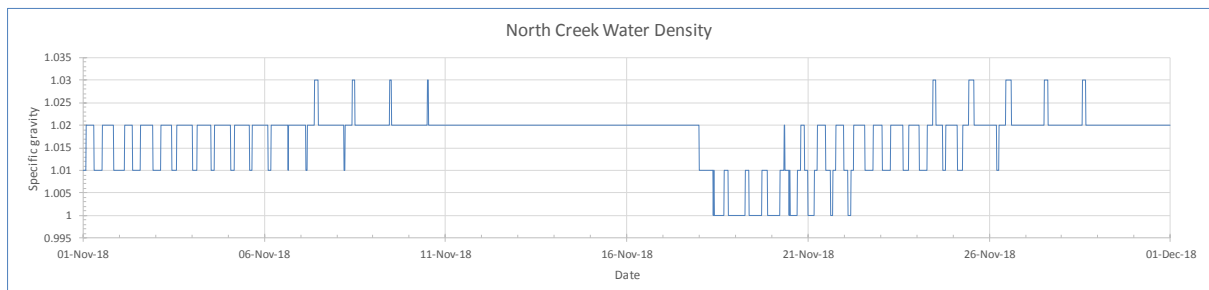
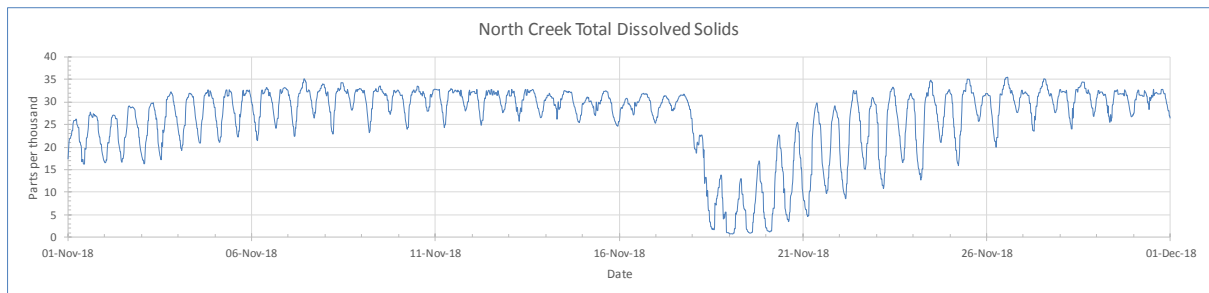
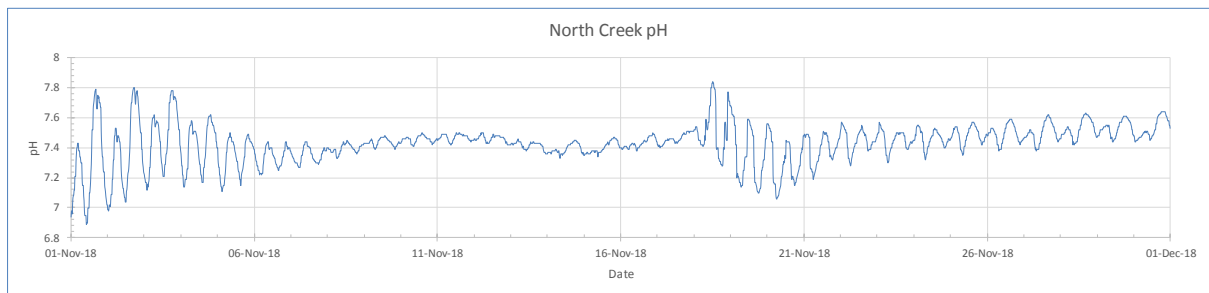
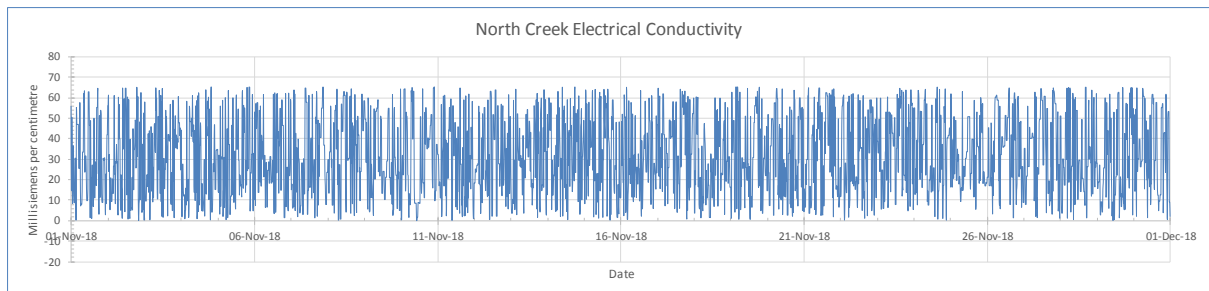
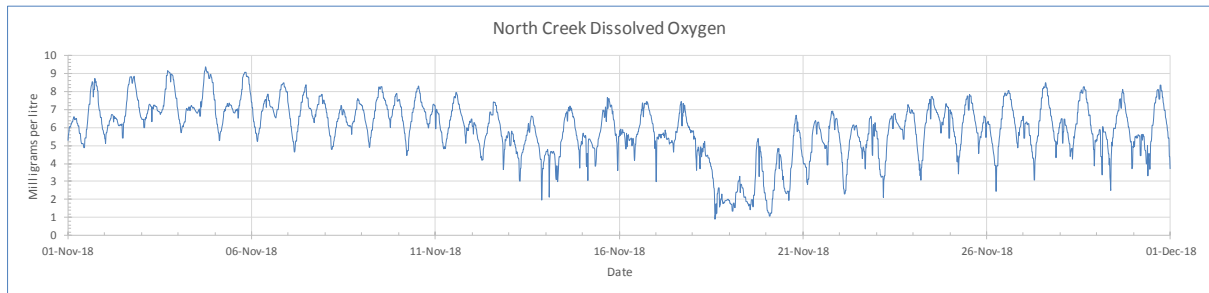
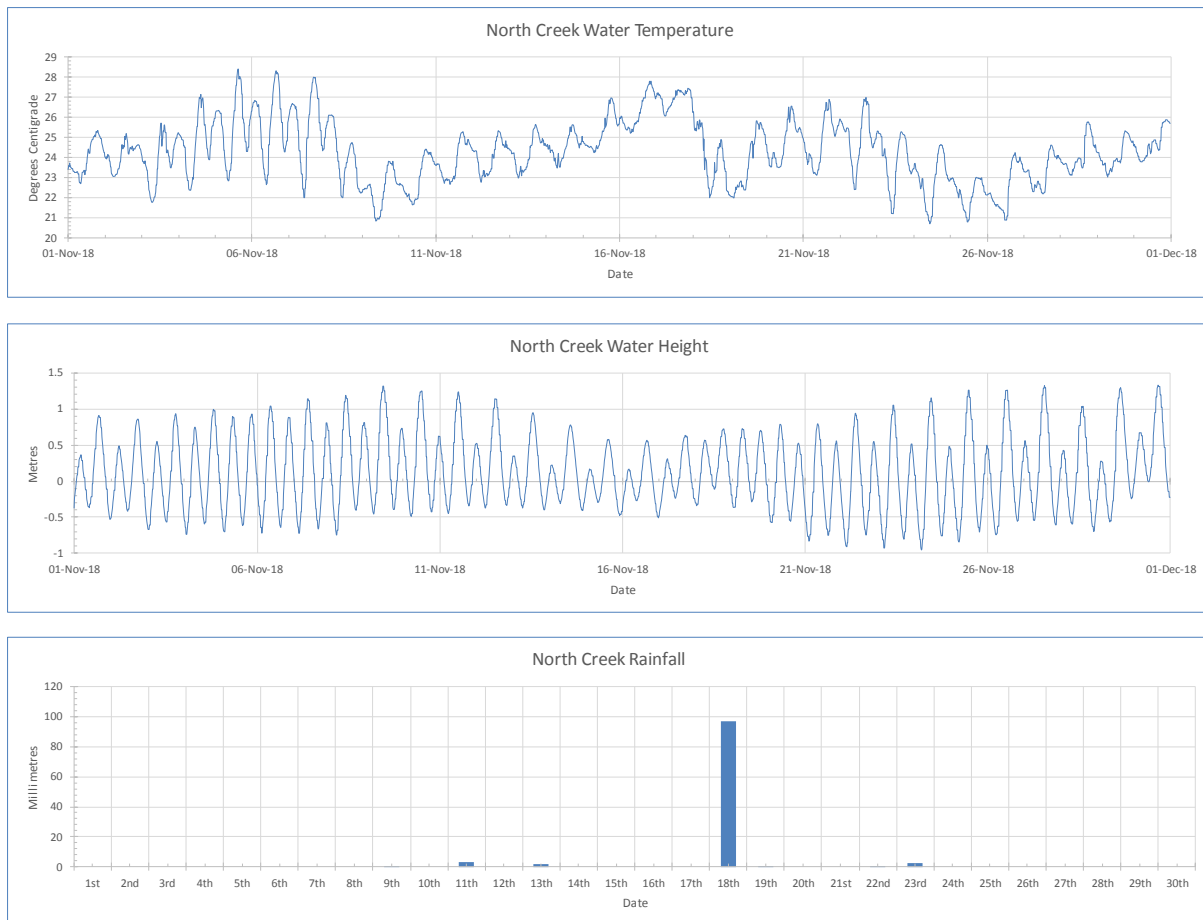


North Creek water quality – November 2018

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.

- Dissolved oxygen* (DO)** for November was recorded from 0.9 to 9.3 mg/L with an average of 5.9 compared to the October average of 6.4. 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.
- Electrical conductivity (EC)** for November is showing large random variations since it was reinstalled on 27th Sept, which is due to a fault and will require further investigation. 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 November was recorded between 6.9 and 7.8 with an average of 7.4 which is alkaline and has risen compared to the October average of 7.1 due to reduced rainfall. 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 November between 0.8 and 34.7 ppt averaging 26.4 which has risen compared to the October average of 18.3 ppt due to reduced rainfall. 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 November density was recorded between 1.0 and 1.03 with an average of 1.02 compared to the October average of 1.01. Fresh water is normally close to 1.0, while sea water is slightly denser at 1.027g/cm³, which leads to the formation of salt wedges and acid water is even denser (Sulfuric acid SG = 1.94 g/cm³). 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 November was recorded between 20.7 and 28.4°C averaging 24.3° which has increased by 2.1° from the October average of 22.2 deg C due to seasonal change. Water temperature is influenced by season, air temperature, solar radiation, cloud cover, day/night, turbidity, tidal movement and rainfall.
- **Water height** was recorded in November between -0.95 and +1.25 and averaging +0.13 which compares to the October average of +0.2 m however the data has been adjusted for errors so no comparison can be made. The highest tide of the month at 1.85 m occurred on 25th November at 10:28 am at Evans Head while the peak at the logger at 1.26 m was recorded on 25th at 11:15 am resulting in a delay of 47 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, increase the tidal height and reduce 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 November at the Ballina Airport Automatic Weather Station (AWS) situated 1.8 km to the west of North Creek logger was 106.0 mm falling over 6 days, which compares to the October rainfall of 218.4 mm over 15 days. The November average for Ballina AWS is 126.1 mm therefore rainfall was below average. Peak 24-hour rainfall of 96.8 mm was recorded between 9 am on 17th and 9 am on 18th November. During November the Tuckean site 4 data logger located 19 km to the SW failed to record for the whole month however a nearby site recorded 45.8 mm over 8 days, while the Rocky Mouth Creek data logger located 37 km to the south-west recorded 96.0 mm over 14 days with a number of records attributed to dew.