

























Attachment 1.

Variation to Table 5.4.1 and 5.4.2 of the *Seasonal Watering Plan 2021-22*

Proposed changes are shown in red text






















Table 5.4.1 Potential environmental watering actions, expected watering effects and associated environmental objectives for the Goulburn River

Potential environmental watering action	Expected watering effects	Environmental objectives
Goulburn River reach 1		
Year-round low flow (400-1,000 ML/day in reach 1) 	<ul style="list-style-type: none"> Maintain habitat for small-bodied native fish Scour fine sediment from the gravel bed and riffle substrate Maintain adequate foraging habitat for platypus and reduce the risk of predation Provide habitat and food for turtles Maintain existing beds of in-channel vegetation Wet and maintain riffles to provide habitat for biofilms and waterbugs 	     
Winter/spring fresh (one fresh of more than 5,000 ML/day for two days in reach 1 during July to September) 	<ul style="list-style-type: none"> Encourage female platypus to select a nesting burrow higher up the bank, to reduce the risk of higher flow later in the year flooding the burrow when juveniles are present 	
Autumn/winter off-stream habitat flow trial (one fresh of up to 6,000 ML/d for three days during May to June 2022 in reach 1) 	<ul style="list-style-type: none"> Maintain off-stream habitat for small bodied native fish and platypus Scour fine sediment from the gravel bed and riffle substrate Maintain existing beds of in-channel vegetation. Connect lower Goulburn River wetlands and anabranches to the river channel 	   
Goulburn River reaches 4 and 5		
Year-round low flow (600-800 ML/day in reach 4 and 600-1,000 ML/day in reach five)	<ul style="list-style-type: none"> Provide slow, shallow habitat required for the recruitment of larvae/ juvenile fish and habitat for adult small-bodied fish Provide deep-water habitat for large-bodied fish Submerge snags and littoral vegetation to provide habitat for fish and waterbugs and a substrate for biofilms to grow Provide habitat and food for turtles Maintain habitat for aquatic vegetation and water the root zone of low-bank vegetation Vary flow within a specified range to encourage plankton production for food, disrupt biofilms and maintain water quality Low, variable flow enables vegetation to establish to protect against notching and bank erosion 	     
Winter/autumn fresh (one fresh of more than 7,300 ML/day for two days in reaches 4 and 5 during July to August 2021 and	<ul style="list-style-type: none"> Provide organic matter and carbon (e.g. leaf litter) to the channel Provide connectivity to off-channel habitats and through the river for fish dispersal and greater food resources Scour bed sediments to maintain pools and change in-channel 	   

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Potential environmental watering action	Expected watering effects	Environmental objectives
May to June 2022)	<p>complexity to improve habitat</p> <ul style="list-style-type: none"> • Provide cues for platypus to nest higher in the bank • Provide sediment and plant propagules from tributary inflows after large rain events, to encourage the establishment of new plants • Inundate and reduce terrestrial vegetation on low banks and trigger the recruitment of native, flood-tolerant streamside vegetation • Improve waterbug habitat and food availability by scouring fine sediments 	 
Pass a portion of natural tributary flows in the mid-Goulburn to reaches 4 and 5 when flows in reach 3 are above 4,000 ML/day (1,000- 5,000 ML/day in reaches 4 and 5 during May and October)	<ul style="list-style-type: none"> • Provide organic matter and carbon (e.g. leaf litter) to the channel • Transport and deposit seed, sediment and plant propagules on the riverbank 	 
Early spring fresh (one fresh of up to 10,500 ML/day with more than seven days above 7,300 ML/day during September and October in reaches 4 and 5)	<ul style="list-style-type: none"> • Provide organic matter and carbon (e.g. leaf litter) to the channel • Provide connectivity to off-channel habitats and through the river for fish dispersal and greater food resources • Scour bed sediments to maintain pools and change in-channel complexity for improved habitat • Increase soil moisture in banks to improve the condition of existing native vegetation • Provide sediment and plant propagules from tributary inflows after large rain events to encourage the establishment of new plants • Inundate and reduce terrestrial vegetation on low banks and trigger the recruitment of native flood-tolerant streamside vegetation • Improve waterbug habitat and food availability by scouring fine sediments and biofilms from hard substrates 	    
Late spring fresh (one fresh of more than 6,000 ML/day for two days during November and December in reaches 4 and 5)	<ul style="list-style-type: none"> • Stimulate spawning of golden and silver perch • Scour bed sediments to maintain pools and change in-channel complexity for improved habitat • Improve waterbug habitat and food availability by scouring fine sediments and biofilms from hard substrates 	  
Autumn fresh (one fresh of more than 5,700 ML/day for two days during March and May in reaches 4 and 5)	<ul style="list-style-type: none"> • Cue fish to move into and through the system to increase their abundance and dispersal • Scour bed sediments to maintain pools, and change in-channel complexity for improved habitat • Increase soil moisture in banks for existing vegetation maintenance 	   
Slow recession of unregulated flows or releases from Goulburn Weir (3,000 ML/day and below in summer/autumn and from 6,000 ML/day in winter/spring in reaches 4 and 5)	<ul style="list-style-type: none"> • Minimise the risk of bank erosion associated with a rapid reduction in the water level • Transport and deposit seed, plant propagules and sediment on the riverbank • Minimise the risk of hypoxic blackwater after natural events 	  
Flows should not exceed 1,000 ML/day for six to	<ul style="list-style-type: none"> • Protect littoral vegetation as habitat for small-bodied fish and macroinvertebrates 	 



Potential environmental watering action	Expected watering effects	Environmental objectives
eight weeks after an early spring fresh in reaches 4 and 5 	<ul style="list-style-type: none"> Allow recently germinated littoral, lower bank and semi-aquatic vegetation to become established 	

Table 5.4.2 Potential environmental watering and expected water use for the Goulburn River under a range of planning scenarios

Planning scenario	Drought	Dry	Below average	Average	Wet
Expected river conditions	<ul style="list-style-type: none"> Very few or no large natural-flow events Blackwater could be an issue if there is a large rain event in the warmer months 	<ul style="list-style-type: none"> One to two short-duration, large, natural-flow events are likely to provide small winter/spring freshes Blackwater could be an issue if there is a large rain event in the warmer months 	<ul style="list-style-type: none"> Large natural-flow events are expected to provide some low flow for a few months from winter/mid-spring and are likely to provide small winter/spring freshes Blackwater could be an issue if there is a large rain event in the warmer months 	<ul style="list-style-type: none"> Large natural-flow events will provide low flow for most of the year and will likely provide winter/spring freshes Blackwater could be an issue if there is a large rain event in the warmer months 	<ul style="list-style-type: none"> Large natural-flow events will provide low flow and multiple overbank flow events in winter/spring
predicted supply of water for the environment ¹	• 330 GL	• 431 GL	• 512 GL	• 590 GL	• 590 GL
Goulburn River reach 1					
Potential environmental watering – tier 1 (high priorities) ²	Tier 1a (can be achieved with predicted supply)				
	<ul style="list-style-type: none"> Year-round low flow Winter/spring fresh 	<ul style="list-style-type: none"> Year-round low flow Winter/spring fresh 	<ul style="list-style-type: none"> Year-round low flow Winter/spring fresh 	<ul style="list-style-type: none"> Year-round low flow Winter/spring fresh Autumn/winter off-stream habitat flow trial 	<ul style="list-style-type: none"> Year-round low flow Winter/spring fresh Autumn/winter off-stream habitat flow trial
Goulburn River reaches 4 & 5					

Planning scenario	Drought	Dry	Below average	Average	Wet
Potential environmental watering – tier 1 (high priorities) ²	Tier 1a (can be achieved with predicted supply)				
	<ul style="list-style-type: none"> Year-round low flow Early spring fresh Autumn fresh (partial) Recession flow management 	<ul style="list-style-type: none"> Year-round low flow Winter/autumn fresh Pass mid-Goulburn tributary flows Early spring fresh Autumn fresh Recession flow management 	<ul style="list-style-type: none"> Year-round low flow Winter/autumn fresh Pass mid-Goulburn tributary flows Early spring fresh Autumn fresh Recession flow management 	<ul style="list-style-type: none"> Year-round low flow Winter/autumn fresh Pass mid-Goulburn tributary flows Early spring fresh Late spring fresh Autumn fresh Recession flow management 	<ul style="list-style-type: none"> Year-round low flow Winter/autumn fresh Pass mid-Goulburn tributary flows Early spring fresh Late spring fresh Autumn fresh Recession flow management
	Tier 1b (supply deficit)				
	<ul style="list-style-type: none"> Pass mid-Goulburn tributary flows Late spring fresh 	<ul style="list-style-type: none"> Late spring fresh 	<ul style="list-style-type: none"> Late spring fresh 	<ul style="list-style-type: none"> N/A 	
Possible volume of water for the environment required to achieve objectives	<ul style="list-style-type: none"> 330,000 ML (tier 1) 60,000 ML (tier 1b) 	<ul style="list-style-type: none"> 396,000 ML (tier 1) 45,000 ML (tier 1b) 	<ul style="list-style-type: none"> 504,000 ML (tier 1) 45,000 ML (tier 1b) 	<ul style="list-style-type: none"> 582,000 ML (tier 1) 520,000 ML (tier 1) 	<ul style="list-style-type: none"> 520,000 ML (tier 1) 458,000 ML (tier 1)
Priority carryover requirements	<ul style="list-style-type: none"> 23,000 ML 			<ul style="list-style-type: none"> 0 ML 	

1 When trading opportunities are available, additional allocations of water for the environment from the Murray River can be transferred to meet Goulburn demand.

2 Low-flow periods following a spring fresh or between summer/autumn pulses are considered tier 1a priorities under all planning scenarios.