Lower Darling River – water quality and flow release update – 8 March 2024

Multiple agencies are monitoring water quality at Menindee and the lower Darling River to minimise the risk of further fish death events. This update provides a summary of information up to 8 March 2024.

On Saturday 10 February, reports were received of tens of dead Golden Perch and hundreds of fish struggling at the water surface in the Darling River at Menindee. Since then, Golden Perch have continued to die in small numbers. This brings the total number of fish affected since February into the thousands. Daily mortalities appear to have peaked during the current incident around 26 February. The numbers of dead and distressed fish are now steadily declining.

Water quality parameters that typically impact fish health have remained within or near acceptable range during this period. This includes dissolved oxygen, temperature, salinity and pH. Testing for pesticide residue and other toxins completed in early February by NSW Department of Climate Change, Energy, the Environment and Water and Environment Protection Authority have not found any adverse results.

NSW DPI has undertaken extensive analysis of affected fish to investigate other potential causes of death. Samples were collected and submitted to NSW DPIs Elizabeth Macarthur Agricultural Institute for testing. Examination found no evidence of the presence of Epizootic Haematopoietic Necrosis Virus (EHNV) and Red Spot Disease (also known as Epizootic Ulcerative Syndrome (EUS)) which are fish diseases found in the Murray-Darling Basin. Testing for betanodavirus was also undertaken, following reports that some affected fish appeared to be swimming unusually, but no evidence of betanodavirus was detected.

All deceased fish showed evidence of the external parasite *Lernaea* species, often referred to as anchorworm. *Lernaea* is a common parasite throughout the Basin and are often found on fish that are suffering impacts from other environmental factors. *Lernaea* infestations are often seasonal, with worst infestations evident in late summer and early autumn. It is not normally fatal to fish except in extreme circumstances and is unlikely to be the primary or sole cause of the fish deaths in this event.

Bacteriological testing detected the presence of *Aeromonas* bacteria in a small number of affected fish. However, their presence is likely to be secondary to initial damage to the skin caused by the

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presence of *Lernaea* attaching to the skin, gills, and soft tissues of fish which causes ulcers and severe irritation. There was no evidence to suggest that these bacteria were the direct cause of these mortality events.

DPI Fisheries also submitted samples to independent experts for post-mortem and parasitological examination. All samples exhibited elevated parasite loads, including various arthropods and nematodes. This is consistent with fish that are suffering a broad range of stressors, however presence of parasites in wild fish is not an unusual finding and there is no evidence to indicate that any of these parasites were the primary cause of mortality. The external advice also confirmed the presence of *Lernaea* on all deceased fish.

At this stage there is no single factor that can be identified as the cause of recent fish deaths. It is likely the combined impact of variable water quality over recent years, elevated temperatures over summer and the ongoing impacts of recent mass fish death events are contributing to broader impacts on the health of Golden Perch in the Menindee weir pool, making them susceptible to a range of diseases and parasites.

Government agencies are pursuing investigations into the causes of the fish deaths, with further water quality, toxicology analysis and sampling of sediments to be undertaken in coming weeks. Agencies will continue to monitor the numbers of deaths and consider any available management responses should circumstances change.

Lernaea are not harmful to humans, however the NSW Food Authority advice on ulcerated fish indicates that mildly affected fish are safe for human consumption, but heavily ulcerated fish should not be consumed due to the potential presence of other unknown pathogens.

Fish in a stressed condition can be more susceptible to parasite infestations. As a precautionary measure, discharge from Lake Pamamaroo is continuing at 750 ML/day to maintain dissolved oxygen levels through the weir pool at Menindee.

The inlet from Lake Wetherell into Lake Pamamaroo was opened on 28 February. The water level difference between the two lakes has reached the stage where this inlet had to be opened to ensure the structural integrity of the regulator. There will be ongoing monitoring to assess if the water entering Lake Pamamaroo from Lake Wetherell is being drawn through the Lake Pamamaroo outlet and posing and increased risk to the water quality in the lower Darling River.

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: https://www.dpi.nsw.gov.au/fishing/habitat/threats/fish-kills-2019-2020/info-sheet or

https://www.dpi.nsw.gov.au/fishing/compliance/report-illegal-activity using the 'dead or dying fish' check box.

Opening of the Lake Pamamaroo inlet

To prevent the poorer quality water in Lake Wetherell from entering Lake Pamamaroo, the inlet between the two lakes was closed in late December 2023. As inflows from the Darling River into Lake Wetherell have continued, the water level difference between the two lakes has reached the stage where this inlet had to be opened to ensure the integrity of the regulator itself. The inlet was opened on 28 February.

Figure 1 and Figure 2 are satellite-derived Sentinel images of the Darling River and Menindee Lakes at Menindee. Areas of increased algal growth in the lakes and rivers have been highlighted. Green indicates areas of low algal growth, yellow medium and red high algal growth. Figure 1 was taken on 27 February 2024 before the Lake Pamamaroo inlet was opened and shows high algal growth in Lake Wetherell (yellow and red) but lower numbers in Lake Pamamaroo (green).

Figure 2 was taken on 3 March after the inlet was opened. It highlights algae are being drawn into Lake Pamamaroo, though southerly winds at the time were pushing the bulk of the algae to the north away from the Pamamaroo outlet. However, the change in colour of the Darling River from green in Figure 1 to yellow in Figure 2 suggests some algae from Lake Wetherell is short circuiting through the Pamamaroo outlet.

Dissolved oxygen monitoring in the Darling River downstream of Main Weir is showing the water being released from Lake Pamamaroo after the inlet was opened is still oxygenated and not posing a threat to fish health. There will be ongoing monitoring to assess if the water entering Lake Pamamaroo from Lake Wetherell is being drawn through the Lake Pamamaroo outlet and posing and increased risk to the lower Darling River.

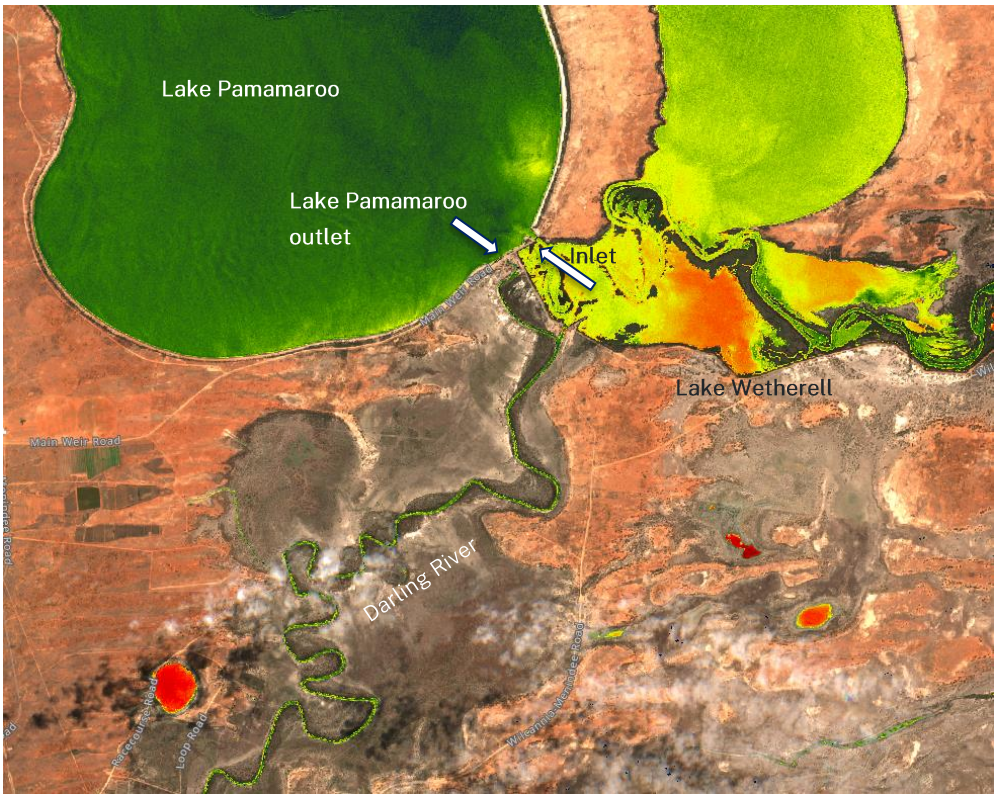

Figure 1: Satellite derived Sentinel image of the Darling River and Menindee Lakes, 27 February 2024, before the Lake Pamamaroo inlet was opened. Areas of low algal growth are highlighted green and high growth in red

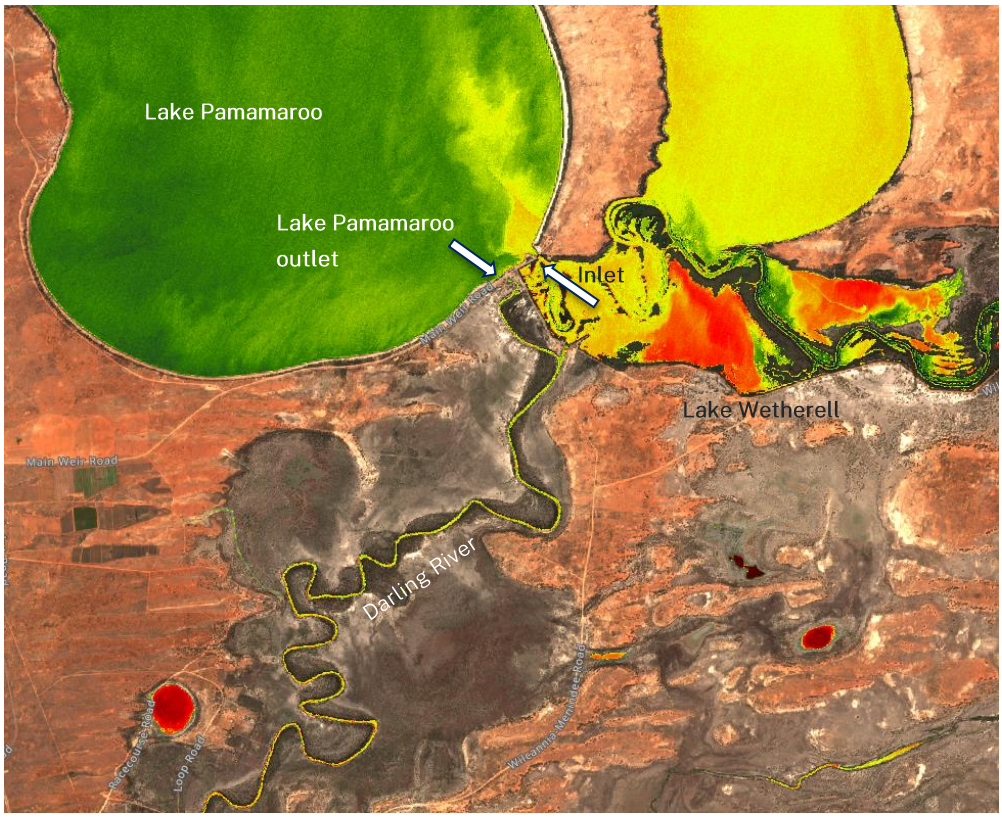

Figure 2: Satellite derived Sentinel image of the Darling River and Menindee Lakes, 3 March 2024, after the Lake Pamamaroo inlet was opened. Areas of low algal growth are highlighted green and high growth in red

Vertical profile water quality monitoring

Darling River at Menindee

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. The amount of dissolved oxygen water can hold decreases with increasing water temperature during summer.

Water temperature monitoring in the weir pool upstream of Menindee township shows that thermal stratification has been breaking down each morning. Monitoring at Menindee township shows that the water column mixed on the morning of 2 March due to a decrease in air temperature (Figure 3Figure 3: Water temperature (°C) continuous monitoring in the Darling River downstream of Menindee). The return to cooler overnight temperatures resulted in continued mixing of the water column each morning since then.

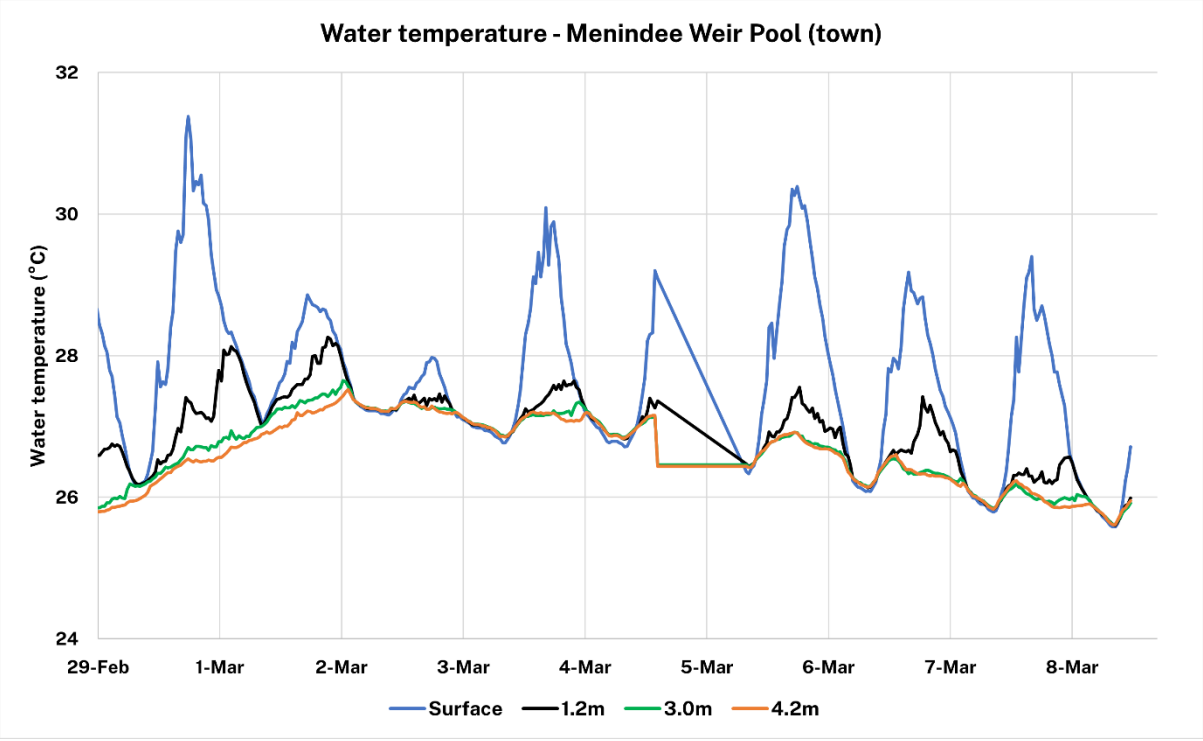

Figure 3: Water temperature (°C) continuous monitoring in the Darling River downstream of Menindee

With the regular break down in thermal stratification in the upper weir pool, dissolved oxygen is being mixed through the water column, resulting in oxygen levels remaining above 4 mg/L. Dissolved oxygen above 4 mg/L presents a low risk to fish health.

Dissolved oxygen results from the weir pool at Menindee township show that during thermal stratification on 29 February and 1 March, dissolved oxygen was not being mixed through the water column. Dissolved oxygen at 4.2 metres decreased below 4 mg/L and continued to fall towards the critical threshold of 2 mg/L on 1 March. The oxygenated water above 3.0 metres would have provided a large refuge area for fish to move into. With the regular break down in thermal stratification since the 2 March, dissolved oxygen has been remaining above 4 mg/L through the entire water column for the last 5 days (Figure 4).

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 River to maintain the quality of the water in the river. Releases from both Lake Pamamaroo and Lake Menindee will continue to be managed to minimise the risk of further hypoxia-related fish deaths in the Darling River at Menindee.

Discharge from Lake Pamamaroo is being maintained at 750 ML/day with discharge from Lake Menindee being held at 50 ML/day to prevent water backing up in the weir pool through Menindee.

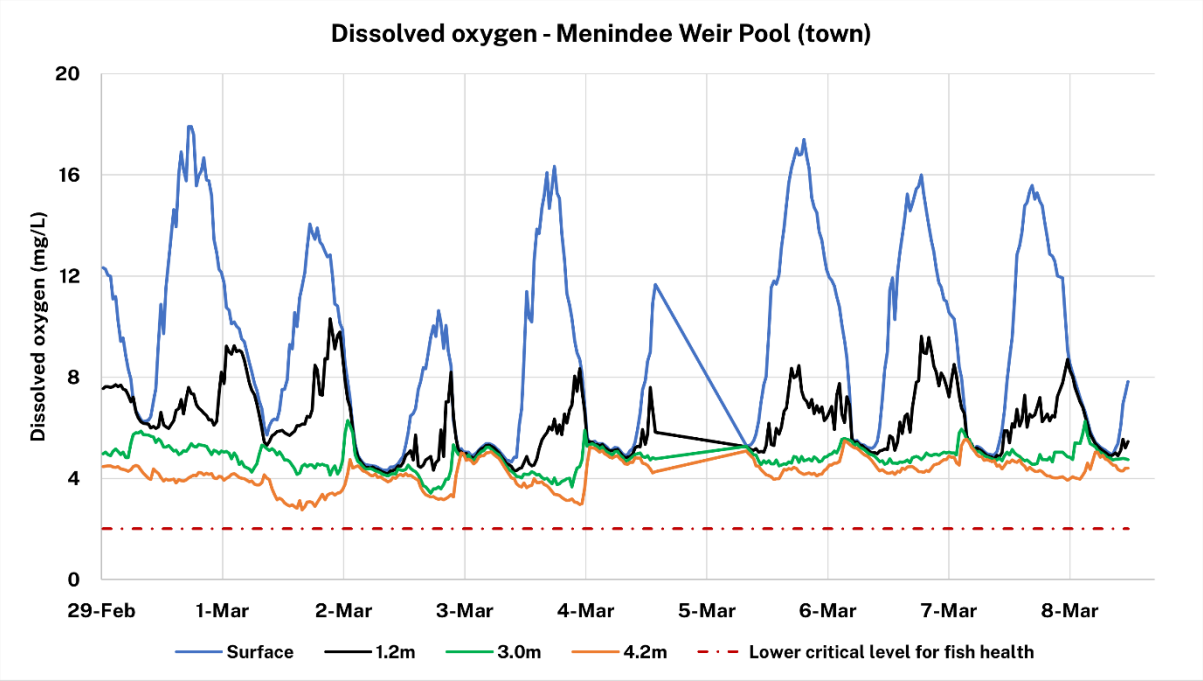

Figure 4: Dissolved oxygen (mg/L) continuous monitoring in the Darling River at Menindee

Fish death summary

In the past week to 8 March there have been continued reports of small numbers of dead Golden Perch in the Darling River at Menindee. Since the fish deaths started on 10 February, Golden Perch have continued to die in small numbers, bringing the total number of fish affected into the thousands.

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

The discharge from Lake Pamamaroo is being maintained at 750 ML/day due to the forecast of continued high daytime air temperatures at Menindee. This flow volume has shown to be sufficient to encourage the breakdown of thermal stratification, reoxygenation of the water column and provide conditions that are less favourable for algal blooms in the Menindee weir pool. Discharge from Lake Pamamaroo will be reduced as air temperatures decrease.

With the re-opening of the inlet between lakes Wetherell and Pamamaroo, monitoring will identify if the water from Lake Wetherell is being drawn through the Lake Pamamaroo outlet and impacting dissolved oxygen levels in the Darling River. There is currently 1,500 ML/day passing through the inlet, but this will be increased to 3,000 ML/day to cater for increasing inflows from the Darling River. At current flow rates, initial sampling results indicate that 50% of the water passing through the Pamamaroo outlet is from Lake Wetherell and 50% is from Lake Pamamaroo.

The Emergency Operations Centre led by NSW Police have been notified and they are on standby should there be an increase in fish deaths. A contractor has also been placed on standby to be available to remove dead fish from the river as soon as possible if a mass fish death event were to occur.

Discharge from Menindee Lakes cannot be reduced below the minimum flow of 350 ML/day as required under the WaterNSW works approval. 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 used to maintain a flow releases of 400 ML/day from Lake Cawndilla to the Great Darling Anabranch. The flow is continuing to deliver environmental

benefits by maintaining connectivity through the Great Darling Anabranch, which facilitates the dispersal of native fish predominantly Golden Perch. The flows are also benefitting vegetation, waterbirds, bush birds, aquatic bugs, frogs, yabbies and other animals that live on the floodplain.

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 Wetherell, Lake Tandure and Copi Hollow. Further down the system, there are also red alert warnings in the Darling River at Ellerslie and Pamona (in the Wentworth weir pool) and the Great Darling Anabranch at Silver City Highway. Algal numbers at most sites in the Menindee Lakes area are 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.

Darling-Barka flood recovery program

The Darling-Barka flood recovery program is a comprehensive river health monitoring program that extends the NSW Government's incident response to the floods and fish kill disasters that occurred in early 2023.

The program is coordinated by the Environment Protection Authority as the lead agency for the NSW Environmental Services Functional Area. It will be delivered until June 2025, extending on the incident response sampling already undertaken this year.

Through the River Health Project, Department of Climate Change, Energy, the Environment and Water – Biodiversity, Conservation and Science have installed 4 telemetered loggers which collect real-time data on water quality in the project area. You can access the real time data online via Dashboard - Darling Barka River Health Program (tago.run)

Weather outlook

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

Additional information

To notify the NSW Department of Climate Change, Energy, the Environment and Water of potential blackwater events email: waterqualitydata@dpie.nsw.gov.au

To view community updates issued, visit Community updates and frequently asked questions | Water (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: https://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.

Monitoring data from the monitoring buoys installed by the NSW Department of Climate Change, Energy, the Environment and Water for the Darling-Barka flood recovery program is available online via Dashboard - Darling Barka River Health Program (tago.run).

Monitoring data from the monitoring buoys installed by WaterNSW and operational updates are available on their Water Insights web page (WaterInsights - WaterNSW).

Further information on blackwater events can be found at the NSW Department of Climate Change, Energy, the Environment and Water website at: https://www.industry.nsw.gov.au/water/allocations-availability/droughts-floods/drought-update/managing-drought-recovery/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

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

To report suspected algal blooms see the WaterNSW website.