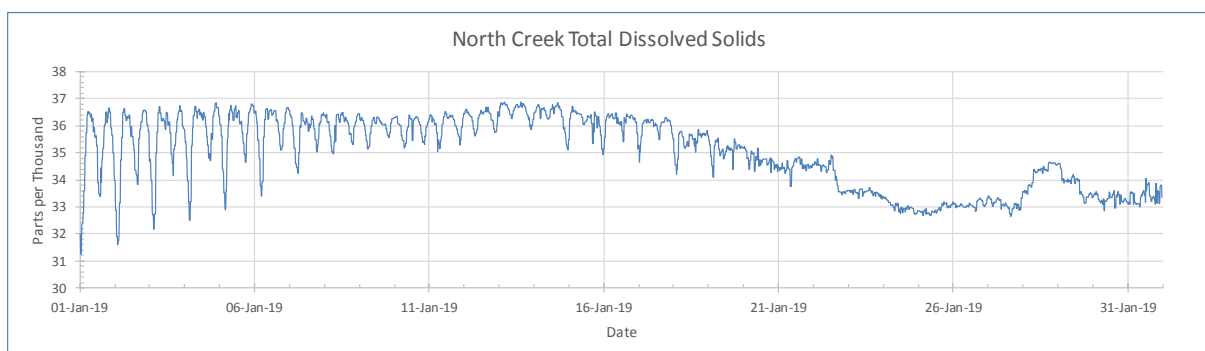
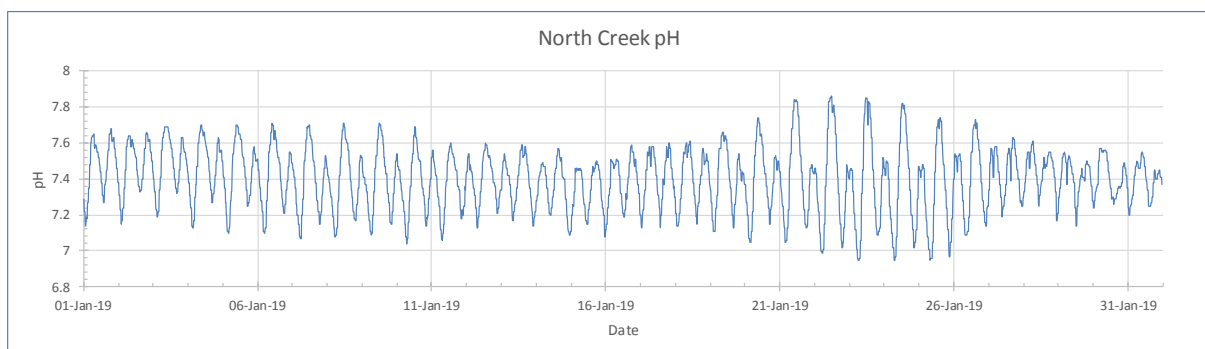
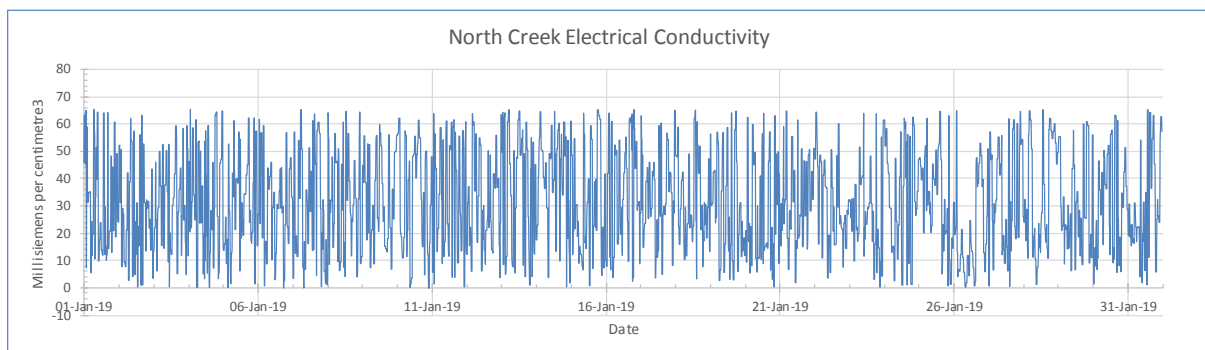
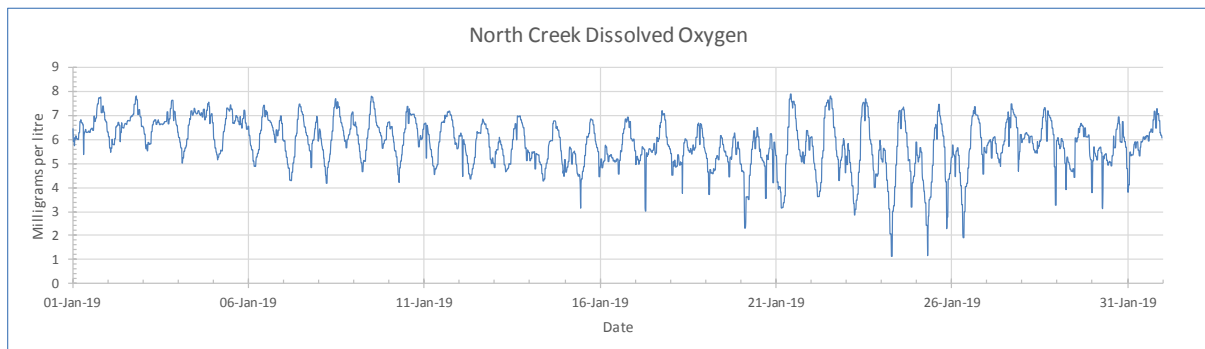
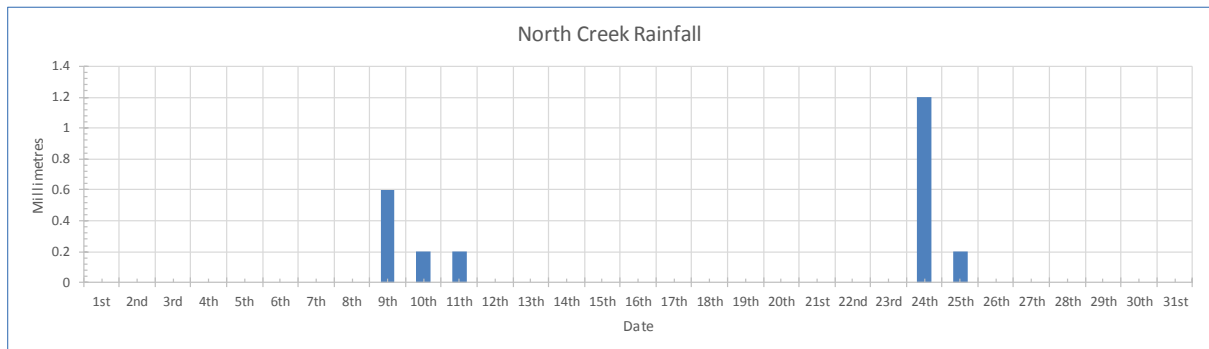
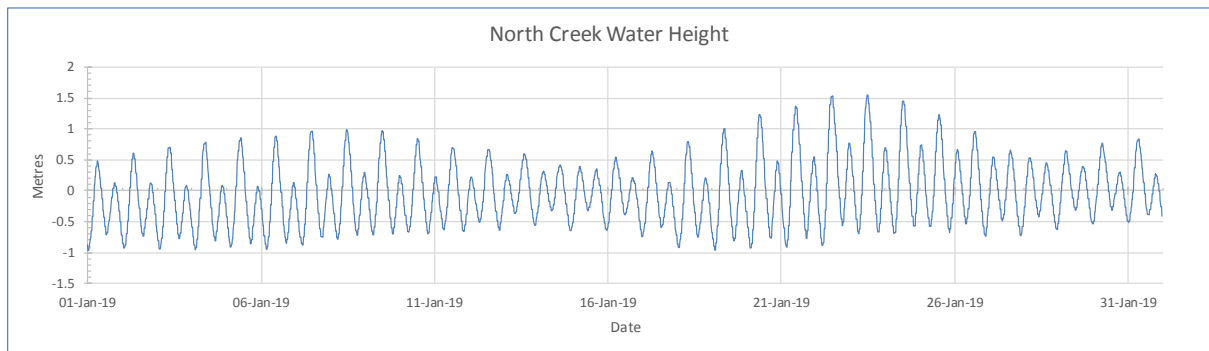
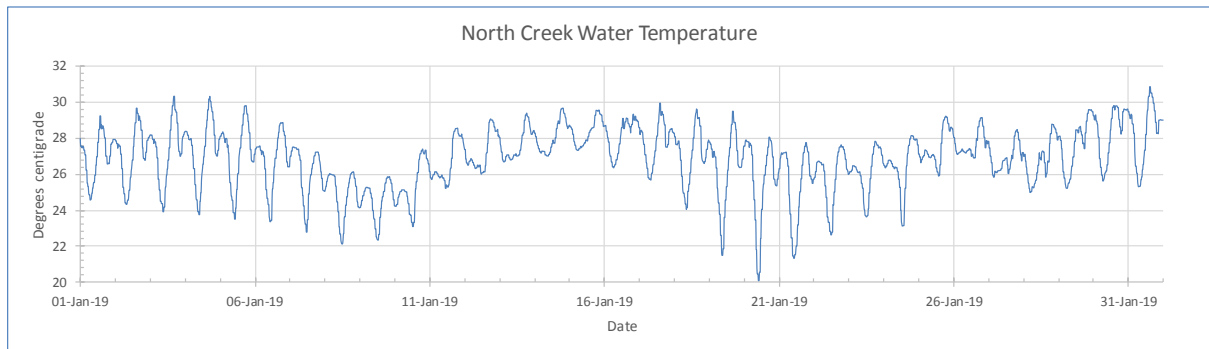
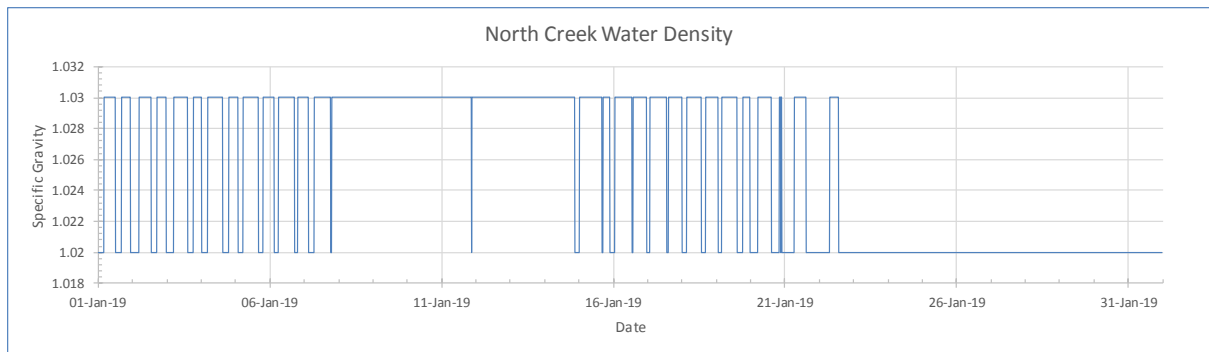


## North Creek water quality – January 2019

Data logger located in North Creek near airport.





## Interpretation

\*Note – EC is showing large random variations and there are depth and TDS errors which have required correction. The unit will need to be sent back to the supplier for repair.

- **Dissolved oxygen\* (DO)** for January was recorded from 1.1 to 7.7 mg/L with an average of 5.9 compared to the December average of 6.7. Levels below 3 mg/L are considered critical to fish, while between 3 and 6 mg/L is considered marginal and above 6 mg/L is optimal. DO is influenced by temperature, rainfall, tidal movement, chemical and biological oxygen demand. DO at North Creek is negatively influenced by runoff from drains following rain.
- **Electrical conductivity (EC)** for January is showing large random variations since it was reinstalled on 27<sup>th</sup> Sept, which is due to a fault and will require the unit to be sent back to the supplier. Levels below 1.8 ms/cm are considered freshwater, while from 1.8 to 4.8 is considered brackish and above 4.8 ms/cm saline with seawater equivalent to approximately 60 ms/cm. EC is influenced by rainfall, runoff, temperature and tidal movement.
- **pH** for January was recorded between 7.0 and 7.9 with an average of 7.4 which is alkaline and has fallen compared to the December average of 7.5. Peaks of pH normally occur on high tide with increasing salinity while troughs occur on low tide as acid drains discharge. River water under normal conditions is generally near neutral (pH 7), while saline water moving upstream during high tides will be higher. pH is measured on a logarithmic scale with each consecutive whole number different by a factor of 10.
- **Total dissolved solids (TDS)** is a measure of the combined content of all inorganic and organic dissolved molecular, ionized or suspended micro-granular substances in the water, including minerals, salts or metals measured in parts per thousand (ppt). TDS was recorded in January between 31.3 and 36.7 ppt averaging 35.0 which has risen by 2.3 compared to the December average of 32.7 ppt due to reduced rainfall and increased tidal exchange. TDS is highest on high tide as salinity increases and lowest on low tide as freshwater is discharged from North Creek. TDS is influenced by tidal movement, rain and runoff.
- **Density** also called specific gravity (SG) is the ratio of the weight of a sample compared to that of fresh water at +4.0°C. For January density was recorded between 1.02 and 1.03 with an average of 1.03 compared to the December average of 1.02. Fresh water is normally close to 1.0, while sea water is slightly denser at 1.027g/cm<sup>3</sup>, which leads to the formation of salt wedges and acid water is even denser (Sulfuric acid SG = 1.94 g/cm<sup>3</sup>). Density varies with temperature with maximum density occurring at +4.0°C, while tides, rainfall, runoff and acid discharges also affect density.
- **Water temperature** for January was recorded between 20.1 and 30.5°C averaging 26.9° which has increased by 1.2° from the December average of 25.7 deg C due to a 2.0°C warmer than average January. Water temperature is influenced by season, air temperature, solar radiation, cloud cover, day/night, turbidity, tidal movement and rainfall.
- **Water height** was recorded in January between -1.0 and +1.41 and averaging -0.04 m which compares to the December average of 0.00 m however the data has been adjusted for errors and uncalibrated so no comparison can be made. The highest tide of the month at 1.93 m occurred on 22<sup>nd</sup> January at 10:15 am at Ballina while the peak at the logger at 1.54 m was recorded on 22<sup>nd</sup> at 11:30 am resulting in a delay of 75 min. The delay in tidal peak along North Creek is caused by restrictions in water entering North Creek due to width and depth, which also reduces the maximum tide height and range. The delay is reduced with higher tides due to the greater depth of water over sand banks allowing more water to enter faster. Dredging of

North Creek would allow more water to enter, increasing the tidal height and reducing the delay in high tide. The logger has not yet been surveyed in to the Australian Height Datum (AHD) so all heights are relative. Zero AHD approximates to mean sea level or a 0.925 m tide height and the readings have been adjusted to approximately AHD. Water height can be affected by river level, floods, tides, storm surge and rainfall and to a lesser extent temperature, wind and barometric pressure.

- **Rainfall** recorded during January at the Ballina Airport Automatic Weather Station (AWS) situated 1.8 km to the west of the North Creek logger was 2.4 mm falling over 5 days, which compares to the December rainfall of 36.6 mm over 11 days. The January average for Ballina AWS is 167.3 mm therefore rainfall was well below average. Peak January 24-hour rainfall of 1.2 mm was recorded between 9:00 am on 23<sup>rd</sup> and 9:00 am on 24<sup>th</sup>. During January the Tuckean site 4 data logger located 19 km to the SW recorded 12.2 mm over 1 day, while the Rocky Mouth Creek data logger located 37 km to the south-west recorded 1.6 mm over 3 days with two records attributed to dew.