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ORICA (Aust.) Limited

MINING SERVICES TECHNOLOGY CENTRE

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

SAMPLING ANALYSIS REPORT

**1st January 2020 to
30th March 2020**

**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 78489.5 hrs and lamp hours 8485.7 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. The back up pump was tested and found to be operational.

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 45% 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 and approved. Commissioning is scheduled for the later part of 2020.

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 RL1 and 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)
43433742	44111550	7.53

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 collected from Palmers Creek catchment upstream of the evapotranspiration area of the STP, and downstream of the evapotranspiration area with nil/ minimal flow conditions at the time of 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 where inspected.

Due to wet (heavy rain intermittent) weather sampling was undertaken flow and ponded sections of the catchment tributaries. upstream and downstream as indicated in the results charts.

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 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	28	count	100 ml
	Clarity	100	Clarity Index	
Sample 2 :	Faecal coliform per 100ml	69	count / 100ml	
	Clarity	100	Clarity Index	

Post Ultra Violet Units

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

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

Sample Location	Analysis Test	Result	Standard / World Best Practice
Sample 1 Pre UV	Faecal coliform count per 100ml	28	Not applicable
	Clarity Index	100	80 - 100
Sample 2 Pre UV	Faecal coliform count per 100ml	69	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	18 mg/l
Suspended Solids	18 mg/l
Ammonia	75 mg/l
Total nitrogen	82 mg/l
Total phosphorous	28 mg/l
Grease (soxhlet)	9 mg/l
pH	6.8 – 7.0
Temperature	19° C
Dissolved Oxygen	1.25. 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	18 mg/l	30mg/l	Nil discharge
Suspended Solids	18 mg/l	30mg/l	Nil discharge
Ammonia	75 mg/l	30mg/l	Nil discharge
Total nitrogen	82 mg/l	30mg/l	Nil discharge
Total phosphorous	28 mg/l	30mg/l	Nil discharge
Grease (soxhlet)	<2	20mg/l	Nil discharge
pH	9 mg/l		
	6.8	6.8 to 7.0	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 or effluent storage tanks #1 & #2	Effluent volume discharge per day to receiving waters	Design Standard – discharge to evapotranspiration area	EPA Licence Limit
7500 L/day (avg)	NIL DISCHARGE	18000 litres per day	16800 litres day

4.3. Palmers Creek

Due to wet weather Palmers Creek catchment within the boundaries of the location resulted in ponding and minor flow conditions.. Samples were collected from locations – PC1 & 2, 3 & 4 & thru to PC5 & 6 sampling points, as these locations were exhibiting visible flow and small ponding to allow samples to be collection for analysis purposes. Each sample site location # 1 to 6 was deemed suitable due to previous 48 hour rainfall at the Tech Centre site.

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.

4.3.1 Palmers Creek Water Quality Result Summary Table :

Upstream Samples	Total Dissolved Solids	Suspended Solids	Total Nitrogen	Ammonia NH4	Nitrate NO3	Nitrite NO2	pH
Sample 1	65 mg/l	28 mg/l	1.1 mg/l	0.1 mg/l	<0.1 mg/l	<0.1 mg/l	6.8
Sample 2	N/A	N/A	N/A	N/A	N/A	N/A	
Downstream Samples							
Sample 3	71 mg/l	2 mg/l	0.8 mg/l	<0.1 mg/l	<0.1 mg/l	<0.1 mg/l	6.7
Sample 4	83 mg/l	<2 mg/l	0.6 mg/l	<0.1 mg/l	0.1 mg/l	< 0.1 g/l	6.7
Sample 5	91 mg/l	3 mg/l	0.8 mg/l	< 0. mg/l	<0.1 mg/l	< 0.1 mg/l	6.7
Sample 6	110 mg/l	3 mg/l	0.9 mg/l	< 0.1 mg/l	<0.1 mg/l	<0.1 mg/l	6.7

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
- Next sampling period due June 2020

SYDNEY ANALYTICAL LABORATORIES

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NATA No: 1884

ANALYTICAL REPORT for:

POLLUTION SOLUTIONS PTY LTD

PO BOX 108
MIRANDA 2228

ATTN: ROBERT NEILL

JOB NO: SAL27532B
CLIENT ORDER: ORICA
DATE RECEIVED: 18/03/20
DATE COMPLETED: 03/04/20
TYPE OF SAMPLES: WATER
NO OF SAMPLES: 1



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Issued on 03/04/20
Lance Smith
(Chief Chemist)

SYDNEY ANALYTICAL LABORATORIES

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ANALYTICAL REPORT

JOB NO: SAL27532B
CLIENT ORDER: ORICA

METHODS OF PREPARATION AND ANALYSIS

The tests contained in this report have been carried out on the samples as received by the laboratory, in accordance with APHA Standard Methods of Water and Wastewater 23rd Edition, or other approved methods listed below:

5210B	Biochemical Oxygen Demand
2540D	Suspended Solids
5520D	Total Grease (Soxhlet)
4500G	Ammonia (Total)
4500B	Total Kjeldahl Nitrogen
4500BF	Total Phosphorus

SYDNEY ANALYTICAL LABORATORIES

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ANALYTICAL REPORT FOR:

POLLUTION SOLUTIONS PTY LTD

PO BOX 108
MIRANDA 2228

ATTN: ROBERT NEILL

JOB NO: SAL27532

CLIENT ORDER: ORICA

DATE RECEIVED: 18/03/20

DATE COMPLETED: 03/04/20

TYPE OF SAMPLES: WATERS

NO OF SAMPLES: 5



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Issued on 03/04/20
Lance Smith
(Chief Chemist)

SYDNEY ANALYTICAL LABORATORIES

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ANALYTICAL REPORT

JOB NO: SAL27532
CLIENT ORDER: ORICA

METHODS OF PREPARATION AND ANALYSIS

The tests contained in this report have been carried out on the samples as received by the laboratory, in accordance with APHA Standard Methods of Water and Wastewater 23rd Edition, or other approved methods listed below:

2540C	Total Dissolved Solids
4500F	Nitrate NO3-N
4500B	Nitrite NO2-N
4500G	Ammonia (Total)
4500B	Total Kjeldahl Nitrogen
2540D	Suspended Solids

SYDNEY ANALYTICAL LABORATORIES

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ANALYTICAL REPORT

JOB NO: SAL27532
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DATE OF COLLECTION SAMPLES	18/03/20 PC1	18/03/20 PC3	18/03/20 PC4	18/03/20 PC5
Total Dissolved Solids	65	71	83	91
Nitrate NO3-N	<0.1	<0.1	<0.1	<0.1
Nitrite NO2-N	0.10	<0.1	<0.1	<0.1
Ammonia (Total)	0.1	<0.1	<0.1	<0.1
Total Kjeldahl Nitrogen	1.1	0.8	0.6	1.0
Suspended Solids	28	2	<2	3

mg/L
mg/L
mg/L
mg/L
mg/L
mg/L

SYDNEY ANALYTICAL LABORATORIES

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ANALYTICAL REPORT

JOB NO: SAL27532
CLIENT ORDER: ORICA

DATE OF COLLECTION
SAMPLES

18/03/20
PC6

Total Dissolved Solids	mg/L	110
Nitrate NO3-N	mg/L	<0.1
Nitrite NO2-N	mg/L	<0.1
Ammonia (Total)	mg/L	<0.1
Total Kjeldahl Nitrogen	mg/L	0.8
Suspended Solids	mg/L	3

