RIVER LAKES COORONG ACTION GROUP

DISCUSSION PAPER:
WATER QUALITY MONITORING IN THE LOWER MURRAY RIVER, LAKES ALEXANDRINA AND ALBERT, THE COORONG AND MURRAY MOUTH.

Prepared by: River Lakes and Coorong Action Group Inc.

1. INTRODUCTION

It is common knowledge that a river dies from its mouth. The first reason this happens is because water is drawn from the river progressively as it moves towards the sea. Such is the well know case of the Colorado River in the USA where the river water no longer reaches the sea.

However, there is a second reason that a river dies from its mouth and that is because pollutants and contaminants are progressively added to the water as it flows to the sea and the concentration of these pollutants and contaminants increase and the water quality progressively deteriorates as the river water moves towards the sea. This is happening in rivers all around the world including the River Murray here in Australia.

In fact, both water quantity and water quality at the mouth of the Murray River are severely stressed. To achieve social, environmental and economic outcomes with the water that is available in the lower reaches of the Murray River, it is now necessary to manage the river flows to achieve more with less water. Projections associated with climate change suggest this will undoubtedly only get worse in the future.

To achieve these management goals of achieving more with less water, this will require the best knowledge of water quality and how water quality parameters respond to managed changes through the river and lakes in the lower reaches of the river.

2. OBJECTIVES

The River Lakes and Coorong Action Group's (RLCAG) objective of this review is to determine what water quality monitoring is currently occurring in The Great Southern Murray Lakes area and is this suitable and adequate for decision makers, researchers and the general public to meet their needs to address the changing and increasingly challenging threats to the Lower Murray River, Lakes Alexandrina and Albert, The Coorong and the Murray Mouth.

3. THE STUDY AREA

The study area is the active waterways in the Murray-Darling Basin below Wellington in South Australia as shown in Figure. 1. This area is often referred to as CLLMM (Coorong, Lower Lakes and Murray Mouth) and will be referred to as this in this paper.

Figure. 1 – The Study Area (The Murray River below Wellington, Lakes Alexandrina and Albert, The Coorong and Murray Mouth).

4. KNOWN THREATS TO STUDY AREA [CLLMM].

Perhaps the most comprehensive list of threats to the study area (CLLMM), has been compiled by DCCEEW in their document "Draft Conservation Advice for the River Murray downstream of the Darling River, and associated aquatic and floodplain systems Ecological Community" as shown in Figure. 2.

DCCEEW advise in this document that the "ecological community has been severely impacted by multiple and long-term threats, most notably river regulation, over-extraction of water, clearing of the floodplain, salinisation, and invasive species. These have compounded and intensified over the past 100 years and, over the past few decades have been exacerbated by the current and increasing threats of climate change. It is well recognised that, in addition to being a significant threat in isolation, climate change may exacerbate other threats (Newton 2009; Steffen et al. 2009). Importantly, the trends of impact associated with climate change may not be gradual or linear, and sudden stepwise changes can occur once critical thresholds are breached—some of which may be irreversible (IPCC 2023)."

Evidence of the changing threat to the CLLMM area can be seen from recent events in the area including a major fish kill in The Coorong Southern Lagoon in May 2024 and a Blue Green Algae (BGA) bloom in Lake Alexandrina from March to July 2024 resulting in health warning and advise to avoid contact with this water which lasted for several months.

Overview of Threats Table (pp. 81-93)

- **Climate change related threats**
  - climate change - general threats to biodiversity
  - rising temperature
  - changes to rainfall & runoff
  - extreme events
  - fire regimes that cause declines in biodiversity
  - sea level rise (SLR) and extreme sea level (ELR)

- **Hydrology related threats**
  - flow – changes to hydrological regimes
  - extraction of surface water
  - river regulation & infrastructure
  - extraction of groundwater
  - Murray Mouth closure (& lack of flow to MM)
  - floodplain harvesting and farm dams
  - irrigation pumps

- **Water quality related threats**
  - salinisation
  - eutrophication
  - algal blooms (toxic and other)
  - blackwater events
  - pollution – chemical and litter (including micro-plastics)
  - acid sulfate soils (ASS)
  - sedimentation – infilling & turbidity

- **Land clearing related threats**
  - clearing of native vegetation
  - mining
  - grazing

- **Problem Species related threats**
  - invasive fish
  - invasive/pest birds
  - invasive mammals
  - invasive/pest invertebrates
  - invasive plants (weeds)
  - disease & pathogens

- **Other**
  - fishing pressure
  - recreational activities & impacts from urbanisation

Figure. 2 – Overview of threats to River Murray – Darling to the Sea (DCCEEW, 2024)

This paper will focus on the "Water Quality related threats":

- salinisation
- eutrophication
- algal blooms (toxic and other)
- blackwater events
- pollution – chemical and litter (including micro-plastics)
- acid sulfate soils (ASS)
- sedimentation – infilling & turbidity

CLLMM being at the downstream end of the River Murray – Darling to the Sea, it is clear that water quality will be at its worst at its end of travel and any water quality threat upstream of the study area will only be exacerbated downstream in the study area.

5. CURRENT WATER QUALITY MONITORING

Publicly available water quality monitoring data is available from several sources:

- Murray Darling Basin Authority (MDBA) – http://riverdata.mdba.gov.au/system-view
- SA Department of Environment and Water (DEW) - https://water.data.sa.gov.au/
- SA Water / Australian Water Quality Centre (AWQC) – on request at https://www.awqc.com.au/contact-us

The MDBA monitoring program sampling locations are shown in Figure 3. As can be seen there are only two (2) sampling sites below Tailem Bend; one at Milang on Lake Alexandrina, and one at the barrage at Goolwa.

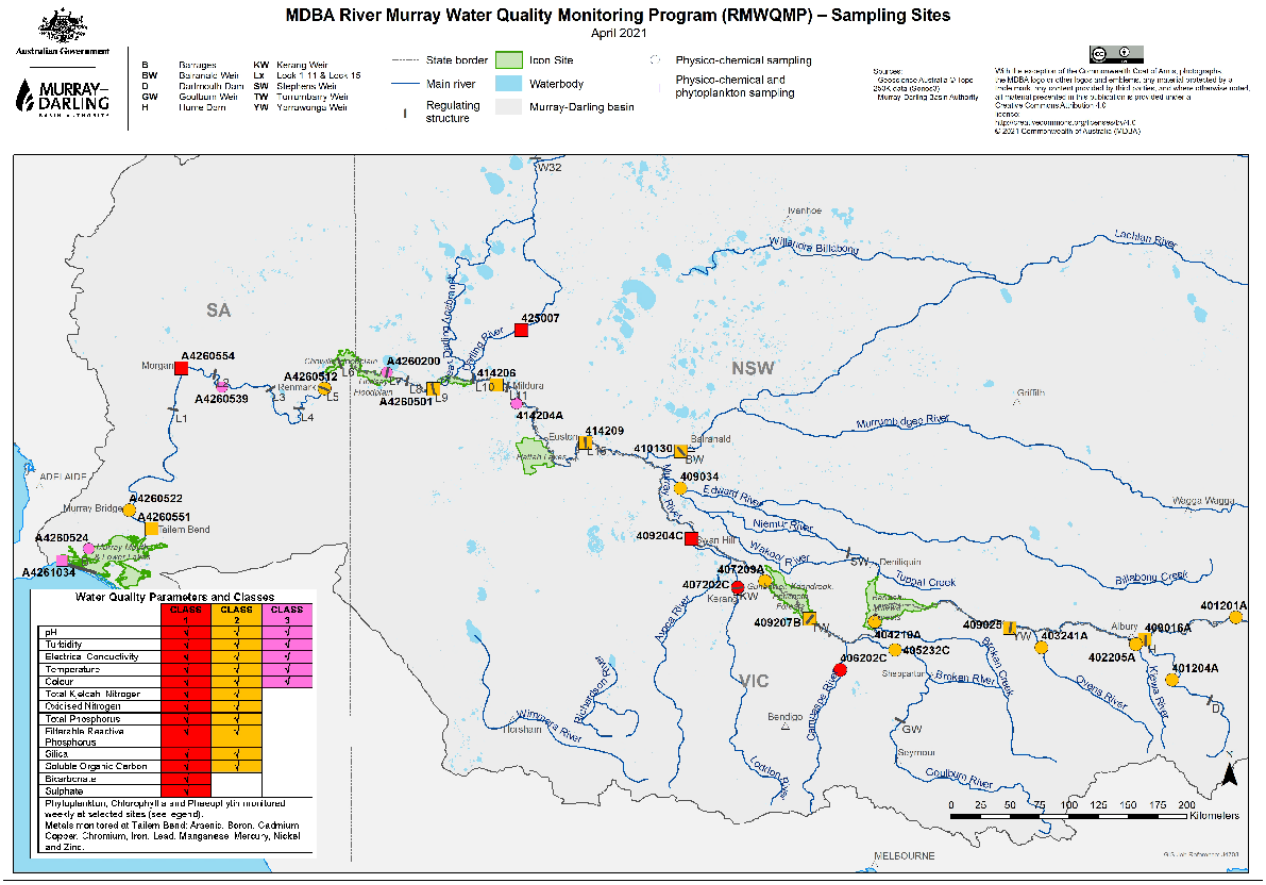

Figure. 3 – MDBA Monitoring Program, Sampling Sites

The MDBA map indicates that only physico-chemical parameters are monitored at Milang, while physico-chemical and phytoplankton parameters are monitored at Goolwa. However, on enquiry, the reverse was correct i.e. physico-chemical and phytoplankton parameters are monitored at Milang and only physico-chemical parameters are monitored at Goolwa.

Only data for a few physico-chemical parameters are publicly available online e.g. water level/storage volume, water temperature, and salinity. Other monitoring data may be requested.

Upon request, the following regular monitoring data was advised to be available.

SP ID	SP ID DESCRIPTION	Test	Frequency
3126	Lake Alexandrina Milang	Temperature	Weely
3126	Lake Alexandrina Milang	Algal Count - Total	Weely
3126	Lake Alexandrina Milang	Algal Biovolume	Weely
3126	Lake Alexandrina Milang	Chlorophyll a & Phaeophytin a	Weely
3126	Lake Alexandrina Milang	Colour - True (456nm) Filtered	Weely
3126	Lake Alexandrina Milang	Conductivity	Weely
3126	Lake Alexandrina Milang	pH	Weely
3126	Lake Alexandrina Milang	Turbidity	Weely
3127	Lake Alexandrina Goolwa Barrage US	Temperature	Weely
3127	Lake Alexandrina Goolwa Barrage US	Colour - True (456nm) Filtered	Weely
3127	Lake Alexandrina Goolwa Barrage US	Conductivity	Weely
3127	Lake Alexandrina Goolwa Barrage US	pH	Weely
3127	Lake Alexandrina Goolwa Barrage US	Turbidity	Weely

It was advised that further monitoring may be employed in response to a specific threat or incident such as the recent BGA bloom, when additional sampling and addition locations may be sampled.

DEW have numerous telemetered data acquisition monitoring locations in the CLLMM study area as shown in Figure.4

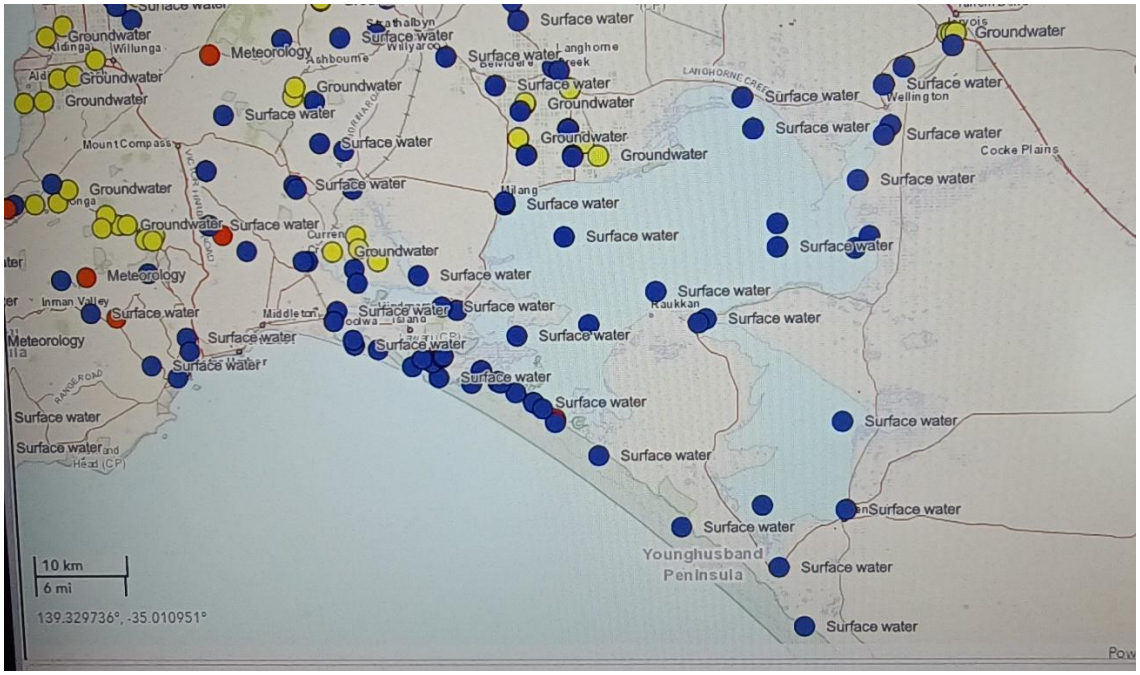

Figure. 4 – DEW Water Quality Monitoring Locations in CLLMM Study Area

The online data available from these sites varies a little but is mainly limited to physico-chemical parameters such as water level/storage volume, temperature and salinity. Some of these telemetered sites have more parameters - i.e. Parnka Point in the Coorong (A4260633) - measures air temperature, atmospheric pressure, dissolved oxygen, EC, pH, humidity, solar radiation, wind direction, total dissolved solids, water level, turbidity, water temperature, wind direction etc.

DEW undertook monthly water quality monitoring at 22 sampling locations in the Coorong, including some sites upstream of the barrages. This monitoring program ran continuously from 2019 to September 2023 and then for a further two months (March and May 2024). The monitoring included algal biovolume, alkalinity, ammonia, chlorophyll a & phaeophytin a, chloride, conductivity & total dissolved solids, dissolved organic carbon, phosphorus, nitrate, pH, silica, suspended solids, nitrogen, total organic carbon and turbidity. The monitoring program is currently unfunded.

In addition to this regular water quality monitoring, research and ad-hoc monitoring is done by researchers and other organisations, but these are not normally available to the public.

6. USE OF WATER QUALITY DATA

Water quality impacts the ecology, and many species depend on a suitable water quality to survive and flourish.

Water quality also impacts all human uses of the water including commercial activities such as agriculture, fishing and tourism, recreational uses such as swimming, fishing and sailing.

Hence water quality data is needed to be readily available to commercial uses, the public as well as researchers.

In addition, water quality data is needed to develop, calibrate and validate predictive models so corrective action can be taken to avoid or alleviate problems caused by poor water quality.

7. ADEQUACY OF CURRENT WATER QUALITY MONITORING.

Several reviews of water quality monitoring in the study area have been carried out including:

1. MDBA, Lower Lakes, Coorong and Murray Mouth Report Card 2022-23, https://www.mdba.gov.au/climate-and-river-health/water-environment/progress-and-outcomes/lower-lakes-coorong-and-murray
2. MDBA, River Murray Water Quality Monitoring Program (RMWQMP) Data Trends Analysis 2021; Centre for Freshwater Ecosystems Publication No.276; (August 2022)
3. MDBA, Blue Green Algae (BGA) Trends: Seasonality, Impacts, Consistency and Measurement: La Trobe Biogeochemestry and Ecotoxicology Group Publication No.3; (November 2023).
4. SA EPA: Coorong, Lower Lakes and Murray Mouth Water Quality Monitoring Program, 2009 to 2016, Dylan Stone1, David Palmer, Ben Hamilton, Cathy Cooney and Luke Mosley; (June 2016).
5. European Water Resources Association (EWRA), vol. 33(3), pages 1087-1101, February. "From Mountain Ranges to Sweeping Plains, in Droughts and Flooding Rains; River Murray Water Quality over the Last Four Decades," Tapas K. Biswas & Luke M. Mosley; (2019).

6. Goyder Institute (TRS No.20/10), Coorong Water Quality Synthesis with a Focus on the Drivers of Eutrophication, Luke Mosely, et al.; (2020) Goyder Institute Technical Report Series (environment.sa.gov.au)
7. Royal Society of South Australia Inc., Natural History of the Coorong, Lower Lakes, and Murray Mouth Region (Yarluwar-Ruwe) (Chap 2.10 – Water Quality of the CLLMM), Kane Aldridge, Luke Mosely and Rod Oliver; (2018) Natural History of the Coorong, Lower Lakes, and Murray Mouth region (Yarluwar-Ruwe) | University of Adelaide Press | University of Adelaide
8. Department for Environment and Water, Healthy Coorong, Healthy Basin - Coorong Water Monitoring Requirements Review., Mosley L.M., Gaget V., Furst D.; (2019).

In the three (3) most current and topical reports published by MDBA, none of them report on any water quality monitoring data sampled in the CLLMM study area.

The CLLMM Report Card 2022-23 (Item 1 above) references several ecological surveys and monitoring programs but no specific water quality data is referenced.

Four (4) of the 24 monitoring sites used in the RMWQMP Data Trends (Item 2) are located in SA but Tailem Bend is the last site which is some 15km upstream from the CLLMM study area.

The BGA Trends Report (Item 3) again only includes four (4) sites in SA, with the lowest being at Tailem Bend because “Goolwa and Milang were excluded from the trends analysis because monitoring was undertaken for a short period only” (page 47).

The SA EPA CLLMM WQ Monitoring Program 2009 to 2016 (Item 4) appears to be the most current report on water quality in the CLLMM study area. This study’s “purpose was to assess changes during and after the extreme drought period (2007 to 2010) in order to improve the environment values (ecosystems and human uses) of the region.” and to provide “Recommendations for future water quality monitoring – to help inform decision makers about suitable management responses aimed to protect environmental, cultural, social and economic values across this important region of the state and the Murray Darling Basin”.

This report recommended:

- Ambient water quality monitoring should be continued at historical sites and increased in frequency, parameters and site numbers.
- Existing CLLMM water quality triggers should be revised and included in the Basin Plan. These need to consider the deterioration in water quality that has been observed over time and the ecological impacts.

The review of the long-term Murray River water quality monitoring program from 1978 to 2015 by Biswas and Mosley (2019) (Item 5) found that “The water quality is highly variable, but on average electrical conductivity (EC), pH, turbidity, dissolved and total nutrient, colour and chlorophyll a levels increase with distance downstream from the headwaters to the lower reaches. This is a function of the natural accumulation of dissolved and particulate components and intermittent, mostly diffuse source, pollutant inputs.”

The study stressed the importance of maintaining the water quality monitoring program to;

- assess water quality effects during and post recovery and use of environmental water during the implementation of the Basin Plan,
- to enable the water quality management plans legislated under the Basin Plan to be developed and assessed, and

- to inform on the potential effects of climate change and increasing influence of extreme events.

In reference to The Goyder Institute's TRS No. 20/10 on water quality in the Coorong (Item 6), DEW's Water Resource Optimisation website (Department for Environment and Water - Water Resource Optimisation) states that "Monitoring data is critical for maintaining the ecological character of the Coorong".

K Aldridge, L Mosley and R Oliver (Item 7) state that "Suitable water quality is essential not only for the economic and social uses of water in this region, but also for shaping the aquatic system" and that "end-of-basin water bodies like Lower Lakes and Coorong is particularly sensitive to environmental change". They conclude that "Water quality in the CLLMM helps inform likely changes….resulting from different water management scenarios and the water regime required to maintain a functioning ecosystem and human use of the water."

The Coorong Water Monitoring Requirements Review (Item 8) found that of the eight (8) Water Quality Monitoring Objectives identified, only one (1) of these objectives could be achieved with the current monitoring program design. The review recommended nine (9) improvements to the monitoring program, some of these were implemented for a short time but none are currently being carried out due to a lack of on-going funding.

Further enquires have been made with:

- CLLMM Research Centre, Dr. Nick Whiterod
- DEW, The Living Murray, Adrienne Rumbelow
- Dr. Luke Mosley, Uni of Adelaide

All three (3) have agreed for the need of additional water quality monitoring.

8. NEXT STEPS

1. It is critical that a long-term water quality monitoring program that adequately addresses multiple needs is in place across the CLLMM area. To achieve this, a thorough review of the historical and existing water quality monitoring is required to establish the most efficient monitoring program for the study area. This will make recommendations on:
   - sufficiency of sites (and the possible need for further sites),
   - the frequency and timing of sampling, and
   - the parameters to be monitored.
2. A commitment of adequate funding to deliver the water quality monitoring program for the long term.
3. It is critical to increase the accessibility of WQ data to public / researchers / industry, including through expansion of DEW's Coorong Automated Dashboard and/or other publicly accessible sites.
4. Utilise outcomes of the water quality monitoring program to enhance existing or develop new hydrodynamic models, identify trigger levels and establish integrated management systems for timely decision making.

9. CONTACT

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