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MINING SERVICES TECHNOLOGY CENTRE

**GEORGE BOOTH DRIVE
KURRI KURRI N.S.W.**

SAMPLING ANALYSIS REPORT

30th September 2019

To

31st December 2019

**WATER TREATMENT PLANT
SEWAGE TREATMENT PLANT
PALMERS CREEK
Wastewater Infrastructure**

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1.0 PLANT OPERATION

1.1. Water Treatment Plant

The Water Treatment Plant (WTP) remains operational on a 24hour 7 day continuous basis. The Ultra violet (UV) disinfection system unit is in continuous operation and is performing to the required design criteria and water quality parameters necessary for a potable water supply system.

Inspection of the unit indicates the installed Ultra Violet treatment system Model 52H –XUV Serial number 23513011 UVX has been in operation in accordance to the manufacturer's recommendations.

All lamps fitted were found to be in operation at the time of inspection. Transmissivity of the UV rays is high and achieving required disinfection performance. Analysis results confirm performance with a zero faecal coliform count recorded from all post UV treatment system samples taken and analysed.

The UV disinfection system has undergone servicing and lamp replacement, with total hours at 7520.6 hrs and lamp hours 4257.3 hrs. General maintenance has been undertaken on the WTP system and there was no visual or physical evidence of any fault/s or system failures when inspected. Two new delivery supply pumps have been installed in compliance to the Orica Maintenance Program.

1.2. Sewage Treatment Plant

The Sewage Treatment Plant (STP) has been in continuous operation from commissioning and subject to various hydraulic and organic loadings. The biomass in the Rotating Biological Contactors (RBC) has a thin cover on all disc media in the first and second units. The STP is producing a high quality effluent with no evidence of pin point flocs, nitrified sludge, visible gross or suspended solids. The secondary clarifier effluent discharge from the V-Notch Weir outlet is of high quality.

The Sludge Return Ratio (SRR) as preset has not required alteration however with increased staff (EP Loading) may require adjustment should pollutant levels analysed increase.

Float level control switches were tested manually and all were found to be operational at the time of inspection. Alarm functions were tested and found to be operational at the time of inspection however the visual alarm unit has been disconnected pending repair and replacement of the alarm mounting stand that has rusted through the metal.

The RBC bearings were inspected and there was no visible indication of bearing problems, failure or misalignment. All bearings should be re-greased with an adequate covering of grease to maintain appropriate lubrication. Oil bath levels in both units were within required limits.

The Clarifiers were inspected along with the V-Notch Weir outlet from the secondary clarifier. The effluent quality was high with a Clarity Index reading of 100. The effluent pH levels remained in the neutral range at 6.8 – 7.0 range. There were pockets of nitrified bio mass in the discharge chamber of the 2nd clarifier that may be an indication of increased solids organic bio mass and denitrification of the sludge accumulated. An adjustment of the sludge return volume (quantity / flow rate /FM ratio) will be initiated if an increase of nitrified bio mass is observed and the next inspection.

There has been no treated effluent discharge to any environmental receiving systems. All effluent discharges are directed to on site irrigation & landscaping areas and/or the evapotranspiration area or held in storage in the 2 Effluent Retention Tanks at 65% capacity.

Electrical Control Panels were inspected and found to all operational with no indications of faults or damage. Isolating switchgear and remote control switches were inspected, tested and found to be operational at the time of inspection.

The Effluent Retention Tanks (ERT) were subject to scheduled maintenance and accumulated organic and foreign matter in tanks 1 & 2 removed. Inspection of the tanks confirmed all infrastructure condition and structural integrity satisfactory. Treated effluent held in the tanks at approximately 85% capacity. Weed growth in Tank 1 should be cleared prior to summer period to prevent weed inundation. A concept design and operation to achieve weed seed being washed down from wash bay has been submitted for consideration.

1.3 Research Laboratory [RL 1] Potable Water Treatment Plant

RL1 has an Ultra Violet (UV) treatment system augmented to the existing stormwater collection and storage tanks water supply system to provide a reliable potable quality disinfected water reticulated service to the RL1 complex.

The UV system has been completed and commissioned into operation , at the time of scheduled inspection access to RL1and the UV Treatment System was unable to be achieved and assumed operating . Visual inspection from the chain link fence confirmed Poly (plastic) tanks have been installed and are in good order

It is noted that no water meter was installed and therefore there is no current data collection on water quantity consumed or used at this location.

2.0 ANALYSIS

2.1. Water Treatment Plant

Analysis of potable water samples was carried out for the determination of faecal coliforms per 100ml sample.

Samples were taken pre UV system and at one of three locations post UV system. Pre UV sample was taken from the outlet valve prior to the UV lamps.

Post UV samples are taken alternately from the Maintenance Building Kitchen/ lunchroom and Reception Admin kitchenette . Clarity tests were also carried out to determine turbidity from dissolved and or suspended solids or particulates.

Samples were collected in Millipore Sampler Units and stored in a refrigerated capsule until return to laboratory. The Millipore Sampler Units were then placed in an incubator for a period of 24 hours and 48 hours at 30°C constant. A coliform count was conducted after each period to determine the water quality.

Meter reading last period	Meter reading this period	Water usage (KL /day)
3433742	43805217	Avg: 5.5

2.2 Sewage Treatment Plant (STP)

Analysis of sewage effluent was carried out for the determination of pollutant levels as per STP design standard criteria, Protection of Environment Operations Act and the New South Wales Conservation and Environment (Environment Protection Authority) Pollution Control Approval Licence applicable and held by Orica Explosives Technical Centre, George Booth Drive Kurri Kurri.

Pollutants listed and tested as follows;

- Biochemical Oxygen Demand
- Suspended Solids
- Total Nitrogen
- Total Phosphorous

pH
Ammonia
Faecal Coliform count at STP discharge outlet
Temperature
Oil and grease (C16-C18)
Clarity

Sample W1 was collected at the V-Notch Weir outlet of the secondary clarifier and W2 was collected from the outlet of the second retention storage tank to the evapotranspiration area.

2.3 Sample collection and transportation:

All samples collected were taken during plant operation in clean sealed plastic HDPE containers.

All samples collected were placed in a refrigerated unit at $<4^{\circ}\text{C}$ and transported to the laboratory for analysis.

2.4 Palmers Creek Sampling

Water samples were not collected from Palmers Creek catchment upstream of the evapotranspiration area of the STP, and downstream of the evapotranspiration area with nil flow conditions at the time of attempting sampling. There was no visible evidence of any waste materials, debris, plastics, refuse or rubbish associated to the Orica Technology Centre operations in the creek bed and tributaries when inspected.

2.5 Wastewater Infrastructure – Truck Wash Facility

The maintenance building and storage area includes heavy vehicle wash bay with all polluted waters subject to an oily water separator and filter that services the washing of trucks and equipment from various sites. The increased use and addition of grass seeds in the trucks wheel and tyres, cabin and general occurring equipment is resulting in an increase into the sewerage reticulation system that may, pending further investigation and analysis, lead to blockages or chokes within the STP. It is evident that the grass seed is foreign to the Orica Site and the surface of the Effluent Storage Tanks is substantial. Orica management has requested a concept design addressing the “seed” problem. This has been submitted with initial parameters and capacities of the oily water

separator and associated mechanical/electrical components taken into consideration with the emphasis on simplicity using a “sox” filter.

The facility was inspected in operation and to achieve the end objective it is recommended to retain the Oily Water Separation Unit and install ” Silt Soxs” on the outlet of the discharge pipe at Retention Tank 1 & 2. Service life of the silt sox is proportionate to usage and deemed to be a operational cost. The used “waste” material can either be disposed on site (to be confirmed) or disposed off site via contractor. This option is the most cost effective process and requires minimal manual handling.

3.0 ANALYSIS TEST METHODS

All samples collected were tested in accordance to the Standard Methods of Examinations of Water and Wastewater 21st Edition APHA, AWWA, WPCF or to a method as approved and accredited by the National Association of Testing Authorities (N.A.T.A.) . The Sydney Analytical Laboratory is a NATA Accredited Laboratory for compliance with ISO/IEC 17025.

4.0. ANALYSIS RESULTS

4.1 . Potable Water Supply systems – WTP Plant & RL1

Pre Ultra Violet Unit WTP

Sample 1 :	Faecal coliform per 100ml	40	count 100 ml
	Clarity	100	Clarity Index
Sample 2 :	Faecal coliform per 100ml	32	count / 100ml
	Clarity	100	Clarity Index

Post Ultra Violet Units

Sample 1 : Reception Kitchenette

Faecal coliform per 100ml zero count / 100ml
 Clarity 100 Clarity Index

Sample 2 : Maintenance Building Kitchen

Faecal coliform per 100ml zero count / 100ml
 Clarity 100 Clarity Index

Potable Water Supply System : Results Summary Table

Sample Location	Analysis Test	Result	Standard / World Best Practice
Sample 1 Pre UV	Faecal coliform count per 100ml	40	Not applicable
	Clarity Index	100	80 - 100
Sample 2 Pre UV	Faecal coliform count per 100ml	32	Not applicable
	Clarity Index	100	80 - 100
Ultra Violet Treated Water Samples			
WTP Wash Basin	Faecal coliform count per 100ml		ZERO-nil count
	Clarity Index		100
Maintenance Kitchen	Faecal coliform count per 100ml	ZERO – nil count	ZERO–nil count
	Clarity Index	100	100
Administration Building Kitchen	Faecal coliform count per 100ml		
	Clarity Index		100
RL 1	Faecal coliform count per 100ml	nil access	ZERO-nil count
	Clarity Index		

4.2. Sewage Treatment Plant – Outlet V Notch Weir – Secondary Clarifier

Biochemical Oxygen Demand	925 mg/l
Suspended Solids	2 mg/l
Ammonia	99 mg/l
Total nitrogen	100 mg/l
Total phosphorous	15 mg/l
pH	6.8
Temperature	18° C
Dissolved Oxygen	1.3. mg/l
Faecal coliform count	>200 count/100ml
Clarity	100 Clarity Index

Sewage Treatment Plant : Effluent Analysis Results Summary Table

Test Item	Result Concentration	Design Standard – discharge to evapotranspiration area	POEO Act – discharge to receiving waters
Biochemical Oxygen Demand	12 mg/l	30mg/l	Nil discharge
Suspended Solids	2 mg/l	30mg/l	Nil discharge
Ammonia	99 mg/l	30mg/l	Nil discharge
Total nitrogen	100 mg/l	30mg/l	Nil discharge
Total phosphorous	19 mg/l	30mg/l	Nil discharge
pH	6.8	6.8 to 7.2	Nil discharge
Temperature	18	12-25 cel	Nil discharge
Dissolved oxygen	1.2 mg/l	1.25 to 2.25 mg/l	Nil discharge
Faecal coliform	>200 count	<300 count	Nil discharge
Clarity Index	100	80-100	Nil discharge

Effluent Volume discharge/day to evapotranspiration & landscape areas	Effluent volume discharge per day to	Design Standard – discharge to evapotranspiration area	EPA Licence Limit

or effluent storage tanks #1 & #2	receiving waters		
4500-7500 L/day (avg)	NIL DISCHARGE	18000 litres per day	16800 litres day

NOTE:

Due to the intense dry weather conditions no flow of any point source could be collected. The above indications are that of a very poor quality sample amalgamated with washdown waters, tertiary effluent and moisture from the evapo area.

I is considered the results posted do not represent the true conditions under which the facility operates

4.3. Palmers Creek

Due to intense temperatures and dry weather Palmers Creek catchment within the boundaries of the location resulted in no flow dry conditions.. Samples were not collected from locations – PC1 & 2, 3 & 4 & thru to PC5 & 6 sampling points, as these locations were dry. In accordance to the directive of the EPA, a revised pollutant sample analysis regime has been implemented. The pollutants analysis regime is :

- Total Dissolved Solids
- Suspended Solids
- Total Nitrogen [Kjeldahl]
- Ammonia NH4
- Nitrite NO2
- Nitrate NO3

Although not stipulated by the EPA, sampling and analysis for pH was conducted at all sample points 1 & 2 , 3 & 5 & 6 of the tributary of Palmers Creek within the Orica property.

The water quality sampling & testing in the portion of Palmers Creek to which potential impacts may occur from the Orica operations is subject to significant variations due to weather conditions and flow rates within the Palmers Creek actual and catchment areas, upstream and downstream of the STP. Over many years variations have been observed where substantial lengthy dry weather conditions creates Nil Flows or Trickle Flow rates, through to intense wet weather conditions and high flow rates and stormwater runoff from within the catchment area. Accordingly, variations as to water quality can be expected and should be considered in context of the analysis results.

5.0. ODOUR

At the time of inspection there were no noticeable odours uncharacteristic to an aerated sewage treatment process plant. There were no odours detected at the evapotranspiration area or the effluent retention tanks at the time of inspection.

There were no odours detected from the potable water storage tank or post UV outlets at the time of inspection and sampling. There was no odour detected from any potable water samples taken.

6.0. RECOMMENDATIONS

The following recommendations are made;

- Regular inspection of Flow Meter Chamber and adjacent manhole chamber in reticulation system for blockages
- Regular inspection of Tarada submersible sludge return pump re electrical failure/seal failure
- RE instate earthen bund wall along north boundary of evapotranspiration area and reposition stop plate at pipe joint inside area
- Feasibility assessment and civil work component for Silt Sox process
- Silt Soxes fitted at STP Retention tank outlets from truck wash
- Next sampling period due March 2020