



REVIVE LAKE CATHIE
voice of the lake

FOR IMMEDIATE RELEASE

ACID SULFATE CONTAMINATION PUTS SHORT TERM ACTIONS ON HOLD

Revive Lake Cathie called and hosted a Lake Cathie/Lake Innes Stakeholder meeting on Friday 27th November 2020, bringing together Community, Local and State Government for the Lake Cathie/Lake Innes Estuarine System.

Identified Lake Stakeholders represented were Member for Port Macquarie Leslie Williams MP, Port Macquarie-Hastings Council Mayor Pinson, Port Macquarie-Hastings Councillors Lisa Intermann & Peter Alley, NSW State Departments, Lake Cathie Progress Association, Lake Cathie Fishing Club and Ozfish Unlimited.

Revive Lake Cathie hosted Southern Cross University Professor of Geoscience Dr Scott Johnson who presented the Lake Cathie / Innes Iron floc event: a chain of causes, its future and its uncertainties. Southern Cross University Professor of Hydrobiogeochemistry Dr Damien Maher also spoke of the SHORT-TERM remediation risks the entire estuarine system.

Revive Lake Cathie President Danielle Maltman stressed concern in NSW Dep of Public Health not being represented in the Lake Stakeholder group. “Revive Lake Cathie’s has a major concern in relation to public health and safety. It is imperative all Stakeholders are represented at these meetings particularly due to our concerns for safety in marine life consumption, which is extremely high following Revive Lake Cathie’s NSW Waterwatch 14 November 2020 testing results”

Revive Lake Cathie’s Peter Fitzroy & Kate Aston explained the sampling reasoning, defined direction and define outcomes supporting the strategies with Revive Lake Cathie - NSW Waterwatch program. Peter Fitzroy asked the question of the day “What are we managing the lake for? Is it for conservation or community recreation?”

The 2–3 year vision of investigating, planning, implementing and delivery of the long-term sustainability for Lake Cathie and Lake Innes is difficult to accept but the only choice in delivery of a holistic and sustainable approach in consideration of the extent of the never seen before acid sulfate leachage, which is estuary wide even present in Lake Cathie Lagoon.

“Understanding the complexity of the Lake Cathie/Lake Innes Estuarine System is crucial as risks can be multiple and cascading” said Southern Cross University Professor of Geoscience Dr Scott Johnson



“The community is informed the lake will not improve its current condition until a holistic plan is implemented through the Port Macquarie-Hastings Council Coastal Management Plan which cannot begin until the Scoping Study is complete and signed off by Port Macquarie-Hastings Councillors and approved from DPIE” Revive Lake Cathie President Danielle Maltman

Immediate actions from this meeting

- Identification of Dept NSW Public Health section responsible as a Lake Stakeholder to join representative urgently required to address public health and safety concerns in relation to marine life consumption and water quality risks.
- All Stakeholders agreed to a long-term sustainable approach due to the unprecedented acid sulfate soil contamination impacting the entire Lake Cathie/Lake Innes Estuarine System
- Communication with the Community by all stakeholders in a united understanding of the issues an proposed plan moving forward
- Launch of the Lake Innes Remote Water Monitoring Sensor, more to come in the next few weeks.

Excerpts from Dr Deb Geronimi's - Summary of results for Lake Cathie / Lake Innes water testing for 14th November 2020

Overall the lake's health is extremely poor and has extremely poor water quality.

In conclusion this constant opening and closing of the lake is not good for the ecology and the organisms that live within and surrounding the lake system.

Salinity

The Salinity of the lake Cathie lagoon (site 7) is 37.4 ppt (Manly Hydraulics). This has increased in salinity since October due to evaporation and lack of rain. Electrical conductivity was high at site 7 (55 100 mS/cm) and these levels are higher than the previous month, indicating that salinity levels are rising due to the lake being closed from the ocean. Electrical conductivity is usually high were there are large amounts of salts dissolved in the water. Other results around the lake ranged from 34 ppt (Cathie Creek) to 39 ppt (Lake Innes and Lake Cathie).

Total dissolved solids (TDS)

Brackish water typically contains TDS in concentrations ranging from 1,000 milligrams per litre (mg/l) to 10,000 mg/l. Saline water or salt water has more than 10,000 mg/l TDS. And, brine is very salty water (TDS



greater than 35,000 mg/l). Seawater typically is very salty (TDS >35,000 mg/l). For water, 1 ppm = approximately 1 mg/L. Total dissolved solids in Lake Cathie ranged from 31 – 37 ppm, Cathie Creek ranged from 0.6 – 36 ppm, Lake Innes 0.6 – 34 ppm.

Water temperature

Water temperature ranged from 26 oC in Lake Cathie, 19 – 27 oC in Cathie Creek and 21 – 22 oC in Lake Innes. As the summer progresses water temperature will increase which will also have a detrimental impact on the level of dissolved oxygen in the water.

pH

Due to the fact that the lake system has a higher salinity than the sea it should have a pH of above 8.2, pH has increased since October and this coincides with an increase in salinity. pH ranged from 7.7 in Lake Cathie lagoon to 8.8 Cathie Creek. Lake Innes however has a pH at approximately 8. Most values are less than the pH of normal ocean water and therefore the activation of acid sulphate sediments are still playing a huge role in this estuarine system. The pH of water is critical to the survival of most aquatic plants and animals. Many species have trouble surviving if pH levels drop under 5.0 or rise above 9.0

Alkalinity

The Alkalinity of Lake Cathie Lagoon was 64 – 76 ppm and much less than last month (October was 102 – 136 ppm), the alkalinity of Cathie Creek ranged from 75 – 103 ppm again much lower than last month where it was 117 to 190 ppm. The alkalinity of Lake Innes was 100 – 115 which is much higher than last month where it was at 1.58 – 1.67 ppm. Overall the buffering capacity of the Lake Cathie Lagoon and Cathie Creek have dropped, but the buffering capacity of Lake Innes has increased. The whole lake system is highly susceptible to acid, therefore pH can drop dramatically. Alkalinity levels will continue to decrease now that the lake is closed to the ocean as clean ocean water carries high concentrations of bicarbonate and carbonate, which helps to neutralise the acid being released from the sediments.

Calcium

Calcium hardness levels for Lake Cathie were 236 – 275 ppm, Cathie Creek was 135 – 289 ppm, and Lake Innes was 239 – 309 ppm. Normal seawater usually has levels at 400 ppm, therefore the hardness levels are lower than seawater in all parts of the lake system.



Acid sulphate sediments

Sulphate levels were extremely high and over range at all sites. Such high levels of sulphate is due to the activation of acid sulphate sediments releasing sulphuric acid into the water. Iron, both Ferrous (Fe^{2+}) and Ferric Iron (Fe^{3+}) were detected at some sites, but absent from the shore samples at Cathie Creek, but present in the water collected from the boat in Cathie Creek. Only 1 site (site 1A) in Lake Cathie Lagoon had detectable Iron in the water. More Ferric than Ferrous Iron was detectable. The Iron is extremely visible throughout the lake as a red / brown precipitate on the surface of the sediments. This is present due to the activation of acid sulphate sediments. However, Iron levels appear to be dropping in the water column and this could be the fact that they have settled on the sediments and not present in the water column.

Aluminium was not detectable in Lake Cathie lagoon and therefore levels have dropped since the previous month (October levels were 0.02 – 0.11 ppm), Cathie creek ranged from 0 to 0.12 ppm and less than last month (October levels were 0.03 – 0.21). Lake Innes had low levels of Aluminium (0 to 0.1 ppm).

Aluminium is released from sediments when acid sulphate sediments have been activated.

Oxygen

Oxygen levels varied in different parts of the lake. Ranging from 3.3 to 5.03 ppm (47.5 – 75.4 % saturation) in Lake Cathie Lagoon which is lower than last month. Last month values were 5.7 – 6.8 ppm in Lake Cathie Lagoon. Cathie Creek ranged from 3.8 to 4.69 (51.2 to 67.2 % saturation) again less than last month (October values were 5.6 to 6.7 ppm). Lake Innes ranged from 3.6 to 4.29 ppm (48.9 to 55.2 % saturation) some readings higher and some lower than last month (October values were 0.7 – 6 ppm in Lake Innes).

Fish growth and activity usually require 5-6 ppm of dissolved oxygen. Dissolved oxygen levels below 3 ppm are stressful to most aquatic organisms. Levels below 2 ppm will not support fish at all. Healthy water should generally have dissolved oxygen concentrations above 6.5-8 mg/L (ppm) i.e. 80 – 100 % saturation of oxygen. Oxygen levels are extremely low in some areas of the lake and very few fish can survive in these low levels. Dissolved oxygen is one of the most important parameters in aquatic systems. The warmer the water, the less dissolved oxygen. As the water temperature of the lake increases over summer a drop in oxygen concentration will occur and hence death of aquatic life

Turbidity

Turbidity in Lake Cathie lagoon ranges from <10 to 15 NtU. Turbidity in Cathie Creek was low <10 NtU. Turbidity in Lake Innes was < 10 NtU. These results are similar to last month. Turbidity values are low throughout the Lake Cathie / Lake Innes system and hence indicate that there is not much phytoplankton in the water which can be a problem as phytoplankton produce oxygen as a byproduct of photosynthesis. Lack of photosynthetic organisms is not good for the lake as they are the start of the food chain and also provide



oxygen to aquatic organisms. Without these photosynthetic organisms means less oxygen and food for aquatic species. Lake productivity is therefore poor and unable to sustain life.

Nitrogen compounds

Ammonia was detected in some sites tested. The recent die-off of fish would cause a spike in ammonia levels. Lake Cathie Lagoon levels ranged from 0 to 0.24 ppm similar to last month where the values were 0.02 – 0.31 ppm. Cathie Creek ranged from 0 to 0.24 ppm, lower than last month's values of 0.05 – 3.00 ppm. Lake Innes had levels at 0 to 0.19 ppm similar values to last month at 0.21 ppm. Nitrates were detected in the water at Lake Cathie 0.24 ppm which is less than last month (5 ppm) and Cathie Creek 0 to 0.13 which is less than last month (6 – 12 ppm). Lake Innes had low levels of nitrate 0.05 to 0.11 ppm, which is more than last month.

Phosphates

Phosphates levels were low in Lake Cathie (0 – 0.06 ppm) and less than last month (0 – 0.22 ppm). Phosphates were higher in Cathie Creek (0 – 1.28 ppm) but concentrations were much less than last month where readings of 88 ppm were found. Lake Innes had detectable low levels of phosphates (0 – 0.05 ppm) similar to last month's concentrations (0 – 0.1 ppm). Phosphates usually get utilised quickly and get bound to sediments easily and could be a reason for a drop in concentrations. Phosphates are usually washed in from surrounding land either from fertilisers, ash from fires and also from household chemicals.

Surfactants

Surfactants were present in Lake Cathie Lagoon (3.4 – over range), Cathie Creek – over range and Lake Innes (5.4 – 6.2 ppm). Surfactants are detergents and may be washed into the lake from the surrounding households. For example washing the car on the drive / streets can cause high levels of surfactants.

Tannins

Tannin levels were extremely high in all areas tested. Lake Cathie Lagoon over range and higher than last month (4.37 – 9.36 ppm), Cathie Creek over range and higher than last month (1.72 – 9.66 ppm) and Lake Innes over range and higher than last month (8.05 – 8.41 ppm).

http://vro.agriculture.vic.gov.au/dpi/vro/vrosite.nsf/pages/soil_acid_sulfate_soils

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