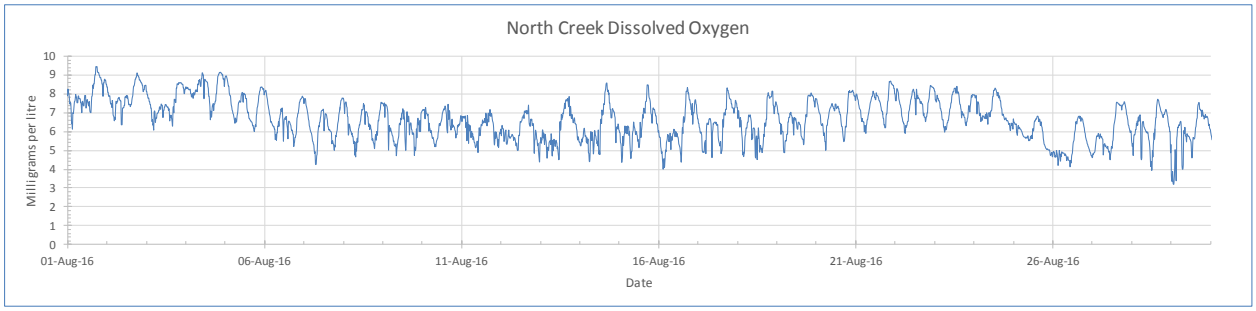
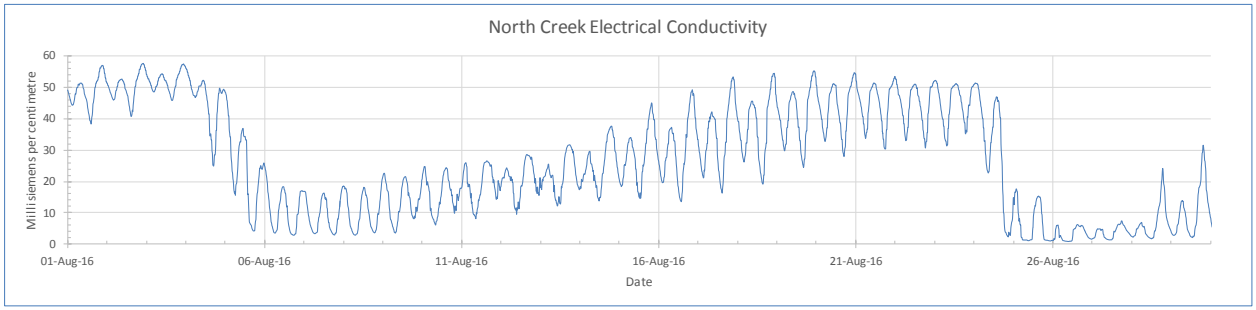
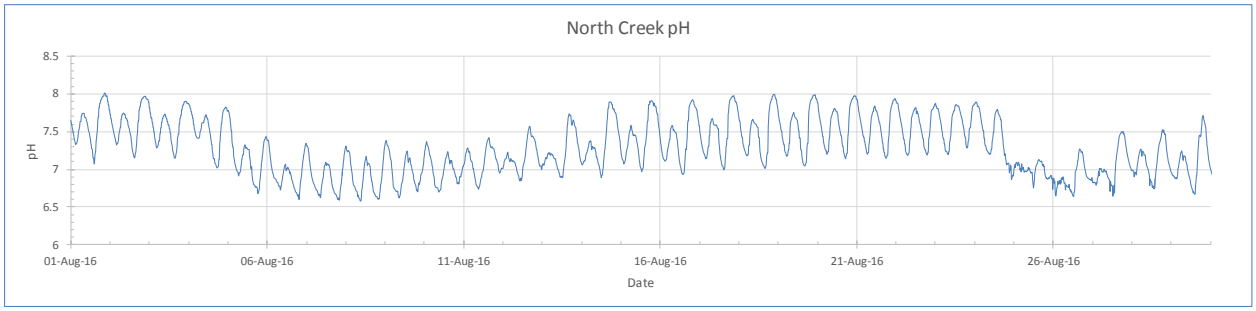
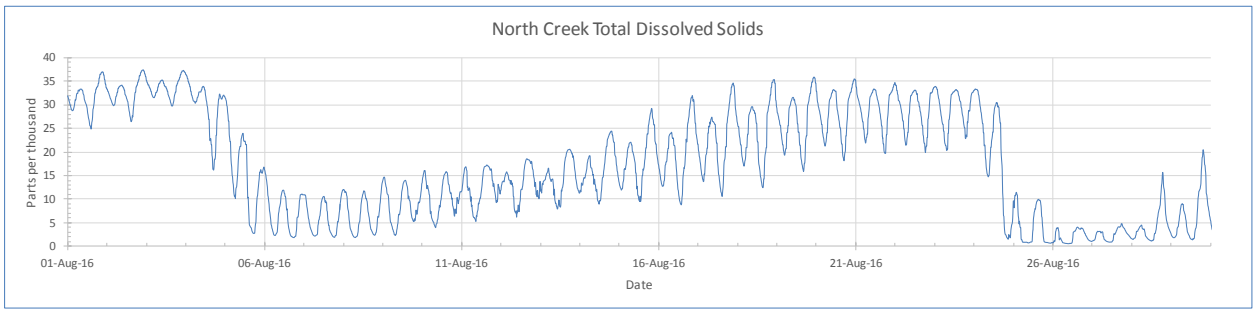
North Creek water quality – August 2016

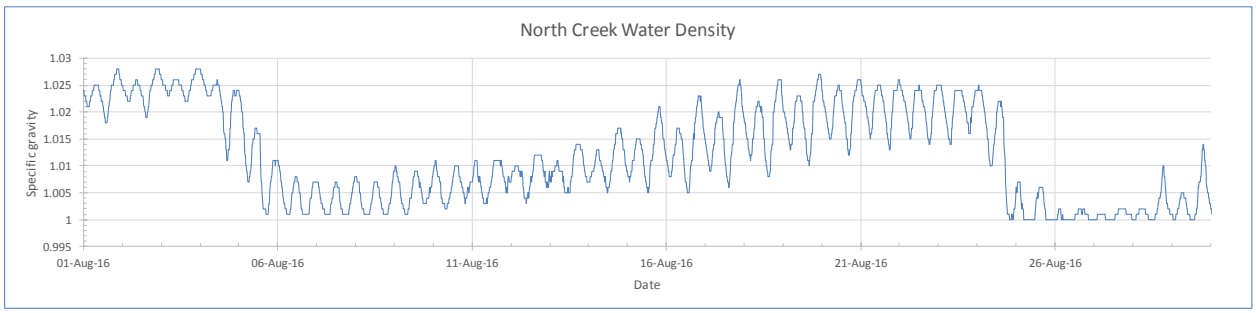
Data logger located in North Creek near airport.

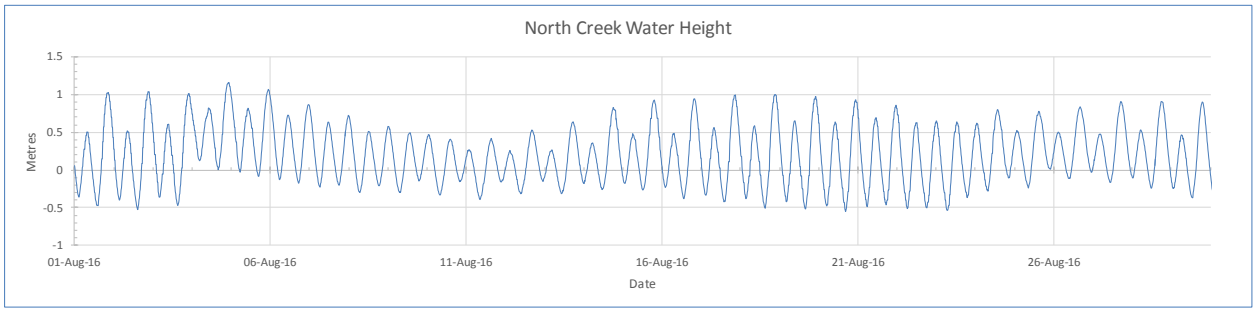


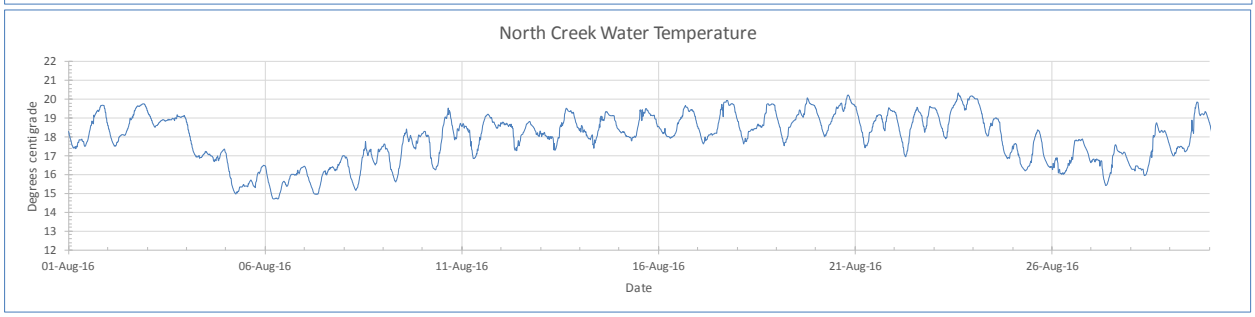


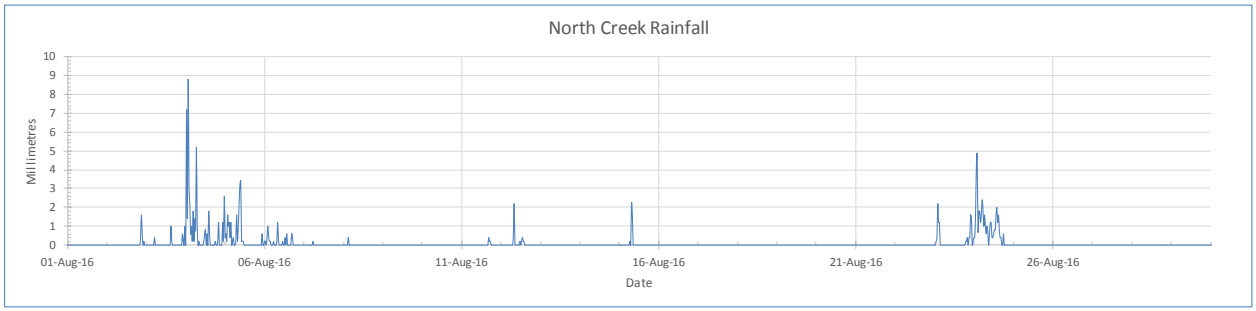












Interpretation

*Note – Water height was adjusted in July to approximate AHD levels by deducting 0.75 m from data logger readings. This adjustment will remain until the logger can be surveyed in to AHD.

- **Dissolved Oxygen (DO)** was recorded from 3.2 to 9.4 mg/L in August with an average reading of 6.6, which has decreased from last month's 7.8 due to higher August rainfall and decreased tidal exchange. DO showed a tidal response as higher quality water moved up the estuary in response to a rising tide, while lower water level at low tide allowed the runoff of low DO water from the floodplain drains. 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 and chemical and biological oxygen demand.

- **Electrical conductivity (EC)** for August ranged from 0.9 to 57.1 ms/cm and averaged 26.3 ms/cm, which is considered saline and has decreased from last month's saline average of 41.2 ms/cm due to higher August rainfall and decreased tidal exchange. 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** in August ranged from 6.6 to 8.0 and averaged 7.3, which is alkaline and 0.2 pH units or 1.58 times less alkaline than last month's 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 recorded in August ranged from 0.56 to 37.4 averaging 17.1 ppt, which has decreased from last month's 26.8 ppt due to higher August rainfall and decreased tidal exchange. TDS was 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^{o}C. During August density ranged between 1.00 and 1.028g/cm^{3} averaging 1.01 g/cm^{3}, slightly lower than last month's reading of 1.02. Fresh water is normally close to 1.0, while sea water is slightly denser at 1.027g/cm^{3}, which leads to the formation of salt wedges and acid water is even denser (Sulfuric acid SG = 1.94 g/cm^{3}). Density varies with temperature with maximum density occurring at +4.0^{o} C, while tides, rainfall, runoff and acid discharges also affect density.

- **Water temperature** for August was recorded from 14.7° to 20.2°C, giving a range of 5.5^{o} and averaging 18.0°C, which has increased by 0.4°C compared to last month's 17.6°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*** for August ranged between -0.55 m and +1.15 m, giving a range of 1.70 m and averaging +0.20 m, which is 0.04 m higher than last month's adjusted average of +0.16 m. The highest tides of the month at 1.84 metres occurred on 2nd at 8.04 pm at the Ballina River entrance, with the corresponding peak at the logger of 1.04 m at 9.00 pm, giving a 56-minute delay. 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 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 metre 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 August at the Ballina Airport Automatic Weather Station (AWS), situated 1.8 km to the west of North Creek logger, was 140.8 mm falling over 12 days, which compares to July rainfall of 33.4 mm over 8 days. Peak rainfall of 8.8 mm was recorded on the 4th August over 30 minutes between 1.00 am and 1.30 am. During August the Tuckean site 4 data logger located 19 km to the SW did not record, however a nearby station recorded 224.9 mm over 10 days, while the Rocky Mouth Creek data logger located 37 km to the south-west recorded 214 mm over 24 days.