Annual Water Outlook

29 November 2019

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Contents

Executive Summary

Below average inflows to all Goulburn-Murray Water (GMW) major storages have continued in the first half of 2019/20. Reserves established in 2018/19 contributed to opening seasonal determinations in the Murray, Goulburn, Campaspe, Bullarook and Loddon systems on 1 July 2019. Seasonal determinations in the Broken opened at 0 per cent of high-reliability water shares (HRWS).

At 15 November 2019, seasonal determinations had increased progressively with the Murray system on 48 per cent HRWS, the Campaspe on 60 per cent, the Goulburn and Loddon on 61 per cent HRWS and the Broken system remained on 0 per cent HRWS. A 100 per cent low-reliability water share (LRWS) seasonal determinations has also been made in the Bullarook system in addition to 100 per cent HRWS. A LRWS seasonal determination in the other systems in 2019/20 is highly unlikely.

The seasonal climate outlooks issued by the Bureau of Meteorology on 28 November 2019 indicate a 25 per cent to 40 per cent chance of exceeding median rainfall across the GMW region from December 2019 to February 2020. On 26 November 2019, the Bureau of Meteorology said despite some weakening of the Indian Ocean Dipole (IOD) over the past fortnight, IOD values remain strongly positive. Typically, a positive IOD brings below average spring rainfall to southern and central Australia with warmer days for the southern two-thirds of the country

Early reserves for 2020/21 have been established in both the Goulburn and the Murray system. The 2020/21 season reserves for the Loddon and Campaspe systems will be in line with their respective seasonal determinations policies. The Broken, Bullarook and Ovens systems are annual systems and water availability will depend on seasonal conditions and inflows closer to the start of 2020/21.

GMW, as Resource Manager for northern Victorian systems, will issue a detailed outlook for seasonal determinations in regulated systems on Monday 17 February 2020.

Seasonal determinations could be very low in 2020/21 if the low inflow trend continues. Contingency planning among agencies will be required if this scenario is looking likely early in 2020.

Following dry conditions in 2018/19, numerous unregulated systems started the 2019/20 water year on restrictions and a further number have since been implemented. Weather conditions in the coming months will determine the extent of restrictions across GMW's region, however, even with average conditions significant restrictions are likely. The seasonal rainfall and temperature outlooks suggest unregulated stream customers should anticipate some level of restriction over the summer and autumn period.

The majority of groundwater licence holders have access to 100 per cent of their entitlement, except for those in the Newlyn zone of the Loddon Highlands Water Supply Protection Area (WSPA) and the Barnadown zone of the Lower Campaspe WSPA, who have a 75 per cent allocation for 2019/20. A final allocation announcement will be made for the Newlyn zone in mid-December 2019. Groundwater levels are likely to continue to decline in 2019/20. The largest impacts are likely to be felt in the western catchments, Shepparton Irrigation Region Groundwater Management Area and the Katunga WSPA. As a result of this, groundwater licence holders in the Lower Campaspe Valley WSPA and Loddon Highlands WSPA are likely to have allocations below 100 per cent in 2020/21.

To the extent it can be predicted, the risk of water quality incidents occurring over the next 12 months that would impact on supply to customers/entitlement holders is considered low. The low rainfall over the winter-spring of 2019 has elevated the risk of hypoxic black-water events occurring over summer and autumn 2019/20, although such events would not prevent the supply of water. The likely need to issue warnings due to high blue green algae levels cannot be predicted, however such warnings would not prevent supply either.

Introduction

Part 4-2 of the Statement of Obligations (General) 2015 requires water corporations to prepare an Annual Water Outlook by 1 December each year. This document provides information in accordance with this obligation and will assist the development of the Water Outlook for Victoria.

The purpose of the Annual Water Outlook is to provide an outlook of water availability for the remaining months of 2019/20 and what conditions are possible at the start of the 2020/2021 water year.

GMW's role is to efficiently manage, store and deliver water to more than 21,000 active customers involved in a diverse range of enterprises and interests across northern Victoria. Our customers include gravity irrigation, regulated and unregulated surface water diverters, groundwater, urban water corporations and environmental water holders. More information about GMW and its services are available on the GMW website, www.gmwater.com.au/about.

This water outlook covers the status and outlook for regulated, unregulated and groundwater sources as well as water quality.

Current climate and streamflow in the longer context

Victoria's climate has shown a warming and drying trend over recent decades, and this trend is expected to continue. In comparison to historical conditions we are already experiencing:

- Higher temperatures;
- Reductions in rainfall in autumn and winter, and in some locations, increases in rainfall during the warmer months; and,
- In many catchments, a shift in the streamflow response to rainfall, with less streamflow generated for the same amount of rain.

The decline in rainfall during autumn and winter is associated with a southerly shift in rain bearing weather systems. Global warming is a contributor to this southerly shift, which means that the downward trend in winter rainfall is likely to continue.

The cause of the reduction in streamflow response to rainfall is not yet fully known and is the subject of continuing research.

Over the longer term, we can expect:

- the rainfall reductions in winter to remain, or become drier still;
- possible increases in summer rainfall;
- increases in potential evapotranspiration due to higher temperature;
- reductions in streamflow across all catchments because of less rainfall and higher potential evapotranspiration; and
- the streamflow response to rainfall to no longer remain the same, and generally decline.

Even if there is an increase in summer rainfall, it is unlikely to offset the streamflow impact of rainfall reductions in winter because catchments are drier in the summer and more rainfall soaks into the ground, is used by vegetation or evaporates than in winter.

Although there will still be a lot of variability in Victoria's climate, the chances of experiencing warmer conditions and less streamflow is now higher than in past decades.

More information on the observed changes and longer-term future climate and water projections can be found at https://www.water.vic.gov.au/climate-change

The Victorian Government is investing in further research to better understand how Victoria's climate is changing and the water resource implications, as part of implementing Water for Victoria.

Regulated Systems

Current seasonal conditions

The 2018/19 water year was drier than average, with storage inflows across GMW's catchments recording well below the average annual volume (based on climate conditions observed since 1975). Inflows into Lake Eppalock were 12 per cent of the average volume, whilst Lake Nillahcootie received 11 per cent. Cairn Curran and Tullaroop both received 22 per cent of average inflows. Dartmouth Dam and Lake Eildon received better inflows, with 63 per cent and 64 per cent of average inflows respectively.

Dry conditions continued into the 2019/20 water year. Rainfall across all of northern Victoria from August to October 2019 was below average (Figure 1) and this has contributed to below average storage inflows (Table 1).

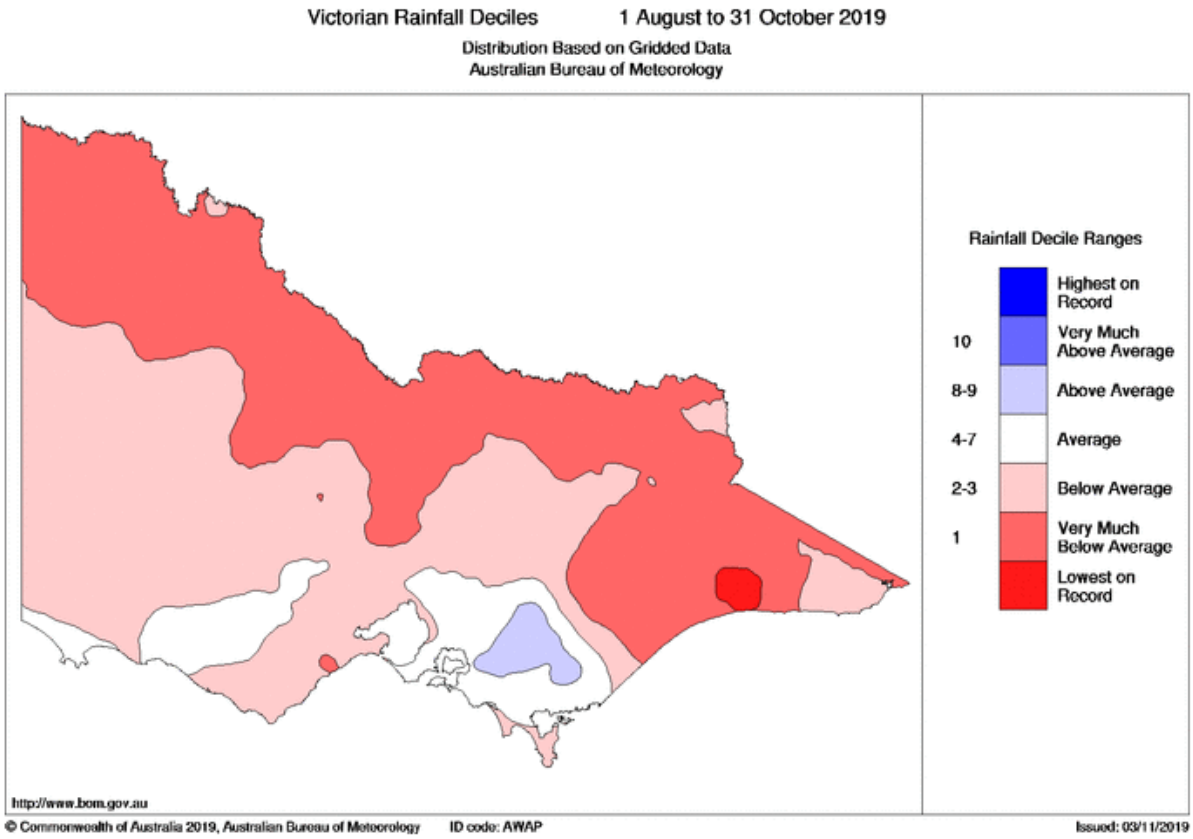

Figure 1. Rainfall deciles for 1 August to 31 October 2019

Table 1. July to October 2019 inflows to the major GMW storages

Storage	July – October inflow (GL)	Percent of average[2]	Chance of greater inflow[2]
Eildon	595.2	68%	71%
Goulburn Weir[1]	331.3	47%	81%
Hume[1]	566.5	38%	89%
Dartmouth	289.2	59%	77%
Buffalo	120.8	48%	78%
William Hovell	74.1	60%	76%
Nillahcootie	6.9	17%	88%
Eppalock	20.4	18%	83%
Cairn Curran	29.0	38%	68%
Tullaroop	30.0	87%	39%

[1] Natural inflows excluding releases from upstream storages

[2] Historical flow records that have been adjusted to match climate conditions observed since 1975

These dry conditions have limited the volume harvested into the major storages. Table 2 outlines the change in storage volumes and percentages from July to mid-November. Demand for water has been low so far this year due to low water availability, meaning storage levels have not yet started to significantly decline.

Lake William Hovell and Lake Buffalo are the only major storages to fill so far in 2019/20.

Table 2. Storage volume changes from July to mid-November

Storage	1 July 2019 Volume (GL)	1 July 2019 Percentage full	15 November 2019 Volume (GL)	15 November 2019 Percentage full	Volume change (GL)	Percentage full change
Eildon	1,262	37.9%	1,549	46.5%	287	8.6%
Hume	724	24.1%	1,112	37.0%	388	12.9%
Dartmouth	2,460	63.8%	2,112	54.8%	-348	-9.0%
Buffalo	14.3	61.0%	23.5	100%	9.2	39.0%
William Hovell	13.9	101.2%	13.8	100.7%	-0.1	-0.5%
Nillahcootie	10.4	25.7%	16.2	40.0%	5.8	14.3%
Eppalock	111	36.4%	102	33.4%	-9.2	-3.0%
Cairn Curran	54.1	36.7%	73.1	49.7%	19.0	13.0%
Tullaroop	34.2	46.9%	57.8	79.3%	23.6	32.4%

Water availability in northern Victoria early in 2019/20 was assisted by the reserves, albeit small, established in 2018/19. This allowed an opening seasonal determination to be made on 1 July 2019 in all systems except the Broken system, which has a smaller, annual storage (i.e. typically fill each year) compared to the other systems.

Seasonal determinations as at 15 November 2019 are shown in Table 3. Only the Bullarook system has reached 100 per cent HRWS so far this water year. The Goulburn system and the Murray System early season reserves for 2020/21 have been established. The reserve volumes contribute to operating commitments for the following water year, aiming to ensure that any water carried over by entitlement holders from the current water year can be delivered at the start of the irrigation season.

Table 3. Seasonal determinations as at 15 November 2019

Water System	High-Reliability Water Share	Low-Reliability Water Share
Murray	48%	0%
Broken	0%	0%
Goulburn	61%	0%
Campaspe	60%	0%
Loddon	61%	0%
Bullarook	100%	100%

Resource Availability

Murray System

The Murray system started 2019/20 with a seasonal determination of 2 per cent HRWS. Low but steady inflow conditions early in 2019/20 enabled seasonal determinations to increase in small consistent increments. The seasonal determination has reached 48 per cent as of 15 November 2019.

There have been no spills from Victoria's share of Lake Hume during the water year so far in 2019/20. A low risk of spill was declared on 1 July 2019 in the Murray, Goulburn and Campaspe systems.

As specified in clause 10.5 of GMW's Murray bulk entitlement, water was borrowed from the Barmah-Millewa Forest Environmental Water Allocation at the start of the 2019/20 water year to support early seasonal determinations for high-reliability water shares. The water borrowed from the Barmah-Millewa Forest Environmental Water Allocation will start to be paid back once seasonal determination are 100 per cent HRWS, before further resource improvements are set aside for 2020/21.

Goulburn System

The reserves established and inflows in May and June in the Goulburn system during 2018/19 were enough for the system to commence the 2019/20 water year with a seasonal determination of 2 per cent HRWS.

Inflows during late winter and early spring 2019 have been more favourable in the catchment above Lake Eildon compared to the mid-Goulburn catchment. The Lake Eildon volume started to increase in July 2019 with improved inflows. The storage volume increased to 48 per cent of capacity in mid-September before releases started to exceed inflows to meet environmental deliveries and early season demand. Waranga Basin reached 67 per cent of capacity before system demands began to draw the storage down in late September 2019.

The seasonal determination in the Goulburn system has gradually increased from the start of the water year to reach 61 per cent on 15 November 2019.

Broken System

The Broken system opened the 2019/20 water year with a seasonal determination of 0 per cent HRWS. In late October 2019, entitlement holders were advised that allocation carried over was available for use throughout the remaining months of the water year.

Continuing dry conditions in the Broken system has seen the seasonal determination yet to increase this water year. Under dry conditions, the Broken system is unlikely to receive an increase in the seasonal determination. Inflow conditions between the average and dry scenarios is required for an opening seasonal determination to be announced.

Campaspe System

The Campaspe system opened the 2019/20 water year with a seasonal determination of 26 per cent. The storage volume increased to 40 per cent of capacity in early-September before releases started to exceed inflows to meet environmental deliveries. These storage increases enabled the seasonal determination to increase to 60 per cent on 15 November 2019.

Loddon and Bullarook Systems

In accordance with the bulk entitlement rules, the Loddon system 2019/20 seasonal determination has increased in line with the Goulburn system from an opening seasonal determination of 2 per cent to 61 per cent at 15 November 2019. The system has enough water in storage to meet 100 per cent of HRWS commitments in 2019/20 and reserves are being established for 2020/21 water requirements.

The Bullarook system is the smallest of the GMW systems with two relatively small annual storages. The Bullarook system opened with a 19 per cent HRWS seasonal determination on 1 July. Rainfall and inflow improvement in July 2019 enabled a seasonal determination of 100 per cent HRWS and 100 per cent LRWS on 15 July 2019.

Ovens System

Despite entitlement holders having water shares, the Ovens system does not receive seasonal determinations like the six other regulated systems operated by GMW. The system is managed similarly to an unregulated stream because of the high volume of inflows relative to storage size. Entitlement holders are restricted if the inflows into the system and the volumes held in Lake Buffalo and Lake William Hovell are insufficient to meet all the demand in the system.

Entitlement holders are currently not restricted, as inflows into the system filled the storages and have maintained the storages at capacity. Entitlement holders in the Ovens and Buffalo rivers had access to their spill-reliability entitlements up to 25 November. The King river can access their spill-reliability entitlements up to 9 December.

Outlook comparison

The outlook for seasonal determinations published on 15 July 2019 (Table 4) indicated that even with average inflows, 100 per cent HRWS was not expected to be reached in the Murray, Goulburn, Broken and Loddon systems by mid-October. Based on the storage inflows outlined in Table 1, the seasonal determination increases to 15 November have followed the patterns suggested by the outlook. The Goulburn and Loddon systems have tracked better than the dry inflow scenario, as the inflows into the Goulburn system have been between the average and dry scenarios. Seasonal determinations in the Murray system have tracked in line with the dry inflow scenario, due to the low inflows into Hume and Dartmouth as well as low contributions from the Ovens River.

Table 4. Outlook for seasonal determinations for 15 October 2019 as published on 15 July 2019

Water System	Inflow Scenario[1]		
	Wet	Average	Dry
Murray	100%	59%	40%
Broken	100%	77%	0%
Goulburn	98%	63%	34%
Campaspe	100%	100%	43%
Loddon	98%	63%	34%
Bullarook	100%	100%	100%

[1] Note dry conditions are defined as inflow volumes to major storages that are greater in 90 years out of 100, average conditions are inflow volumes to major storages that are greater in 50 years out of 100 and wet conditions are inflow volumes to major storages that are greater in 10 years out of 100

Outlook for remainder of 2019/20

The Bureau of Meteorology's three month outlook for December 2019 to February 2020, issued on 28 November 2019, indicated the chances of exceeding the median rainfall over most of GMW's region range from 25 to 40 per cent (Figure 2).

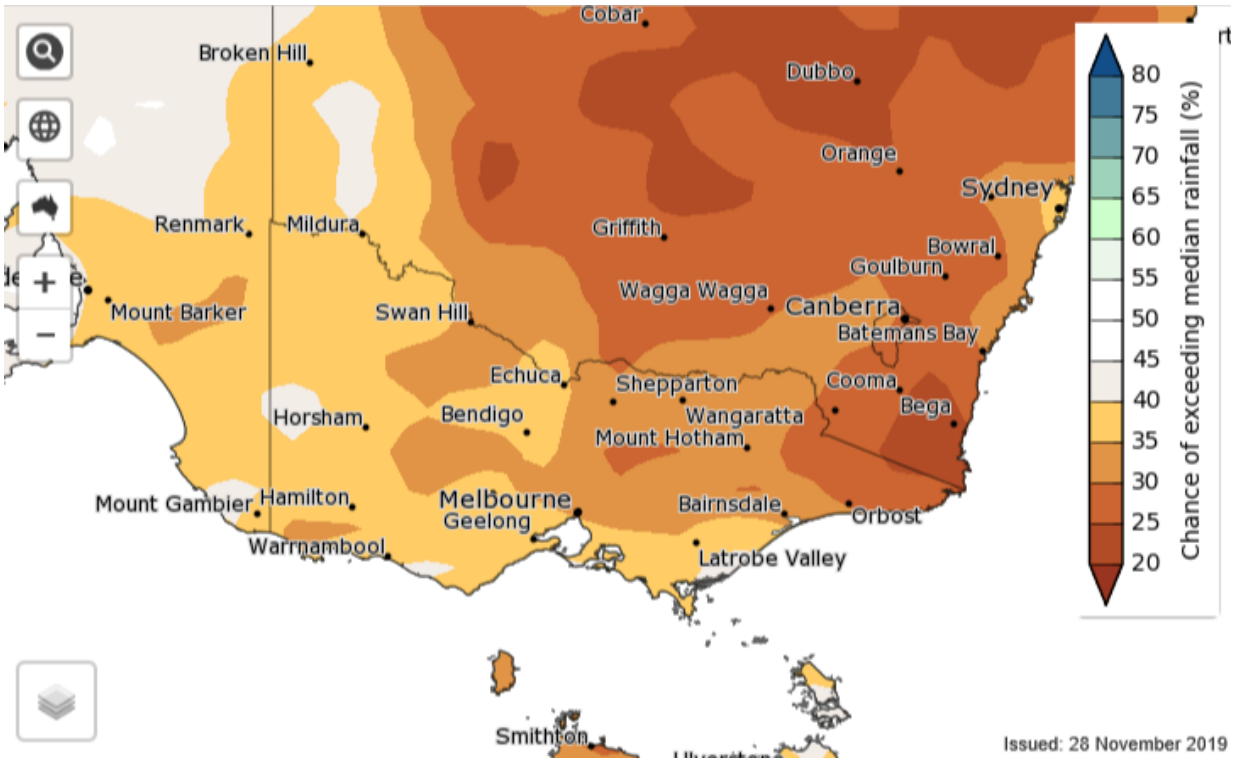

Figure 2. Chance of exceeding median rainfall for the period December 2019 to February 2020 (Source Bureau of Meteorology).

The Bureau of Meteorology's ENSO Wrap-Up issued on 26 November said that the El Niño–Southern Oscillation (ENSO) remains neutral and stated: *Indian Ocean Dipole (IOD) values remain strongly positive but have weakened slightly over the past fortnight. Water are warmer than average near the Horn of Africa, and cooler than average waters persist in the eastern Indian Ocean, south of Indonesia.*

International climate models surveyed by the Bureau indicate the positive IOD is likely to be slower to decline than usual, and may persist into mid-summer.

Typically, a positive IOD brings below average spring rainfall to southern and central Australia with warmer days for the southern two-thirds of the country. Positive IOD events are often associated with a more severe fire season for southeast Australia.

Temperature and rainfall outlook updates are available from the Bureau of Meteorology website (www.bom.gov.au/climate/ahead/).

As the historical peak inflow period has passed and catchments have dried during spring, inflows are not expected to increase significantly unless passing severe weather systems bring heavy rain to the catchments.

Resource improvements in the Goulburn and Loddon systems will contribute to seasonal determination increases until seasonal determinations reach 100 per cent HRWS. If inflows follow the dry outlook scenario, seasonal determinations in both systems are expected to be about 66 per cent HRWS by mid-February 2020. In the Murray system, the dry outlook scenario would allow seasonal determinations to reach 58% HRWS by mid-February 2020. For the Broken system, inflows close to average are required to reach 17% HRWS by mid-February 2020. Only marginal increases are expected in the Campaspe system under the dry outlook category.

Bullarook entitlement holders have their maximum seasonal determination and will not see any changes for the remaining months of 2019/20.

GMW's seasonal determination policy describes how available water is distributed to entitlement holders. In the Murray, Goulburn, Campaspe and Loddon systems, available water is allocated progressively to HRWS once all system operating requirements can be met. Once HRWS are fully available, reserves (in addition to the early reserve in the Murray and Goulburn systems) to support HRWS in the following water year start to be established. After HRWS in the following water year are secured, assumed inflows with a probability of exceedance of 99 per cent are received, any available water is allocated to low-reliability entitlements.

In the Broken and Bullarook systems, available water is allocated progressively to HRWS once all system operating requirements can be met. Once seasonal determinations reach 100 per cent HRWS, any available water is allocated to low-reliability entitlements.

In the Goulburn and Murray systems, where both HRWS seasonal determinations are still below 100 per cent, the necessary operating reserves for 2019/20 are yet to be established. It is extremely unlikely that a LRWS seasonal determination will be announced in the Murray system or the Goulburn system in 2019/20.

Entitlement holders in the Ovens system may experience restricted diversion access this water year if storage inflows reduce and water from the storages is needed to meet demand before the end of December. History indicates that restrictions are not needed to manage demand when the storages are still at capacity in January.

Irrigation deliveries in the first three months of the 2019/20 irrigation season have been less than half the volume delivered to the same time in 2018/19. Weather conditions in the remaining months of the season, as well as any further increases in the seasonal determinations and trade opportunities will dictate how much water is used in 2019/20 and how much is carried over into 2020/21.

Outlook for 2020/21

Reliable long-term weather outlooks for the start of 2020/21 are not available as the Bureau of Meteorology rainfall outlooks only extend for three months. GMW, as Northern Victoria Resource Manager, will release a detailed first outlook for the 2020/21 water year on 17 February 2020 based on historical inflows and update the outlook on 15 May 2020.

If conditions remain dry, low flow contingency measures may be required for the 2020/21 season in the Murray, Goulburn, Campaspe and Broken system and opening seasonal determinations are likely to be zero or very low. Reserves in these systems could be the lowest since the millennium drought. Water availability in 2020/21 will be heavily dependent on inflows to the major storage during winter and spring 2020.

Murray System

The seasonal determination in the Murray system is greater than 44 per cent HRWS and the 2020/21 early reserve has been secured. This volume contributes to system operating requirements in 2020/21 to enable delivery of carryover from the start of the season. If extreme dry conditions are experienced, water availability and seasonal determinations are likely to be very low in 2020/21. Seasonal determinations will be available under dry inflow conditions, but are unlikely to reach 100 per cent HRWS. Average inflow conditions should allow seasonal determinations to reach 100 per cent HRWS during spring 2020.

Goulburn System

The seasonal determination in the Goulburn system is greater than 50 per cent HRWS and the 2020/21 early reserve has been secured. Average inflow conditions should allow seasonal determinations to reach 100 per cent HRWS during spring 2020. Seasonal determinations will be available under dry inflow conditions, but are unlikely to reach 100 per cent HRWS. Similar to the Murray system, seasonal determinations could be very low if inflows are extremely low.

Campaspe System

With the seasonal determination currently at 60 per cent as of the 15 November 2019, there is yet to be any reserve established for operating commitments in the Campaspe system for 2020/21. The ability to deliver carryover and secure water for seasonal determinations in 2020/21 will depend on inflows during the 2020 winter and spring.

Loddon System

About 45 GL has been reserved for operating commitments 2020/21. If conditions allow, seasonal determinations in the Loddon system will be the same as the Goulburn system in 2020/21. If inflows are insufficient in the Loddon system to maintain the same seasonal determination as the Goulburn system, the Loddon system seasonal determination will be lower than the Goulburn system. Schedule 3 of the Loddon bulk entitlement outlines the relationship between the seasonal determinations in the Goulburn and Loddon systems.

Broken System

The Broken system is an annual system, so 2020/21 reserves will depend on the final seasonal determination for 2019/20, how much water is utilised this water year and the inflows during the traditional inflow months in winter and spring 2020. As all resource improvements are contributing to operating requirements in 2019/20, operating reserves for 2020/21 will not commence until the seasonal determinations reach 100 per cent LRWS. Based on current water availability and inflow trends, reserves for 2020/21 are likely to be lower than those at the end of 2015/16 when planning for a low inflow year in 2016/17 commenced.

Bullarook System

Like the Broken, the Bullarook system is an annual system, so 2020/21 reserves will depend on how much water is used this water year and the inflows during the traditional inflow months in 2020. There is currently about 1,100 ML available to support system operations in 2020/21.

Ovens System

Water availability in the Ovens system depends on weather and streamflows, so it is difficult to determine what water availability will be in 2020/21. Restrictions are unlikely under wet and average inflow conditions, but remain possible under drier scenarios.

Unregulated Systems

Current seasonal conditions

Unregulated streams are monitored in accordance with relevant Local Management Rules (LMRs). Minimum streamflow requirements are outlined in LMRs. A minimum flow requirement of 3 ML/day is applied to streams that do not have a LMR.

If minimum flow requirements are not met, restrictions are put in place (Table 5). Restrictions range from Stage 1 Roster (access to 10 per cent of entitlement every 10 days) to Stage 5 suspension (only diversion for domestic and stock use is permitted). LMRs and the details of rosters and restrictions are available online at https://www.gmwater.com.au/water-resources/diversions.

Table 5. Current Stage 5 Suspensions on unregulated streams (as at 28 November 2019)

Catchment	Stream	Suspension start date
Broken	Boosey Creek	13 January 2017
Kiewa	Bight Creek	9 October 2018
	Glen Creek	1 November 2019
	Kinchington Creek	15 November 2019
	Back Creek (Yackandandah Creek)	19 November 2019
	Bay Creek (Kiewa Creek)	19 November 2019
	Deep Creek	19 November 2019
	Hellhole Creek	19 November 2019
	Junction Creek	19 November 2019
	Plain Creek	19 November 2019
	Sheep Creek	19 November 2019
	Middle Creek (Kiewa Creek)	27 November 2019
	Back Creek (9 Mile Creek)	28 November 2019
	Cherry Tree Creek	28 November 2019
	House Creek (Kiewa Creek)	28 November 2019
	Nine Mile Creek (Yackandandah trib)	28 November 2019
Murray Tributaries	Black Dog Creek (Upper)	17 November 2017
	Indigo Creek	9 October 2018
Mitta Mitta	Lockharts Creek	22 October 2019
	Sandy Creek	22 October 2019
	Waterfall (trib of Tallangatta Creek)	24 October 2019
King	Hurdle Creek	18 November 2019
	Scrubby Creek	18 November 2019
	Boggy Creek	22 November 2019
Ovens	Reedy Creek (above Yellow Creek)	1 November 2019
	15 Mile Creek	22 November 2019 (Stage 4)
	Happy Valley Creek	28 November 2019 (Stage 3)
	Snowy Creek	28 November 2019 (Stage 3)
Goulburn	Sunday Creek (Kurakurac & Kilmore)	9 October 2019
	Seven Creeks	25 November 2019
Campaspe	Wanalta Creek	8 November 2016
	Cornella Creek	21 September 2017
	Axe Creek	6 October 2017
	Sweenies Creek	6 October 2017

	Emu Creek	6 October 2017
	Sheep Wash Creek	6 October 2017
	Mount Ida Creek	10 October 2019
	McIvor Creek	10 October 2019
	Wild Duck Creek	10 October 2019
	Stony Creek	10 October 2019
	Campaspe River upstream Eppalock	1 November 2019
	Falls Creek	1 November 2019
	Five Mile Creek	1 November 2019
	Smiths Creek	1 November 2019
	Smokers Creek	1 November 2019
	Jones Creek	25 November 2019
	Little Coliban River	25 November 2019
Loddon	Muckleford Creek	7 December 2016
	Bullock Creek	12 December 2016
	Bet Bet Creek	28 October 2019
	Barkers Creek	24 October 2017
	Back Creek	28 October 2019
	Lake Meran	8 March 2019
	Back Creek	28 October 2019
	Bet Bet Crek	28 October 2019
	Joyces Creek	31 October 2019
	Creswick Creek	26 November 2019
	Slattery Creek	26 November 2019

Outlook for remainder of 2019/20

The Bureau of Meteorology current seasonal streamflow forecast predicts well below median streamflows for November to January across the GMW region (http://www.bom.gov.au/water/ssf/).

The most likely scenario is that more streams will not meet the minimum flow requirements and be put onto restrictions.

Upper Murray Catchment

- The Bureau of Meteorology predicts that flows are likely to be well below median and a 30 per cent chance of exceeding median rainfall in the Upper Murray catchment.
- No restrictions are forecast for the main stem of the unregulated Murray River and the Mitta Mitta River above Lake Hume.
- Tributaries may experience restrictions or suspension.

Kiewa Catchment

- The Bureau of Meteorology predicts lower than median flow and around a 30 per cent chance of exceeding median rainfall in the Kiewa catchment.
- Although no restrictions are forecast for the Kiewa main stem, a number of smaller tributaries already have prolonged restrictions applying and it is likely that additional streams will have suspension applied to irrigation.

Ovens Catchment

- The Bureau of Meteorology predicts lower than median flow and around a 30 per cent chance of exceeding median rainfall in the Ovens catchment.
- Flows on the Upper Ovens main stem are lower than at similar periods since the introduction of the Upper Ovens River Management Plan since 2012.

- Restrictions are likely for the main stem of the Ovens River upstream of Myrtleford and larger tributaries in accordance with the Plan.
- Suspension of irrigation is likely for smaller tributaries.

Goulburn Catchment

- The Bureau of Meteorology predicts significantly lower than median flow and around a 30 per cent chance of exceeding median rainfall in the Goulburn catchment.
- Most tributaries are likely to be placed on restriction or suspension.

Broken Catchment

- The Bureau of Meteorology predicts significantly lower than median flow and around 30 per cent chance of exceeding median rainfall in the upper parts of the Broken catchment.
- The Upper Broken River and all tributaries are likely experience restrictions and suspensions.

Campaspe Catchment

- The Bureau of Meteorology does not provide a prediction on streamflow, but estimates a 30 per cent chance of exceeding median rainfall in the Campaspe catchment.
- The Upper Campaspe, Coliban and all tributaries are likely to experience restrictions and/or suspension.

Loddon Catchment

- The Bureau of Meteorology predicts lower than median flow and a 30 per cent chance of exceeding median rainfall in the Loddon catchment.
- The Loddon River upstream of Cairn Curran Reservoir and most tributaries are expected to experience restrictions or suspension.

Outlook for 2020/21

Access to unregulated systems in 2020/21 will depend on weather conditions (Table 6).

Table 6. Unregulated systems outlook for 2020/21

Catchment	Worst on record weather conditions (greater for 95 of 100 years)	Dry weather conditions (greater for 75 out of 100 years)	Average weather conditions (greater for 50 out of 100 years)
Loddon	All streams on suspension	All streams on suspension	All tributaries and the Upper Loddon on restriction or suspension.
Campaspe	All streams on suspension	All streams on suspension	All tributaries and the Upper Campaspe on restriction or suspension.
Goulburn	All minor and major tributaries on restriction or suspension.	All minor tributaries on suspension. All major Goulburn tributaries on restriction	Most minor tributaries on restriction or suspension.
Broken	All streams on suspension.	All minor tributaries on suspension.	All minor tributaries on restriction or suspension.
Ovens	All minor tributaries on suspension. Upper Ovens River and larger tributaries on restriction	All minor tributaries on suspension. Upper Ovens River and major tributaries on restriction	All minor tributaries on restrictions. Tributaries of the Upper Ovens to be on the same level of restriction as the Ovens main stem above

			Myrtleford. Several smaller tributaries on suspension.
Kiewa	All minor tributaries on suspension. Kiewa River on restriction	All minor tributaries on suspension. Kiewa River on restriction	All minor tributaries on restrictions.
Upper Murray	All minor tributaries on suspension. Upper Murray River on restriction	All minor tributaries on suspension. Upper Murray River on restriction	All minor tributaries on restrictions.

Note: worst conditions on record are defined as instream flows that are in 95 years out of 100, dry conditions are greater 75 out of 100 years, average conditions are inflow volumes to major storages that are greater in 50 years out of 100 and wet conditions are inflow volumes to major storages that are greater in 10 years out of 100).

Groundwater

Current seasonal conditions

Currently, all groundwater licence holders have access to 100 per cent of their entitlement, except for those in the Newlyn zone of the Loddon Highlands Water Supply Protection Area (WSPA) and Barnadown zone in the Lower Campaspe Valley WSPA who have a 75 per cent allocation for 2019/20 (Table 7).

Table 7. Groundwater allocation for 2019/20

Groundwater Management Unit (GMU)	2019/20 Allocations (% Licensed Volume)
Barnawartha GMA	100%
Broken GMA	100%
Central Victorian Mineral Springs GMA	100%
Eildon GMA	100%
Katunga WSPA	100%
Kiewa GMA	100%
Loddon Highlands WSPA	100% (75% in Newlyn zone)
Lower Campaspe Valley WSPA	100% (75% in Barnadown zone)
Lower Ovens GMA	100%
Mid Goulburn GMA	100%
Mid Loddon GMA	100%
Shepparton Irrigation GMA	100%
Strathbogie GMA	100%
Unincorporated GMU	100%
Upper Goulburn GMA	100%
Upper Murray GMA	100%
Upper Ovens WSPA	100%
West Goulburn GMA	100%

*WSPA = Water Supply Protection Area; GMA = Groundwater Management Area

Outlook for remainder of 2019/20

Allocations for the Newlyn zone of the Loddon Highlands WSPA will be reviewed in mid December 2019, but it is unlikely that the allocations will increase.

Groundwater use and trading activity is likely to be above average in 2019/20 if dry conditions continue.

Outlook for 2020/21

Groundwater recovery and drawdown levels in northern Victoria are dependent on rainfall recharge and groundwater extraction. Above-average groundwater use in 2018/19, coupled with continued dry conditions in 2019/20, have resulted in declining groundwater levels in the Loddon and Campaspe catchments, as well as the Katunga WSPA. Groundwater levels in other areas in northern Victoria remain stable.

Groundwater levels are likely to continue to decline in 2019/20. The largest impacts are likely to be felt in the western catchments and the Katunga WSPA. As a result of this, groundwater licence holders in the Lower Campaspe Valley WSPA and Loddon Highlands WSPA are likely to have allocations below 100 per cent in 2020/21 (Table 8).

Table 8. Groundwater outlook for 2020/21

Catchments	Groundwater Management Unit	Groundwater level outlook	Allocations outlook
Loddon/ Campaspe	Central Victorian Mineral Springs GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Mid Loddon GMA	Seasonal drawdown and recovery likely to continue to decline	Remain at 100%
	Loddon Highlands WSPA	Seasonal drawdown and recovery likely to remain stable except in Newlyn Zone where both are likely to continue to decline.	Remain at 100% except in Newlyn & Blampied zones – 75%;
	Lower Campaspe Valley WSPA	Seasonal drawdown and recovery likely to continue to decline	75% allocation for all zones
Goulburn/ Broken/ Mid Murray	Broken GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Eildon GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Katunga WSPA	Seasonal drawdown and recovery likely to continue to decline	Remain at 100%
	Mid Goulburn GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Shepparton Irrigation GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Strathbogie GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Upper Goulburn GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	West Goulburn GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
Kiewa/ Ovens/ Upper Murray	Barnawartha GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Kiewa GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Lower Ovens GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Upper Murray GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Upper Ovens WSPA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%

Surface Water Quality

Current seasonal conditions

The winter-spring period of 2019 has not caused any surface water quality problems in the GMW region. Blue green algae levels in most storages are very low at the moment except for Tullaroop Reservoir, which has been experiencing algae scums since April 2019 and has had a recreational warning in place since then. Past experience has shown that blue green algae have the ability to increase in concentration quickly, as occurred in Waranga Basin in early 2019.

Outlook for 2019/20

It is difficult to estimate the likelihood of water quality incidents occurring over the next 12 months, as there are a range of factors that have an influence and many are weather dependent.

Water storage levels currently range between 35% and 100% of full capacity and are not expected to fall to levels low enough to cause any water quality problems prior to winter 2019.

The low rainfall over the winter-spring period of 2019 and the forecast for continuing dry conditions elevates the risk of hypoxic black-water events occurring over summer and autumn 2019/20 due to the build-up of organic matter on the floodplains. However, black-water can only occur if rain falls with sufficient intensity to cause overland flow that can carry organic matter into a stream, combined with temperatures high enough to cause rapid bacterial activity in the receiving stream.

The likelihood of blue green algae reaching levels that warrant the issuing of recreational warnings cannot be predicted. Elevated blue green algae levels have occurred under a range of weather, storage level and stream flow scenarios. For example, Lake Eppalock and Tullaroop Reservoir have experienced algae warnings in summer, autumn and winter, and also over a wide range of storage levels. The low inflows as experienced thus far in 2019 can reduce the risk with less sediment and nutrient mobilised, but on the other hand low storage levels can lead to warmer water that may favour algal growth.

The occurrence of elevated blue green algae or hypoxic black-water events is unlikely to affect GMW's supply to rural customers, as the phenomena are not considered harmful to irrigated agriculture (although the impact on stock is unknown). However, both events can impact aquatic life and recreational use of water bodies. Current blue green algae warnings in GMW systems can always be found on our website www.g-mwater.com.au/news/bga along with links to further information.

Urban water corporations are generally able to treat blue green algae affected water to provide safe drinking water, although very high levels like those experienced in parts of the channel network during 2018/19 can present significant challenges. Similarly, the urban water corporations are generally able to manage the taste and odour issues typically associated with black-water water, although it also presents a challenge.

High salinity in water systems is unlikely to occur under the current and expected water resource position.

Information Updates

GMW will update seasonal determinations on the 1st and 15th of each month, or next business day, until all seasonal determination are 100 per cent HRWS. Seasonal determinations will then be updated on the 15th of each month, or next business day.

The first outlook for 2020/21 seasonal determinations will be issued on 17 February 2020. All resource management updates can be located on the Northern Victoria Resource Manager website at http://nvrm.net.au/.