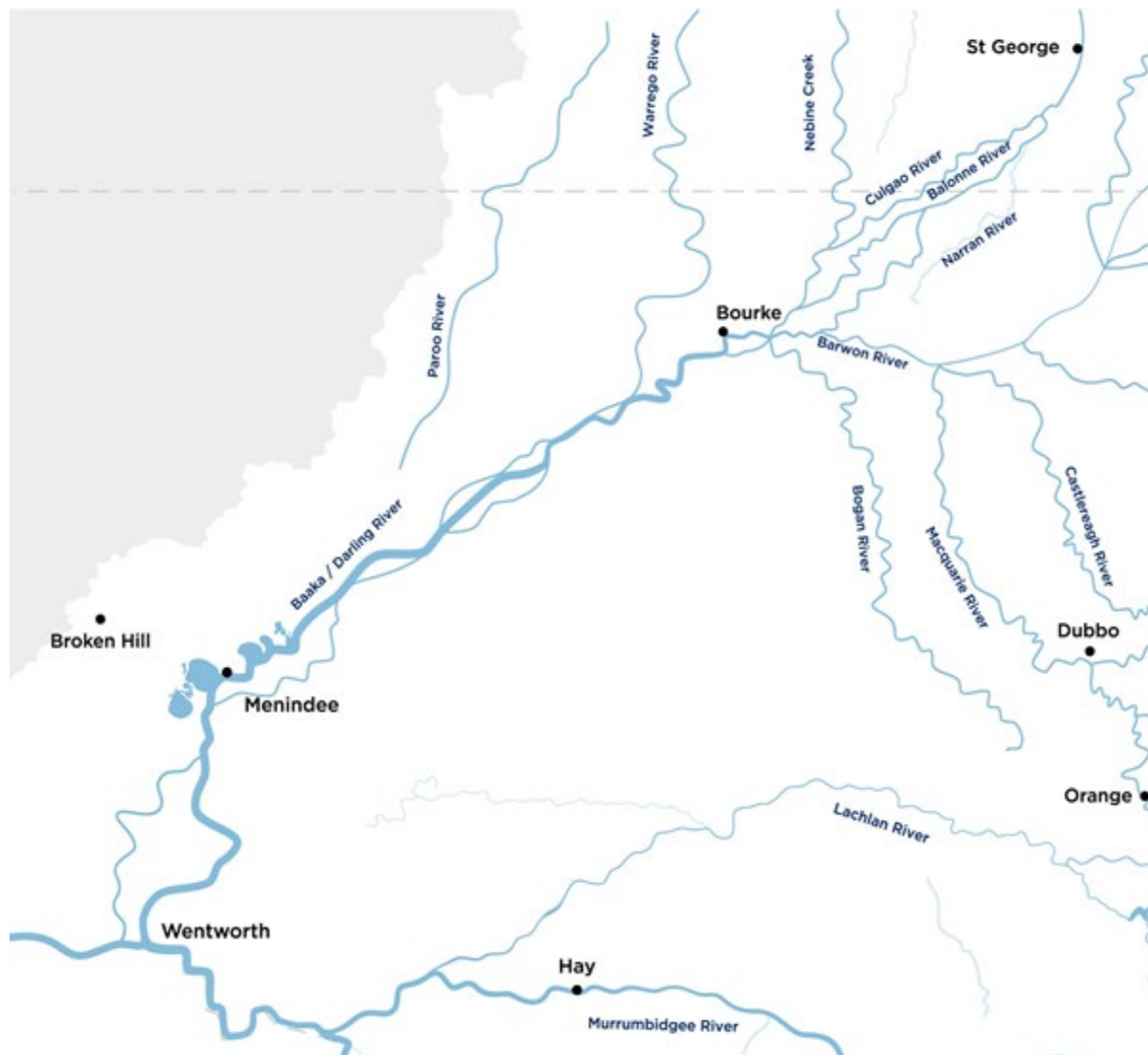
Critical Dry Condition Triggers for the Environment

Why develop triggers?

- Response to the Independent Panel recommendations
- *Water Management Act 2000*

What are our goals?

- Reduce the risk of catastrophic damage
- Outline clear and predictable actions



What is triggered?

- Management responses to mitigate risks
- Potential s324 water restrictions upstream of Lake Wetherell (*FPH, Supp access, Barwon-Darling A,B and C, some northern unreg*)

Main considerations

- Measurable and evidence-based
- Realistic response times

Draft Trigger Locations

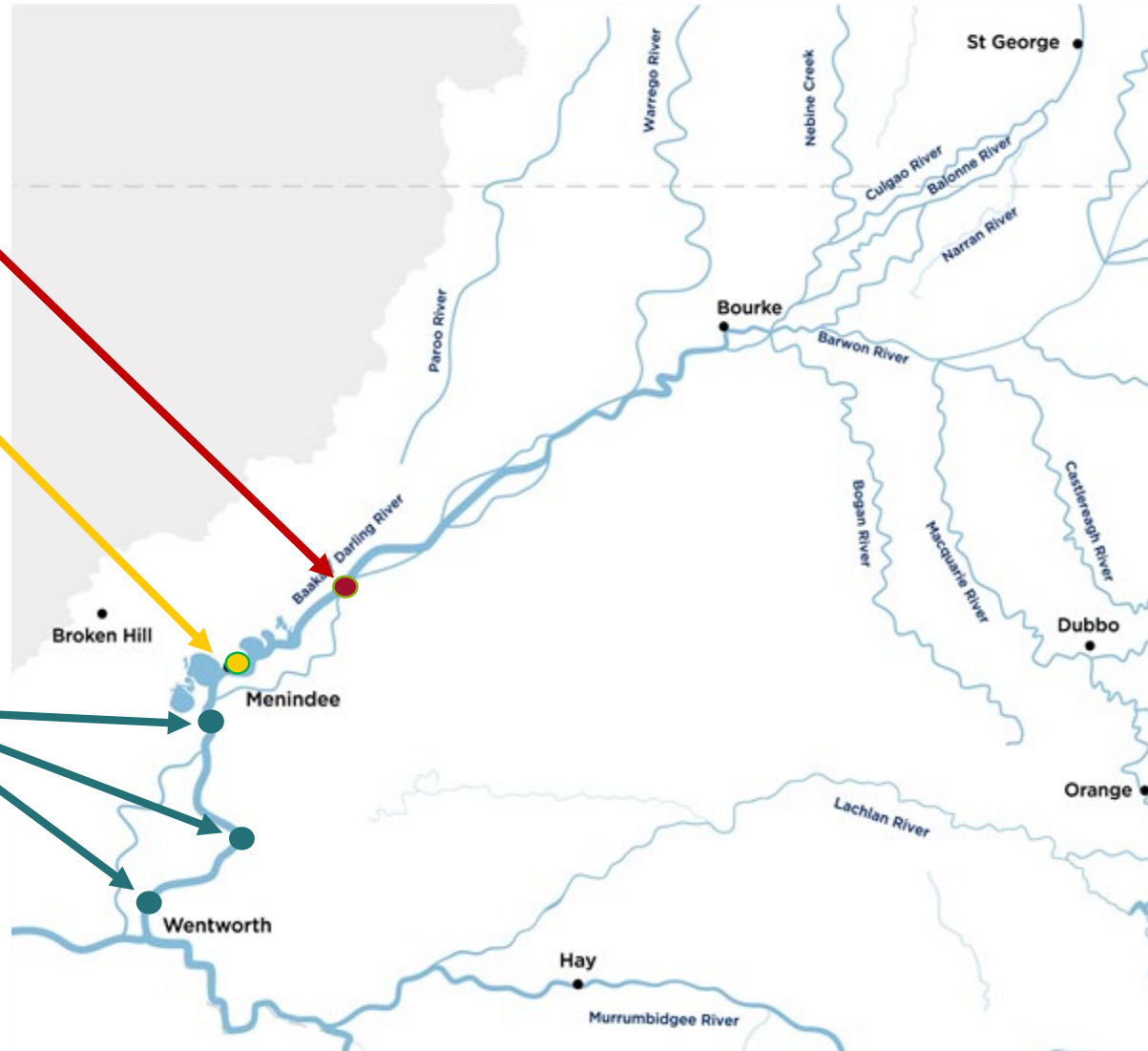
Barwon-Darling at Wilcannia

Walgett, Brewarrina and Bourke in development

Lake Wetherell

Lower Darling-Baaka main weirs

Weir 32, Pooncarie, Burtundy



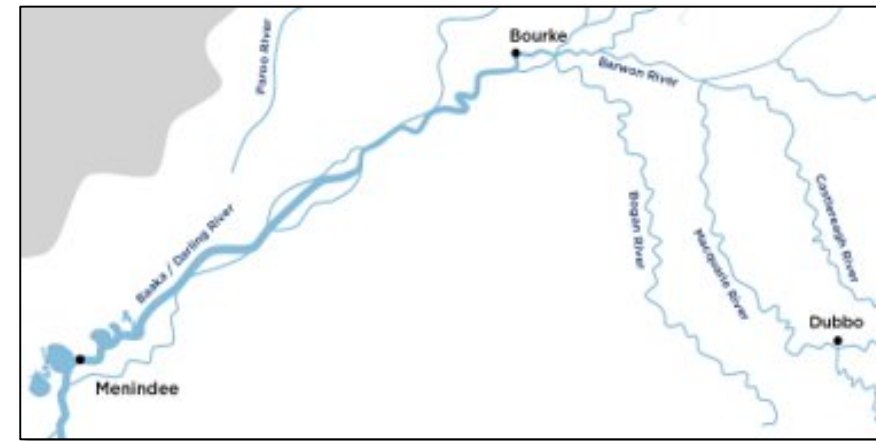
Time based triggers -
allow for travel time of
first flows – factor in time
delay

Height based triggers -
allow for travel time and
volume requirements

Water quality based
triggers – measure risk of
stratification with real
time monitoring

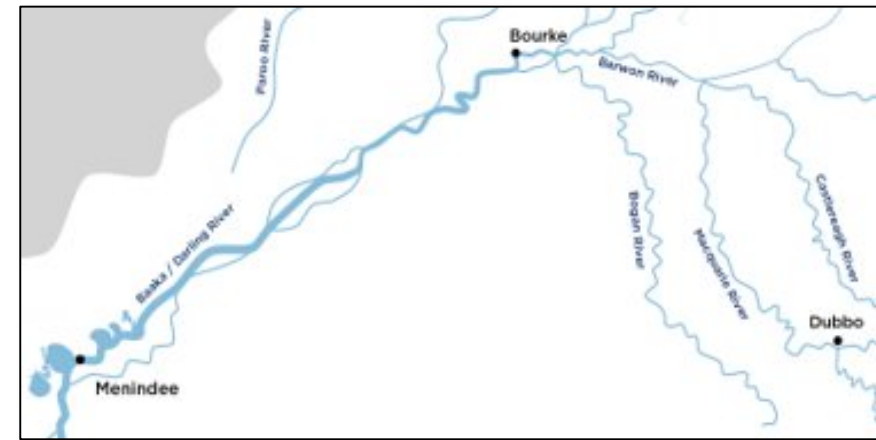
Draft Critical Environmental Dry Condition Triggers - Barwon-Darling and Lake Wetherell

Triggers for restricting upstream take



	Draft Critical Dry Period Trigger	Next Steps
Barwon-Darling River at Wilcannia	Flows below 20 ML/day for 120 days at Wilcannia flow gauge	<ol style="list-style-type: none"> 1. Scenario testing 2. May be replaced by real-time trigger
Lake Wetherell	Storage in Lake Wetherell below 105 GL (60.52m AHD) measured across Lake Wetherell and Lake Tandure	<ol style="list-style-type: none"> 1. Scenario testing 2. Refine final volume
Barwon-Darling River at Walgett, Brewarrina and Bourke	<i>Currently in development</i>	<ol style="list-style-type: none"> 1. Real-time trigger research 2. Scenario testing

Draft Critical Environmental Dry Condition Triggers - Barwon-Darling and Lake Wetherell



Remote Sensing of Pool Conditions

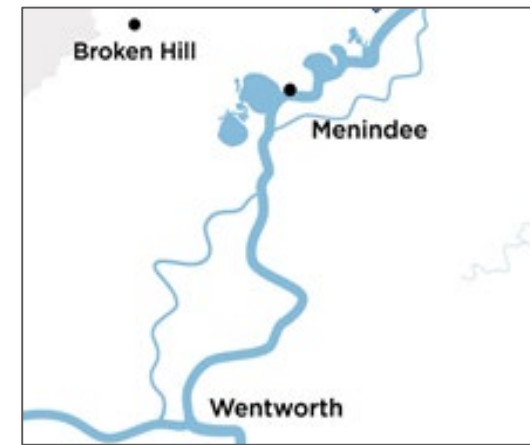
Barwon-Darling River
at Walgett, Brewarrina and
Bourke

- *Blue* areas are wet, *orange* are dry.
- *We can monitor remnant pools, degree of fragmentation over time (weekly, fortnightly etc). Key question: can we identify a tipping point when risk escalates?*
- *Would respond to on-ground climate (takes longer to reach trigger in cool weather, quicker in hot weather)*



Draft Critical Environmental Dry Condition Triggers - lower Darling-Baaka

Triggers for releasing water from Menindee Lakes



	Draft Critical Dry Period Trigger	Next Steps
Darling-Baaka River at Weir 32	<p>Dissolved oxygen < 5 mg/L Algal concentration > 4mm³/L when flows below 1ML/day at Weir 32 flow gauge</p>	<ol style="list-style-type: none"> 1. Scenario testing 2. Develop monitoring program
Darling-Baaka River at Pooncarie Weir	<p>Dissolved oxygen < 5 mg/L Algal concentration > 4mm³/L when flows below 1ML/day at Weir 32 flow gauge</p>	<ol style="list-style-type: none"> 1. Scenario testing 2. Develop monitoring program
Darling-Baaka River at Burtundy Weir	<p>Dissolved oxygen < 5 mg/L Algal concentration > 4mm³/L when flows below 1ML/day at Weir 32 flow gauge</p>	<ol style="list-style-type: none"> 1. Scenario testing 2. Develop monitoring program

Draft Dry Condition Triggers – Critical Human Needs

Wilcannia Flow Target = 120 days no flow

- Critical town weir duration is 6 months no flow
- Consistent with environmental target

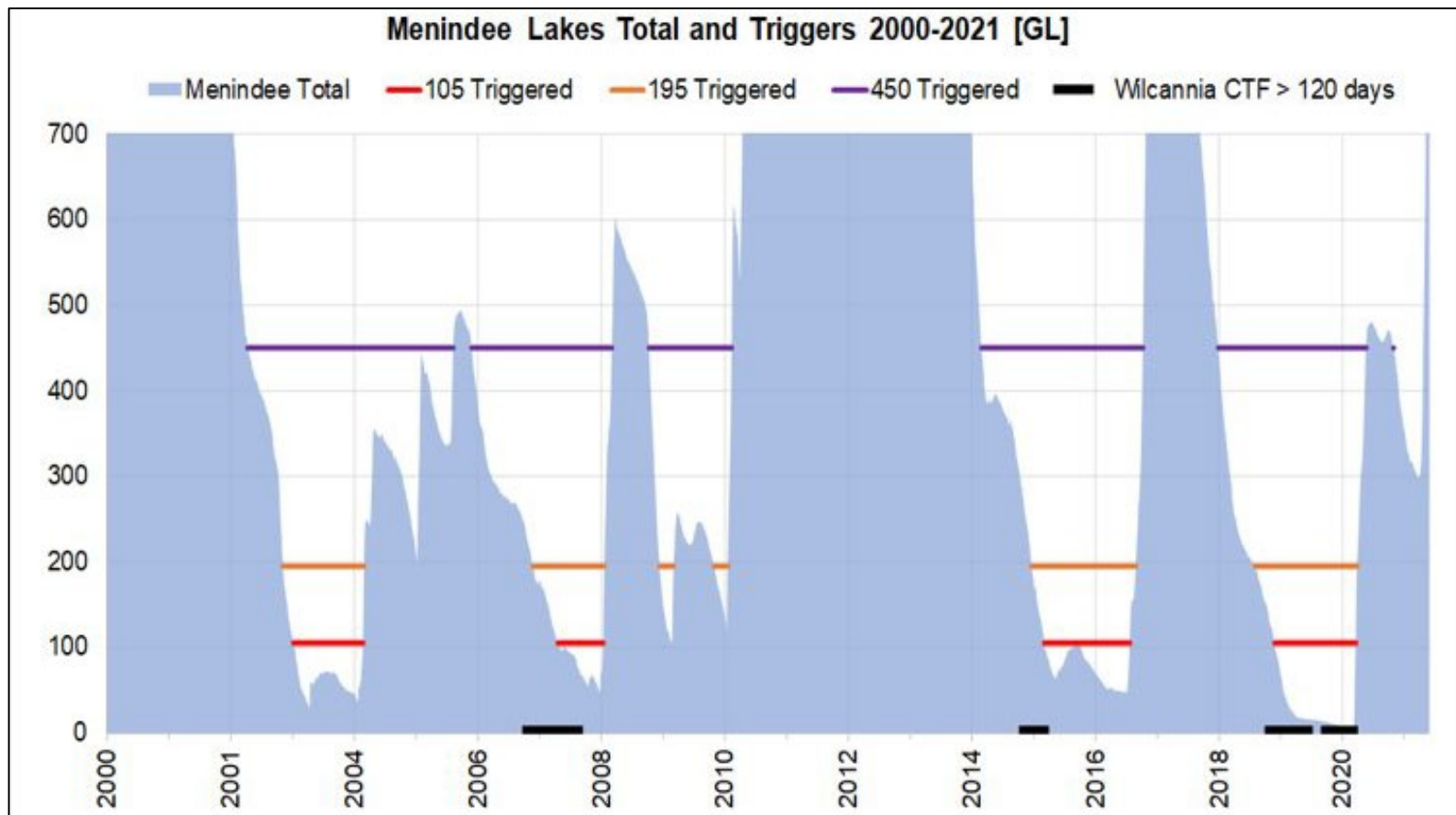
Upper Menindee Lakes Storage Target = 195 GL

- 12 months' supply for high priority needs – town, domestic and stock, basic landholder rights
- No inflows, average evaporation, minimum water sharing plan monthly releases
- Would exceed storage required for critical environmental needs target
- 2 year's supply is 450 GL – but this is normal supply rather than critical, i.e. general security allocations start at 300-350 GL in Lakes

Wilcannia cease to flow greater than 120 days since 2000

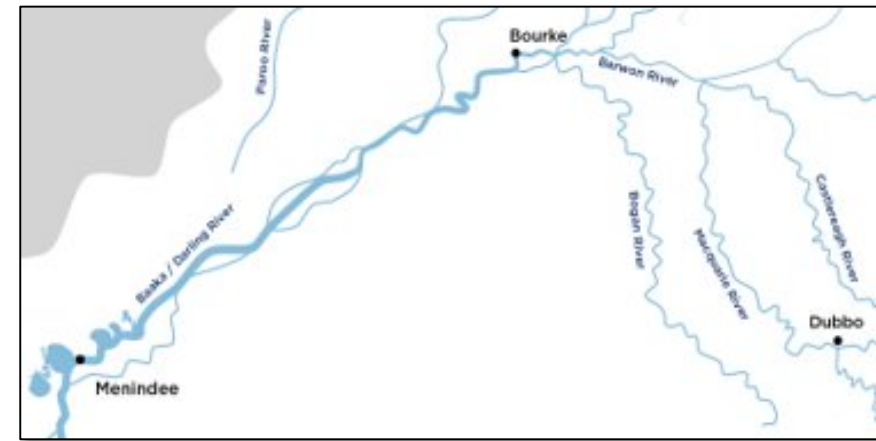
Lakes below trigger volumes and Wilcannia 120 days cease to flow

Start	End	Days
19/10/2002	15/12/2002	58
26/01/2003	3/04/2003	68
16/10/2006	20/08/2007	309
1/11/2014	8/03/2015	128
24/10/2018	16/06/2019	236
22/09/2019	9/03/2020	170



Draft Critical Dry Condition Triggers - Barwon-Darling, Lake Wetherell, and Northern tributaries

*Triggers for restricting upstream take –based on critical human
and environmental needs*



	Draft Trigger
Barwon-Darling River at Wilcannia	Flows below 20 ML/day for 120 days at Wilcannia flow gauge
Lake Wetherell	Storage is below 195 GL
Northern Tributaries	Northern tributary (Macquarie, Namoi, Gwydir, Border Rivers) is in Drought Stage 4

Draft targets for initiating 324 restrictions

Who:

- A, B and C class access in the Barwon-Darling,
- floodplain harvesting in the Barwon-Darling and northern valleys,
- supplementary access in the northern regulated valleys and
- large unregulated river access in the lower northern valleys.

How:

- **If** flows are forecast to occur; and
- **If** forecast flows will meaningfully contribute to meeting the targets.

Proposed targets for lifting 324 restrictions

Lifting of restrictions would occur:

- progressively as flows move through the systems
- if there is high confidence in downstream flow predictions meeting targets.
- in consideration of travel times and antecedent conditions which will impact on river losses
- if the nearest downstream targets are met or forecast to be met **and** the event will not meaningfully contribute to meeting any further downstream targets.

Relaxation targets:

- The relaxation targets used in the 2020 first flush event are currently being reviewed to ensure consistency with Barwon Darling RoF rules, and to ensure they meet BLR needs



Thank you
