5.5. WATER AND WASTEWATER QUARTERLY REPORT FOR THE PERIOD ENDING 31 MARCH 2019

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DEPARTMENT Water and Wastewater

RECOMMENDATION

That council receives and notes the Quarterly Report of the Water and Wastewater branch for the period ending 31 March 2019.

EXECUTIVE SUMMARY

This report documents progress on key operational and service delivery areas as well as the regulatory compliance status within the Water and Wastewater Branch for the period 1 January to 31 March 2019.

The results of this report are overall generally positive even though we received a high number of water quality complaints and the shire experienced a new record flood level in more than 100 years at Daintree River.

Notable capital improvements include the nearly complete Daintree Bore installation which will supply raw water to the Daintree raw water reservoir and the new clarifier installed at the Mossman Wastewater Treatment Plant.

BACKGROUND

This report is the third Quarterly Report submitted by the Water and Wastewater branch during the 2018/2019 Financial Year. This report highlights progress against key performance areas required by the Department of Natural Resources, Mines and Energy and required compliance levels by the Department of Environment and Science.

COMMENT

This report enables Councillors and the community to obtain a strategic view of activities within the Water and Wastewater Branch.

The Quarterly Report documents progress on key operational and service delivery aspects and regulatory compliance levels.

The Water and Wastewater Quarterly Report does not include comprehensive progress reporting in terms of the Capital Works Programs, Operational Plan and financial statements as these are dealt with in separate Quarterly Reports to Council.

FINANCIAL/RESOURCE IMPLICATIONS

Failure to comply with required standards and to respond quickly and effectively to water and wastewater incidents may result in harm to the community and substantial penalties.

RISK MANAGEMENT IMPLICATIONS

Council, as a registered water service provider, has a statutory obligation to ensure it provides water and wastewater services to customers. Council's reputation would suffer if it is unable to maintain service levels at prescribed standards.

This Quarterly Water and Wastewater report provides information on strategies implemented by the Water and Wastewater branch to minimise occupational health and safety risks and risks to Council infrastructure.

SUSTAINABILITY IMPLICATIONS

Economic: It is essential to adequately maintain water and wastewater infrastructure in order to provide satisfactory services in support of economic development in the Shire.

Environmental: Failing to provide adequate and compliant water and wastewater services can lead to environmental harm and breaching of licence conditions.

Social: The Community expects fully operational and compliant water and wastewater services.

CORPORATE/OPERATIONAL PLAN, POLICY REFERENCE

This report has been prepared in accordance with the following:

Corporate Plan 2014-2019 Initiatives:

Theme 3 - Improve Environmental Performance

3.2.3 - Investigate process improvements at Council's wastewater treatment plants to improve wastewater quality, save energy and identify markets for end products.

Theme 5 – Governance

5.2.1 - Provide Councillors and community with accurate, unbiased and factual reporting to enable accountable and transparent decision-making.

5.3.4 - Develop practices and skill levels to ensure safety and wellbeing in the workplace.

Operational Plan 2018-2019 Actions:

2.1.2 - Additional water extraction site designed and integrated into existing water infrastructure.

2.1.3 - Asset Edge trial for Water and Wastewater operations.

3.1.1 - Develop and implement a Trade Waste Environmental Management Plan and update processes and software to ensure compliance and efficiency.

COUNCIL'S ROLE

Council can play a number of different roles in certain circumstances and it is important to be clear about which role is appropriate for a specific purpose or circumstance. The implementation of actions will be a collective effort and Council's involvement will vary from information only through to full responsibility for delivery.

The following areas outline where Council has a clear responsibility to act:

Asset-Owner	Meeting the responsibilities associated with owning or being the custodian of assets such as infrastructure.
Regulator	Meeting the responsibilities associated with regulating activities through legislation or local law.

CONSULTATION

Internal: Nil

External: Water and wastewater quality parameters are tested by an accredited laboratory and test results and service levels are required to be reported to the Department Natural Resources, Mines and Energy and the Department of Environment and Science.

ATTACHMENTS

1. Water and Wastewater Quarterly Report for the period ending 31 March 2019 **[5.5.1]**

1 January – 31 March 2019

The aim of the Water and Wastewater Quarterly Report is to inform Councillors and the community on the progress of key operational and service delivery areas as well as regulatory compliance status within the Water and Wastewater Branch.

The Water and Wastewater Quarterly Report does not include comprehensive progress reporting in terms of the Capital Works Programs and the Operational Plan which are dealt with in separate Quarterly Reports to Council.

This report highlights certain aspects of the activities of the Water and Wastewater Branch that are generally industry benchmark indicators as well as key performance areas and compliance monitoring parameters as required by the Department of Natural Resources, Mines and Energy (DNRME) and the Department of Environment and Science (DES).

Water

1. Water reticulation services

General maintenance was carried out on all schemes for this quarter including all intakes. Water flushing programs were implemented during this quarter due to some water quality complaints that related to aesthetic issues in water within Port Douglas reticulation network. All water quality complaints were responded to immediately and the customers were satisfied with the outcome.

Water flushing also occurred after water main break repairs and to maintain a good chlorine residual in the reticulation network.

Regular reservoir and pump station checks and intake maintenance are carried out on all schemes. Table 1 below shows the number of maintenance activities undertaken across all schemes.

Table 1. Water Reticulation Services

Douglas Shire Reticulation (all schemes)	
Settlement Meter Reads	84
New Water Services Connections	5
Service Repairs	120
Water Mains Repairs	7
Water Quality Complaints	9
Dial before you dig	110
Flushing Events: Mossman/Port Douglas/Cooya/ Newell	13
Flushing Events: Whyanbeel/Wonga	3
Flushing Events: Daintree	2

There were 9 water quality complaints during the reporting period. Table 2 below shows the nature of the complaint, how it was resolved and the response time. All water quality parameters measured were within the health guideline limits in the Australian Drinking Water

Water Guidelines (ADWG), but complaints related to aesthetic issues in water. Issues may have been a result of a new water pipeline that went online from the Crees Road Reservoir. Additionally there may have been sediment build-up in the water reticulation system due to a low frequency of flushing during prolonged water restrictions.

Table 2. Water Complaints

Address	CRM No & Date	Nature of water complaint	How it was resolved	Response Time
Unit 10/51 Macrossan Street, Port Douglas	69659/2019 22/03/2019	Tap water was discoloured	Water had cleared and quality testing results were good. At another point nearby water was tested and was clear.	20 mins
7 Sorrento Crescent, Port Douglas	67495/2019 30/01/2019	Tap water was cloudy and had a bad taste	Turbidity in water due to a large break at Sheraton Mirage earlier in the morning. Water quality testing results were good. Water main was flushed, water came clear and customer was happy with the outcome.	25 mins
316 Port Douglas Road, Port Douglas (Ramada Resort)	67492/2019 30/01/2019	Tap water was discoloured	Turbidity in water due to a large break at Sheraton Mirage earlier in the morning. Water quality testing results were good. Water main was flushed, water came clear and customer happy with the outcome.	25 mins
8 Oriole Street, Craiglie	67354/2019 25/01/2019	Tap water was cloudy and discoloured	Water quality samples were taken and results were good and clear and no taste difference. Water main system was flushed day prior to this notification. Customer satisfied and happy with the outcome.	15 mins
Gorge Road, Mossman (Mossman Gorge Aboriginal Centre)	67343/2019 24/01/2019	Tap water was discoloured	Water main system was flushed and became clear. The water main system was given a second cautionary flush on the next day, water was clear and customer was satisfied and happy with the outcome.	20 mins

6 Sandpiper Street, Port Douglas	67293/2019 23/01/2019	Tap water was discoloured	Water quality samples were taken and results were good. Water main system was flushed and water was clear. Customer satisfied and happy with the outcome.	15 mins
1 Undine Street, Port Douglas	67248/2019 23/01/2019	Tap water was cloudy	Water main system was flushed and situation monitored, customer was advised via email the outcome as no other source of contact was provided.	30 mins
10-12 Coral Drive, Port Douglas	67096/2019 18/01/2019	Tap water was discoloured	Water main system was flushed and water was clear. Followed up with customer after weekend and no more water issues. Customer satisfied and happy with the outcome.	10 mins
Unit 3/13-15 Coral Drive, Port Douglas	67071/2019 18/01/2019	Tap water was discoloured	Water main system was flushed and water was clear. Followed up with customer after weekend and no more water issues. Customer satisfied and happy with the outcome.	45 mins

Capital works program is nearly complete on the Daintree Bore installation and is within budget. This capital works project will supply raw water into the raw water reservoir and be a back up supply for the Daintree community when the Daintree intake becomes blocked from heavy rainfall events. All other water reticulation capital works programs are currently in design stages.

2. Water schemes and potable water consumption

Water Restrictions

Following on from very much needed rain in December 2018, the rain kept coming down in January 2019. Level 2 water restrictions were lifted on 02 January 2019 to NO water restrictions. This was due to the on set of a monsoon trough over North Queensland where a new record flood level in more than 100 years was recorded at Daintree River.

Figure 1 shows the Mossman Water Treatment Plant usage and Rex Creek Intake levels for the period 01 January through to 31 March 2019.

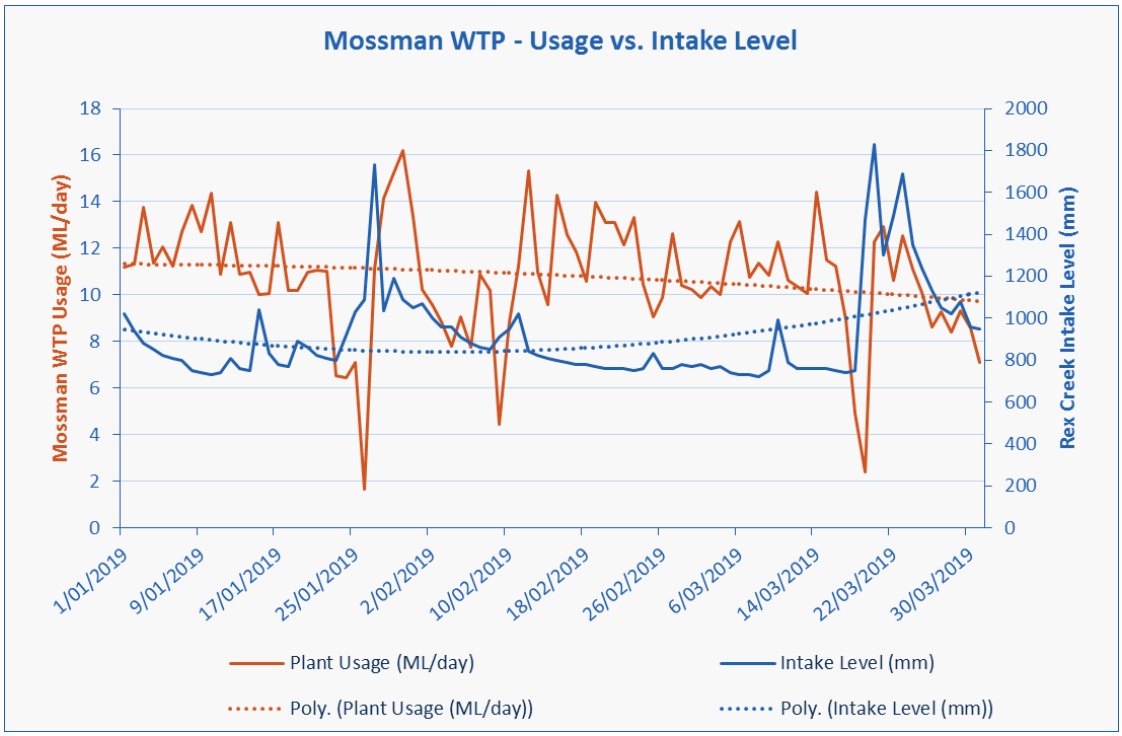

Fig 1. Mossman WTP usage and Rex Creek intake levels for the period 1 January 2019 – 31 March 2019

All Schemes

Raw water quality has been impacted by numerous heavy rain and flood events throughout this reporting period. The monsoonal trough produced a number of lows and cyclones, resulting in heavy falls in all of the catchments. We experienced numerous intake screen blockages, heavy flows of sand and debris including fallen trees creating ongoing issues and major work loads to maintain the intakes in a serviceable condition. The Water Quality and Water Reticulation teams worked round the clock to secure a steady supply of raw water to enable the water plants to treat water.

Throughout the water schemes, all pump stations performed well with no incidents.

The De Meio Drive bore field and De Meio non-potable storage reservoir operated at normal production. Craiglie reservoir was fully operational and both Flagstaff and Rocky Point reservoirs performed well with stable chlorine levels in all schemes. The new Crees Road reservoir has been an immense benefit to the region ensuring that we did not run out of drinking water during this record rain weather event.

Cert IV water industry training continued for two Water and Wastewater plant operators and staff completed various computer skills training courses.

Mossman/Port Douglas Scheme

Mossman Water Treatment Plant met all demand requirements during the reporting period.

Consumer demand has reduced in line with seasonal trends providing relief to operations as the water quality team strived to maintain production at the water treatment plants during the monsoonal rains.

Rex Creek intake levels have increased due to heavy rains and the catchment has been well and truly replenished resulting in good flows at the intake.

All Ultra Filtration (UF) racks were operational and maintenance works continued with cartridge repairs to ensure compliance with UF rack integrity test limits. General maintenance works were also undertaken including pump repairs and equipment servicing.

There were no water quality reportable incidents in the Mossman/Port Douglas water scheme for the reporting period.

Mossman Water Supply

The total monthly consumption of water in Mossman, Cooya Beach and Newell Beach areas can be seen in Figure 2.

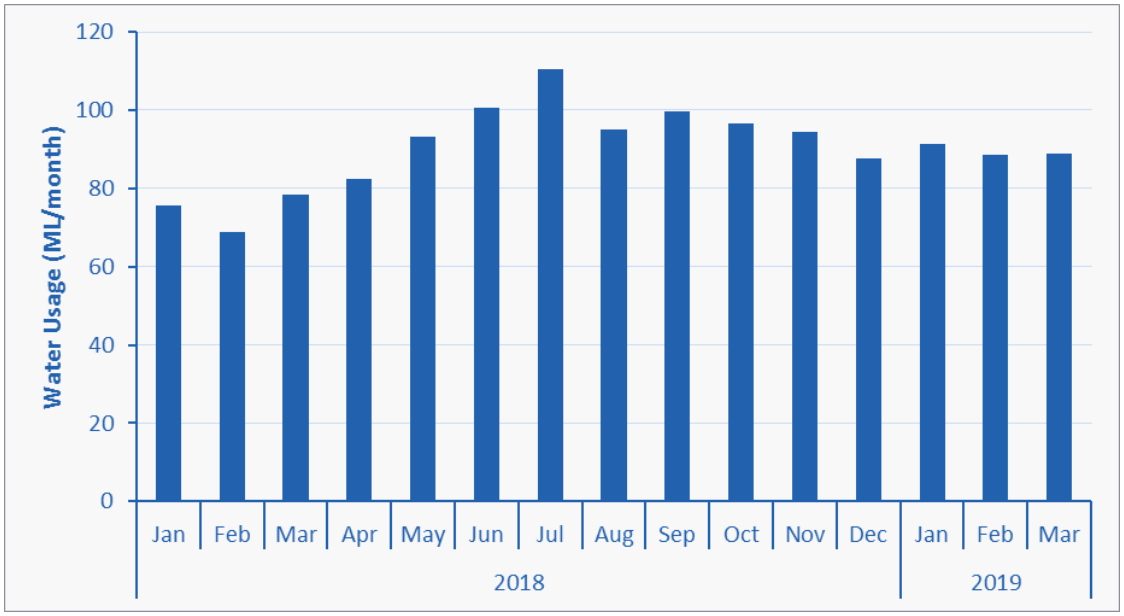

Fig 2. Mossman Scheme Monthly Consumption Figures

Port Douglas Water Supply

The total monthly consumption of water in Port Douglas can be seen in Figure 3.

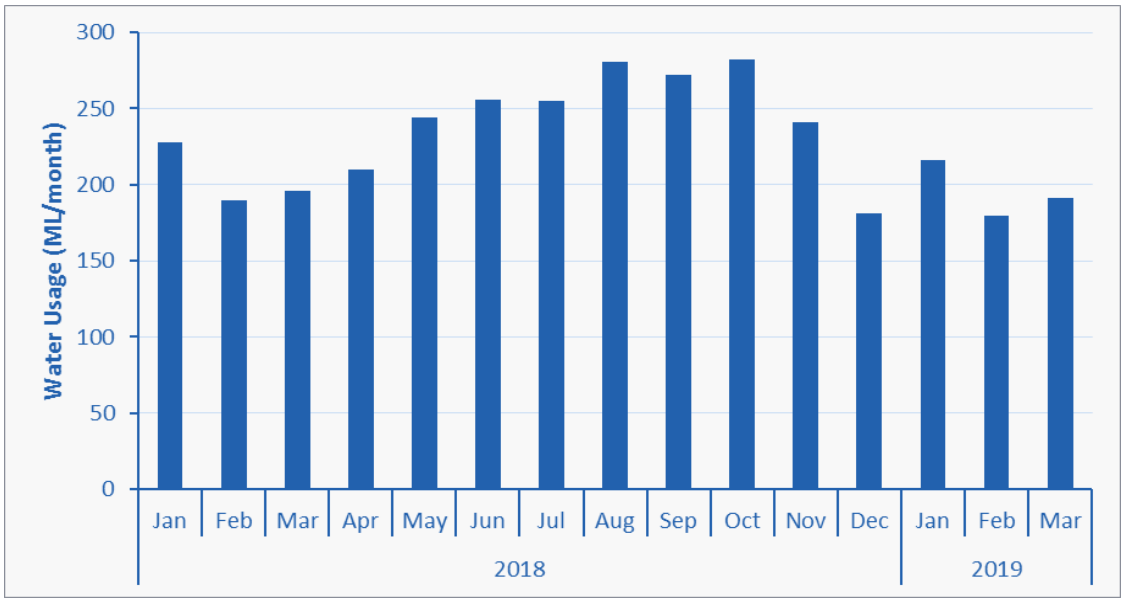

Fig 3. Port Douglas Scheme Monthly Consumption Figures

Whyanbeel Scheme

Whyanbeel Water Treatment Plant met all demand requirements during the reporting period. However, the little falls creek intake was impacted heavily by heavy rain and flooding in the catchment resulting in numerous blockages and high raw water turbidity shut downs.

Operational staff responded to numerous incidents and through persistence managed to maintain the treated water reservoir at adequate levels to meet consumer demand.

The UF rack was fully operational during the reporting period. To maintain UF filter efficiency chemical clean-in-place operations were undertaken and general maintenance work continued.

There were no water quality reportable incidents in the Whyanbeel water scheme for the reporting period.

Whyanbeel Water Supply

The total monthly consumption of water in the Whyanbeel scheme can be seen in Figure 4.

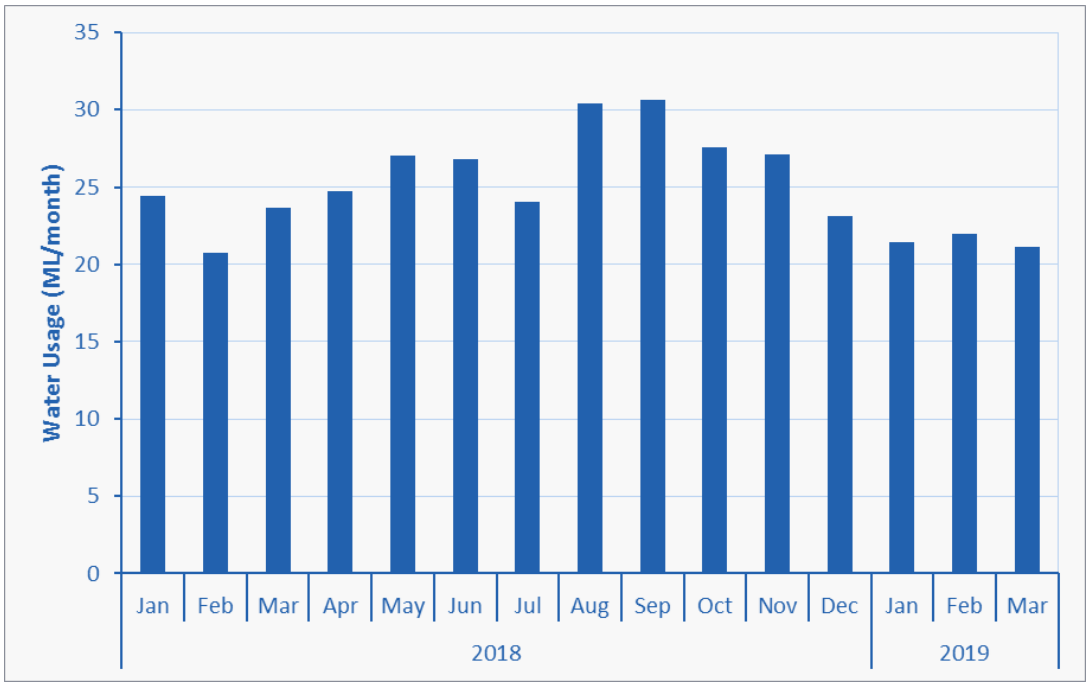

Fig 4. Whyanbeel Scheme Monthly Consumption Figures

Daintree Scheme

Daintree Water Treatment Plant met all demand requirements during the reporting period. However, intake levels at intake creek were impacted by heavy rains and flooding resulting in numerous blockages at the intake and raw water pipeline.

Operational staff attended numerous incidents braving flood waters and torrential rains to ensure a steady supply of raw water to the filtration plant. The treated water reservoir level was adequate to meet consumer demand.

The new Daintree bore field extraction pumping station has been commissioned with final water quality sampling underway. The bore field extraction site will be utilised to augment the regions raw water supply during severe weather events whereby the flows from intake creek become diminished.

To maintain UF filter efficiency chemical clean-in-place operations were undertaken and general maintenance works continued.

There were no water quality reportable incidents in the Daintree water scheme for the reporting period.

Daintree Water Supply

The total monthly consumption of water in the Daintree scheme can be seen in Fig 5.

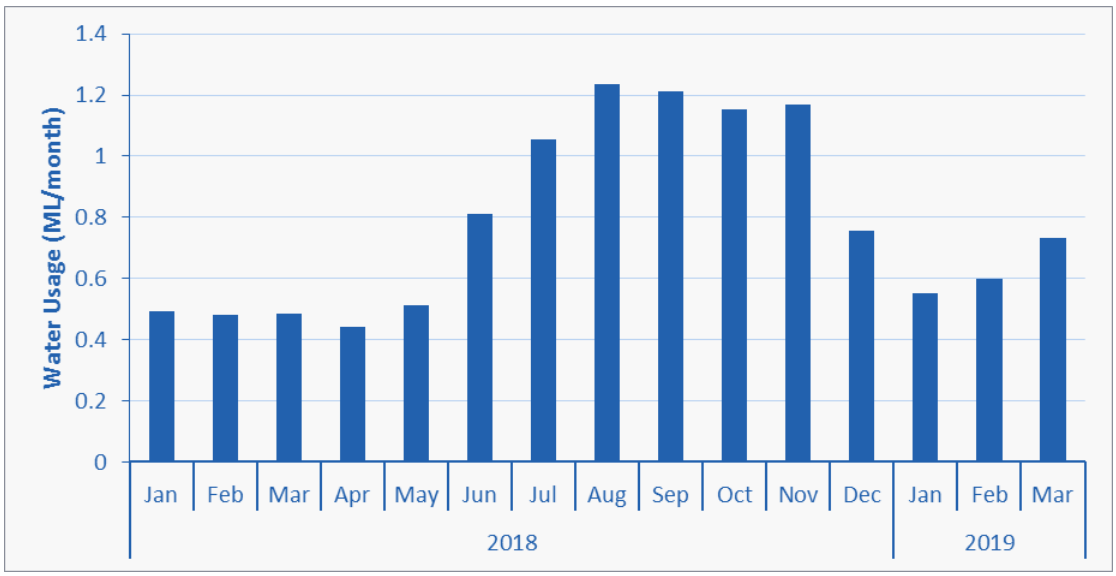

Fig 5. Daintree Scheme Monthly Consumption Figures

3. Water quality monitoring and results

Drinking water is sampled at intakes, reservoirs and in the reticulation network to ensure compliance with the Australian Drinking Water Guideline (ADWG).

Water quality verification monitoring includes regular testing of individual reticulation zones with monthly sampling at the reservoirs. Supporting programs for the verification of drinking water quality include;

- Water treatment plants and reservoirs that have SCADA alarms for action and critical limits and are operated under critical control points;
- Reservoir inspections that are done regularly to ensure that the reservoirs are intact and that any points of ingress are repaired; and
- Network operations that have a flushing program that ensures the chlorine residual is above 0.2 mg/L.

For the reporting period a total of 75 treated water E.coli compliance samples were taken in the three drinking water schemes. A total of 29 E.coli samples were tested in the Douglas water laboratory and 46 in NATA accredited laboratory. Other parameters monitored allow us to observe trends in water quality through the schemes. All tested parameters in drinking water samples during the reporting period were compliant with ADWG health guideline values and standards required by the Water Supply Regulator and Queensland Health.

In addition raw water quality was monitored at all of the intakes and Daintree bore site, including 16 raw water E.coli samples. During the reporting period works at the Daintree bore field were finalised and the testing of the Daintree bore has now been integrated into the monthly sampling schedule. Raw water sampling assists us to understand the treatment plant needs and the health based targets.

Supplementary rain water system has been installed at the Daintree water treatment plant, which could provide water into the raw water reservoir in the future. This option is still being investigated further.

Mossman/Port Douglas Supply Scheme

Average monthly values for key operational and compliance parameters can be seen in Tables 3 and 4 for treated water at Port Douglas Reservoirs and Port Douglas/Mossman Reticulation network, respectively. During January the Port Douglas reticulation network experienced high turbidity events that furthermore had higher iron results. No health guideline values were exceeded, but water supply was flushed for aesthetic reasons. Figure 6 indicates the daily turbidity trends at the intake and treated water as recorded at the Mossman Water Treatment Plant for the period January to March 2019.

Table 3. Average monthly values for key operational and compliance parameters in the Port Douglas Reservoirs.

Month	pH	Temp °C	Total Alkalinity mg CaCO3/L	Free Cl mg/L	Total Cl mg/L	E.coli MPN
Standard	6.5 - 8.5	10 - 30	0 - 200	0.2 - 5.0	<5	<1
Jan-19	6.7	26.9	<5	1.1	1.1	<1
Feb-19	6.8	28.4	5	1.1	1.2	<1
Mar-19	7.1	26.6	5	1.1	1.2	<1

Table 4. Average monthly values for key operational and compliance parameters in the Mossman/Port Douglas Reticulation Network.

Month	pH	Temp °C	Free Cl mg/L	Total Cl mg/L	Colour PCU	Cu mg/L	Fe mg/L	Mn mg/L	E.coli MPN
Standard	6.5 - 8.5	10 - 30	0.2 - 5.0	<5	<15	<1	<0.3	<0.1	<1
Jan-19	6.9	27.8	0.8	0.8	<5	0.007	0.112	<0.005	<1
Feb-19	7.2	29.1	0.8	0.8	<5	0.005	0.013	<0.005	<1
Mar-19	7.1	28.0	0.8	0.8	<5	0.006	0.007	<0.005	<1

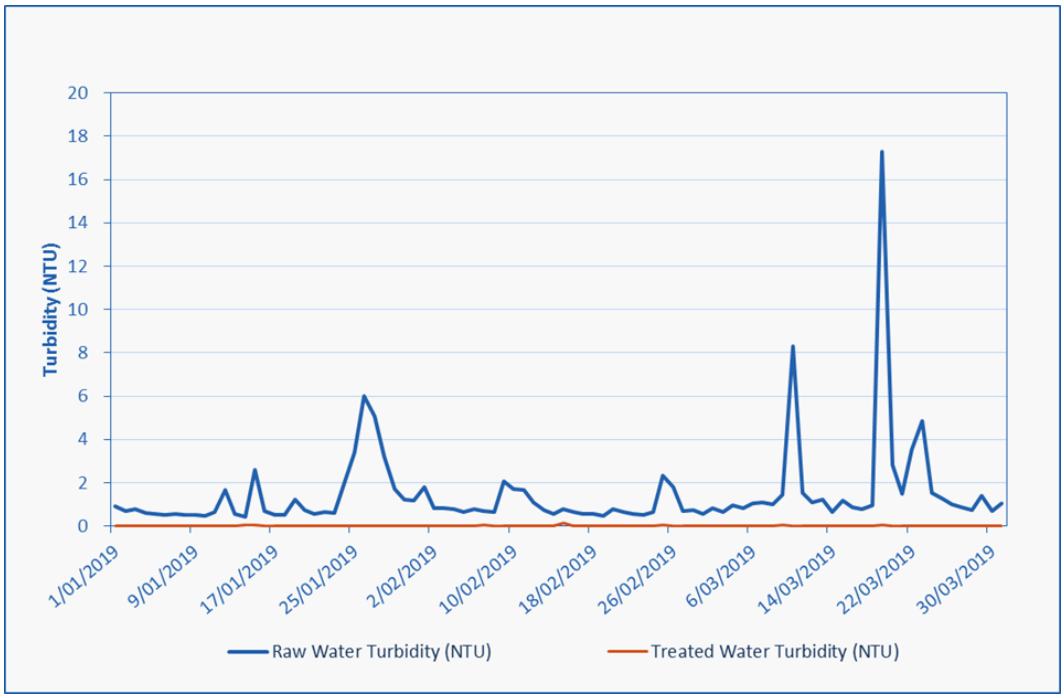

Fig 6. Turbidity trends at the Rex Creek intake and treated water at the Mossman Water Treatment Plant

Whyanbeel Supply Scheme

Average monthly values for key operational and compliance parameters can be seen in Tables 5 and 6 for treated water at the Whyanbeel Reservoir and Whyanbeel Reticulation Network, respectively. Figure 7 indicates the daily turbidity trends at the intake and treated water as recorded at the Whyanbeel Water Treatment Plant for the period October to December 2018.

Table 5. Average monthly values for key operational and compliance parameters in the Whyanbeel Reservoir.

Month	pH	Temp °C	Total Alkalinity mg CaCO3/L	Free Cl mg/L	Total Cl mg/L	E.coli MPN
Standard	6.5 - 8.5	10 - 30	0 - 200	0.2 - 5.0	<5	<1
Jan-19	7.4	28.2	12	0.9	1.0	<1
Feb-19	7.3	29.8	12	0.9	0.9	<1
Mar-19	7.5	27.6	13	1.0	1.0	<1

Table 6. Average monthly values for key operational and compliance parameters in the Whyanbeel Reticulation Network.

Month	pH	Temp °C	Free Cl mg/L	Total Cl mg/L	Colour PCU	Cu mg/L	Fe mg/L	Mn mg/L	E.coli MPN
Standard	6.5 - 8.5	10 - 30	0.2 - 5.0	<5	<15	<1	<0.3	<0.1	<1
Jan-19	7.5	28.4	0.7	0.8	<5	0.005	0.024	<0.005	<1
Feb-19	7.5	29.2	0.6	0.6	<5	0.007	0.023	<0.005	<1
Mar-19	7.6	28.4	0.8	0.9	<5	0.004	0.025	<0.005	<1

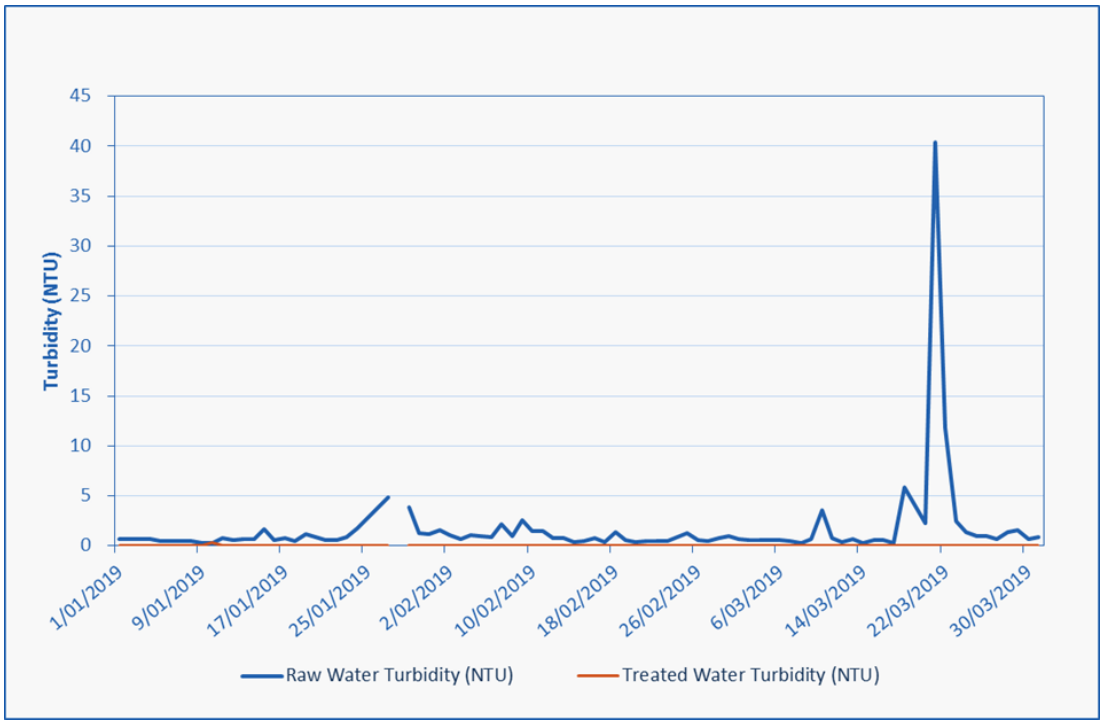

Fig 7. Turbidity trends at the Little Falls Creek intake and treated water at the Whyanbeel Water Treatment Plant. Whyanbeel WTP was offline during 27/1/19 – 28/1/19.

Average monthly values for key operational and compliance parameters can be seen in Table 7 for treated water at Daintree Reticulation network. Daintree reticulation network experienced some low chlorine events due to low water usage within the network. Low chlorine results initiated a flushing program, which helped reduce water age and elevated the chlorine levels back to normal. Figure 8 indicates the daily turbidity trends at the intake and treated water as recorded at the Daintree water treatment plant for the period January to March 2019.

Table 7. Average monthly values for key operational and compliance parameters in the Daintree Reticulation Network.

Month	pH	Temp °C	Free Cl mg/L	Total Cl mg/L	Colour PCU	Cu mg/L	Fe mg/L	Mn mg/L	E.coli MPN
Standard	6.5 - 8.5	10 - 30	0.2 - 5.0	<5	<15	<1	<0.3	<0.1	<1
Jan-19	8.3	26.9	0.3	0.3	<5	0.004	0.007	<0.005	<1
Feb-19	8.2	27.5	<0.1	<0.1	<5	0.002	<0.005	<0.005	<1
Mar-19	7.9	27.0	0.8	0.7	<5	0.002	<0.005	<0.005	<1

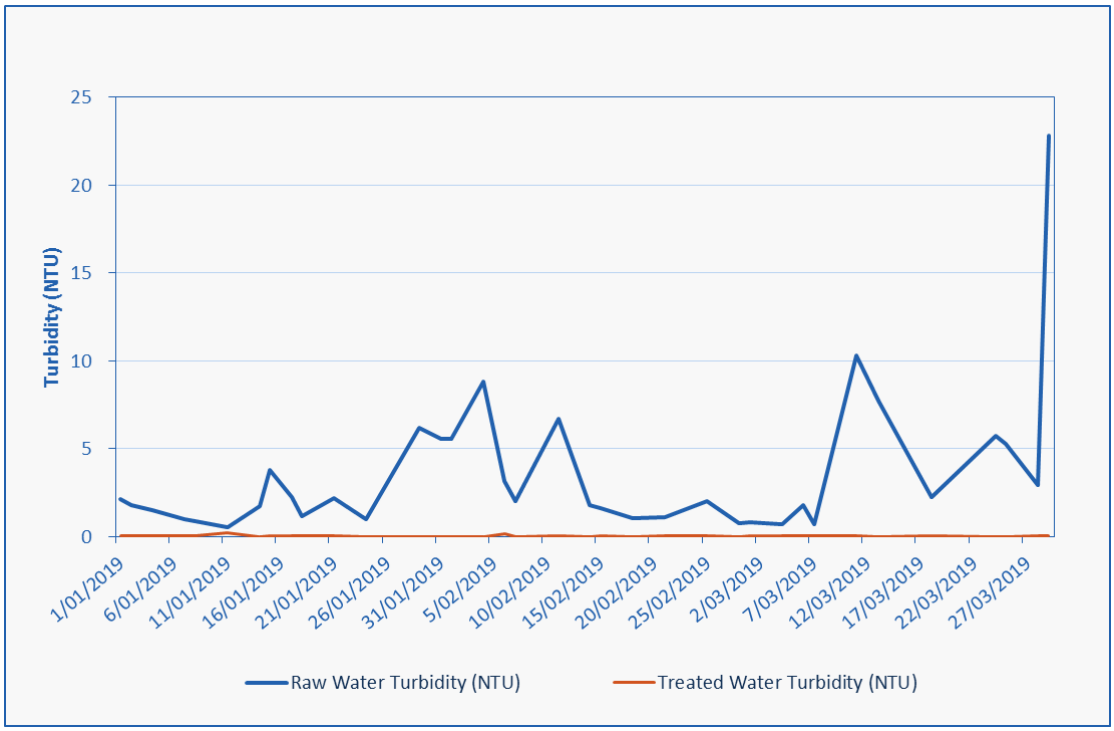

Fig 8. Turbidity trends at the Intake/Martin Creek intake and treated water at the Daintree Water Treatment Plant. Daintree WTP was offline several times during this period.

4. Wastewater reticulation services

General maintenance programs were carried out at the reticulation networks and 31 pump stations in the Mossman and Port Douglas catchments. Location of all sewer manholes was carried out during this reporting period to maintain the integrity of our data within our asset management system as well as improve on asset location accuracy for use in our mapping system. One incident was reported to DES on the 27 March 2019 for a rising main break within the Port Douglas area.

Table 8 below shows the number of maintenance activities undertaken across all schemes.

Table 8. Wastewater Reticulation Services

	Port Douglas Catchment	Mossman Catchment
Pump Blockages	9	9
Sewer Chokes	2	1
Sewer Main Breaks	3	0
HCB Repairs (House Connection Branch)	5	4
Odour Complaints	1	1

Influent and irrigation flows

Port Douglas Wastewater Treatment Plant

A total of 388,022 kL of influent entered the Port Douglas Wastewater Treatment Plant during the reporting period. The average daily flow was 4,311 kL/day. Tanker truck contractors delivered 552 kL of septage to the plant and 2,003 kL of Leachate from the Killaloe Landfill and Transfer Station. Influent is treated in a Sequencing Batch Reactor (SBR) which produced compliant effluent during the reporting period. A total of 24% of the treated effluent was pumped to two resorts and the remaining discharged into the Dickson Inlet. The Sheraton Mirage received 61,184 kL and Palmer Sea Reef received 11,588 kL of treated effluent during this period. Total rainfall on site during the reporting period was measured as 1,659.5 mm. On 27 January 2019, the highest rainfall on a day was recorded as 255 mm in the Reef Park weather station.

Daily inflows and total monthly flows for the reporting period are presented in Fig 9 and 10 respectively.

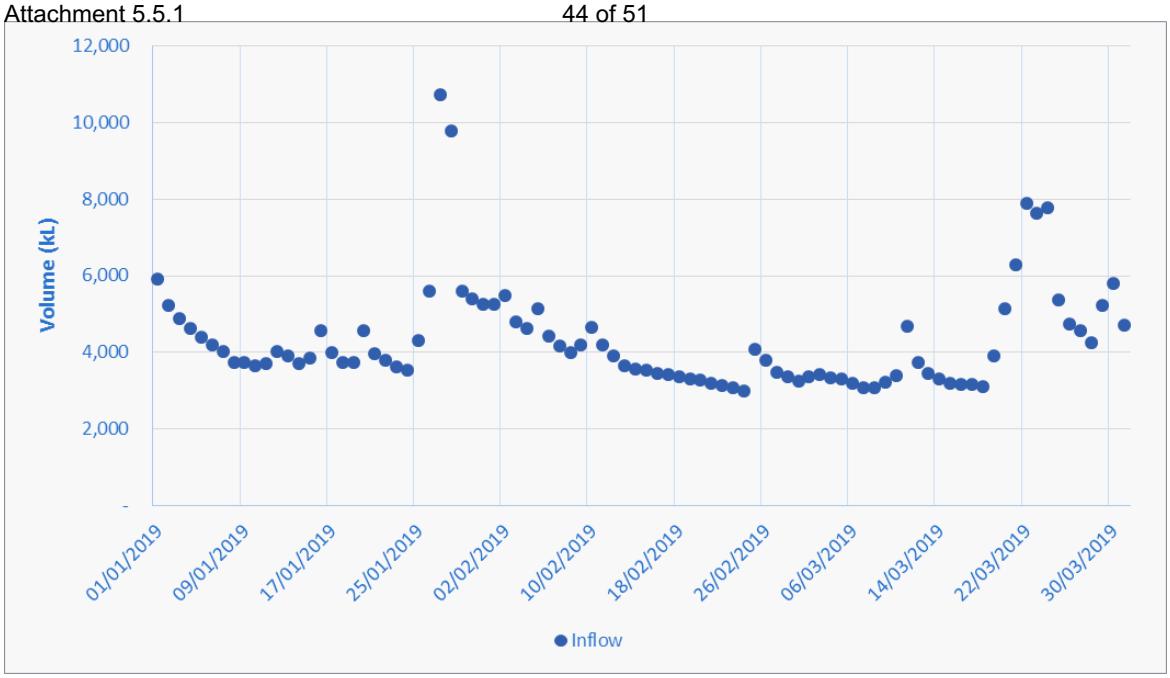

Fig 9. Port Douglas Daily Inflow

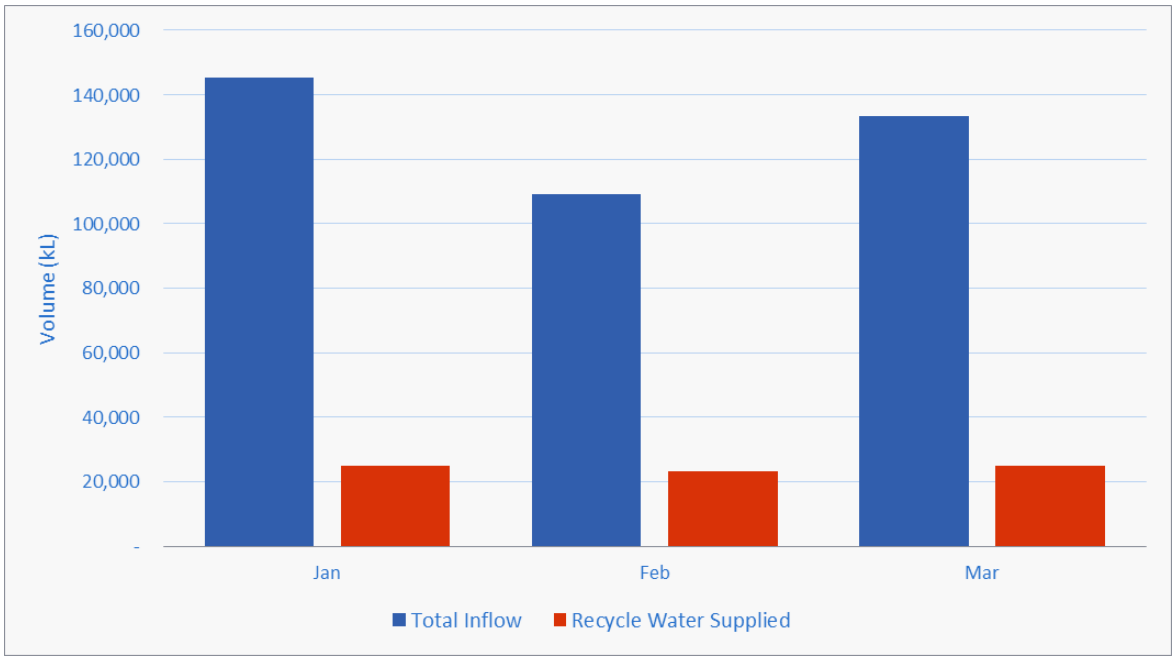

Fig 10. Port Douglas Total Monthly Flow 2019

Mossman Wastewater Treatment Plant

The Mossman Wastewater Treatment Plant received a total influent flow of 180,546 kL during the reporting period. The average daily flow was 2,006 kL/day. Influent is treated in an Oxidation Ditch system and compliant effluent is discharged into the Mossman River. A total of 1931.5 mm of rain fell on site for the reporting period with the highest daily rainfall measured at 562 mm on 27 January 2019 from the Central Mill weather station.

Douglas Shire Council Environmental Authority Permit EPPR01790513 states an inflow limit: Inflows must not exceed the peak design capacity of three times the Design Average Dry Weather Flow (DADWF) of 1.15 ML/day – equating to 3.45 ML/day – on any day unless the standard treatment processes of the plant are bypassed. One exceedance of the inflow was reported to DES for flow on 22 March 2019. The exceedance did not result to an environmental harm, as all the inflow was processed through the normal treatment process.

Outflow and Inflow data for the reporting period are shown in Fig 11 and 12 respectively.

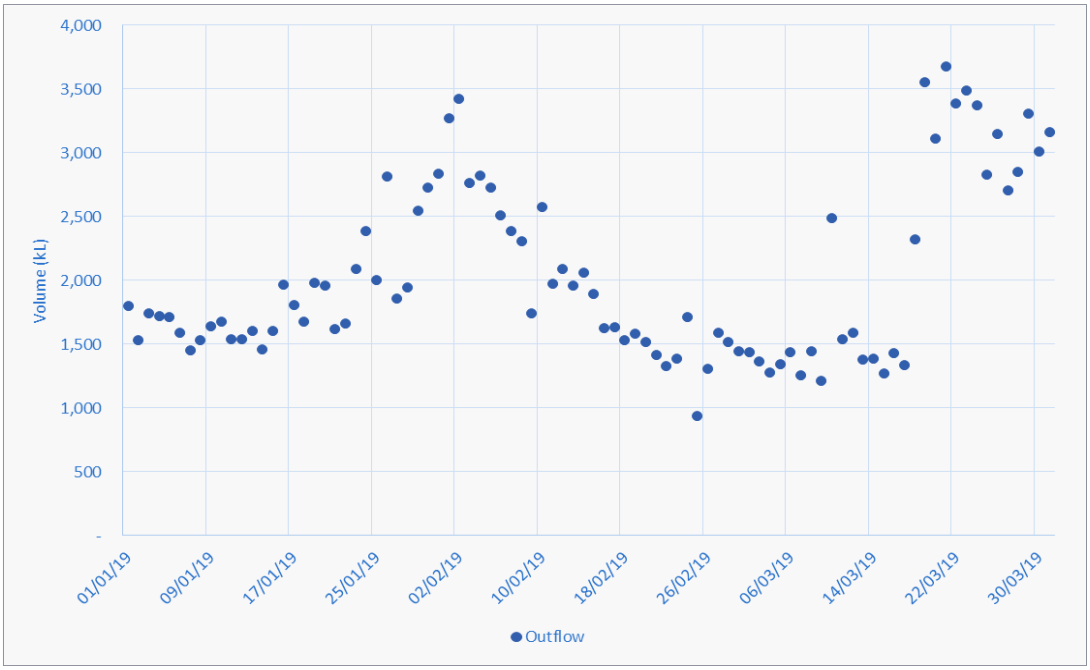

Fig 11. Mossman Wastewater Treatment Plant Daily Outflow

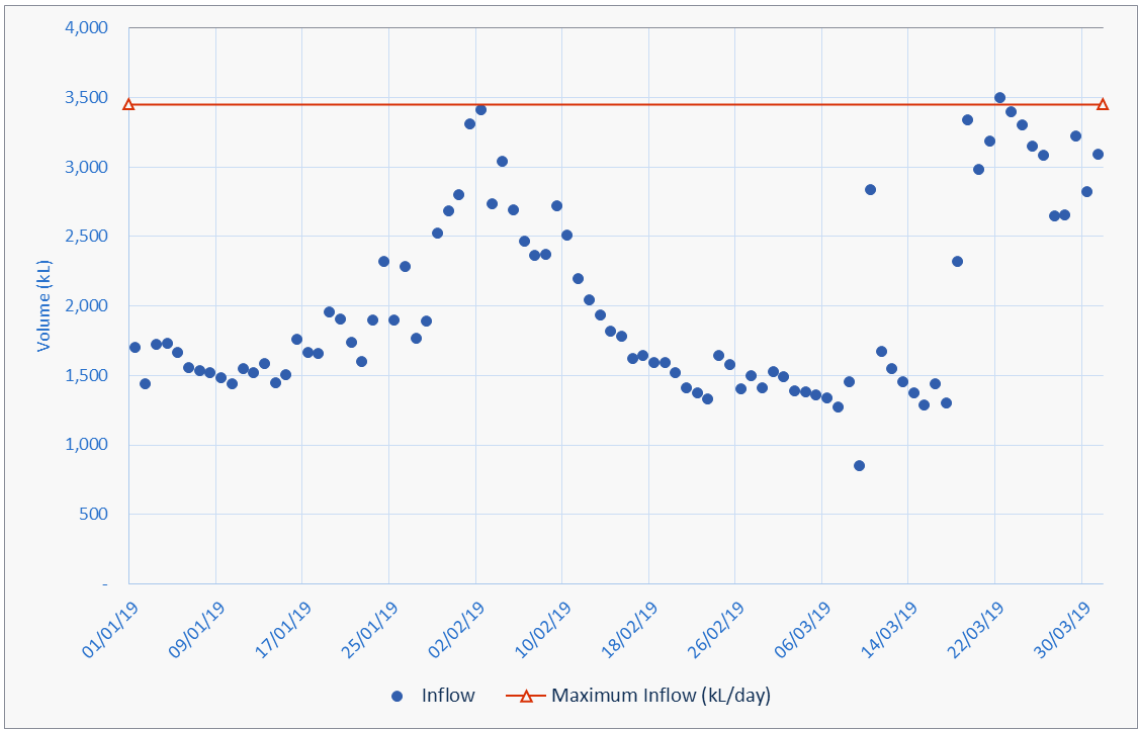

Fig 12. Mossman Wastewater Treatment Plant Total Daily Inflow 2019

5. Bio-solids Production

Bio-solids were produced at the dewatering plants at Mossman Wastewater Treatment Plant (13.23% solids) and Port Douglas Wastewater Treatment Plant (11.3% solids). Bio-solids were transported by Arkwood Organics to Edmonton Farms, Tablelands Regional Farms and Spring Mount Waste Facility for further treatment and beneficial land application as organic fertiliser and soil conditioner.

Port Douglas Wastewater Treatment Plant

At Port Douglas Wastewater Treatment Plant, 272 tonnes of wet biosolids were produced during the reporting period and sent to farms for beneficial reuse. This amount of wet biosolids equates to 30.7 dry tonnes.

The monthly bio-solids production trends can be seen in Figure 13.

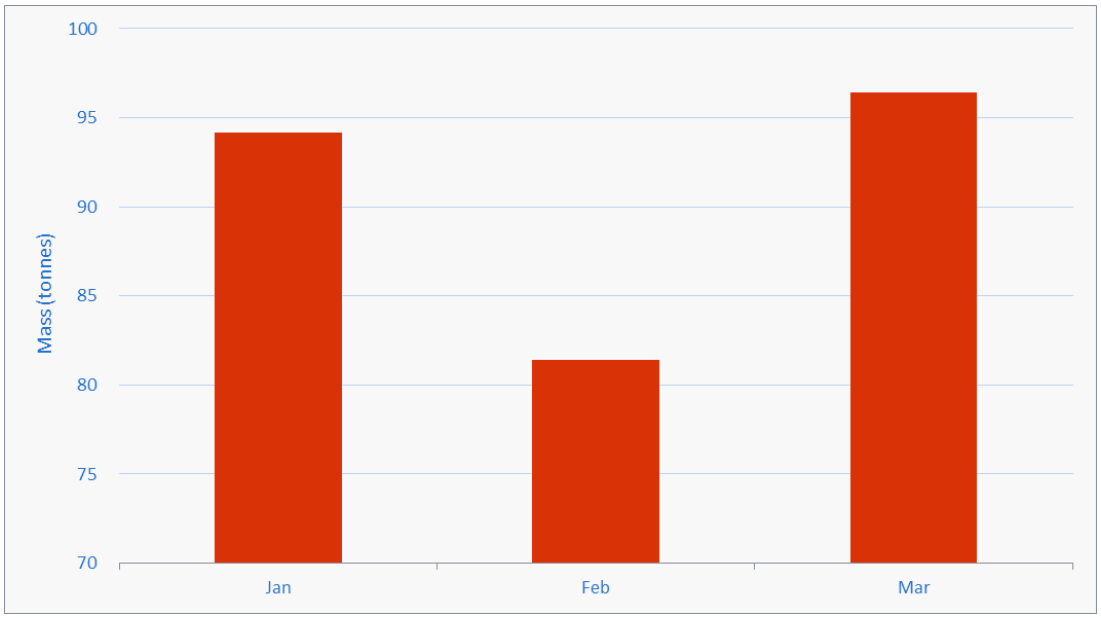

Fig 13. Port Douglas Wastewater Treatment Plant monthly bio-solids production 2019

Mossman Wastewater Treatment Plant

At Mossman Wastewater Treatment Plant, 56.4 tonnes of wet biosolids were produced during the reporting period and sent to farms for beneficial reuse. This amount of wet biosolids equates to 7.5 dry tonnes. The monthly bio-solids production trends can be seen in Figure 14.

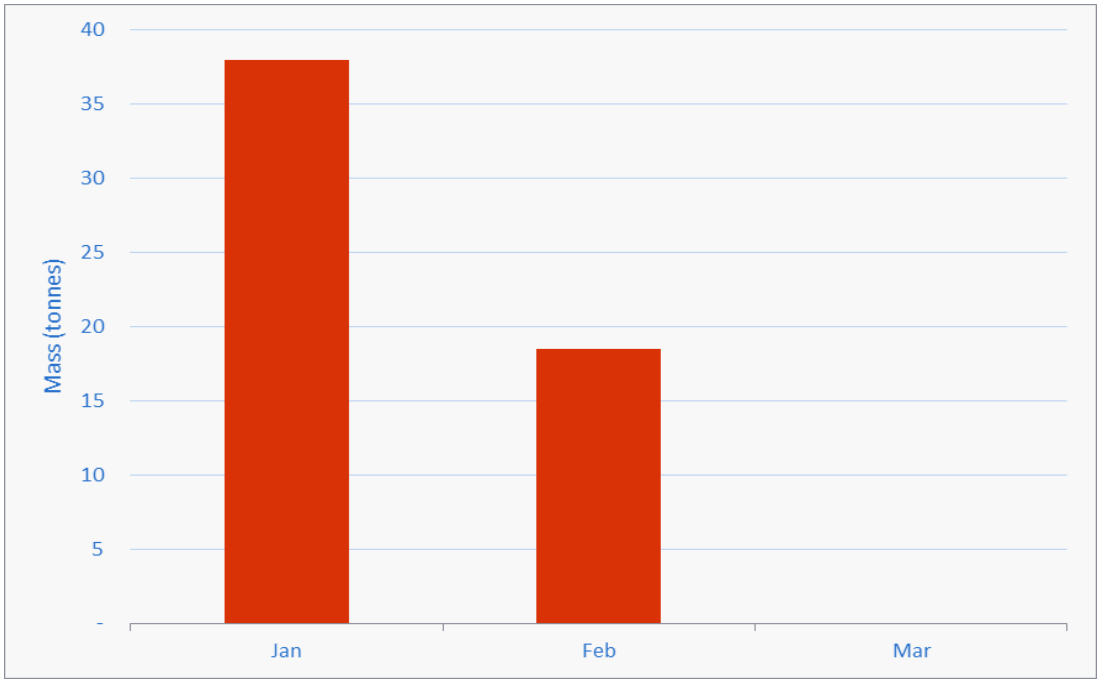

Fig 14. Mossman Wastewater Treatment Plant monthly bio-solids production 2019
***No Bio-solids removed in March 2019.**

Effluent quality and compliance

During the reporting period compliance sampling was conducted as per EPPR01790513 license conditions, see Table 9.

Table 9. Monitoring of contaminant releases to waters as per Environmental Authority EPPR01790513

Characteristics Determination	PDWWTP Frequency	MWWTP Frequency
5-day Biochemical Oxygen Demand	weekly	fortnightly
Suspended Solids	weekly	fortnightly
pH	weekly	weekly
Dissolved Oxygen	weekly	weekly
Ammonia Nitrogen	fortnightly	fortnightly
Total Nitrogen	fortnightly	fortnightly
Total Phosphorus as P	fortnightly	fortnightly
Oil and Grease	fortnightly	fortnightly
Faecal Coliforms (Organisms/100ml)	fortnightly	fortnightly
Free residual chlorine	-	fortnightly

Additionally more samples were taken from the treatment processes, bio-solids, receiving waters and bores. Samples were tested by a NATA accredited laboratory for physical, chemical and microbiological parameters. All parameters tested during the reporting period from the Port Douglas and Mossman wastewater treatment plants were compliant.

The process and compliance is monitored each day by in-house analyses of samples at the wastewater treatment plants. Process settings, effluent quality, flow rates, pump stations performance and maintenance aspects are monitored and controlled with SCADA Citect via an extensive Telemetry network.

Port Douglas Wastewater Treatment Plant

The results for final effluent key licence compliance parameters (Ammonia, Total Phosphorous, and Total Suspended Solids & BOD_5) are shown in Figure 15, 16, 17 & 18.

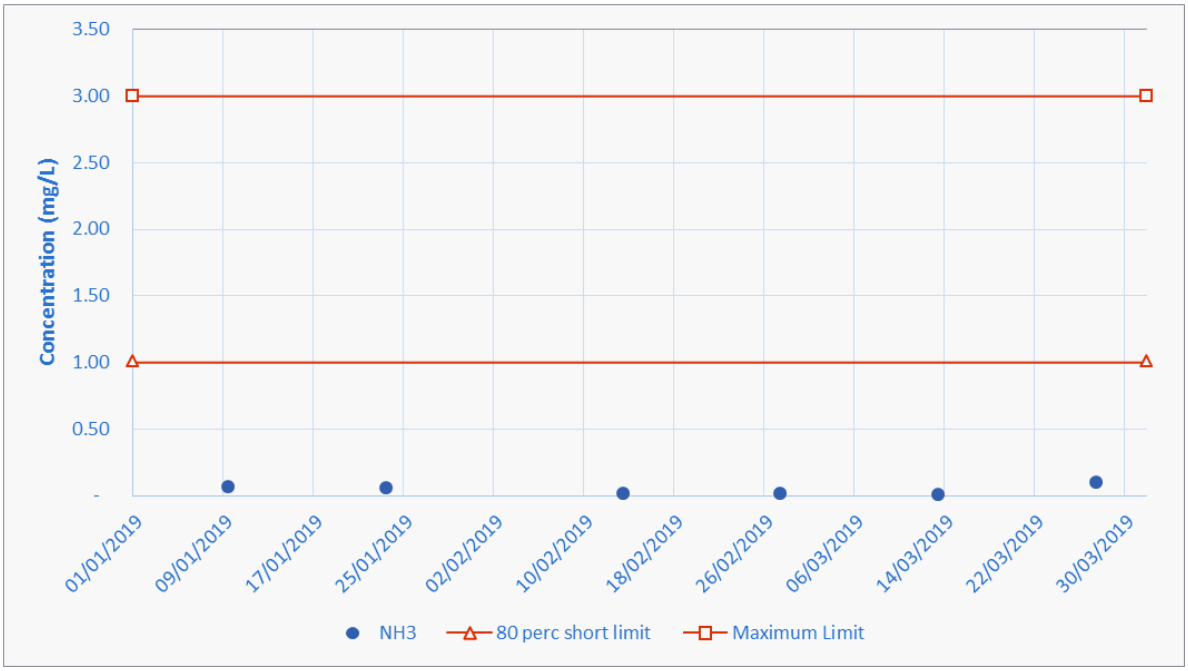

Fig 15. Port Douglas Wastewater Treatment Plant Final Effluent Test Results for Ammonia

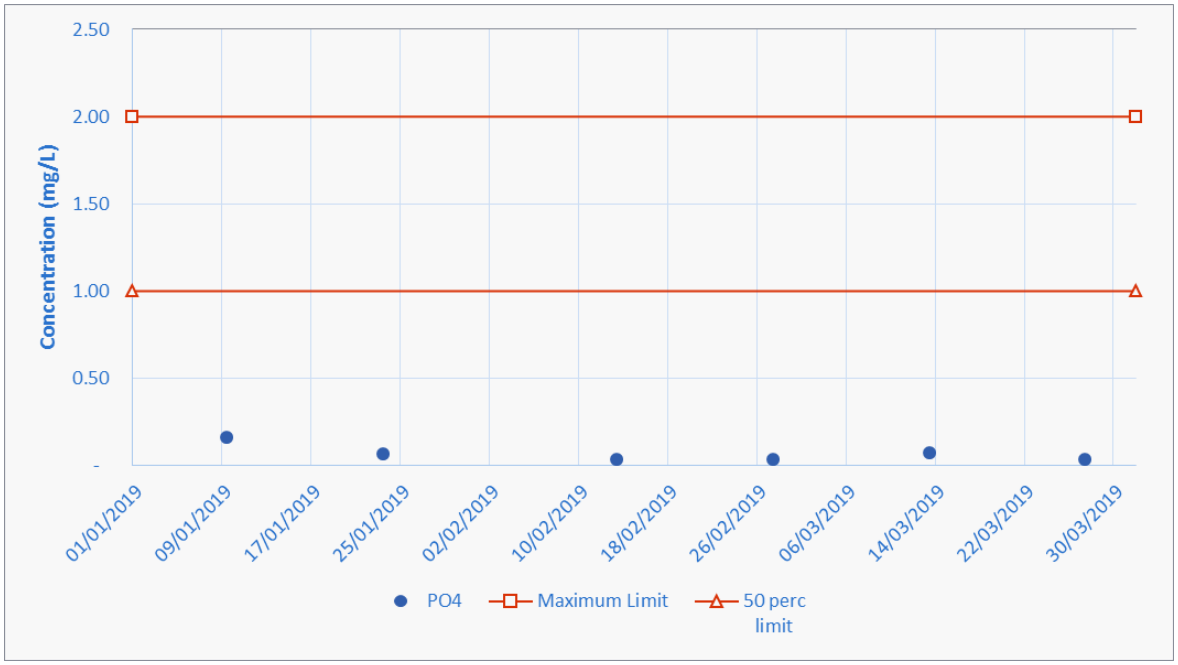

Fig 16. Port Douglas Wastewater Treatment Plant Final Effluent Test Results for Total Phosphorous

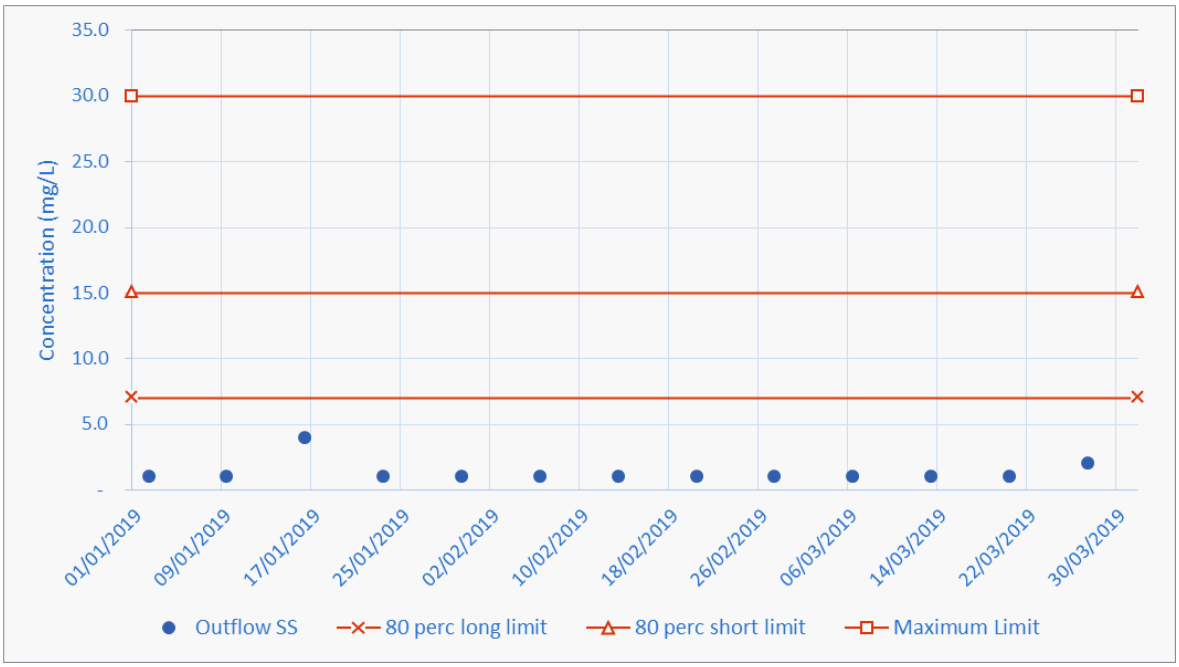

Fig 17. Port Douglas Wastewater Treatment Plant Final Effluent Test Results for Total Suspended Solids

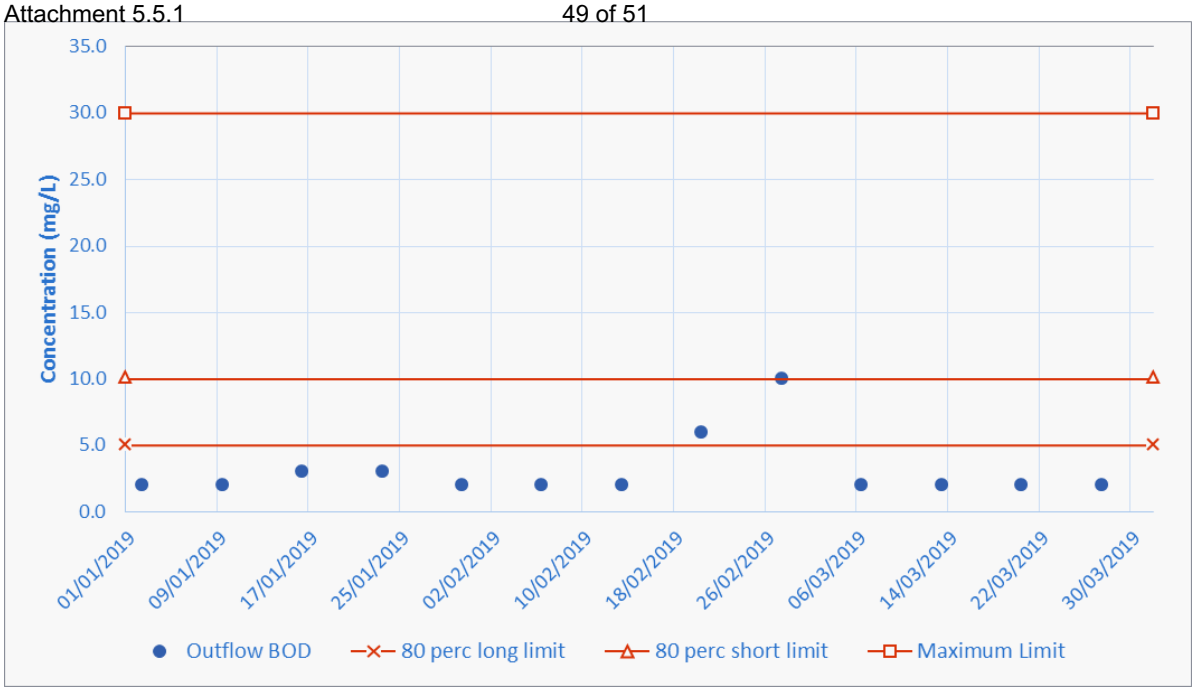

Fig. 18 Port Douglas Wastewater Treatment Plant Final Effluent Test Results for BOD_5 (Biochemical Oxygen Demand)

Mossman Wastewater Treatment Plant

The results for final effluent key licence compliance parameters (Ammonia, Total Phosphorous, Total Suspended Solids & BOD_5) are shown in Figures 19, 20, 21 & 22.

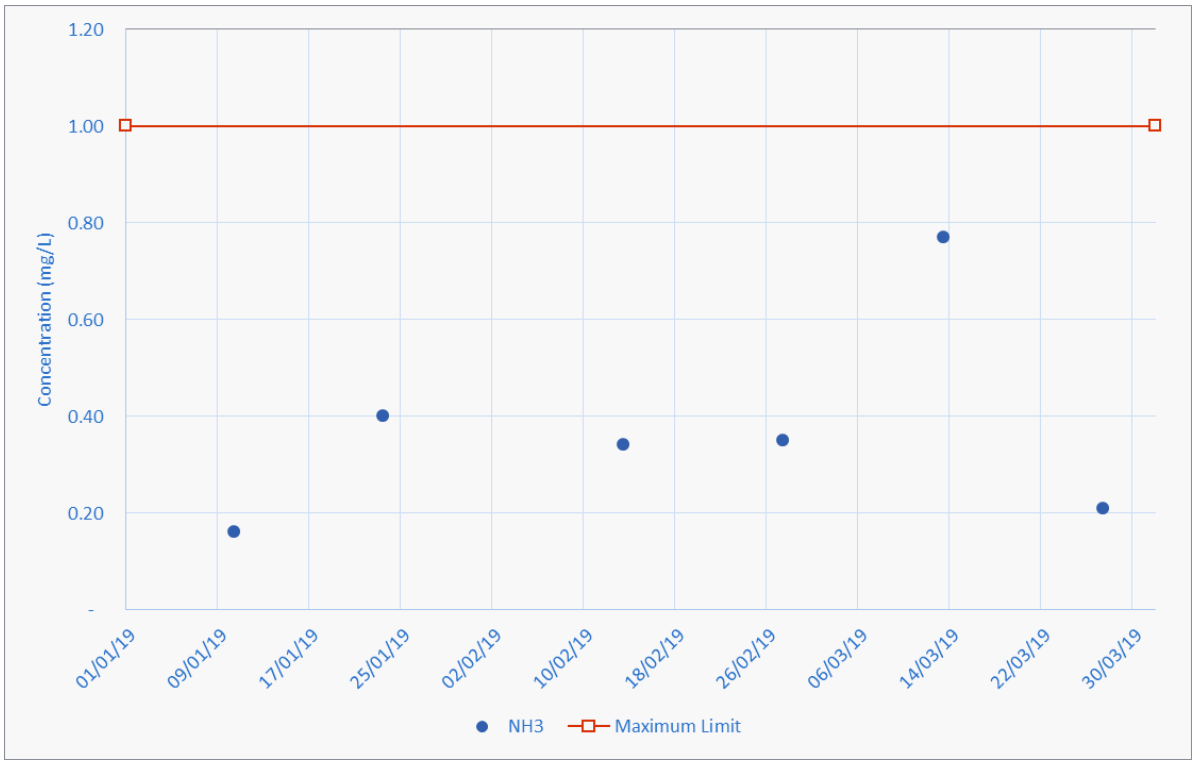

Fig. 19 Mossman Wastewater Treatment Plant Final Effluent Test Results for Ammonia

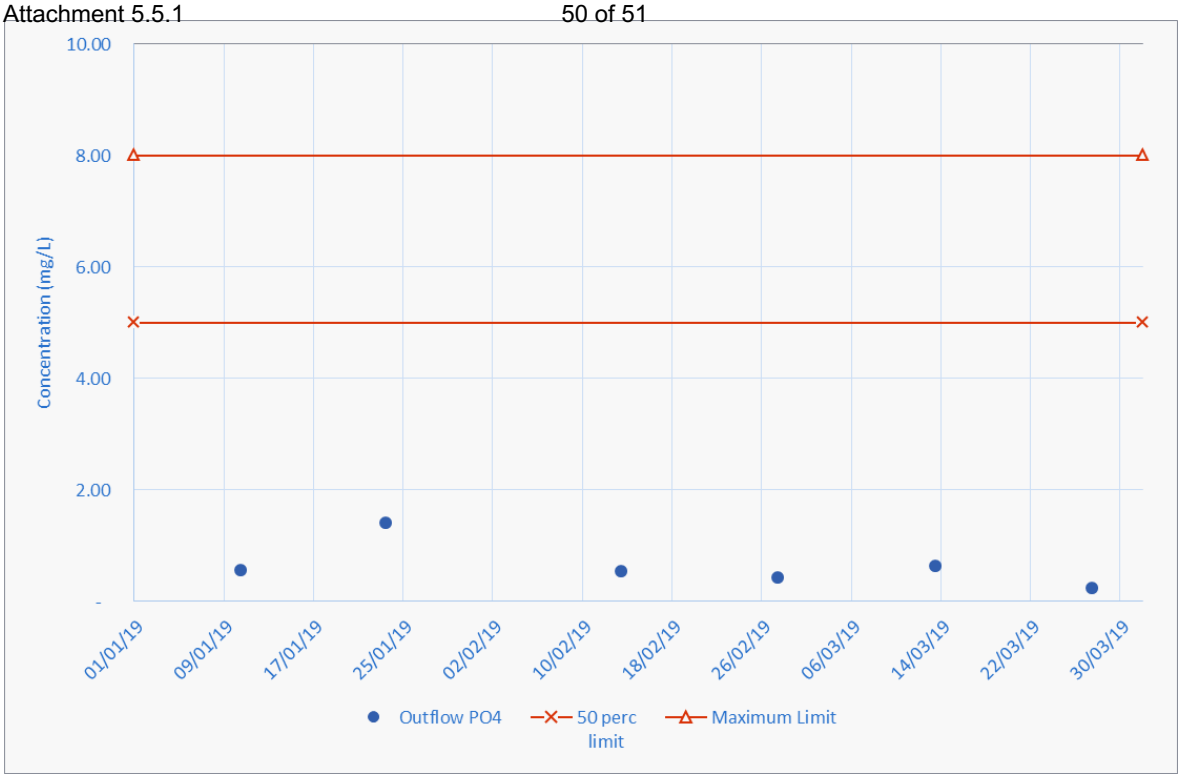

Fig. 20 Mossman WWTP Final Effluent Test Results for Total Phosphorous

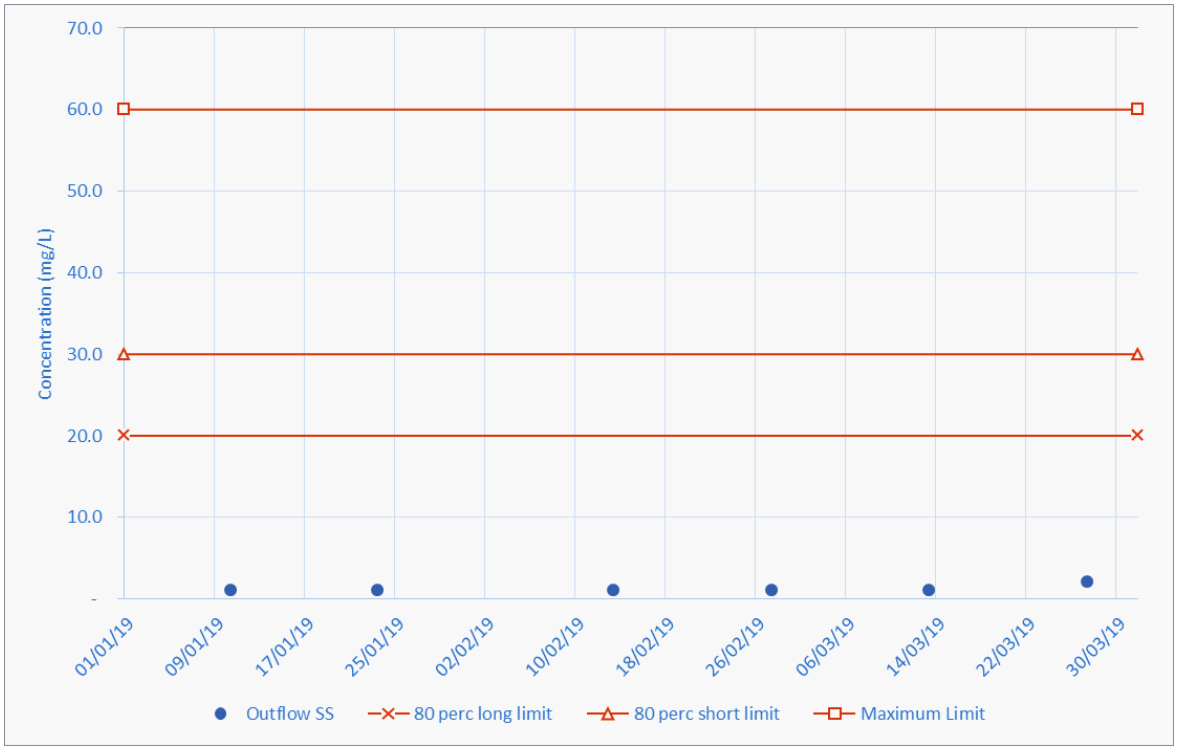

Fig. 21 Mossman WWTP Final Effluent Test Results for Total Suspended Solids

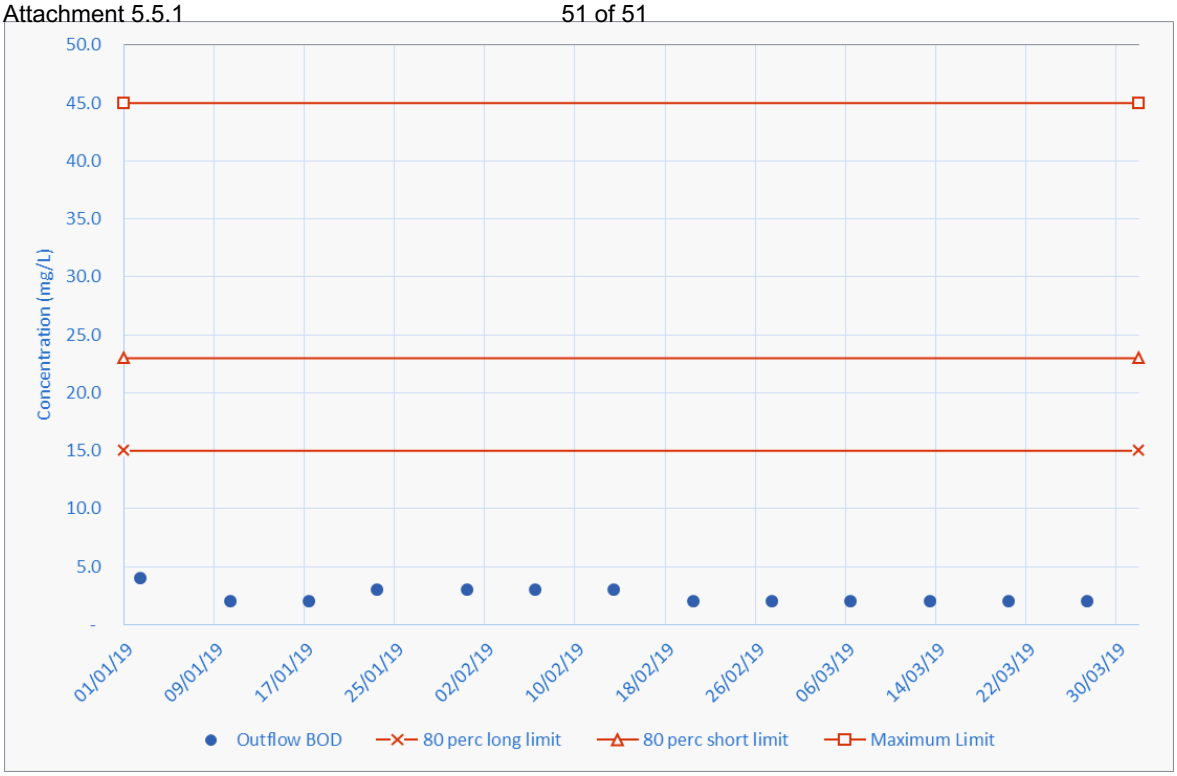

Fig. 22 Mossman Wastewater Treatment Plant Final Effluent Test Results for BOD_5 (Biochemical Oxygen Demand)