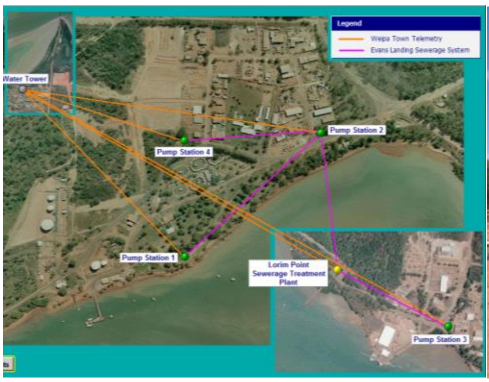
Rio Tinto Weipa

Lorim Point Sewage Treatment Plant

Site Based Management Plan

May 2017




MANAGEMENT PLAN STATUS

This Management Plan covers the Lorim Point Sewage Treatment Plant. The manual must be kept current and should be revised regularly, consistent with continual improvement and particularly after significant incidents.

Distribution

Copy Number	Position	Location
1	Water & Sewage Crew Leader	Weipa
2	Civil Superintendent	Weipa
3	Environmental Operations Specialist	Weipa
4	HSE Manager	Weipa

Revision Status

Revision No	Date of Issue	Valid to Date	Revision Description
1			
2	29/05/2017	29/05/2018	Updated to include new plant infrastructure, and submission for TEP close out

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GLOSSARY

Term	Meaning
Aerobic	The state where excess dissolved oxygen is available in the wastewater (when DO is above 0.5mg/L). Aerobic bacteria perform carbonaceous oxidation and nitrification.
Ammonia	A pollutant in wastewater derived mainly from urine. Ammonia has an oxygen demand and is toxic to marine life at high levels.
Anaerobic	The state where limited oxygen or nitrate is present in the wastewater. Anaerobic bacteria consume carbonaceous material to produce more cell mass, methane and energy (heat). Fermentation occurs during anaerobic conditions. Anaerobic conditions should be avoided at Lorim Point WTP.
Anoxic	The state when there is limited dissolved oxygen in the wastewater but nitrate (NO_3) is present. Usually anoxic conditions occur between a DO about 0.1 to 0.5mg/L. Denitrification occurs during anoxic conditions.
Biomass	The combination of microorganisms (bacteria, fungi, protozoa, rotifers) that absorb pollutants in wastewater.
Bioreactor	The main process tank at Lorim Point that contains the aerators
Biosolids	Also known as Waste Activated Sludge (WAS). The biodegradable sludge collected in the geobags that can be utilised for soil conditioning and mine rehabilitation
BOD	Biochemical Oxygen Demand. The amount of organic material in the water that can be degraded by microorganisms. Mainly carbon compounds in the wastewater that, when utilised by bacteria, require the bacteria to take oxygen out of the water in order to use the BOD as an energy source.
Brush Aerator	Cause turbulence in the bioreactor water to allow oxygen to mix with the water.
Bulking	Used to describe biomass (or mixed liquor) that does not want to settle. Usually caused by filamentous bacteria present in high numbers in the biomass.
Carbonaceous Oxidation	The process in which bacteria consume carbonaceous material (or BOD) and oxygen and convert it to more bacterial mass, (growth) or carbon dioxide, water and heat energy (respiration).
Carousel	See Oxidation Ditch.
COD	Chemical Oxygen Demand. The amount of organic content in water that can be degraded by microorganisms and oxidised by chemical reaction, i.e. the total organic content of the water.
Denitrification	The process in which bacteria consume carbonaceous material (or BOD) and nitrate (NO_2) and convert it to more bacterial mass, nitrogen gas (N_2), oxygen (O_2) and heat energy and release alkalinity. The bacteria must use nitrate as the oxygen source as there is limited dissolved oxygen present (anoxic conditions).

DEHP	Queensland Department of Environment and Heritage Protection. The authority which issues the licence for the Lorim Point WTP effluent discharge.
Dissolved Oxygen	The measure of dissolved oxygen (O_2) in the water at Lorim Point is done using the handheld sonde. The ideal DO range is 1.5 - 3.0 when the aeration is running and decaying to 0.2 - 0.5 when the aeration is off.
Endogenous Respiration	This is where the F:M is so low that the biology has no food to consume except for the biomass itself.
EPA	Queensland Environmental Protection Agency - Now called the Department of Environment and Heritage Protection (also previously known as DERM).
F:M	Food to Biomass ratio calculated by (Influent BOD x Daily Flow) / (MLSS x Tank Vol x VSS%). The food to biomass ratio determines the amount of food that the mixed liquor has. The plant should run at an F:M between 0.1 and 0.3 with an ideal ratio of 0.15.
Geobag	The semi-permeable bags that are used to capture and dewater the biosolids.
Mixed Liquor	See Biomass
MLSS	The measure of the amount of biomass in the plant. The MLSS is dependent on the BOD loading and, to a small extent, the sludge wasting rate. The plant is designed to handle a BOD up to 4,000mg/L.
Nitrate	NO_3 - Nitrate is a nutrient that supports plant and algae growth. It is the oxygen source when DO is not present and the system is anoxic. If there is no DO or nitrate the system is anaerobic. Nitrate is formed by the oxidation of ammonia to nitrite then nitrate during the aeration cycle and reduce during the anoxic cycle. Nitrate presence in the effluent at the same level as influent ammonia means that the plant is fully aerobic and not going anoxic. If there were no nitrate in the effluent then the plant would probably be running anaerobic.
Nitrite	NO_2 - Ammonia is oxidised to nitrite. Nitrite is unstable and is readily oxidised to nitrate (NO_3).
Nitrification	The process in which ammonia, oxygen and alkalinity is utilised by microorganisms and converted to nitrite and nitrate.
Oxidation Ditch	The technology used at Lorim Point. An oxidation ditch is an oval shaped bioreactor which is aerated by a brush surface aerator.
Pasveer Ditch	See Oxidation Ditch.
Pathogen	A microorganism which has the ability to cause disease such as diptheria, cholera and typhoid. Commonly known as a germ, pathogens are common in raw sewage and precautions such as maintaining proper hygiene and having inoculations for Hepatitis A and B, Tetanus, Polio and Diptheria.
pH	The level of acidity or alkalinity of a solution. A pH of 7.0 is neutral. A pH lower than 7.0 is termed acidic and a pH above 7.0 is alkaline.

Phosphorus	A nutrient that, like nitrate, supports plant and algae growth. Sourced mainly from detergents and other cleaning products.
Pin Floc	Small flocs of microorganisms that, due to their size, do not readily settle in the wastewater and carry out into the effluent. Usually caused by over-aeration, low MLSS, low F:M or long sludge age. Pin flow can cause effluent TSS compliance issues.
Sludge	See Biosolids.
Sludge Age	The age of the sludge calculated by the formula Sludge age = volume of tank / volume of wasting per day. A short sludge age causes more WAS to be generated but requires less oxygen.
Sludge Thickener	The inverted pyramid-shaped tank used to thicken the WAS prior to pumping to the geobags. The sludge thickener should be emptied when excess biosolids are overflowing back to the bioreactor.
Sludge Volume Index	The measure of the settleability of the biomass. Calculated by the formula - SVI = settled volume of sludge in 1,000mL sample / MLSS. This indicates to some degree the extent of filaments in the sludge. A SVI of over 150mL/g indicates poor settling mixed liquor which indicates a process upset.
Supernatant	The clear layer of water after mixed liquor is settled. The effluent from the plant during the decant is supernatant as is the overflow from the sludge thickener.
TKN	Total Kjeldahl Nitrogen is the sum of organic nitrogen; ammonia (NH_3) and ammonium (NH_4^+).
Total Nitrogen	The sum of TKN and nitrite(NO_2) and nitrate (NO_3).
TSS	Total Suspended Solids - The amount of solids particles that remain in suspension in the water. Also called non-filterable material. The TSS limit for the Lorim Point WWTP effluent is 30mg/L. TSS will mainly be affected by the presence of biomass in the weir overflow during the decant phase. The measure of biology in the bioreactor is also TSS but is commonly termed MLSS.
VSS %	Volatile Suspended Solids - This is the measure of biomass in the MLSS as a percentage. Typical VSS is around 80% microbial mass and 20% inorganic material.
WAS	See Biosolids

1 INTRODUCTION

The Lorim Point Sewage Treatment Plant (LRP STP) is owned and operated by Rio Tinto Weipa (RTW) servicing the Evans Landing and Lorim Point areas of the Weipa sewage catchment. The STP was built in the late 70s/early 80s and historically has been operated primarily for the removal of carbonaceous material, in particular BOD and suspended solids. In recent years, increasingly stringent licence standards have resulted in the installation of additional equipment such as an inlet filter screen, secondary filtration, and a Membrane Filtration System (MBR) plant to improve effluent quality.

The Plant is located on the Embley River, where effluent is discharged to the river via a submerged pipe to the south-west of the site. The plant is located on Ports Corporation operated land.

1.1 Site Management Structure

The following table lists the individuals having responsibilities for operation, maintenance, surveillance and/or emergency preparedness and response for the facility, including external advisors and service providers.

Role	Responsibility	Contact Details
General Manager	Statutory	Daniel Van Der Westhuizen
Health Safety and Environment Manager	Overall direction, planning and safety	Melissa Winks
Environmental Operations Specialist	Management, training, compliance, reporting, and safety	Tim Ryan
Water Treatment Crew Leader	Management, training and reporting	Phil Rye

Table 1: Designated Personnel for Operation, Maintenance, Surveillance and Emergency Response (OMSE)

1.2 Licence Requirements

The STP currently operates under Environmental Permit Number EPPR03383115 which authorises ERA 14(b) Sewage Treatment Plant (Lorim Point) under the Environmental Protection Act 1994 (EP Act). In August 2011, Rio Tinto Alcan Weipa (RTAW) transitioned to an Environmental Authority (EA) under the EP Act, which process consolidated a number of licences that formerly regulated activities carried out on Mining Lease 7024. A transitional Environmental authority was issued to RT Weipa in 2015, to assist with the transition to the new environmental conditions, specifically Faecal Coliforms.

Part of the Lorim Point STP is situated outside the boundaries of ML7024, on Lots 14 and 15 of SP116851, and is therefore not regulated by the EA. Lots 14 and 15 of SP116851 are leased by North Queensland Bulk Ports Corporation (NQBP) from the State under the Land Act 1994. Both Lots 14 and 15 are strategic port land under the Transport Infrastructure Act 1994. In September 2013, RTW obtained a development application from NQBP under the Sustainable Planning Act 2009 (NQBP Reference PM/008/00274) which is a permit for carrying out an environmentally relevant activity associated with the off-lease component of the STP. The development application also includes conditions from DEHP which must be met for continued operations of the facility.

In 2013 a bypass clause was written into the DEHP licence to allow influent flows larger than 3 times the Average Dry Weather Flow (ADWF) to bypass the plant once screened.

RTW are seeking to transition to a single EA that encompasses the entire facility in the future. The current licence standards that the Lorim Point STP must adhere to are shown in Table 2 below.

Parameter	**Units**	**Value**	**Type**
pH value	#	6.0 – 8.0	Range
Temperature	% increase	<2.0	-
Suspended Solids	mg/L	<30	80th Percentile
BOD_5	mg/L	<20	80th Percentile
Dissolved Oxygen	mg/L	>2.0	Minimum
Ammonia as N	mg/L	<3.0	Maximum
Free chlorine residual	mg/L	<0.55	Maximum
Faecal Coliforms	Orgs/100mL	<1000	Median

Table 2: Current Licence Standards

1.3 Sewage Catchment

The STP's catchment mainly consists of the Evans Landing Industrial Area (including Single Persons Quarters and Evans Landing Wharf), RTAW Lorim Point and Shiploader Areas, and Humbug Wharf. Figure 1 below depicts these areas in relation to the STP. Most loading in the catchment is during the day when the administration building and industrial area are occupied. At night, the catchment only caters for a few on night shift and the loading would be very low.

Figure 1: Lorim Point Sewage Treatment Plant Service Area

1.4 Influent Flows

The plant receives a median flow of 63m^3/day which compares to a nominal design capacity of 190m^3/day suggesting that the plant is operating at about 33% of its hydraulic capacity.

The maximum daily flow recorded since January 2010 is 911m^3/day, indicating a very high peak wet weather flow (PWWF) factor of at least 14. This flow however is unusual, with the 90th percentile flow being about 133m^3/day (~2.1 ADWF). A stormwater bypass was installed in June 2015 which allows flows 3 ADWF or greater to bypass the plant to minimise the potential of the discharge weir overflowing prior to the decant beginning.

Current Equivalent Person (EP) based on guideline calculations is as follows:

Parameter	Average	EP* Calculation
Flow (dry weather)	65kL/d	325 persons
Phosphorous	300g	120 persons

Table 3: Equivalent Person Calculations

The STP has a design biological capacity to treat up to a population equivalent of up to 600 people, based on the bioreactor size and the aeration equipment installed. It is unlikely that the plant will ever reach biological capacity unless significant development occurs in the catchment.

1.5 Receiving Environment

Effluent is discharged to the Embley River via a submerged outfall channel to the south-west of the site. Discharge is cyclical with a discharge event lasting about 30 minutes. The outfall is about 25 meters from the bank at a depth of 2 to 3meters below the low water datum. The Embley River is a major shipping harbour and channel which is subject to annual dredging campaigns by North Queensland Bulk Ports Authority (NQBP).

The Embley River is a tide dominated estuary and is similar to other rivers that flow to Albatross Bay, such as the Mission River and Pine River which experience both semi-diurnal (2 tides/day) to diurnal (1tide/day) tides. These rivers are considered to be relatively shallow and are subject to increased flow due to the wet season. Albatross bay experiences high levels of turbidity naturally due to the local wind and swell, similar to other river systems in the Gulf of Carpentaria. The receiving marine environment habitats in the Weipa surrounds include benthic communities, mangroves, rocky foreshore habitats, and seagrass meadows.

The Embley River has no threated ecological communities as recorded in the EPBC Act database; however there are a number of threatened and migratory species in the region and species of ecological significance. These include turtles (Flatback, Hawksbill, Olive Ridley, Loggerhead, and Green), and crocodiles.

There are a range of environmental values applicable to the Embley River using the Queensland water quality guidelines, including aquatic ecosystems, recreational and aesthetics (primary recreation, secondary recreations and visual aesthetics), industrial uses, and cultural and spiritual values.

1.6 Weipa Climate

Weipa has a tropical monsoonal climate with a distinct wet and dry season. The average annual rainfall is approximately 1.8 metres with most occurring from December through to March. Very little rainfall is reported from May to September. A graph showing the monthly rainfall history for Weipa is shown in Figure 2**Error! Reference source not found.** below.

Average daily maximum temperatures range from 31 degrees during the winter months up to 35 degrees during late spring before the commencement of 'the wet'. Minimum overnight temperatures are 18-19 degrees during the winter months and near 24 degrees during summer.

The cyclone season is from December through to April with cyclones regularly affecting the area. RTW has a weather station at the ATSF that has been operational since early 2009. Data from this facility is downloaded weekly, collated and used for correlation with design and performance criteria.

The region tends to have light to moderate southeast to east winds during the dry season. Over the summer, winds are mostly light tending moderate westerly when the monsoon trough dips south of the area. Fresh winds occur occasionally but strong or gale force winds normally only occur with a tropical cyclone.

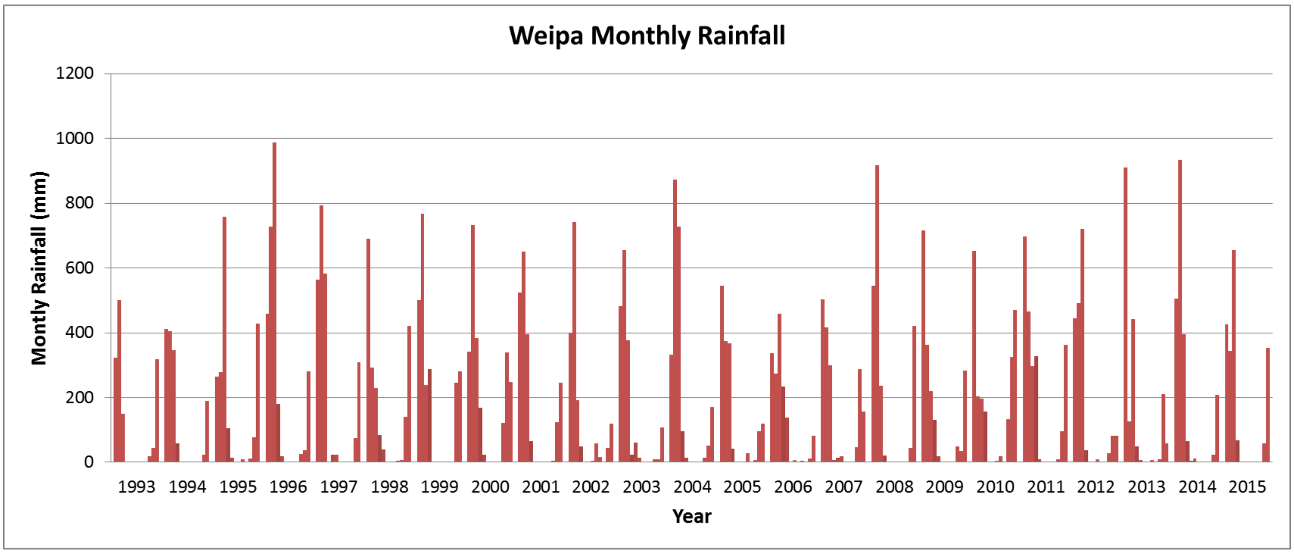

Figure 2: Weipa Monthly Rainfall Data (Bureau of Meteorology Weipa Aero Station)

1.7 RTW Health, Safety and Environment Management System (HSE MS)

The HSE MS is used at Rio Tinto Weipa to manage our HSE requirements and drive continuous improvement including CLASSIC HSE Procedures and other related policies, procedures, documents and resources. The HSE MS provides a structured method to identify, assess and control significant HSE risks:

- ISO14001 Environment Management System, and
- OHSAS 18001 Occupational Health and Safety Management System.

The HSE MS applies to all contracted and internal tasks conducted by or for Rio Tinto Alcan Weipa whether the works are within the bounds of the Rio Tinto Alcan Weipa mining lease or not. The operation of the Lorim Point STP are bounded by the RTA HSE MS, this includes the procedures and policies that describe it. The following are relevant HSE MS documents that are applicable to the operation of the plant to ensure environmental compliance:

- RTA Weipa Risk Register
- Legal and Other Obligations register
- Water Quality and Control Procedures
- Non-mineral Waste Management Procedures
- Measuring and Monitoring Standards
- Training, Competency and Awareness Procedure
- Performance Assessment and Auditing

2 PLANT SPECIFICATIONS

2.1 Infrastructure

Some basic information relating to the plant's design is provided in the sections below. Figure 3 below gives an overview of the plant arrangement.

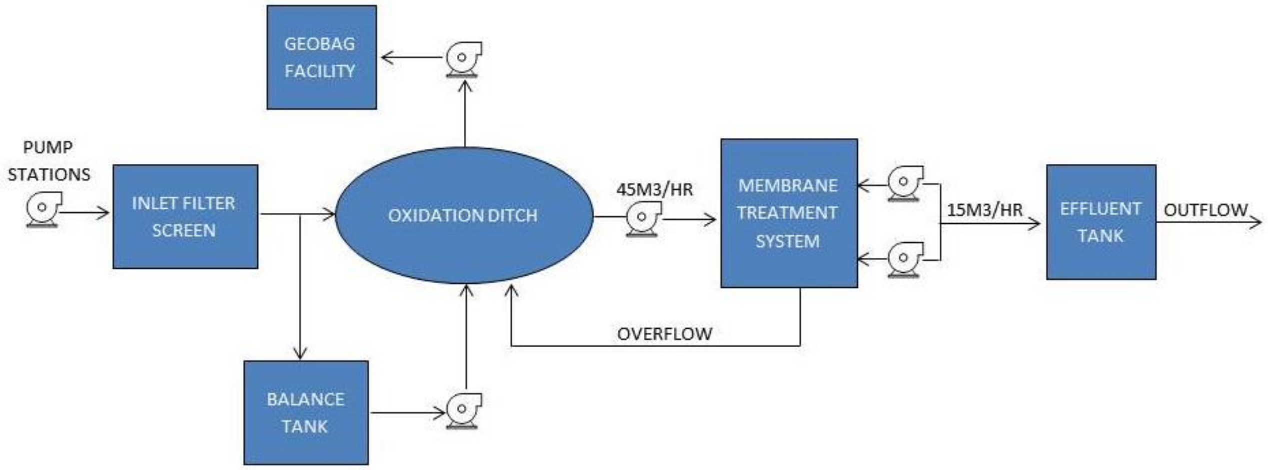

Figure 3: Overview of Plant Arrangement

2.1.1 Pump Stations

Raw sewage is pumped to the plant from two pump stations (PS2 and PS3), both of which contain fixed speed pumps, operating off level switches. The individual pumps in each station have slightly difference capacities. The sewage is metered before being directed to an automatic inlet filter screen which serves to remove gross solids from the influent.

2.1.2 Inlet Filter Screen

The fines screening unit automatically removes gross solids (toilet paper, sanitary products, condoms, etc.) from the influent waste prior to entry to the Pasveer ditch (bioreactor). The screenings are then transferred to a standard residential bin via an automatic auger and discharged into a bag. The unit also includes a manual bypass screen for downtime events to continue the flow of influent into the bioreactor. The screen is constructed on a bunded concrete slab with a drain to the sludge lagoon for cleaning requirements.

The current screen size is 2mm to cater for the membrane requirements however it is interchangeable with a 5mm screen.

2.1.3 Balance Tank

In 2016 the sludge lagoon was converted into a balance tank to create an additional 160,000L of storage. This tank is utilised in an increased flow scenario to storage influent when the bioreactor is at its maximum capacity (refer to Section 3 for details). It is also utilised if the Membrane Filtration System (MBR) plant or bioreactor are required to be taken off line for maintenance and/or repairs.

2.1.4 Stormwater Bypass

Post screening the raw sewage is directed through and underground pipe to the bioreactor with a tee off for stormwater bypass requirements. The purpose of this bypass line is to bypass the Pasveer ditch during high flow events (3 x Average Dry Weather Flow) in order to minimise the quantity of micro-organisms flushed through to discharge and to enable all releases to be detected, controlled and reported.

2.1.5 Biological System

The biological system consists of a single intermittent Pasveer ditch (also known as the Bioreator) operating in a CFID (continuous feed intermittent decant) arrangement. The ditch is fitted with sloping sidewalls and two floating horizontal shaft brush aerators which provide aeration and motive force to mix and circulate the contents of the ditch. Post screening the raw sewage enters the ditch at a point remote from the outlet weir to minimise the chance of effluent short circuiting the bioreactor. Aeration occurs for an adjustable time before stopping and reversing for a short period to 'still' the ditch and prepare the contents for settlement.

The plant's control system operates cyclically, with a reported maximum cycle time of 2 hours, with a maximum aeration period of 90 minutes. The current cycle is slightly shorter than 120 minutes, and incorporates 3 basic phases:

- Aeration, which occurs for about 45 minutes in total (30 minutes of forward aeration and 13 minutes of revers aeration. An additional quiescent period of about 7 minutes occurs between the forward and reverse aeration period;
- Settling, which occurs for about 35 minutes, during which no aeration occurs; and
- Decanting, which occurs for about 30 minutes, during which no aeration occurs.

No automatic dissolved oxygen control is currently available. However the aerator submergence is adjustable by increasing or reducing the applied ballast. Increasing the submergence increases the power draw and increases the oxygen transfer rate (and vice versa). Further adjustments can be made by varying the aerator operating times, operating the aerators intermittently during the aeration period (if the control system provides sufficient flexibility) and possibly by shutting down one of the aerators.

2.1.6 Inline Monitoring

A monitoring system has been installed in the pasveer ditch in order to measure and monitor dissolved oxygen, pH, ammonia, nitrate and suspended solids in the wastewater. Being able the monitor these parameters reduces the likelihood of licence breaches at the plant.

2.1.7 Membrane Treatment System

The MBR system was installed to remove dissolved organics (faecal coliforms) and suspended solids in wastewater in order to achieve compliance with the DEHP licence requirements. The MBR system was designed to treat an Average Dry Weather Flow (ADWF) of <150kL/day and a Peak Wet Weather Flow (PWWF) of <350kL/day.

Effluent is pumped from the bioreactor to the membrane tank using a duty and standby pump arrangement. From the membrane tank treated effluent is stored in the backpulse tank while the remaining effluent overflows back into the bioreactor. The treated effluent stored in the backpulse tank is used to backpulse the MBR system on a regular basis and overflow from this tank is discharged to the receiving environment.

2.1.8 Sample Point and Laboratory

Routine monitoring of the plant is undertaken as per the table 4 below:

Frequency	**Site**		
	Influent (PR/LRP/STP-INF)	**Bio Reactor (PR/LRP/STP-BIO)**	**Effluent (PR/LRP/STP-EFF)**
External Laboratory (Nata Accredited)			
Weekly Sample	pH	X	X
	EC (Us/cm)	X	X
	Alkalinity (mg/L)	X	X
	• Total	X	X
	• Carbonate	X	X
	• Bi-Carbonate	X	X
	• Hydroxide	X	X
	BOD 5 (mg/L)	X	X
	COD (mg/L)	X	X
	Chorine Free (mg/L)	X	X
	Suspended Solids (mg/L)		
	• Total	X	X
	• Volatile	X	X
	TDS (mg/L)	X	X
	Ammonia (mg/L)	X	X
	Nitrite (mg/L)	X	X
	Nitrate (mg/L)	X	X
	Nitrogen (mg/L)	X	X
	• Total	X	X
		X	X

	• Kjeldahl	X		X
	• Organic	X		X
	Total Phosphorous (mg/L)	X		X
	Oil and Grease	X		X
	E. Coli (MPN/100ml)	X		X
	Faecal (TTC) (MPN/100ml)	X	X	
	HPC (CFU/mL)			
Field Analysis – Sonde Measurement				
Weekly	-	Temperature		X
	-	Nitrate (mg/L)		X
	-	EC (Us/cm)		X
	-	Dissolved Oxygen (mg/L)		X
	-	pH		X
	-	Chorine (mg/L)		X
	-	• Free		X
	-	• Total		X
Key Process Instrumentation[1.]				
Instantaneous	Inlet Flow Rate Bypass Flow Rate Inlet Level	DO Ammonium Nitrate pH Temperature TSS	Permeate Flow rate	
Onsite Laboratory (non – NATA operational monitoring analysis)				
Daily Analysis	-	Nitrate Ammonia	-	

1. Does not include all Process monitoring conducted i.e. equipment run time, current draw etc. only relevant process monitoring information outlined here.

Table 4: Routine Monitoring

2.1.9 Geo-Bag Facility

Waste activated sludge (WAS), also known as biosolids, is drawn from the ditch every aeration cycle for a pre-set time period. The WAS is pumped at approximately 2.3L/s for 12 minutes every 2hr cycle to the geo-bags for storage and dewatering.

The geo-bags are large porous bas, with a mesh fine enough to capture solids while allowing liquid to pass. Overtime, the weight of sludge held in the bags squeezes out the water, generating reasonably dry biosolids. The liquid is captured on gravel beds prior to being returned to the plant for reprocessing. Once full, the geo-bags are left to stand before being cut open and the solids directed to final disposal.

2.2 Plant Sizing Data

Parameter	Units	Value	Comments
Nominal Capacity	EP	1,300	
Bioreactor Design Hydraulic Capacity	kL	600	
Maximum Physical Hydraulic Capacity	kL	1,959	
Average Dry Weather Flow	kL/day	65	
Inlet Filter Screen	mm	2	Mesh Size
Bioreactor Volume			
BWL	m^3	235	
TWL	m^3	398	
Top of Wall	m^3	404	
Depth to Floor			
BWL	m	1.37	
TWL	m	1.97	
Top of Wall	m	1.9	
Aeration Capacity			
Standard Oxygen Transfer Capacity	kgO_2/hr	12	Two rotors running
Aerator Motor Power	kW	5.5	Each
Estimated Ditch Velocity	m/s	0.3	Typical
Nominal Recirculation Rate	ML/d	110	
Nominal Recycle Ratio	#	>400	Recirculation: raw flow
Circuit Time (est.)	Min	2.9	
Pump Capacities			
PS2	L/s	8.2 - 12.4	
PS 3	L/s	10.0 – 11.4	
WAS Pump	L/s	3.2	
Balance Tank			
Estimated Volume to TWL	m^3	168	
Depth (max to TWL)	m	2.4	
Membrane Treatment System			
Number of Membrane Trains	#	1	
Number of Cassettes per Train	#	1	
Number of Modules per 16M Cassette	#	16	
Total Number of Modules	#	16	
Total Membrane Surface Area	m2	446	
Membrane Tank Capacity	m3	7.5	
Membrane Feed Rate	m3/hr	63	
Membrane Overflow Rate (RAS)	m3/hr	51.5	
Permeate Pump Capacity	m3/hr	15	

Table 5: Basic Plant Sizing Data

2.3 Environment and Community Aspects

2.3.1 Environmental Goals

The Rio Tinto HSE policy is the leading document that describes the process which the business undertakes Health, Safety and Environmental activities. Our commitment to health safety and environment and communities is fundamental to how we do our business at Rio Tinto. Below is the HSE policy which details our company commitment.

Policy

Health, Safety, Environment and Communities

Our commitment to health, safety, environment and communities is fundamental to how we do business at Rio Tinto. It applies wherever and whenever we operate, from exploration, to closure.

RESPECT We recognise and consider the views of others and treat them as we would want to be treated.

INTEGRITY We act fairly, honestly and consistently in what we say and do and we speak out when necessary.

TEAMWORK We work together and learn from each other to achieve our goals.

ACCOUNTABILITY We take responsibility for our actions and hold others to account for theirs.

Delivering world class health, safety, environment and communities performance is essential to our business success. Meeting our commitments in these areas contributes to sustainable development and underpins our continued access to resources, capital and engaged people. Our focus on continuous improvement ensures regular renewal and relevance of our policies, procedures and activities.

Our goals include for everyone to go home safe and healthy every day. We believe all fatalities, injuries and occupational illnesses are preventable and aim to build and optimise wellbeing. We have committed leaders, employees and contractors creating this culture to drive great performance.

Equally critical, is maintaining stakeholder confidence through accountable and effective management of our risks and our impacts.

We approach each social, environmental or economic challenge as an opportunity to create safer, more valuable and more responsible ways to run our business. Wherever possible we prevent, or otherwise minimise, mitigate and remediate the effects of our business' operations. We assess the impact of our activities and products in advance, and we work with local communities and agencies to manage and monitor these impacts.

Our approach starts with compliance with relevant laws and regulations. We support and encourage further action by helping to identify, develop and implement world class practices through the application of our Group wide standards.

We actively monitor and ensure the security and resilience of our operations and collaborate when confronted with unwanted events or interruptions to minimise the impact on our people, stakeholders and operations.

We promote active partnerships at international, national, regional, and local levels, based on mutual commitment and trust. We engage with our joint venture partners to share our practices and insights. We acknowledge and respect Indigenous and local communities' connections to lands, waters and the environment and seek to develop mutually beneficial agreements with land connected peoples. We respect human rights and work with communities to create mutual value throughout and beyond the life of our operations.

Importantly, it is a shared responsibility, requiring the active commitment and participation of all our leaders, employees and contractors. Our business standards, systems and processes, support responsible operations, as well as contributions and innovations that make a positive and sustainable difference in every region we are part of.

RioTinto

2.3.2 Stormwater Management

There is no method for stormwater overflow to occur or to become a nuisance or for contaminants washed into surface water or groundwater. Any waters collected in the geobag or sludge drying pit systems is self-contained, and returns to the main pit and treated as sewage effluent. The volume collected in these pits at the site is considered negligible.

The site is on a naturally elevated location with rainfall shedding away from the infrastructure. The infrastructure on the site is typically above ground level in which rainfall cannot enter the STP, the surrounding area is grassed and rainfall sheds to the west of the property.

2.3.3 Cultural Heritage

The area the plant occupies has been previously cleared for mining and no cultural heritage sites are located in the vicinity of the plant or the outfall. The traditional owners of the land are the Wik Wik people.

2.3.4 Acid Sulphate Soils

The plant is already constructed and operational therefore this section is considered not applicable as no major excavation is proposed.

2.3.5 Air and Noise Emissions

According to NGER reporting standards Greenhouse emissions from this facility have been considered negligible due to its size.

Noise and odour from the plant is considered not to cause harm as no odour or noise complaint has been received by RTAW in the course of operating the plant. The STP is located in an area that has no residential areas nearby or a business within 100m.

2.3.6 Waste Management

Sludge from the operation of the plant is pumped into 1 tonne geobags until full. These are dried out in the allocated bunded area. When ready for transport, dewatered geobags are disposed of in the Evans Landing Landfill, collected by the regulated waste contractor. Other general waste bins located in the compound, such as the inlet filter screen bins, are collected through the routine collection system.

Records of this waste transfer are kept on file at the Landfill, which is owned by RTW and managed by regulated waste contractor.

2.3.7 Hazardous Substances

At times flocculants or hazardous substances may be used as part of assisting the sludge dewatering operation of the plant, though no chemical, other than sodium hypochlorite, have been used in the last few years. These are stored at Awonga STP, where suitable storage is in place. Substances used in the operation of the LRP STP shall be stored in the compound area in accordance with their relevant MSDS.

The Membrane requires a monthly flush of Chlorine. The Chlorine is injected into the System via the chlorine pump and automated control arrangement. This process consumes approximately t 20L chlorine per month which is stored in drums on site

3 OPERATING PHILOSOPHY

3.1 Normal Flow

During normal operations effluent is pumped from the pump stations through the inlet filter screen and directed into the bioreactor as shown in Figure 4 below. The MBR system draws effluent from the bioreactor and stores treated effluent in the backpulse tank which discharges to the environment.

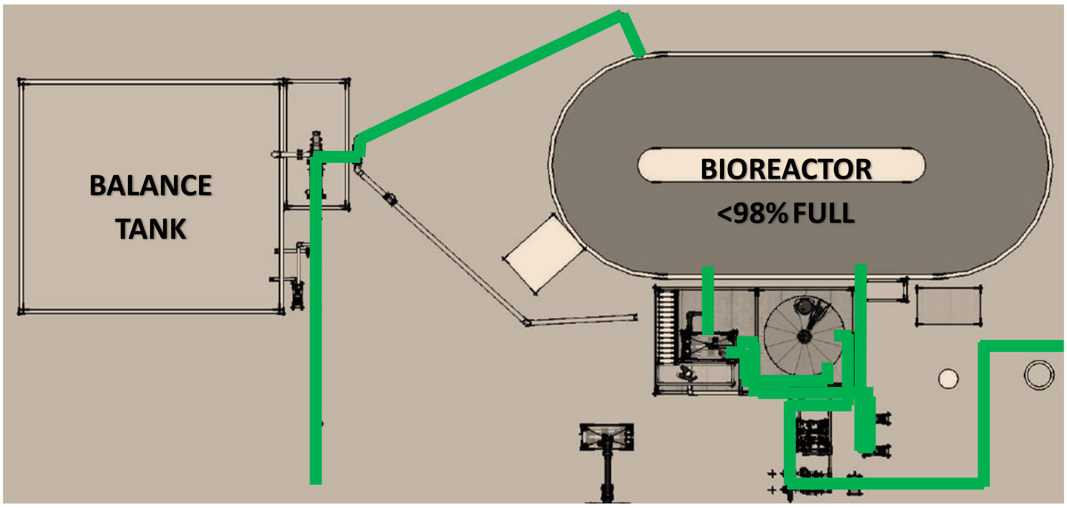

Figure 4: Normal Flow Philosophy

3.2 Normal Flow to Increased Flow

If the bioreactor level sensor records the bioreactor as being 98% full (likely due to the membrane being offline or increased flow into the plant) the plant control system will change the direction of flow from the bioreactor to the balance tank after the inlet screen as shown in Figure 5 on the following page.

While the plant is in stormwater bypass mode the MBR system will continue the draw from the bioreactor and treat effluent which will lower the level of the bioreactor over time. The plant will switch back to normal mode once the level in the bioreactor is less than 80% (refer to section 3.5).

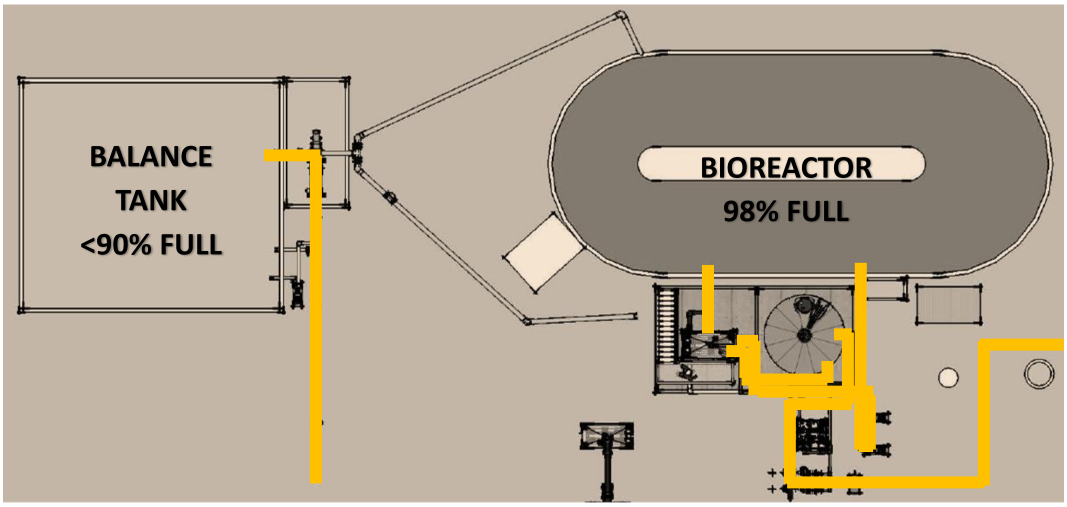

Figure 5: Normal Flow to Increased Flow Philosophy

3.3 Increased Flow to Stormwater Bypass

From increased flow mode, if the balance tank level sensor records the balance tank as being 90% full and the bioreactor remains above 80% full, the plant control system will change the direction of flow from the balance tank to the stormwater bypass line after the inlet screen as shown in Figure 6 below. This is due to the plant storing the maximum amount of inflow possible and to eliminate the risk of an uncontrolled discharge via the bioreactor overflow point.

Furthermore, if the inlet flowmeter records that the inflow to the plant is more than 5L/s for more than 60 minutes (storm event) than the plant control system will automatically switch into stormwater bypass mode. This can occur no matter if the plant is in normal mode or in increased flow mode to begin with. This plant control logic has been added to maximise the storage volume available in the plant after the storm event has passed and prioritises the treatment and storage of effluent over stormwater. While the plant is in stormwater bypass mode the MBR system will continue the draw from the bioreactor and treat effluent which will lower the level of the bioreactor over time.

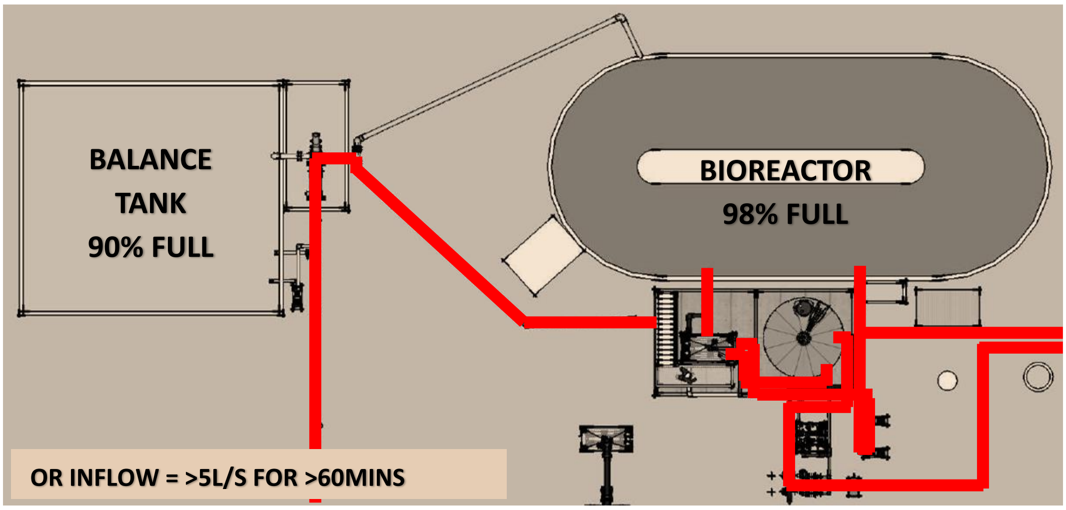

Figure 6: Increased Flow to Stormwater Bypass Philosophy

3.4 Stormwater Bypass to Increased Flow

In order for the plant to switch back from stormwater bypass mode to increased flow mode the inflow to the plant must be less than 5L/s for more than 5 minutes.

While the plant is in increased flow mode the MBR system will continue the draw from the bioreactor and treat effluent which will lower the level of the bioreactor over time. When the level in the bioreactor reaches less than 90% full the balance tank pump will switch on and transfer effluent stored into the balance tank into the bioreactor. In the case that the bioreactor reaches 98% full this pump will turn off. The plant will stay in increased flow mode with inflow directed to the balance tank until it gets the signal to switch to normal mode. An overview of this mode is shown in Figure 7 below.

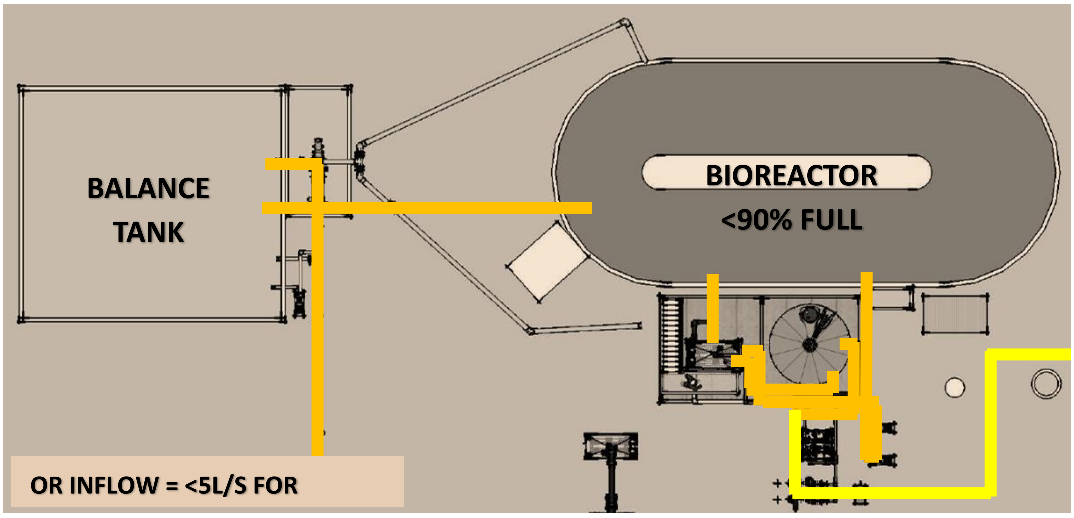

Figure 7: Stormwater Bypass to Increased Flow Philosophy

3.5 Increased Flow to Normal Flow

In order for the plant to switch from increased flow mode back to normal mode, the level sensor in the bioreactor must record less than 80% full. Once this occurs the inflow will be directed from the balance tank to the bioreactor after the inlet filter screen. During this time, as the bioreactor level is less than 90%, the balance tank pump is also transferring stored effluent across to the bioreactor for treatment.

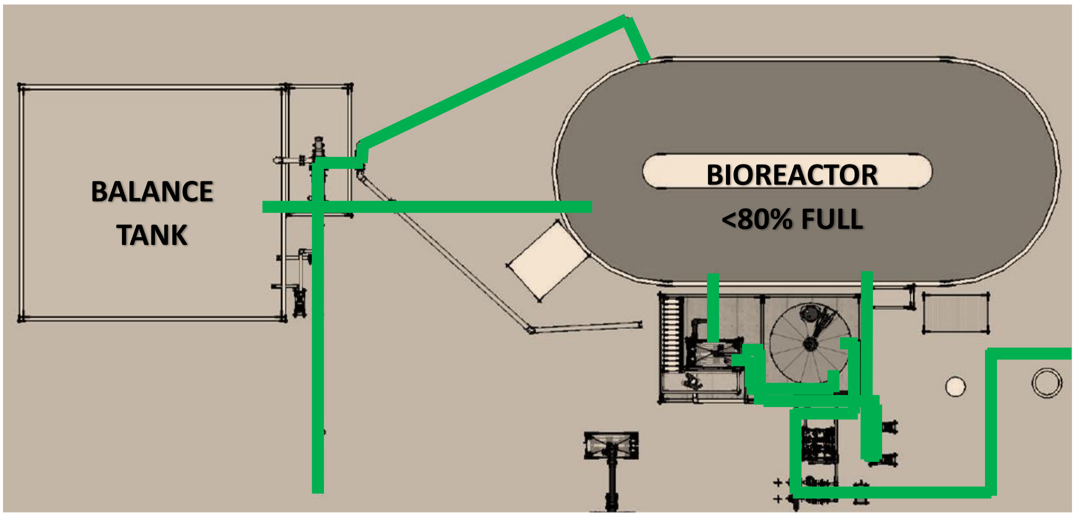

Figure 8: Increased Flow to Normal Flow Philosophy

4 MONITORING

The plant is monitored both by the Environment team who conduct routine monthly sampling to fulfil licensing requirements. The suites of analytes chosen are ones that assist in the interpretation of the health of the plant and to determine environmental and health characteristics. In situ testing for MLSS, pH, electrical conductivity, and temperature are recorded using a YSI water sonde. All laboratory analysis is completed by a NATA accredited lab in Cairns.

The table below describes the Plant task schedule required to operate the plant. Each schedule is accompanied by standard procedures to ensure the sampling is conducted correctly and safely.

Task	Standard Procedure	Frequency
Flow Measurement	LPT-001	Daily
Routine Maintenance	LPT-002	Daily
Sonde Measurements	LPT-004	Weekly
Sampling	LPT-005	Weekly
WAS Control	LPT-006	Weekly
Reporting	LPT-010	Weekly
Biosolids Disposal	LPT-009	When Geobags are full

Table 6: Plant Task Schedule

Maintenance programs are in place for all onsite equipment and consumables, these undertaken in accordance with the site maintenance scheduled, however visual inspection of the key flow meter and screening bins are undertaken daily.

4.1 Record Keeping

All environmental licensing data collected by the Environment Team is stored in the EnviroSys program on site. The analysing laboratory also has all results available via an internet page to enable 24hr access to results.

All operational data collected from the task list above is maintained and kept indefinitely. Any sampling analysis sent off site is also available via an internet page. The Environmental Authority states that all data must be kept on site for the period of 5years.

5 REPORTING

The LP STP requires a series of different reporting; they are tabulated below in Table 7

	Information or data	Location
Annual Return Report	Summarises the results of the weekly compliance monitoring, including incidents, complaints recieved and data review.	Environment J Drive All data is required to be kept on site for no less than 5 years.
Incidents	Incident data supplied to DEHP is listed in condition A8, A9, A10, and 11	Environment J Drive
Receiving Environmental Monitoring Plan	Summarises results of the REMP monthly monitoring, See EA conditions C10 to C13.	Environment J Drive

Table 7. Reporting Requirements for Lorim Point Sewage Plant as per its environmental authority requirements.

6 TRAINING

6.1 Staff Training

The Water Treatment Team is comprised of trade qualified plumbers and electricians that are required to obtain a Certificate III in Water Operations. This is a nationally recognised qualification that is aimed at water or waste water treatment plant operators and water industry technicians.

Further onsite training is provided including:

- Onsite water quality testing, this assists with the day to day operation of the sewage treatment plants that RTW maintains;
- Compliance water quality monitoring;
- Operational procedures; and
- Health, Safety and Environmental Safety Standards.

7 REFERENCES

Qld Water Quality Sampling manual, 2009, Dept of Environment and Heritage

Environmental Authority, EHP permits number SPCE05672613, 2013, Dept of Environment and Heritage.