Lower Darling River – water quality and flow release update

Following the mass fish deaths in the Darling River at Menindee in March 2023 multiple agencies are continuing to monitor water quality conditions in this area to identify potential risks to ecological communities, implement mitigating measures and minimise the risk of further fish death events. This update provides a summary of information and operational measures up to 4 December 2023.

Monitoring is showing dissolved oxygen levels near the water surface in the Darling River at Nelia Gari, Lake Wetherell and Menindee have been dropping below the threshold of 4 mg/L for fish health. Increasing air temperatures at Menindee last week saw the development of thermal stratification in the Darling River and dissolved oxygen near the riverbed had declined to levels that posed an increased risk to fish health.

The environmental flow release for the lower Darling-Baaka was in progress to support the recovery of native fish populations that were hard-hit by hypoxic conditions in autumn 2023. The environmental flows were specifically timed to support Murray Cod breeding and maintained at 550 megalitres (ML)/day at Weir 32. In response to the low dissolved oxygen levels and increasing risks to fish health last week, a pulse of water in addition to the environmental flow was released from Lake Pamamaroo to assist with managing downstream water quality. Discharge increased from 100 ML/day on Thursday 23 November up to 1,000 ML/day on Saturday 25 November and dropped again to 100 ML/day by Thursday 30 November. As a further measure, discharge from Lake Menindee was reduced from 450 ML/day down to 100 ML/day to encourage the flushing of the weir pool through Menindee township.

Monitoring showed the increase in flow from Lake Pamamaroo resulted in improved downstream dissolved oxygen levels near the riverbed. The higher flows combined with a drop in air temperature resulted in the complete mixing of the water column on the morning of 25 November and further improvement in dissolved oxygen levels.

Operational releases from Menindee Lakes had been temporarily paused by the Murray Darling Basin Authority due to earlier heavy rainfall and tributary inflows to the Murray River. As these

unregulated flows are no longer meeting the needs of water users in the Murray River, there is now a need to resume releasing water from Menindee Lakes. Discharge from Lake Menindee was increased to 1,000 ML/day on 30 November and 100 ML/day from Lake Pamamaroo.

There have been no fish deaths reported in the Darling River this week. To report any incidents of dead fish, fish struggling or starting to gasp at the water surface, or crayfish exiting the water, please call the NSW Department of Primary Industries Fisheries' Fishers Watch Phoneline 1800 043 536 or fill in a fish kill protocol and report form (including a photo) at: www.dpi.nsw.gov.au/fishing/habitat/threats/fish-kills-2019-2020/info-sheet or www.dpi.nsw.gov.au/fishing/compliance/report-illegal-activity using the 'dead or dying fish' check box.

Increased chance of fish deaths in Lake Wetherell

Water quality conditions in Lake Wetherell are deteriorating. There is a high likelihood of stratification* occurring in the water column, which could lead to hypoxic conditions (low dissolved oxygen levels) when the water mixes (destratification**).

Maximum air temperatures are expected to be in the high 30s to low 40s over the coming week, followed by substantial decreases in maximum temperatures around 9 or 10 December 2023. This could cause a destratification** event, resulting in low dissolved oxygen levels throughout the entire water column.

If a destratification event occurs in Lake Wetherell over the next week or so there is an increased risk for fish deaths.

Unfortunately, options are limited to prevent or mitigate water quality issues and fish death risks in Lake Wetherell. Increased flows from upstream as a result of recent rain are expected in the coming weeks, which should assist with improving the water quality within Lake Wetherell.

Due to the size and limited access to waters within the lake, if a fish death event does take place, it will not be feasible to remove dead and dying fish. There is also still a lot of water within the lake that is spread across the floodplain, meaning it is very shallow in parts of the lake and oxygen depletes in those areas very quickly.

However, given the large volume of water in the lake, increased flows, and upstream connectivity, there is the opportunity for fish to move to find better water quality refuge so if a fish kill was to occur, it may not be large.

Dissolved oxygen levels – Darling River at Menindee

As water temperatures warmed up during spring and moving into summer, dissolved oxygen levels were always likely to decrease again. As the surface water of the river is heated by the sun, the water at the bottom of the deeper pools is often not warmed to the same temperature. During the summer months this can result in a difference in temperature between surface and bottom waters which is known as thermal stratification. This can lead to other issues such as increased algal blooms on the surface, and nearer the riverbed, low dissolved oxygen and higher nutrient concentrations. In addition, the amount of dissolved oxygen water can hold decreases with increasing water temperature.

In response to the low dissolved oxygen levels and the increasing risks to fish health, a pulse of water was released from Lake Pamamaroo. The aim of the pulsed flow was to disrupt thermal stratification which would allow oxygen to mix through the whole water column.

WaterNSW undertook dissolved oxygen and water temperature profile monitoring on 1 December in the Darling River near Menindee. The dissolved oxygen levels fell below the critical threshold for fish health of 4 mg/L below the surface at the 2 sites further downstream (Figure 1). The water temperature results showed thermal mixing throughout the profile for all 5 sites with a small increase in temperature near the surface at the downstream sites (Figure 2). The location of the five sites assessed are shown in Figure 3.

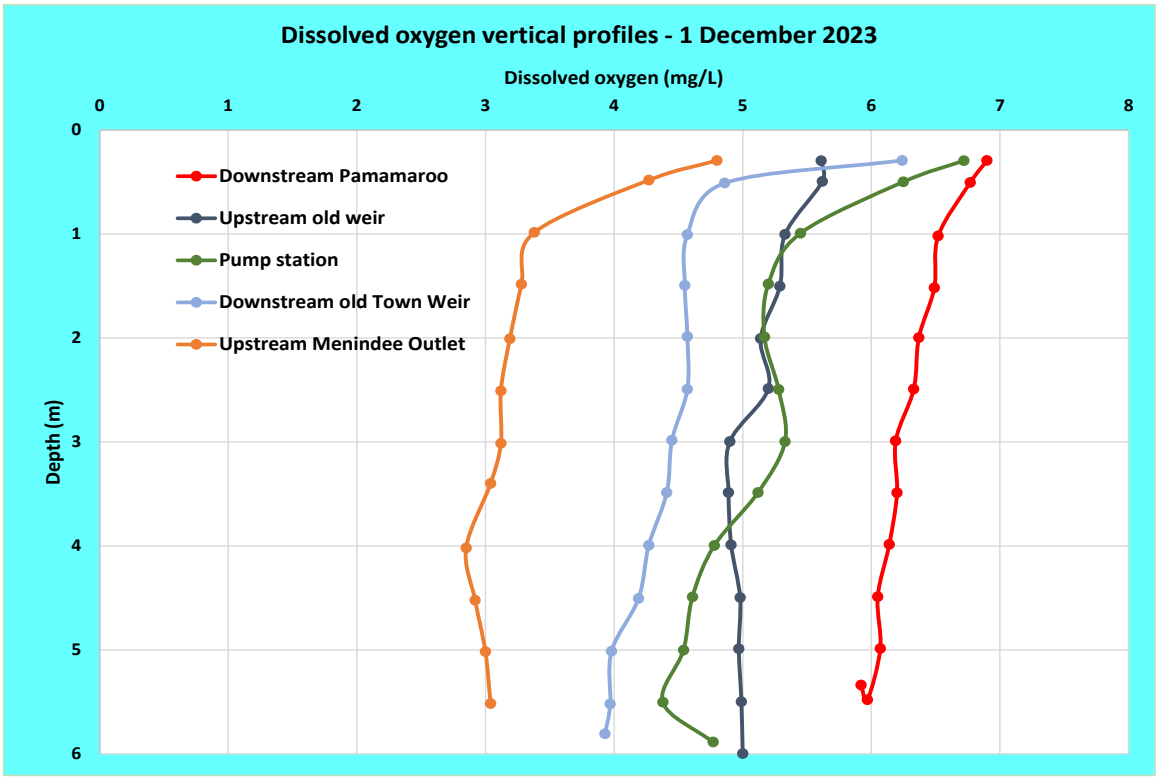

Figure 1: Dissolved oxygen (mg/L) profiles at five sites in the Darling River at Menindee: 1 December 2023

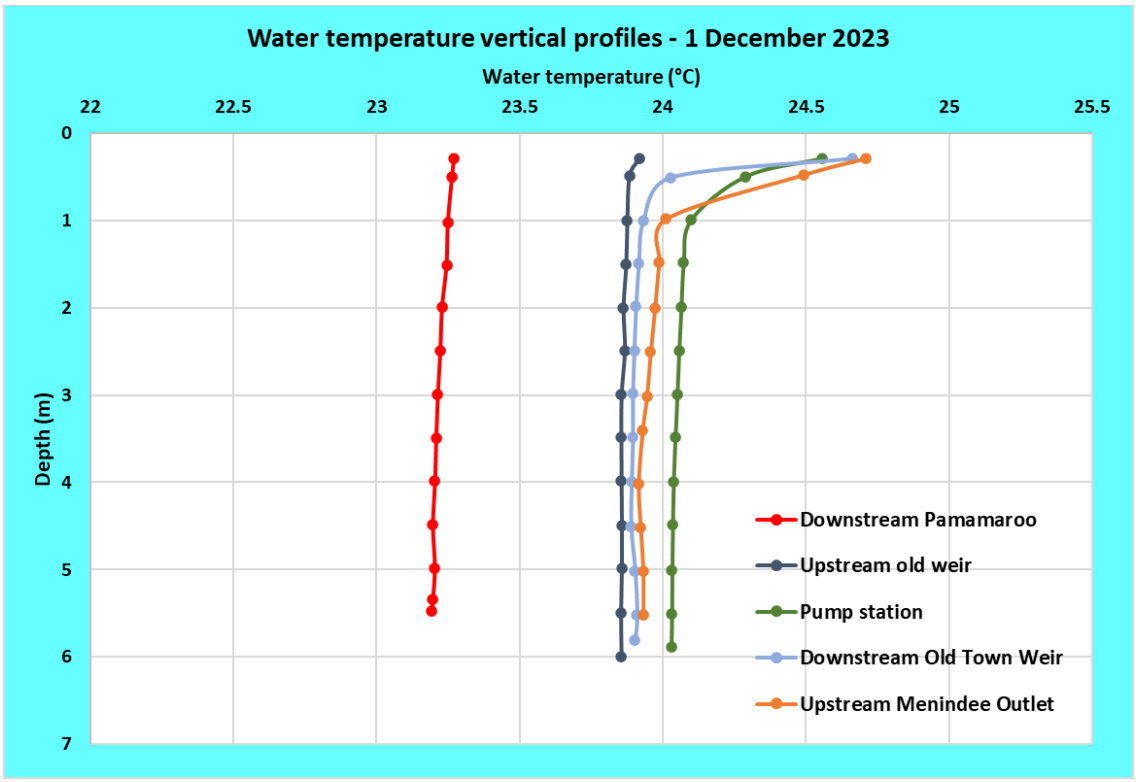

Figure 2: Water temperature (°C) profiles at five sites in the Darling River at Menindee: 1 December 2023

Figure 3: Location of vertical profile monitoring sites in the Darling River near Menindee.

Monitoring by the Department of Planning and Environment – Environment and Heritage Group also shows that with the increasing air temperatures at Menindee, thermal stratification was established, with a difference in water temperature between 1.2 metres and 3.0 metres (Figure 4).

The increase in flow on 23 November, combined with a drop in air temperature saw mixing occurring on the morning of 24 November, with uniform water temperature through the whole profile. Through until 1 December, there has been some stratification occurring during the day near the water surface, but this has been breaking down again each night. Since 1 December the difference in water temperature between the surface and the bottom has been increasing with thermal stratification developing again.

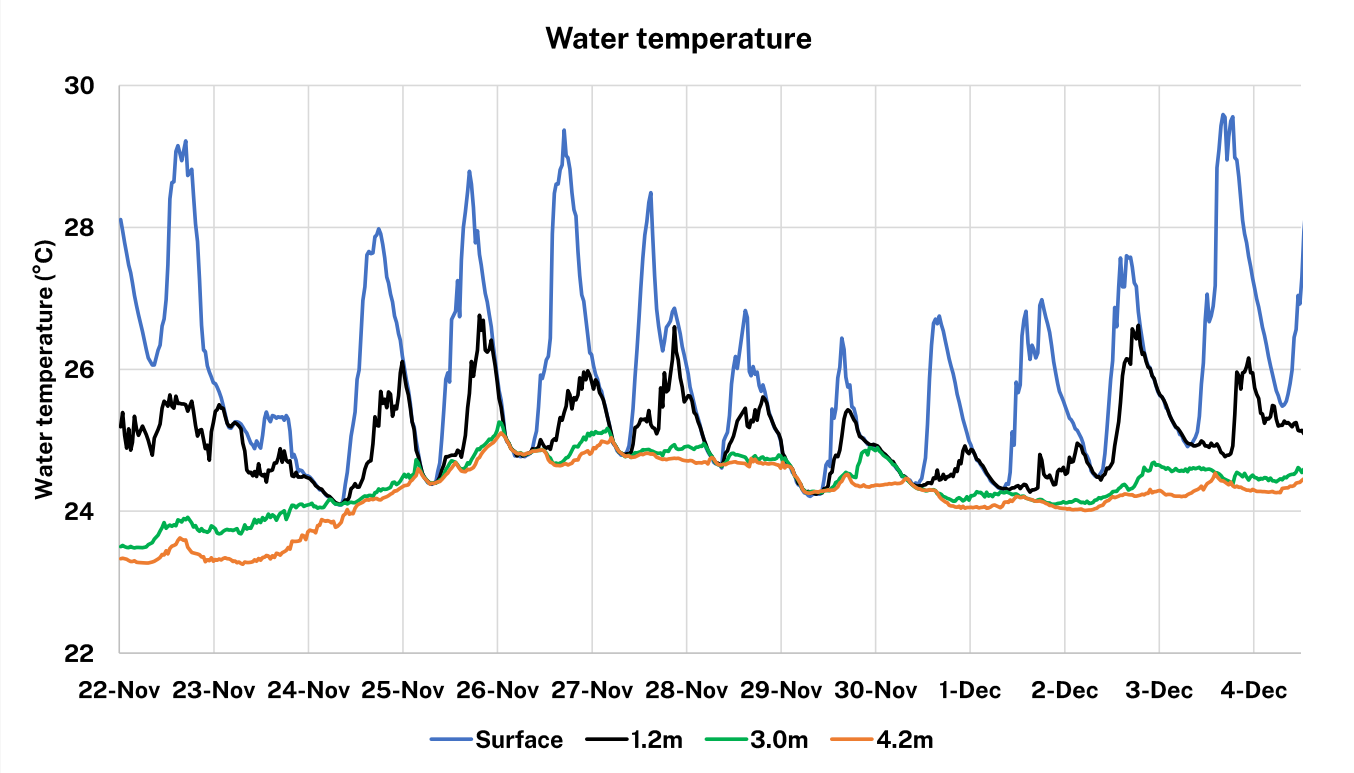

Figure 4: Water temperature (°C) continuous monitoring in the Darling River at Menindee

The dissolved oxygen results also show stratification between 1.2 and 3.0 metres. The lack of mixing resulted in very low dissolved oxygen near the bottom. Similar to water temperature, the increase in flow saw a gradual improvement in dissolved oxygen on 24 November before the complete mixing on 25 November (Figure 5). The breakdown in thermal stratification on the morning of 24 November allowed the oxygenated surface waters and low oxygen bottom waters to mix completely, producing a dissolved oxygen level above 4 mg/L through the water column. Dissolved oxygen near the water surface has been increasing during the day as algae and aquatic plants photosynthesise, and then mixing again overnight. As the water has been stratifying again over the last few days the

surface and bottom waters are not mixing, causing the dissolved oxygen near the riverbed to decline. Another pulse release may be required in the coming days.

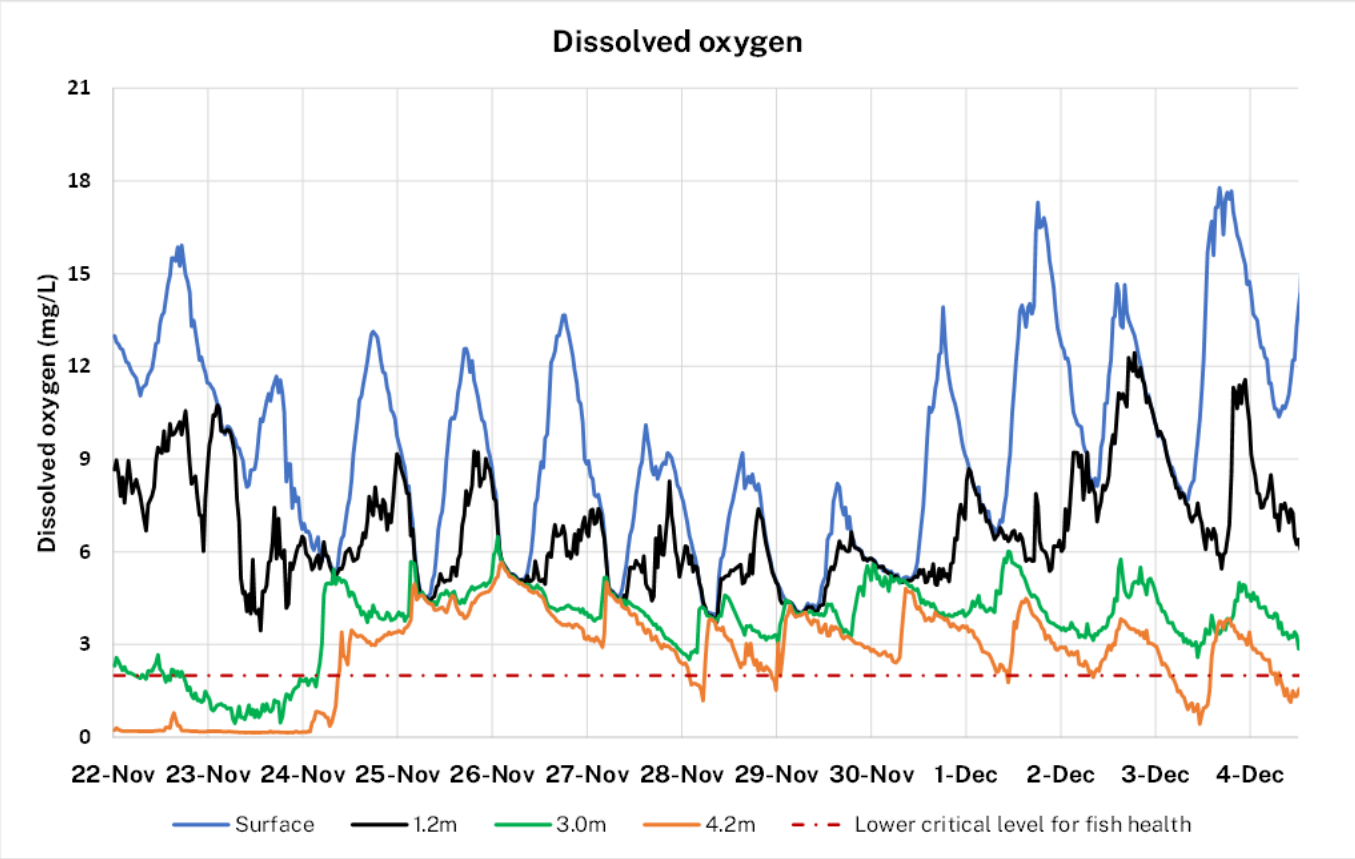

Figure 5: Dissolved oxygen (mg/L) continuous monitoring in the Darling River at Menindee

NSW and Commonwealth agencies will continue to work together and monitor dissolved oxygen levels in this area and advise the best operational measures to mitigate risks to aquatic life as much as possible. This can involve adjusting the timing, size and location of releases from the lakes into the lower Darling-Baaka River to maintain the quality of the water in the river. Releases from both Lake Pamamaroo and Lake Menindee continue to be managed to minimise the risk of further hypoxia-related fish deaths in the Darling River at Menindee.

Fish death summary

In the past week there have been no reports of native fish deaths.

Large numbers of Bony Herring and Carp remain in the reach of Darling River between Main Weir and Menindee Creek (Weir 32 weir pool). There remains a risk of further fish deaths in the Menindee area as fish (particularly Bony Herring) may be in poor condition from previous low oxygen conditions, limited food supply and may be more susceptible at reduced flow rates.

What is being done?

Flow releases into the lower Darling-Baaka

From late August, environmental water allocations have been delivered at a rate of 550 ML/day for native fish outcomes, particularly Murray Cod breeding, in the lower Darling-Baaka. The flows comprise 450 ML/day from Lake Menindee and releases of 100 ML/day from Lake Pamamaroo to provide some support for water quality in the Menindee town reach.

Water in addition to the environmental flow from Lake Pamamaroo was released in a pulse over the weekend, commencing on 23 November. Monitoring showed there was a need to disrupt thermal stratification and reduce the risk to fish health from declining dissolved oxygen levels in the weir pool between the Main Weir and Menindee Creek. Discharge increased from 100 ML/day on 23 November up to 1,000 ML/day on 25 November and reducing again to 100 ML/day on 30 November. As a further measure, discharge from Lake Menindee was reduced from 450 ML/day down to 100 ML/day to further encourage the flushing of the weir pool through Menindee township.

Operational releases from Menindee Lakes had been temporarily paused by the Murray Darling Basin Authority due to earlier heavy rainfall and tributary inflows to the Murray River from the upper catchment. These unregulated flows were meeting the needs of water users in the Murray River up until now, but there is now a need to resume releasing water from Menindee Lakes. Discharge from Lake Menindee was increased to 1,000 ML/day on 30 November and 100 ML/day is being released from Lake Pamamaroo. Ongoing monitoring will continue to inform operations to mitigate potential fish deaths.

Flows from Lake Cawndilla into the Great Darling Anabranch

Commonwealth environmental water is being released from Lake Cawndilla to maintain connectivity through the Great Darling Anabranch to provide a pathway for juvenile golden perch to migrate from the Basin's north to the south. The flow is also benefitting vegetation, waterbirds, bush birds, aquatic bugs, frogs, yabbies and other animals that live on the floodplain.

River operators, Commonwealth and state agencies have been working together on options for releases to best meet the needs of all water users. River operators have been working with environmental water holders and land holders to look at options for delivering some of the MDBA's call on water from Lake Cawndilla via the Great Darling Anabranch rather than via the lower Darling River. Agreement has been reached to trial a small volume of releases, likely around 500 ML/day at Packers Crossing initially, commencing in the coming days.

Environmental Water Holders will cover any additional loss of the water resource from delivering this water via the Great Darling Anabranch rather than the Darling River.

Using water from Lake Cawndilla to help meet operational demands allows water managers to conserve more water in the 'upper lakes' of Pamamaroo and Wetherell for use as a drought reserve. At the same time, it delivers an environmental benefit by helping to keep the Great Darling Anabranch flowing and facilitate the dispersal of native fish predominantly golden perch into the Murray River. This is a 'win' for the environment and the community that relies upon the water supply of the upper lakes.

Menindee Old Town Weir

The NSW Government remains committed to removing the remaining sections of the weir when conditions allow for it to be safely completed and environmental risks, such as potential fish deaths, can be reduced. The removal of the weir builds on the work previously undertaken to remove parts of the weir in 2020, which independent experts have confirmed significantly improved fish passage and boat safety. The Government will continue to engage with the community as the project progresses.

Native fish programs

Programs to benefit native fish, such as improving fish passage and habitat restoration to provide conditions conducive to fish breeding and population growth, are ongoing. These works are vital and provide an environment where fish populations can bounce back from low oxygen events.

Blue-green algae

WaterNSW undertake routine blue green algae monitoring in Menindee Lakes and in the Darling River. Alert warnings are declared where algal cell numbers exceed the triggers identified in the Guidelines for Managing Risk in Recreational Waters (NHMRC 2008).

The most recent results indicate a red alert warning for recreational use in Lake Tandure, the Darling River at Pomona and the Great Darling Anabranch at Silver City Highway. Algal numbers at most sites in the Menindee Lakes area remaining in the amber alert range for recreational use (Algae Alerts NSW map - WaterNSW). When a red alert warning is in place, people should avoid recreational activities that brings them into contact with the water and drinking untreated water. At the amber alert warning level, blue-green algae may be multiplying in numbers but remains suitable for recreational use. The water may have a green tinge and musty or organic odour.

The water should be considered unsuitable for potable use and alternative supplies or prior treatment of raw water for domestic purposes should be considered. The water may also be unsuitable for stock watering. Water users should use caution and avoid water where signs of blue-green algae are present.

Weather outlook

Refer to the Bureau of Meteorology website for the latest forecasts.

Additional information

To notify the NSW Department of Planning and Environment – Water of potential blackwater events email: waterqualitydata@dpie.nsw.gov.au

To report dead fish, fish struggling or gasping at the water surface, or crayfish leaving the water please call the NSW DPI Fisheries Phoneline 1800 043 536 or fill in a fish kill protocol and report form at: www.dpi.nsw.gov.au/fishing/habitat/threats/fish-kills-2019-2020/info-sheet

Information on recent fish deaths is available at: Fish kills in NSW. When reporting, please include the name of the river/waterbody, location and date of your observation and provide photographs. If possible, please also record what species are affected and an estimate of number of each species observed.

Further information on blackwater events can be found at the DPE Water website at: water.dpie.nsw.gov.au/allocations-availability/drought-and-floods/hypoxic-blackwater

Additional information is also available on the Murray-Darling Basin Authority website at: https://www.mdba.gov.au/publications/mdba-reports/water-management-101-factsheets

Operational updates are available at: WaterInsights - WaterNSW

Water quality data collected after the fish deaths at Menindee is available on the Environment Protection Authority web page at: www.epa.nsw.gov.au/working-together/community-engagement/updates-on-issues/menindee-fish-kill

To report suspected algal blooms see the WaterNSW website.