Noosa Integrated Catchment Association

Water Quality Monitoring Annual Report January-December 2024

Noosa River Catchment of Southeast Queensland

Part of Basin 140

March 2025

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Executive Summary

This report has been written to provide feedback to Noosa Council, Noosa Integrated Catchment Association (NICA), water watch volunteers, other local water watch groups and key stakeholders of Southeast Queensland. The water monitoring program has been increasingly collaborative over 2024, and we wish to thank everyone for their time, support and input.

The Noosa River catchment has consistently achieved A- ratings in Healthy Land & Water's Annual Report Cards with estuarine water quality rated as excellent. Urban areas are concentrated around the lower estuarine reaches with extensive land clearing and urban runoff key influencers in the health of the catchment system. (https://reportcard.hlw.org.au/results?currentYear=2023&show=null&action=null&tab=overview&regions[0]=region.Noosa)

In summary, this report has noted increases in water temperatures, decreases in dissolved oxygen and decreases in turbidity in the Noosa Catchment in 2024. Notable increases in average water temperatures were recorded at most sites excluding upper river and freshwater sites. The river and tributary systems are highly influenced by natural weather events and rainfall and the site locations are often influenced by urban and industrial run off. This contributed to excess nutrients observed in 2024. Excess concentrations of Total Nitrogen and Total Phosphorus were reported which had peaks in concentrations noted due to the 'first flush' of contaminants post rainfall.

Although the sites tested and analysed in this report do not always fit within the Department of Environment, Tourism, Science and Innovation (DETSI) water quality objectives (WQOs), a revision of guidelines to reflect locally relevant WQOs will help to better understand the river system. To maintain and promote healthy waterways, natural bushland catchments should be retained or extended as they support filtration. As the population of the Noosa area increases, water sensitive urban design practices should be prioritised in new development to reduce runoff loads.

1. Introduction

The NICA water watch program collects water quality data in the Noosa River Catchment of Southeast Queensland. Data is collected monthly by volunteers and NICA staff. This includes 27 water samples and 5 nutrient samples. Water samples are taken using Horiba U-52 water quality metres. Nutrients samples are collected for laboratory analysis at Unity Water.

This report aims to interpret the results of the water quality data collected from January 2024 to December 2024 and compare this to historical results as well as the Department of Environment, Tourism, Science and Innovation (DETSI) Water Quality Objective (WQO) Guideline values for the Noosa Shire. This assessment of the water quality can help identify potential pollution sources as well as monitor environmental health and ecosystem sustainability.

The 2023-24 El Niño event was a key influence on the Noosa River system for 2024 with the increased rainfall influencing results.

2. Methodology

Water sampling is carried out in accordance with the DETSI WQ manual (Water monitoring and sampling manual | Environment | Department of the Environment, Tourism, Science and Innovation, Queensland). Two Horiba U52 Water Quality Meters were used to collect the data across the following measurement parameters:

- Temperature (^{0}C)
- pH
- Dissolved Oxygen (DO)
- Electrical Conductivity (EC)
- Turbidity (NTU)
- Total Dissolved Solids (TDS)
- Salinity (ppt)

Figure 1: Equipment used at site MUR060

Readings are either tested directly from the water body or as a collected bucket sample representative of the water body. Estuarine readings are taken late on the outgoing tide to ensure river water is collected, without the influence of incoming ocean water.

The two water quality meters were manufactured in 2014 and are calibrated every second month. An additional air calibration for dissolved oxygen is carried out before each day of testing, as recommended after being serviced. Servicing of the meters was completed by Australian Scientific in June 2024 with pH sensors replaced to enhance device reliability. Details in calibration and water testing procedures have been refined over the year with advice from Australian Scientific and other water testing groups around the Noosa Shire for continuity.

Other Water Quality Assessment

5 nutrient samples are collected for laboratory analysis. Nutrient samples test for Total Nitrogen, Total Phosphorus, Ammonia as N, Phosphate as P and Nitrate + Nitrate.

Considerations

All efforts are made to collect accurate data, but there is still the chance of equipment errors, errors in data collection, legibility of testing sheet and/or the data entry process as well as errors during the data analysis process. Medians of the data were used to analyse and compare the data and outliers were identified and removed from the analysis. Rainfall data was used from a centralised location as reliable data for rainfall closer to each site was unavailable. Tests aim to be taken mid-month and at a similar time of the day and tide (for key sites), but this can vary based on availability of water testers. It has been noted that temperatures of surface water can differ substantially, especially in shallow lakes with dark sediment.

In analysing the data to give a picture of the water quality over the 2024 annual year, there were complexities in determining locally relevant environmental value (EV) zones for some sites. In classifying sites to compare to WQOs, the QLD Globe mapping was different to past report cards written for the sites or were mapped incorrectly e.g. as freshwater when they record tidal influences. Some sites fit into multiple EV zones, were mapped on the border of 2 zones or have historically been compared to Environmental Protection (water) Policy 2010 and the updated 2022 Policy which made it unclear which WQO parameters should be compared to. Best efforts have been made to give an analysis of the results compared to historical data, but not always the specific WQOs. More time and clarification is required to investigate WQO specifics for deeper data analysis. Noosa Shire Council and Natural resource Management (NRM) groups will be working on developing local water quality objectives, specific to the Noosa Catchment in 2025.

3. Sampling Sites

A focus for 2024 was to design and scope an integrated water monitoring program with other relevant stakeholders and revise site selection accordingly. Through this process, 4 sites were removed due to overlap or unnecessary data collection. The location of the site EEN030 under Walter Hay Drive bridge was moved to the other side of the river due to safety concerns. Some sites have been tested monthly dating back to 2005, but some a lot less, such as the sites TNC001 and TNC002 where historical data pre 2024 was unavailable. The sites have been chosen over the past decades based on potential issues that require investigation, ease of accessibility for testing as well as giving a broader spread of sites over the region.

For ease of reporting, this summary report divides the 27 water quality sites into 7 sub-categories based on the DETSI Environmental Protection (Water and Wetland Biodiversity) Policy (EPP) water types. Sites were categorised using the Queensland Globe mapping (https://qldglobe.information.qld.gov.au/).

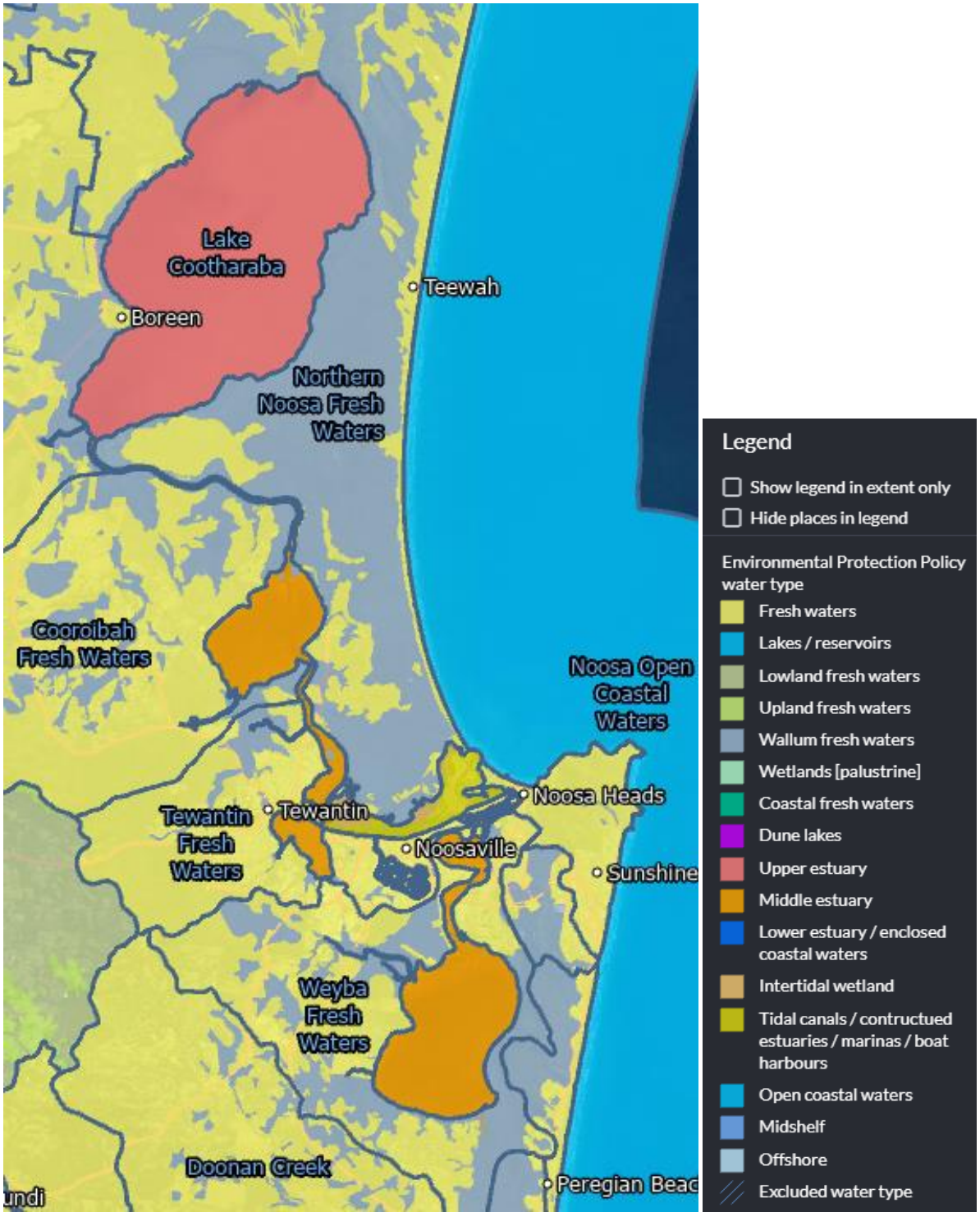

Figure 2: Environmental Policy (EPP) water types. Taken from Queensland Globe mapping (https://qldglobe.information.qld.gov.au/)

NICA Water Monitoring Sites and Codes:

Upland Freshwater:

Noosa River, above Lake Como	NOO300

Upper Estuary:

Kinaba Centre	KIN997
Boreen Point	COT200
Lake Cootharaba mid lake	COT205
Cooloothin Creek	COO050
Tronson's Canal Upstream	NOO401
Tronson's Canal Discharge	NOO400
Kin Kin Creek, upstream	KIN990

Lowland freshwater:

Eenie Creek Small Drain, Rene St	EEN010

Wallum freshwater:

Wooroi Creek, George St	WOO550
Murdering Creek, Clarendon Road	MUR060

Middle Estuary:

Cranks Creek, Hooper Crescent	CRA900
Cooroibah Creek, Noosa Banks Jetty	CBH020
Weyba Creek, Lake Weyba Drive	WEY550
Weyba Creek Kayser Island	WEY900
Mid-Lake Cooroibah	CBH010
Wooroi Creek Mouth	WOO980
Makepeace Island	NOO500
Lake Doonella	NOO650
Eenie Creek Large Drain, Rene St	EEN020
Eenie Creek, Walter Hay Drive Bridge	EEN030

Canals:

Noosa Sounds West Reef Site	TNC02
Noosa Canal Inflow at waterfall	NOW780
Noosa Canal Outflow, above lock	NOW070

Lower estuary:

Munna Point	NOO820
TNC Oysterbed Goat Island	TNC01

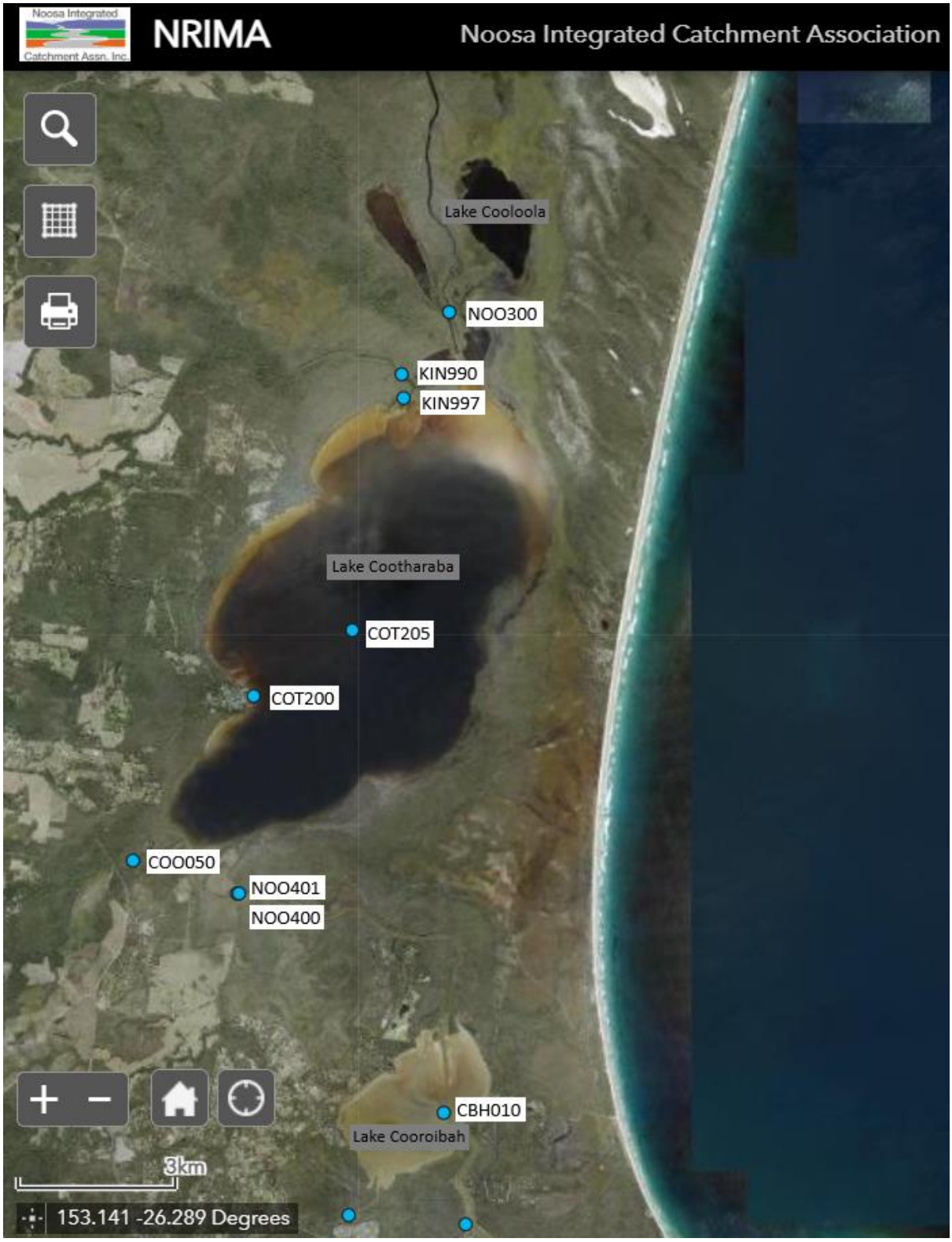

Figure 3: Upper River Sites taken from NICA's NRIMA mapping software

Figure 4: Lower River Sites taken from NICA's NRIMA mapping software

Red dots are nutrient testing sites

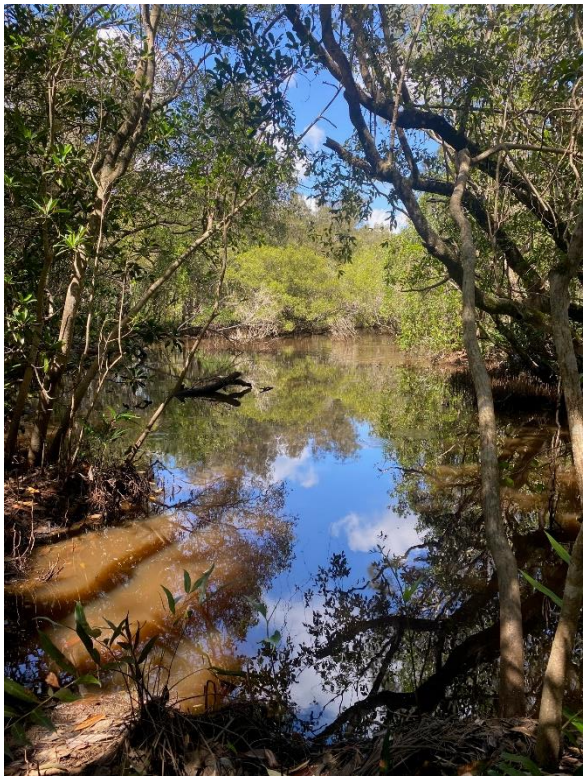

Figure 5: Wooroi Creek, George St- WOO550

Figure 6: Tronson's Canal Discharge- NOO400

4. Environmental Guidelines

See appendix B for Department of Environment, Tourism, Science and Innovation (DETSI) water quality objective (WQO) Guideline values for the Noosa Shire.

5. Results

Recent rainfall and tidal data is collected from the Bureau of Meteorology, at the Tewantin RSL Park weather station. Tewantin's total rainfall for 2024 was 2300mm, compared to the 1996-2025 average annual rainfall of 1593.3mm. Heavy rainfall events (over 70mm in 24 hours) were recorded January 3rd (105.2mm), January 31st (119.2mm), March 18th (81.4mm), March 19th (70mm) and April 21st (76mm). (http://www.bom.gov.au/climate/averages/tables/cw_040908.shtml)

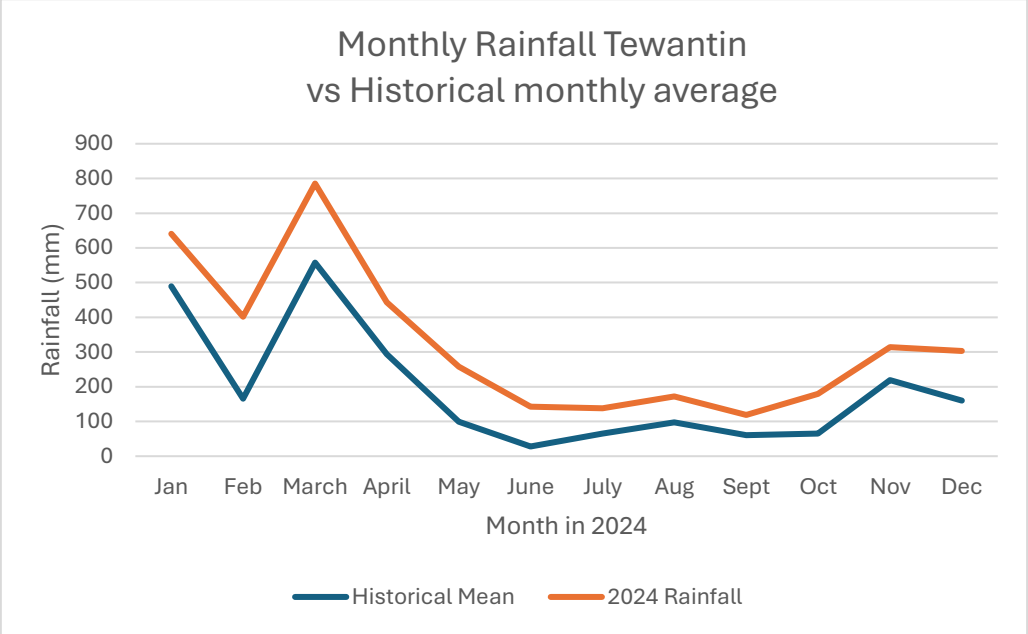

Figure 7: Monthly rainfall 2024 and historical averages for Tewantin RSL

Upland freshwater

The Noosa River site above Lake Como had a slight increase in median pH from 5.19 to 5.24, which sits much below the WQO of 6.8-7.7. There was a small decrease in dissolved oxygen, TDS and conductivity. Turbidity increased from 1.1 to 2 NTU compared to historical medians. Turbidity was high during the months with highest rainfall. DO% was recording much lower results in March and April, and no reading was recorded in May due to the DO probe malfunctioning. These results suggest inaccuracies in recordings from the Horiba meter. All records of DO sit below the WQOs.

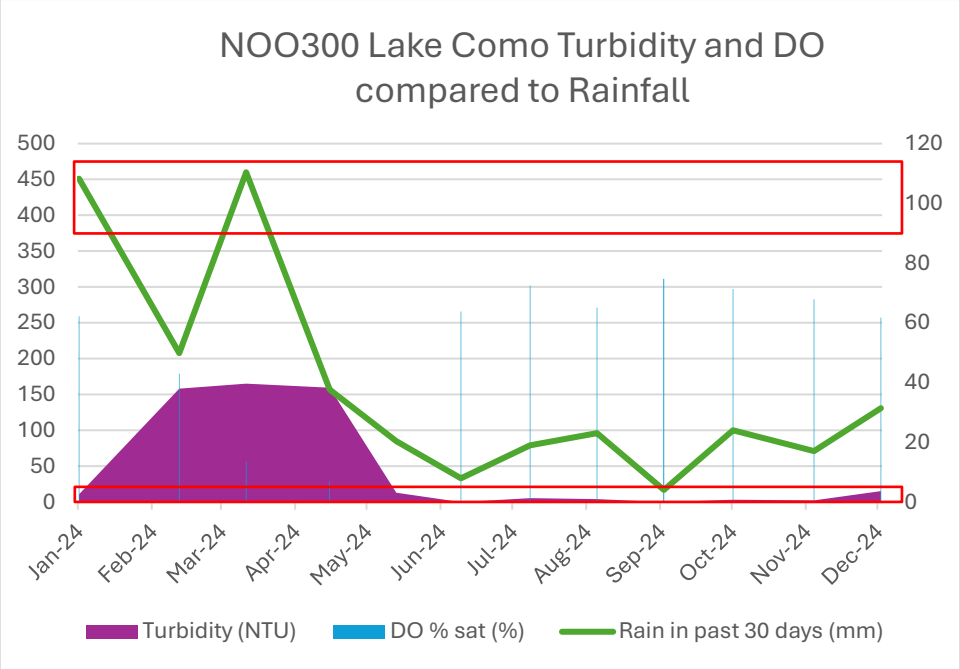

Figure 8: Lake Como NOO300 Turbidity, DO% and Rainfall. Red outline is the WQO guidelines for Cootharaba Fresh Waters HEV/SD low flow, Turbidity 1-2-4 NTU, DO 90-100-110

Upper estuary

Three of the upper estuary sites showed large decreases in median turbidity compared to historical medians, where they more than halved at both Boreen point COT200 and mid-lake Cootharaba COT205. 2 of the 7 sites annual median turbidity results fit within the DETSI WQO guidelines. The upper estuary sites also mostly decreased in dissolved oxygen, conductivity and total dissolved solids compared to historical data. pH results varied from medians of 6.42 to 7.52, with 2 sites medians within the WQO guidelines. Temperatures recorded were relatively consistent with historical averages, with only a slight decrease. DO recorded much lower results in March and April, and no reading was recorded in May due to the DO probe malfunctioning. These results suggest inaccuracies in recordings from the Horiba meter before it was serviced in June.

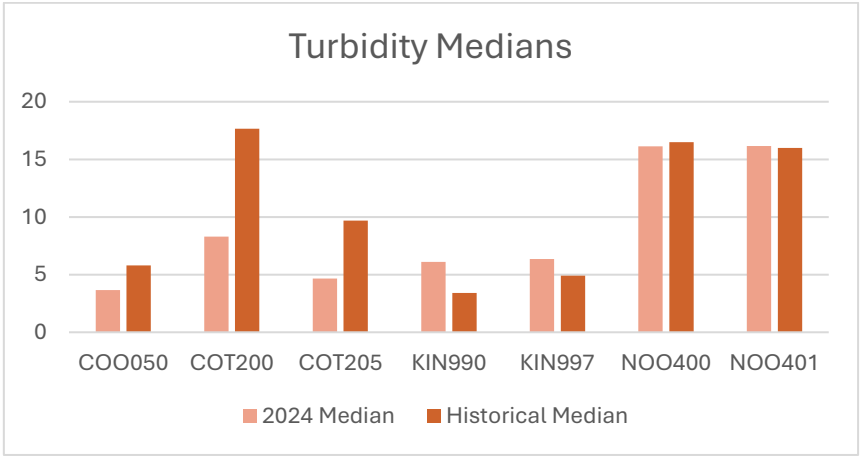

Figure 9: Turbidity medians 2024 compared to historical medians for upper estuary sites

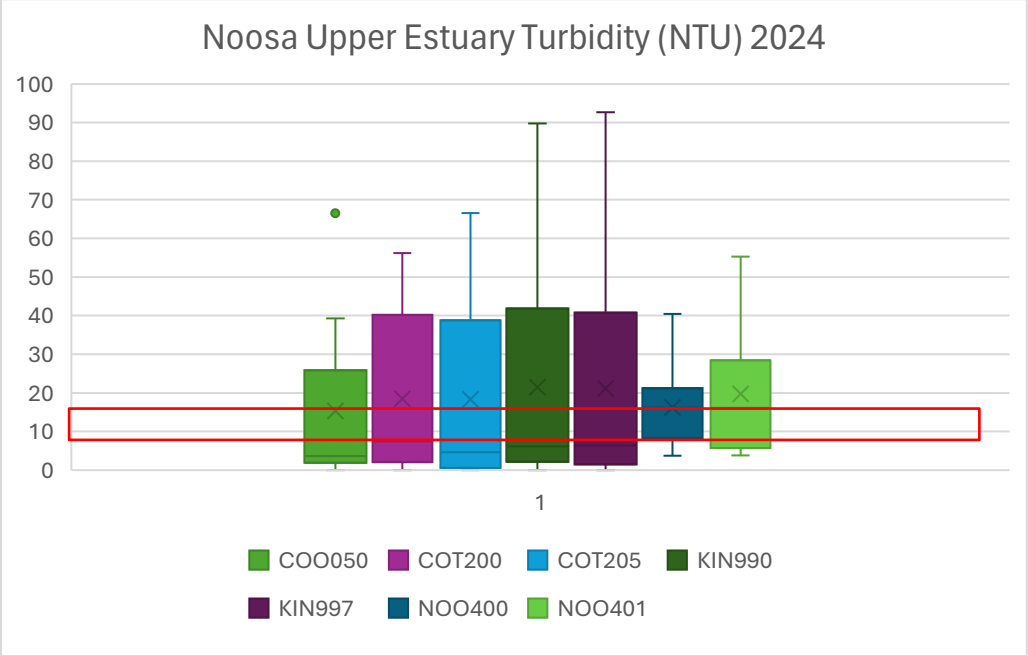

Figure 10: Noosa Upper Estuary Turbidity compared to 2022 WQO guidelines (8-11-16 NTU) for Noosa Upper Estuary High Ecological Value Ecosystems

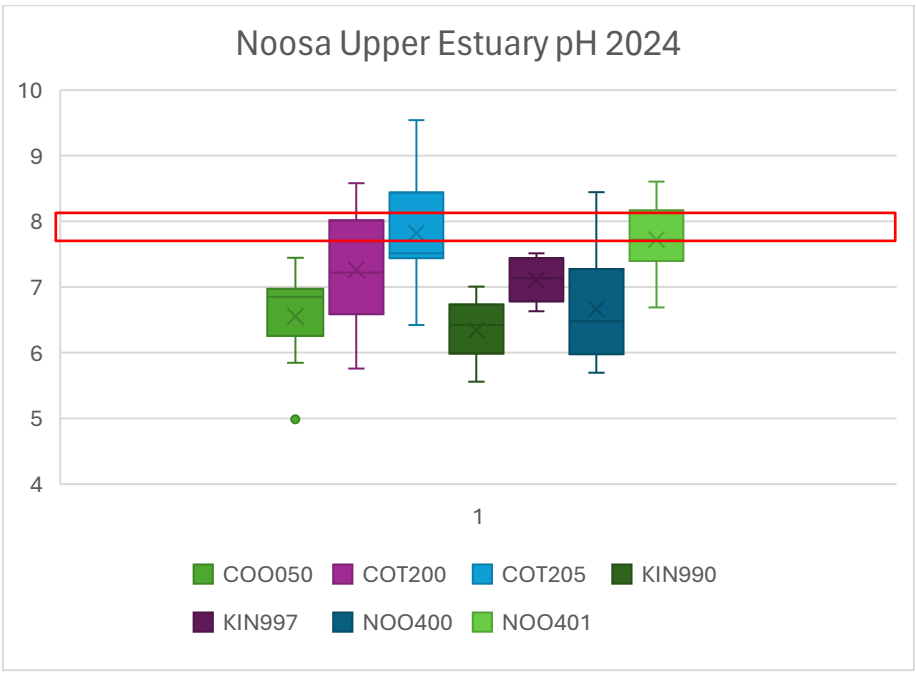

Figure 11: Noosa Upper Estuary pH readings for 2024. The red box (pH 7.7-8.1) is the DETSI WQO 2022 guidelines for Noosa Upper Estuary High Ecological Value Ecosystems

Lowland freshwater (<150m elevation)

The small drain site at Eenie Creek generally has slow flowing freshwater. During the drier months, the water was only just deep enough to be tested but had little to no flow. This affected DO% fluctuations which rarely within the WQO guideline. Conductivity, Turbidity and pH readings were slightly lower than historical medians. Turbidity is higher than EPP WQO guidelines during higher rainfall months.

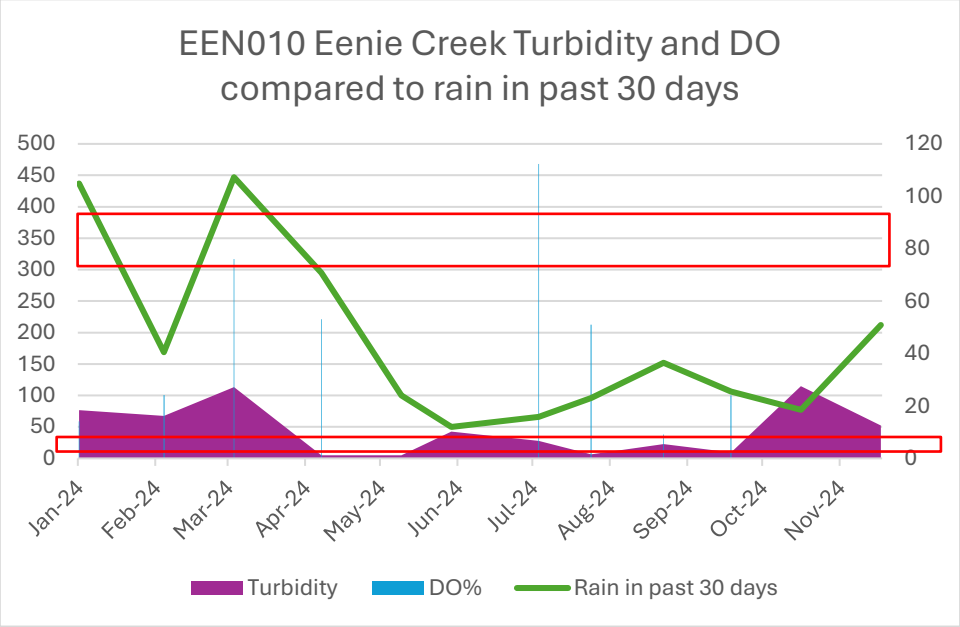

Figure 12: Eenie Creek Small drain 2024 Turbidity, DO% and rainfall. The red box outlines the Lowland Freshwaters, (Weyba Freshwaters, Slightly Disturbed), low flow, Turbidity WQO of 1-2-4 NTU and DO 85-100-110

Wallum/tannin-stained freshwater

At the two wallum freshwater sites, both recorded a decrease in pH (by at least 0.45), as well as decreases in median conductivity and TDS compared to historical medians. The median dissolved oxygen increased at the Murdering creek MUR060 site from 38% to 55%. Wooroi Creek WOO550 continues to record low dissolved oxygen and high turbidity compared to the WQO parameters. Average water temperatures slightly decreased, most likely due to increased rainfall. The June reading for high Turbidity appears to be an error- the riverbed sediment may have been stirred up during testing as the test site is shallow. The turbidity readings generally sit above the WQOs.

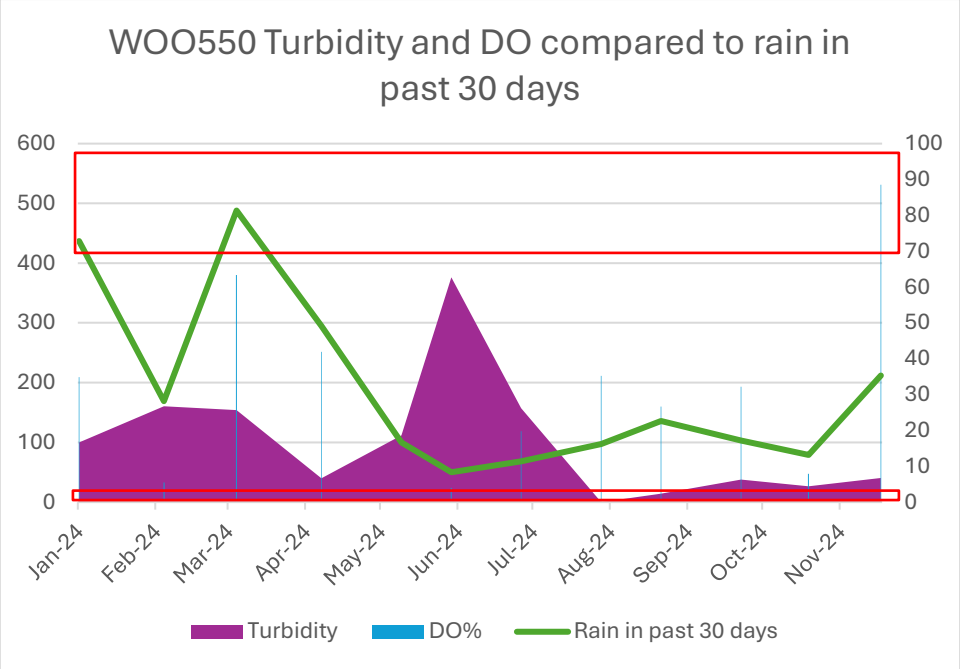

Figure 13: Wooroi Creek WOO550 Turbidity and DO compared to rainfall. Red box WQO for Turbidity 1-1-2 and DO% 85-100-110 for Wallum waters HEV Low Flow

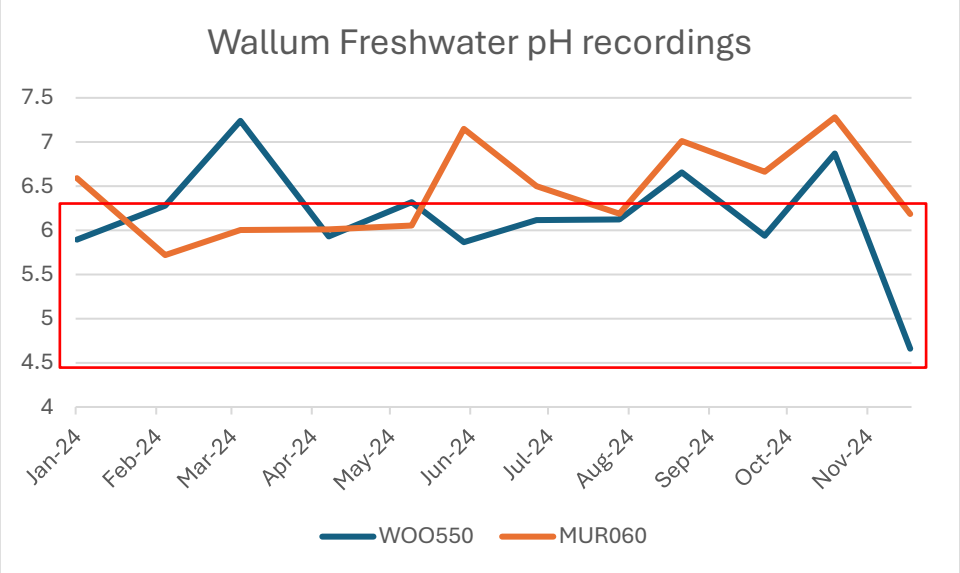

Figure 14: Wallum sites pH recordings for 2024. The red box (pH 4.4-6) is the DETSI 2022 WQO guidelines for wallum freshwaters for all levels of protection (HEV SD or MD)

Middle estuary

Over the sites in Noosa catchment's middle estuary, water surface average temperate increased by an average of 1 degree, excluding Eenie Creek EEN020 despite higher rainfall (see figure 17). Turbidity medians decreased at all sites excluding Eenie Creek EEN020 and Wooroi creek mouth WOO980. Conductivity and dissolved oxygen decreased at most sites and TDS reduced at some sites. Some higher variability of recordings in the upper creek medians may have been due to more freshwater on outgoing tides and testing after higher rainfall.

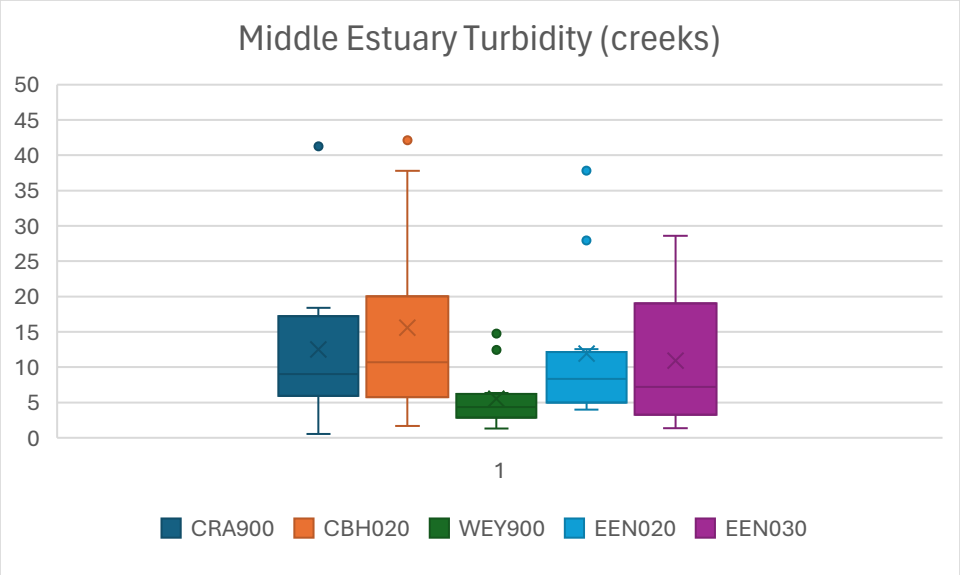

Figure 15: Turbidity spread for creeks in the middle estuary

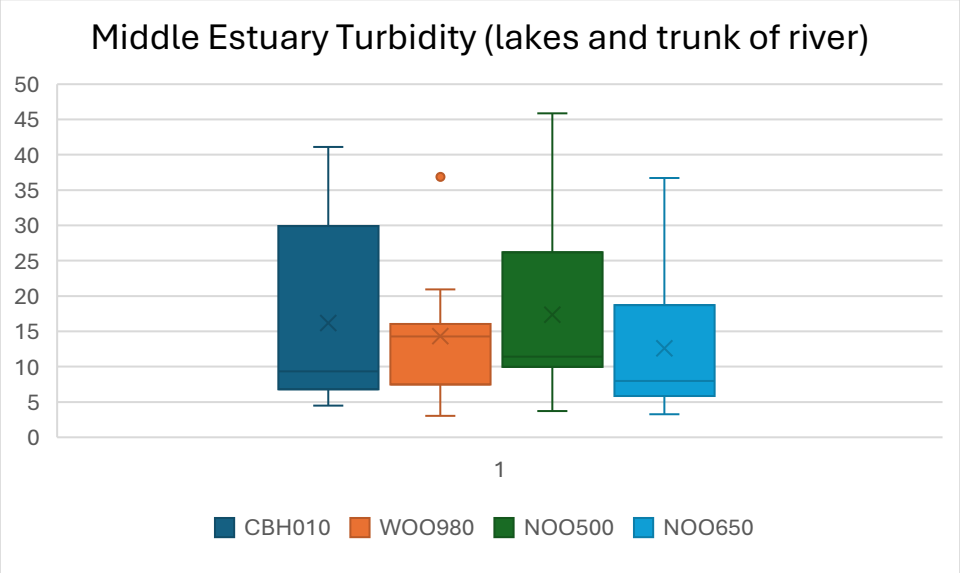

Figure 15: Turbidity spread for middle estuary lakes and main trunk of Noosa River

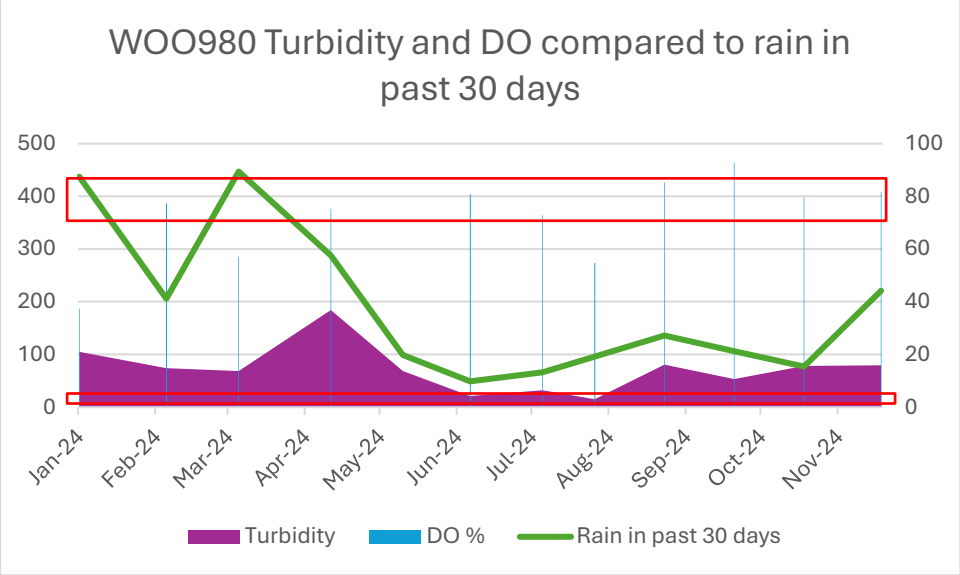

Figure 16: WOO980 Turbidity, DO% and rainfall. WQO for Middle Estuary (Doonella Lake and Noosa) HEV low flow is Turbidity 3-4-6 NTU and DO% 85-95-105.

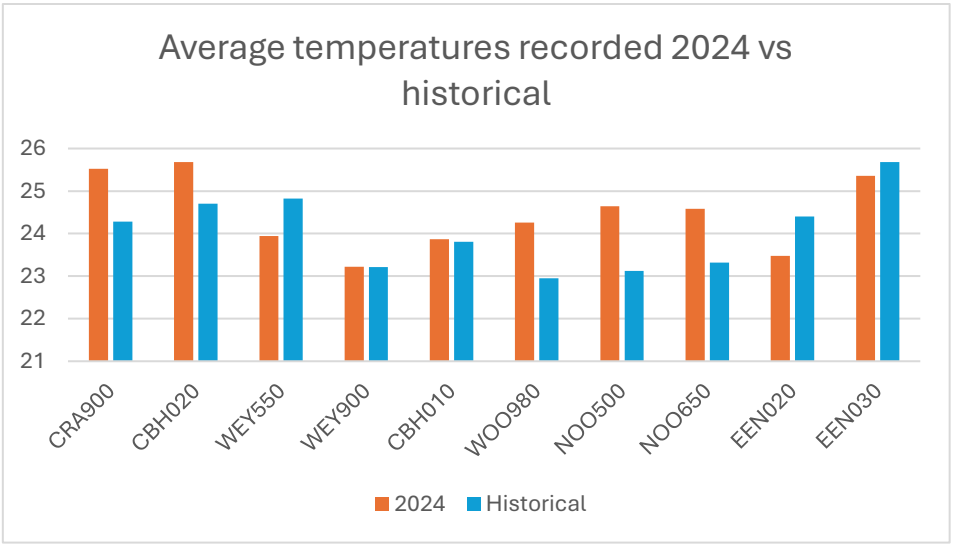

Figure 17: Average temperatures across the middle estuary sites comparing 2024 data to historical records

Canals

The two sites tested in Noosa canal showed only slight changes to historical medians. The outflow (NOW070) had a 1.3-degree average increase in temperature and a decrease in turbidity. The inflow site (NOW780) had a decrease in median pH and DO.

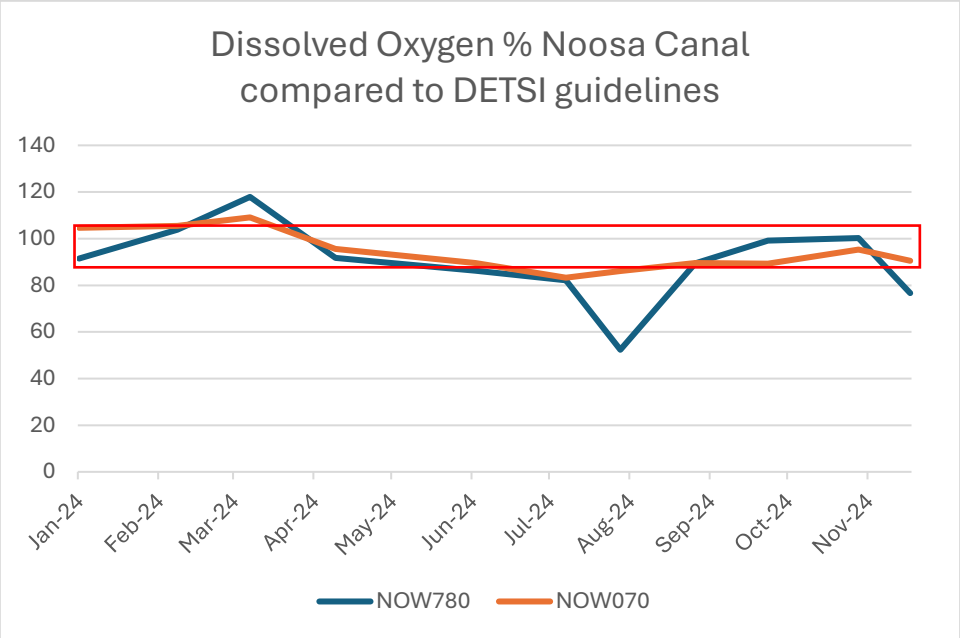

Figure 18: The red box (DO% 85-105%) is the DETSI guidelines for Noosa River Moderately Disturbed (MD) Canals and marinas

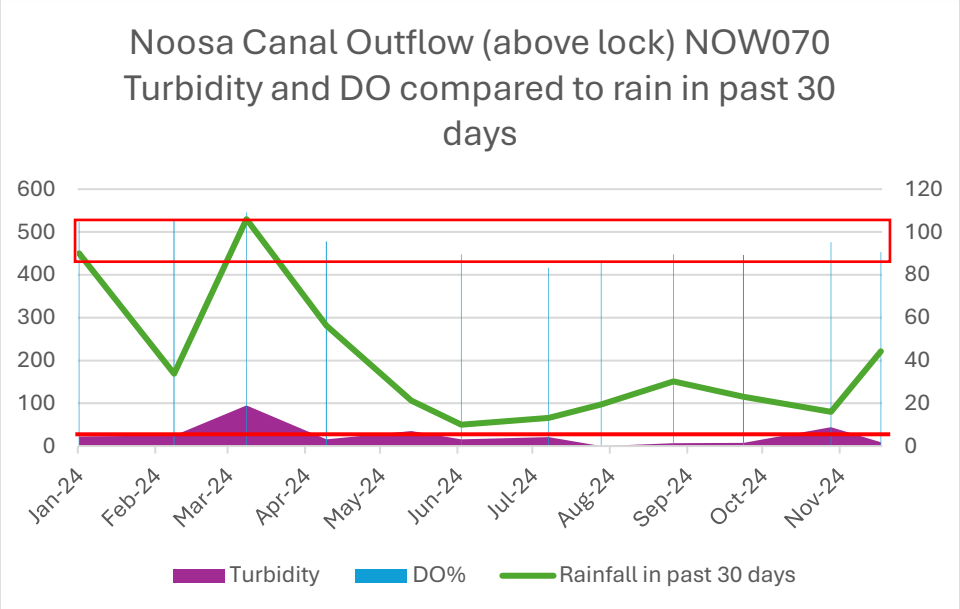

Figure 19: Turbidity, DO% and rainfall compared in the Noosa Canal outflow site NOW070. WQO for DO% 85-105% and Turbidity 6 for Noosa River Moderately Disturbed (MD) Canals and marinas

Lower Estuary

The Munna Point site (NOO820) sits on the boundary of the middle and lower estuary and tests the confluence of outflows near the river mouth. The medians showed little change to historical data. The water temperature average increased by 0.91 degrees.

Insufficient data was collected for TNC02 to analyse for 2024.

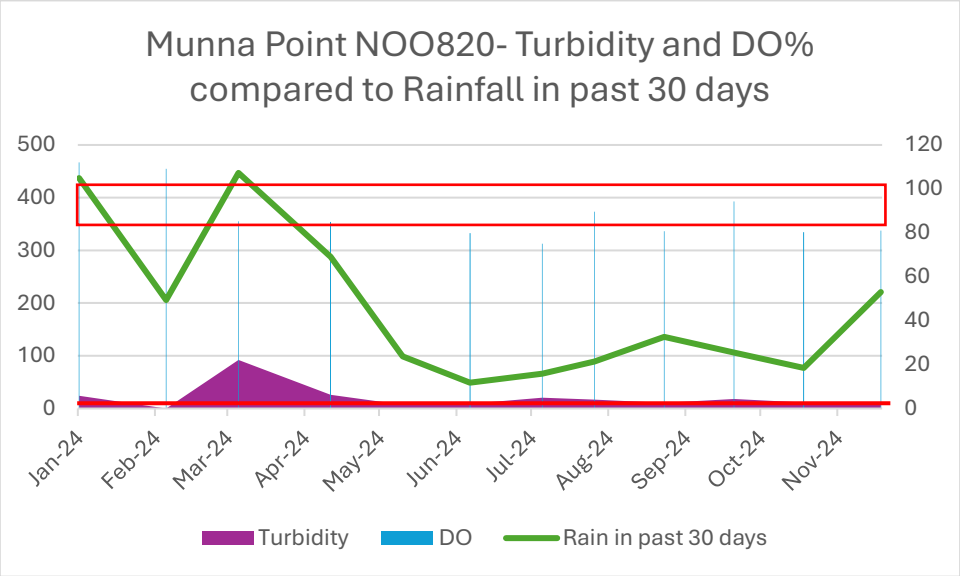

Figure 20: Turbidity, DO% and rainfall compared at Munna Point NOO820. WQO for DO% 90-95-105 and Turbidity 1-2-3 for Noosa River HEV lower estuary and enclosed coastal waters low flow (<45 mS/cm, where annual median is 41.9 mS/cm)

Nutrient analysis results

Results fluctuated at the two nutrient sampling sites in the Noosa Waters canal, NOW070 and NOW780. Total Nitrogen (TN) concentrations increased during periods of high rainfall and exceeded the WQO during all sampling rounds, except for January 2024 (NOW070 only) and February 2024. In November, NOW070 recorded the highest concentration of TN (0.45mg/L) since nutrient sampling began in 2020.

Similarly, Total Phosphorus (TP) fluctuated at both sites dependent on rainfall, with a peak concentration observed in January 2024 at NOW780. Ammonia concentrations remained below the WQOs at both sites during all sampling events, with the exception of October 2024 (NOW070 only). Nitrate + Nitrite (NOx) concentrations remained below the WQO during all sampling events.

At sampling site NWB001, TN concentrations only exceeded the WQO in May 2024. NOx concentrations exceeded the WQO several times, recording a peak concentration of 0.059mg/L in May 2024. TP and Ammonia remained below the limit of detection for all sampling events.

NSC001 reported the highest concentrations of TN (0.061mg/L), TP (0.02mg/L), NOx (0.072mg/L) and Phosphate (0.010mg/L) observed since the nutrient sampling program began, all of which exceeded the WQOs. Ammonia exceeded the guidelines during multiple sampling rounds.

At sampling site WEC001, a peak concentration of TN was recorded in the April 2024 monitoring round (0.7mg/L), which was also the highest concentration observed historically. The WQO was also exceeded several times over the year. TP remained on or below the limit of detection (0.01mg/L) during all monitoring rounds, while concentrations of Ammonia exceeded the WQOs during most sampling rounds.

Phosphate concentrations generally remained at or below the limit of detection at all sites throughout the year.

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5. Discussion

The 2023-24 El Niño event was a key influence on the Noosa River catchment for 2024 because of the above average rainfall. Rainfall impacts on water quality in Southeast Queensland are highly dynamic and can be influenced by local conditions, such as land use, the extent of urbanization, and the proximity to coastal areas. Rainfall may dilute pollutants, leading to a slight increase in pH, but in areas with runoff from agricultural land, pH can decrease. Heavy rainfall events can flush contaminants into the river system at high concentrations, so nutrient levels can increase directly after these events. Conductivity typically decreases with rain dilution but increases when rainwater flushes agricultural runoff or urban pollutants into the river. Increased aeration due to rainfall often raises DO, though high organic runoff could reduce DO if decomposition occurs. Turbidity and total dissolved solids (TDS) can increase during rainfall and runoff events that bring in agricultural or urban contaminants as well as stirring up sedimentation, especially in the lakes which then flush downstream. Salinity generally decreases in freshwater systems with increased rainfall as it dilutes seawater. Temperature typically decreases with rainfall, as rainwater is usually cooler than river water.

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6. **Observations and Key Findings**

The 2024 water quality testing over the Noosa Catchment had key findings in relation to turbidity and temperature. Turbidity medians were generally lower than historical records at many sites in the upper and middle estuary. Turbidity readings often spiked during the first few months of the year, which correlated with high rainfall events. Sites such as EEN020 had an increase in turbidity, which may be due to the large amount of stormwater input from nearby industrial areas compared to sites with natural runoff

filtered through bushland catchments. The canals and lower estuary sites have recorded low turbidity compared to the WQOs. Despite these changes in median turbidity, many medians for other sites sit above the DETSI water quality objectives excluding the lower estuary and canals.

Notable increases in average water temperatures were recorded at many sites including the canals and lower estuary sites. The sites that had minimal change in average temperature or a decrease were the upper river and freshwater sites which is often caused by increased rainfall. The increase in mean water temperatures is notable and may be due to increasing air temperatures or time of the day tests were taken.

DO recordings have decreased in 2024 compared to historical medians which is unusual given the higher rainfall and increased water flow. Lower estuary and canal sites had median DO recordings that comply with the WQOs. Most other sites records are below the WQO guidelines and will need to be investigated further to see if WQOs are locally relevant. There was a decrease in DO at the upland freshwater, upper estuary and middle estuary sites which is possibly due to increased organic input and decomposition with increased rain events. Sites such as WOO550 and EEN010 have an influence from urban runoff and slow flow which may be lowering DO. This is comparable to the other wallum freshwater site at MUR060 which had an increase median DO.

The upland freshwater site had and increased median pH compared to historical data but still sits well below the WQO. Upper estuary sites also have pH readings lower than the WQOs. Although there were decreases in pH medians at the wallum freshwater sites they still sit within the WQOs. Locally relevant WQOs are required for pH.

The electrical conductivity decreased in most sites including the upper estuary, middle estuary and wallum freshwater. This may be due to the higher-than-average rainfall recorded, rain events and the tidal influences at some sites.

Nutrient Testing

Nutrient results varied over the 2024 sampling year and often fluctuated dependent on rainfall.

The Noosa Waters canal monitoring sites, NOW070 and NOW780 both reported exceedances of the WQOs for TN and TP. The Noosa Waters canal receives significant amounts of run-off from the Noosa Civic commercial estate and surrounding areas from stormwater drainage systems that run directly into the canal. This run-off often carries excess nutrients into the Canal, affecting water quality and contributing to algal blooms.

Residents in the canal estate may also contribute to the excess nutrients into the water, by fertilising their lawns which can cause run-off during rainfall or when watering the lawns.

The excess nutrients in the Noosa Waters canal contribute to the formation of algal blooms, which typically occur each year around September. While the algae is not harmful to human health, it creates an unsightly appearance in the water and produces an unpleasant odour. This reduces the aesthetic quality of the canal and affects resident's enjoyment of the area.

The Noosa River also has a large amount of stormwater infrastructure that discharges directly into the river. Stormwater flows through urban areas, where it picks up pollutants such as nitrogen and phosphorus from residential, commercial and agricultural land. This run-off flows into the river and contributes to the excess nutrients observed in 2024. In turn, this affects the health of aquatic ecosystem (for example, excess nutrients promote the growth of algae on seagrass, which impacts photosynthesis).

High concentrations of TN at sites NSC001, WEC001 and NWB001 were observed in 2024, and TP for NSC001. These excess nutrients are likely attributed to both stormwater run-off in general, with peaks in concentrations noted due to the 'first flush' of contaminants post rainfall. This occurs when the initial run-off from heavy rainfall flushes away accumulated contaminants into waterways (often into stormwater drainage), impacting water quality.

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7. Management Recommendations

The results of the 2024 data analysis suggest a continuation of the water monitoring program with the current sites to compare to historical data. A broader picture of some sites could be gathered with an introduction of more nutrient testing and potentially macroinvertebrate testing. The current nutrient testing sites need to be revised and directed to more areas of concern. Nutrient testing could be implemented at Kinaba centre or another site in the upper estuary to give more in depth analysis. The influence of stormwater inputs and urban/industrial runoff seems to require more investigation such as at the Eenie Creek sites. Natural bushland catchments should be retained or extended as they support filtration and healthy waterways. As the population of the area increases water sensitive urban design practices should be prioritised in new development to reduce runoff loads.

With the evolution of the program more time and clarification is required to investigate WQO specifics for deeper data analysis. Annual report cards for each site or key sites

should be developed and local WQO guidelines need to be created. Noosa Shire Council and Natural Resource Management (NRM) groups will be working on developing these local water quality objectives, specific to the Noosa Catchment in 2025. Further networking, collaboration and education would assist in depth of reporting.

Horiba water meters are functioning reasonably well after being serviced but may need replacement in years to come to ensure accuracy in measurements.

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8. **Conclusion**

The analysis of the Noosa Catchment's waterways as a complex system requires substantial time and collaboration. NICA's water watch program gives a snapshot of the catchment's health with a substantial focus on areas of concern.

With limitations considered, the data analysed for 2024 show the lower estuary as healthy waterways. Although the sites tested and analysed in this report do not always fit within the DETSI water quality objectives, a revision of guidelines to reflect locally relevant WQO will help to better understand the river system. Many sites analysed are also areas of concern based on location in proximity to urban development.

Over 2024, this report has noted increases in water temperatures, decreases in dissolved oxygen and decreases in turbidity. Notable increases in average water temperatures, by over one degree, were recorded at most sites excluding upper river and freshwater sites. Despite higher rainfall, dissolved oxygen recordings decreased in 2024 at the upland freshwater, upper estuary and middle estuary sites compared to historical medians which is possibly due to increased organic input and decomposition with increased rain events. Turbidity readings often spiked during the first few months of the year, which correlated with high rainfall events and turbidity medians were generally lower than historical records at many sites in the upper and middle estuary.

Large amount of stormwater infrastructure discharge directly into the Noosa River and canals which contributed to excess nutrients observed in 2024. High concentrations of TN were reported at all sites which exceed the WQO. TP also exceeded the WQO in the Noosa Canal and NSC001. These excess nutrients had peaks in concentrations noted due to the 'first flush' of contaminants post rainfall.

The river and tributary systems are highly influenced by natural weather events and rainfall and the site locations are often influenced by urban and industrial run off. Sites located near natural bushland catchments support filtration and healthy waterways.

9. Appendices

- **Appendix A:** Historical Data Tables
- **Appendix B:** Department of Environment, Tourism, Science and Innovation (DETSI). Environmental Protection (Water and Wetland Biodiversity) Policy 2019. Noosa River Environmental Values and Water Quality Objectives. Table 2 Aquatic ecosystem water quality objectives- Upland and lowland freshwaters, lakes and reservoirs, estuarine and coastal waters (pages 12-22).
- **Appendix C:** Laboratory Analysis Reports