CANUNGRA
Sewerage Treatment Plant
MAINTENANCE MANUAL

MAINTENANCE MANUAL

INTRODUCTION

The Canungra sewage treatment plant (STP) treats wastewater from the Canungra region in the Scenic Rim Area.

The plant is designed to process average dry weather flows up to 300m^3/day and 1500EP.

The Canungra STP is divided into the following sections;

- Inlet Works (Screens, Grit Removal and Wet Weather By-Pass)
- Secondary Treatment Processes (Anaerobic, Pre-anoxic, Aeration, De-aeration, Post-Anoxic, Scum and Wasting and RAS Recycle Pump Stations)
- Tertiary Treatment Processes (MBR Process)
- Blower Room (Aeration and MBR Blowers)
- Sludge Handling (Polymer System, Sludge Dewatering Unit and Sludge Storage)
- Chemical Dosing (Sugar, Sodium Hydroxide, Sodium Hypochlorite and Aluminium Sulphate)
- Utilities (Compressed Air, Service Water, Potable Water and Back-up Generator)
- Creek Outfall (Treated Effluent and Stormwater Bypass)
- Miscellaneous (Fire, Security and RTU)

The information contained in this maintenance manual has been extracted from the specific vendor documentation, functional descriptions and/or arrangement and assembly drawings – with the basic structure of the manual being divided into four (4) areas for each system and a particular section for job plans.

The four (4) areas include the following;

- System Description – A basic, not too technical description of the process involved – where possible, a capture of the SCADA screen has been included to assist in the identification of equipment.
- Equipment Listing – Where the major components of the process involved are listed, including the product name, model number, quantity and supplier information – where possible, the maintenance spares and/or lubrication information are supplied.
- Maintenance Schedule – The major maintenance tasks are listed for the major components of the process involved with the supplier/manufacturer recommendations for maintenance intervals – where possible a list of spares are supplied.
- Drawings – A guideline provided to highlight the process isolation required when taking the major components of the process involved off-line for maintenance purposes.
- Job Plans – While these documents do not form part of the maintenance manual – they are located at the end of each respective section – for clarity. (These “Job Plans” are current at date of issue of this document) Always refer to the electronic version/s prior to accessing critical decisions and/or performing maintenance.

1 INLET WORKS

1.1 PROCESS OVERVIEW

Raw sewage – from the (existing) pump station – is delivered to the inlet works of Canungra sewage treatment plant (STP).

The raw sewage pump station is not included within the scope of Canungra STP Upgrade.

The inlet works system is based on the principle any/all wastewater (up to 10 x ADWF) will be screened, and degritted, prior to downstream processing – with 40L/s being the (maximum) design capacity of this facility.

Additionally, the inlet works system receives feed from the following;

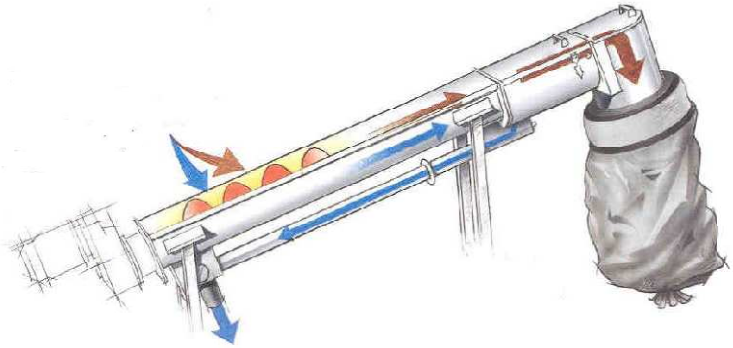
- The filtrate pump station and
- The S-recycle pump station.

1.2 INLET WORKS EQUIPMENT

The inlet works comprises the following equipment;

- Two (2) Spirac inlet screen tanks (TK_-0210-001 and TK_-0210-002) complete with Spirac model CCP250-3 inlet screen conveyors (CV_-0210-001 and CV_-0210-002).
- One (1) Aquatec-Maxcon grit tank (TK_-0230-001) complete with Spirac model SAW420 grit screw conveyor (CV_-0230-001).
- One (1) Endress + Hauser model 50W2H (raw sewage) flowmeter (FITQ_-0210-001).
- One (1) Endress + Hauser model 50W2H (plant bypass) flowmeter (FITQ_-0210-006).
- One (1) Endress + Hauser model 50W1F (secondary plant influent) flowmeter (FITQ_-0230-001).

1.3 SPIRAC INCLINED CONVEYOR – GENERAL INFORMATION



Make/Description:	Spirac Inclined Conveyor
Model:	CCP-250
Gearmotor Make/Model:	SEW-Eurodrive FA77DRE90M4
Supplier:	Spirac (Australia) Pty Ltd Unit 43/5-7 Inglewood Place BAULKHAM HILLS NSW 2153 Phone: (02) 9839 3700 Fax: (02) 9838 3777 http://www.spirac.com/

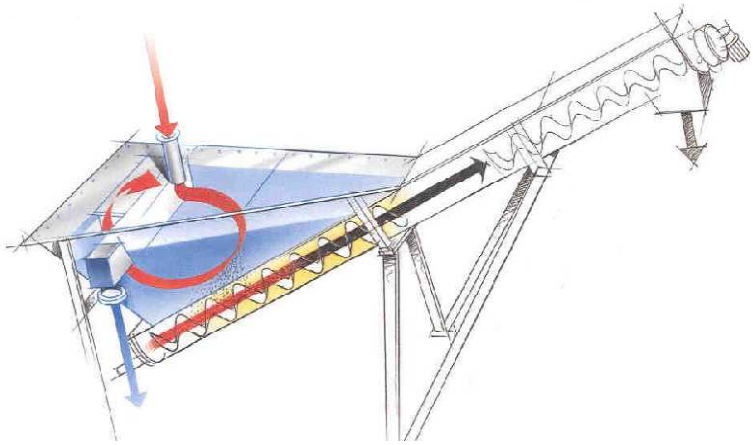
1.4 SPIRAC INCLINED CONVEYOR – MAINTENANCE SCHEDULE

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
SPIRAC MODEL CCP250-3 CONVEYOR										
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Check bell housing packing box temperature	x									>60^0 Check grease level
Wash down the interior of the conveyor trough			x							
Wash down the exterior of the conveyor trough			x							
Check/verify conveyor liner for wear			x							Replace as necessary
Check bell housing packing box for leaks			x							
Check conveyor spiral is not damaged/deformed			x							Replace as necessary
Check the tightness of all conveyor fasteners					x					Tighten as necessary
Check/inspect all conveyor welding					x					
Check all safety equipment operates correctly					x					

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
SEW MODEL FA77 GEAR UNIT										
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Check gearbox oil temperature			x							
Change gearbox oil after initial 100 running hours										Alpha SP 220 Oil
Check gearbox oil level				x						
Inspect gearbox oil for colour consistency				x						
Check gearbox unit for oil leakage				x						
Check tightness of all gearmotor fasteners						x				
Clean, inspect, repack/replace the motor bearings								x		AP3 Grease
Change gearbox oil every 10,000 hours or 3 years								x		Alpha SP 220 Oil

All lubricants are Castrol unless otherwise noted

1.5 SPIRAC GRIT CLASSIFIER – GENERAL INFORMATION



Make/Description:	Spirac Grit Classifier
Model:	SAW-420
Gearmotor Make/Model:	SEW-Eurodrive FA87DRE90M4
Supplier:	Spirac (Australia) Pty Ltd Unit 43/5-7 Inglewood Place BAULKHAM HILLS NSW 2153 Phone: (02) 9839 3700 Fax: (02) 9838 3777 http://www.spirac.com/

1.6 SPIRAC GRIT CLASSIFIER – MAINTENANCE SCHEDULE

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
SPIRAC MODEL SAW420 CONVEYOR										
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Check bell housing packing box temperature	x									>60^0 Check grease level
Wash down the interior of the conveyor trough			x							
Wash down the exterior of the conveyor trough			x							
Check/verify conveyor liner for wear			x							Replace as necessary
Check bell housing packing box for leaks			x							
Check conveyor spiral is not damaged/deformed			x							Replace as necessary
Check the tightness of all conveyor fasteners					x					Tighten as necessary
Check/inspect all conveyor welding					x					
Check all safety equipment operates correctly					x					

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
SEW MODEL FA87 GEAR UNIT										
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Check gearbox oil temperature			x							
Change gearbox oil after initial 100 running hours										Alpha SP 220 Oil
Check gearbox oil level				x						
Inspect gearbox oil for colour consistency				x						
Check gearbox unit for oil leakage				x						
Check tightness of all gearmotor fasteners						x				
Clean, inspect, repack/replace the motor bearings								x		AP3 Grease
Change gearbox oil every 10,000 hours or 3 years								x		Alpha SP 220 Oil

All lubricants are Castrol unless otherwise noted

1.7 INLET WORKS GENERAL EQUIPMENT – INFORMATION

Equipment Description	Supplier Information
 Endress + Hauser Model 50W Flowmeter	Endress + Hauser (Australia) Pty Ltd 8/277 Lane Cove Road NORTH RYDE NSW 2113 Phone: (02) 8877 7000 Fax: (02) 8877 7099 www.au.endress.com/
 VEGA Model Vegakon 61 Level Switch	VEGA (Australia) Pty Ltd 398 The Boulevarde KIRRAWEE NSW 2232 Phone: (02) 9542 6662 Fax: (02) 9542 6665 www.vega.com/au

1.8 INLET WORKS EQUIPMENT – DRAWINGS

NOTE

REFER TO THE QUEENSLAND URBAN UTILITIES TAG OUT/LOCK OUT GUIDE FOR CORRECT COMPANY TAG OUT/LOCK OUT PROCEDURES

- 486/5/5 – 0094-005 – Inlet Works – P & ID
- 486/5/5 – 0094-200 – Inlet Works – General Arrangement
- 486/5/5 – 0094-201 – Inlet Works – General Arrangement – Side Elevation
- 486/5/5 – 0094-202 – Inlet Works – Raw Water Inlet Pipework Arrangement
- 486/5/5 – 0094-203 – Inlet Works – Grit Chamber By-Pass Pipework Arrangement
- 486/5/5 – 0094-204 – Inlet Works – Wet Weather By-Pass Pipework Arrangement
- 486/5/5 – 0094-205 – Inlet Works – Screened Effluent to STP Pipework Arrangement
- 486/5/5 – 0094-206 – Inlet Works – Manual Screen Overflow Pipework Arrangement
- 486/5/5 – 0094-210 – Inlet Works – Service Water Pipework Arrangement
- 486/5/5 – 0094-214 – Inlet Works – Maintenance Platform Arrangement

1.9 INLET WORKS EQUIPMENT – ISOLATION VALVES

Sections For Maintenance	Manual Isolation Valves
Spirac Inlet Screen Tank (TK_-0210-001) Complete with Spirac CCP250-3 Conveyor (CV_-0210-001)	DN150 Keystone F952 Knifegate Valve (VV_-0210-007) DN150 Keystone F952 Knifegate Valve (VV_-0210-009) DN15 Keystone F152 Ball Valve (VV_-0210-023) DN25 Keystone F152 Ball Valve (VV_-1030-011)
Spirac Inlet Screen Tank (TK_-0210-002) Complete with Spirac CCP250-3 Conveyor (CV_-0210-002)	DN150 Keystone F952 Knifegate Valve (VV_-0210-008) DN150 Keystone F952 Knifegate Valve (VV_-0210-010) DN15 Keystone F152 Ball Valve (VV_-0210-024) DN25 Keystone F152 Ball Valve (VV_-1030-011)
Aquatec-Maxcon Grit Tank (TK_-0230-001) Complete with Spirac SAW420 Conveyor (CV_-0230-001)	DN250 Keystone F952 Knifegate Valve (VV_-0210-011) DN15 Keystone F152 Ball Valve (VV_-0230-021) DN15 Keystone F152 Ball Valve (VV_-0230-022) DN25 Keystone F152 Ball Valve (VV_-1030-011)
Endress + Hauser 50W2H Flowmeter (Raw Sewage) (FITQ_-0210-001)	DN150 Keystone F952 Knifegate Valve (VV_-0210-002) DN150 Keystone F952 Knifegate Valve (VV_-0210-007) DN150 Keystone F952 Knifegate Valve (VV_-0210-008)
Endress + Hauser 50W2H Flowmeter (Plant By-Pass) (FITQ_-0210-006).	DN150 Keystone F952 Knifegate Valve (VV_-0210-007) DN150 Keystone F952 Knifegate Valve (VV_-0210-008)
Endress + Hauser 50W1F Flowmeter (Secondary Plant Influent) (FITQ_-0230-001).	DN150 Gemu (Pneumatic) Diaphragm Valve (FCV_-0230-004)

2 SECONDARY TREATMENT PROCESS

2.1 AERATION PROCESS OVERVIEW

Air shall be supplied to the both the Aerobic Zone and the Membrane Tanks utilising four (4) Ingersoll Rand model HH S2H52 (positive displacement type) blowers operating in the following configuration;

- One (1) duty unit – For aeration of the aerobic zone.
- One (1) duty unit – For each of the two (2) membrane tanks.
- One (1) common standby unit.

The (duty) Ingersoll Rand model HH S2H52 (positive displacement type) blower, for the Aerobic Zone, will discharge air to AquaBlade fine pore membrane diffusers mounted on the floor of the aerobic zone.

Under normal operations, the speed of the (duty) Ingersoll Rand model HH S2H52 blower – and therefore the air supply – will be adjustable-based to maintain a specified dissolved oxygen (DO) concentration at the end of the zone under closed-loop feedback control. The system will enable the DO feedback control to be suspended for a short period, after rotation of membrane tank duty, to reduce the impacts on the Aerobic Zone DO control.

Over time, the AquaBlade fine pore membrane diffusers can become fouled due to aging of the membrane material and/or build-up of deposits on the diffuser surface and/or pores. The AquaBlade fine pore membrane diffusers can be periodically “bumped” – the act of temporarily increasing the air flow to the cell for a set duration of time – to minimise fouling.

The Aerobic Zone will undergo diffuser “bumping” on a weekly and/or monthly basis with the process being initiated automatically and/or by the operator. On completion of a “Bumping” sequence, the aeration control will return to the previously selected operating mode.

The following five (5) modes will be provided for control of the Aerobic Zone Aeration;

- Mode 1: Constant Blower Speed – The (duty) Ingersoll Rand model HH S2H52 blower is operated at the speed input at the SCADA.
- Mode 2: Scheduled Blower Speed – As per the above mode; except the blower speed is automatically varied up to six (6) times per day (According to a schedule).
- Mode 3: Constant DO Setpoint – The (duty) Ingersoll Rand model HH S2H52 blower speed is adjusted to maintain the dissolved oxygen (DO) setpoint input at the SCADA.
- Mode 4: Scheduled DO Setpoint – As per mode 3; except the DO setpoint is automatically varied up to six (6) times per day (According to a DO setpoint schedule).
- Mode 5: De-Aeration 1 DO Feedback for Aerobic Zone DO Setpoint Adjustment – As per Mode 3, except the DO setpoint in the Aerobic Zone is automatically varied based on DO measured in the De-Aeration Zone.

2.2 AERATION EQUIPMENT

The aeration process comprises the following equipment;

- Four (4) Ingersoll Rand model HH S2H52 (positive displacement type) blowers (BL_-0650-001, BL_-0650-002, BL_-0650-003 and BL_-0520-001).

2.3 INGERSOLL RAND POSITIVE DISPLACEMENT BLOWER – GENERAL INFORMATION

Make/Description:	Ingersoll Rand Blower
Model:	HH S2H52
Supplier:	PDA Blower Company Pty Ltd 34 Nicole Way DANDENONG SOUTH VIC 3175 Phone: (03) 9794 0855 Fax: (03) 9794 0722 http://www.pdablower.com.au/

2.4 INGERSOLL RAND POSITIVE DISPLACEMENT BLOWER – MAINTENANCE SCHEDULE

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
PDA MODEL HH S2H52 BLOWER										
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Check air inlet filter	x									If DP is high
Check gearbox oil temperature		x								
Check gearbox oil level		x								
Check gearbox for leakage		x								
Change gearbox oil after initial 200 running hours										Alphasyn EP 220 Oil
Check gearbox for oil leakage				x						
Change gearbox oil every 2,000 operating hours										Alphasyn EP 220 Oil
Inspect gearbox oil for colour										At every oil change
Clean gearbox sight glasses										At every oil change

All lubricants are Castrol unless otherwise noted

2.5 AQUABLADE MEMBRANE DIFFUSER – GENERAL INFORMATION

Make/Description:	Australian Water Membrane Diffuser
Model:	AquaBlade AQB1001750
Supplier:	Aquatec-Maxcon Pty Ltd 119 Toongarra Road IPSWICH QLD 4305 Phone: (07) 3813 7100 Fax: (07) 3813 7199 http://www.aquatecmaxcon.com.au/

2.6 AQUABLADE MEMBRANE DIFFUSER – MAINTENANCE SCHEDULE

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
AWC MODEL AQB DIFFUSER										
Initiate regular “bumping” of membrane diffusers			**x**							
Inspect bioreactor pipework for leaks			**x**							
Drain excess water at the DN20 purge valve			**x**							
Fully open and close isolation valves				**x**						
Inspect and clean membrane diffusers						**x**				

2.7 R-RECYCLE PUMP STATION PROCESS OVERVIEW

Two (2) Grundfos model SEV.80.80 (dry mount) submersible pumps will be used to recycle mixed liquor from the end of the Anoxic Zone to the start of the Anaerobic Zone – within the (existing) oxidation ditch and operating in the following configuration;

- One (1) duty unit – For mixed liquor from the end of the anoxic zone.
- One (1) standby unit – For mixed liquor from the end of the anoxic zone.

The R-recycle provides the biomass to the Anaerobic Zone to facilitate excess biological phosphorus removal with any/all flows to be controlled to minimise the return of nitrate to the anaerobic zone.

The following three (3) modes will be provided for control of the R-Recycle;

- Mode 1: Constant Speed – The (duty) Grundfos model SEV.80.80 (dry mount) submersible pump will be operated at the speed setpoint specified at the SCADA. This mode is provided to enable ongoing operation, when the Endress + Hauser model 50W R-Recycle flowmeter (FIT-0540-001) is not available.
- Mode 2: Constant Flow – The speed of the (duty) Grundfos model SEV.80.80 (dry mount) submersible pump will be controlled to maintain a specified flow setpoint under feedback control from the Endress + Hauser model 50W R-Recycle flowmeter (FIT-0540-001).
- Mode 3: Flow Paced – The R-Recycle Flowrate setpoint is calculated from an operator selected ratio setpoint multiplied by the time-smoothed flowrate of sewage to the anaerobic zone (as measured by FITQ-0230-001). As per Mode 2 – The speed of the (duty) Grundfos model SEV.80.80 (dry mount) submersible pump will be controlled to deliver the calculated flow setpoint via feedback from the Endress + Hauser model 50W R-Recycle flowmeter (FIT-0540-001).

2.8 R-RECYCLE PUMP STATION EQUIPMENT

The R-Recycle pump station comprises the following equipment;

- Two (2) Grundfos model SEV.80.80 (dry mount) submersible pumps (PU_-0540-101 and PU_-0540-102).
- One (1) Endress + Hauser model 50W2H (R-Recycle) flowmeter (FITQ_-0540-001).
- One (1) Endress + Hauser model 50W1F (secondary plant influent) flowmeter (FITQ_-0230-001).

2.9 GRUNDFOS SUBMERSIBLE (R-RECYCLE) PUMP – GENERAL INFORMATION

Make/Description:	Grundfos (Dry Mount) Submersible Pump
Model:	SEV.80.80
Supplier:	Grundfos Pumps (Australia) Pty Ltd 2/68 Murdoch Circuit ACACIA RIDGE QLD 4110 Phone: (07) 3272 1980 Fax: (07) 3273 8735 http://www.grundfos.com.au/web/homeaunz.nsf

2.10 GRUNDFOS SUBMERSIBLE (R-RECYCLE) PUMP – MAINTENANCE SCHEDULE

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
GRUNDFOS MODEL SEV.80.80 PUMP										
Check gearbox oil level				x						Shell Ondina 917 Oil
Inspect gearbox oil for colour consistency				x						
Check gearbox unit for oil leakage/contamination				x						Replace the shaft seal
Check electrical cable is not pinched/bent sharply				x						Relocate where required
Check for any "abnormal" noises and vibrations				x						Rectify immediately
Change gearbox oil every 3.000 hours or 1 year						x				Shell Ondina 917 Oil
Change the submersible pump shaft seal						x				
Inspect the submersible pump internal parts						x				Replace where required
Inspect the submersible pump ball bearings						x				Replace where required

All lubricants are Castrol unless otherwise noted

2.11 A-RECYCLE PUMP STATION PROCESS OVERVIEW

Two (2) Grundfos model SE1.100.150 (dry mount) submersible pumps will be used to recycle mixed liquor from the De-Aeration Cell 2 (in the new bioreactor tank) to the start of the Anoxic Zone – within the (existing) oxidation ditch and operating in the following configuration;

- One (1) duty unit – For mixed liquor from the de-aeration cell 2.
- One (1) standby unit – For mixed liquor from de-aeration cell 2.

The mixed liquor from De-Aeration Cell 2 contains high concentrations of nitrate and; hence, is to the anoxic cells – where the denitrification process can occur.

R-recycle provides the biomass to the Anaerobic Zone to facilitate excess biological phosphorus removal with any/all flows to be controlled to minimise the return of nitrate to the anaerobic zone.

The following three (3) modes will be provided for control of the A-Recycle;

- Mode 1: Constant Speed – The (duty) Grundfos model SE1.100.150 (dry mount) submersible pump will be operated at the speed setpoint specified at the SCADA. This mode is provided to enable ongoing operation, when the Endress + Hauser model 50W A-Recycle flowmeter (FIT-0540-011) is not available.
- Mode 2: Constant Flow – The speed of the (duty) Grundfos model SE1.100.150 (dry mount) submersible pump will be controlled to maintain a specified flow setpoint under feedback control from the Endress + Hauser model 50W A-Recycle flowmeter (FIT-0540-011).
- Mode 3: Flow Paced – The A-Recycle Flowrate setpoint is calculated from an operator selected ratio setpoint multiplied by the time-smoothed flowrate of sewage to the anaerobic zone (as measured by FITQ-0230-001). As per Mode 2 – The speed of the (duty) Grundfos model SE1.100.150 (dry mount) submersible pump will be controlled to deliver the calculated flow setpoint via feedback from the Endress + Hauser model 50W A-Recycle flowmeter (FIT-0540-011).

2.12 A-RECYCLE PUMP STATION EQUIPMENT

The A-Recycle pump station comprises the following equipment;

- Two (2) Grundfos model SE1.100.150 (dry mount) submersible pumps (PU_-0540-201 and PU_-0540-202).
- One (1) Endress + Hauser model 50W2H (A-Recycle) flowmeter (FITQ_-0540-011).
- One (1) Endress + Hauser model 50W1F (secondary plant influent) flowmeter (FITQ_-0230-001).

2.13 GRUNDFOS SUBMERSIBLE (A-RECYCLE) PUMP – GENERAL INFORMATION

Make/Description:	Grundfos (Dry Mount) Submersible Pump
Model:	SE1.100.150
Supplier:	Grundfos Pumps (Australia) Pty Ltd 2/68 Murdoch Circuit ACACIA RIDGE QLD 4110 Phone: (07) 3272 1980 Fax: (07) 3273 8735 http://www.grundfos.com.au/web/homeaunz.nsf

2.14 GRUNDFOS SUBMERSIBLE (A-RECYCLE) PUMP – MAINTENANCE SCHEDULE

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
GRUNDFOS MODEL SE1.100.150 PUMP										
Check gearbox oil level				x						Shell Ondina 917 Oil
Inspect gearbox oil for colour consistency				x						
Check gearbox unit for oil leakage/contamination				x						Replace the shaft seal
Check electrical cable is not pinched/bent sharply				x						Relocate where required
Check for any "abnormal" noises and vibrations				x						Rectify immediately
Change gearbox oil every 3.000 hours or 1 year						x				Shell Ondina 917 Oil
Change the submersible pump shaft seal						x				
Inspect the submersible pump internal parts						x				Replace where required
Inspect the submersible pump ball bearings						x				Replace where required

All lubricants are Castrol unless otherwise noted

2.15 S-RECYCLE PUMP STATION PROCESS OVERVIEW

Two (2) Grundfos model SE1.100.150 (dry mount) submersible pumps will be used to recycle mixed liquor from the Membrane Tanks to the start of the Aerobic Zone – within the (new) bioreactor tank and operating in the following configuration;

- One (1) duty unit – For mixed liquor from the membrane tanks.
- One (1) standby unit – For mixed liquor from the membrane tanks.

Actuated valves will determine the two (2) Membrane Tanks to withdraw S-Recycle.

The withdrawal of permeate through the membranes increases the concentration of mixed liquor in the membrane tanks. Hence; the S-Recycle flowrate has a significant bearing on the solids concentration in the membrane tanks, aerobic zone, and anoxic zones and the prevailing mass fractions in the secondary treatment process.

2.16 S-RECYCLE PUMP STATION EQUIPMENT

The S-Recycle pump station comprises the following equipment;

- Two (2) Grundfos model SE1.100.150 (dry mount) submersible pumps (PU_-0540-301 and PU_-0540-302).
- One (1) Endress + Hauser model 50W2H (S-Recycle) flowmeter (FITQ_-0540-021).
- One (1) Endress + Hauser model 50W1F (secondary plant influent) flowmeter (FITQ_-0230-001).

2.17 GRUNDFOS SUBMERSIBLE (S-RECYCLE) PUMP – GENERAL INFORMATION

Make/Description:	Grundfos (Dry Mount) Submersible Pump
Model:	SE1.100.150
Supplier:	Grundfos Pumps (Australia) Pty Ltd 2/68 Murdoch Circuit ACACIA RIDGE QLD 4110 Phone: (07) 3272 1980 Fax: (07) 3273 8735 http://www.grundfos.com.au/web/homeaunz.nsf

2.18 GRUNDFOS SUBMERSIBLE (S-RECYCLE) PUMP – MAINTENANCE SCHEDULE

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
GRUNDFOS MODEL SE1.100.150 PUMP										
Check gearbox oil level				x						Shell Ondina 917 Oil
Inspect gearbox oil for colour consistency				x						
Check gearbox unit for oil leakage/contamination				x						Replace the shaft seal
Check electrical cable is not pinched/bent sharply				x						Relocate where required
Check for any "abnormal" noises and vibrations				x						Rectify immediately
Change gearbox oil every 3.000 hours or 1 year						x				Shell Ondina 917 Oil
Change the submersible pump shaft seal						x				
Inspect the submersible pump internal parts						x				Replace where required
Inspect the submersible pump ball bearings						x				Replace where required

All lubricants are Castrol unless otherwise noted

2.19 BIOREACTOR MIXER PROCESS OVERVIEW

The Grundfos model AMD (submersible) propeller mixers – located in the non-aerated cells of the bioreactor – are utilised to keep the mixed liquor in suspension, maintain homogeneity and minimize short-circuiting of flow through the cell.

The Grundfos model AMD (submersible) propeller mixers are positioned (and angled) in each cell to ensure optimum mixing (and the prevention) of solids deposition throughout the entire cell.

The operation of the Grundfos model AMD (submersible) propeller mixer shall prevent – as far as reasonably practical – vortices, vibration and not permit air entrainment into the liquid and/or generate surface splashing.

2.20 BIOREACTOR MIXER EQUIPMENT

The bioreactor mixer process comprises the following equipment;

- Two (2) Grundfos model AMD.15.45B (submersible) propeller anaerobic mixers (MX_-0511-001 and MX_-0511-002).
- Two (2) Grundfos model AMD.25.45B (submersible) propeller anoxic mixers (MX_-0511-003 and MX_-0511-004).
- Two (2) Grundfos model AMD.15.45B (submersible) propeller de-aeration mixers (MX_-0511-005 and MX_-0511-006).
- Two (2) Grundfos model AMD.15.45B (submersible) propeller post-anoxic mixers (MX_-0511-007 and MX_-0511-008).

2.21 GRUNDFOS (SUBMERSIBLE) PROPELLER MIXER – GENERAL INFORMATION

Make/Description:	Grundfos (Submersible) Propeller Mixer
Model:	AMD.15.45B or AMD.25.45B
Supplier:	Grundfos Pumps (Australia) Pty Ltd 2/68 Murdoch Circuit ACACIA RIDGE QLD 4110 Phone: (07) 3272 1980 Fax: (07) 3273 8735 http://www.grundfos.com.au/web/homeaunz.nsf

2.22 GRUNDFOS (SUBMERSIBLE) PROPELLER MIXER – MAINTENANCE SCHEDULE

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
GRUNDFOS MODEL AMD MIXER										
Thoroughly clean the mixer motor housing				x						
Inspect the propeller blades for accumulation				x						Remove where required
Inspect the propeller blades for wear/tear				x						Replace where required
Check electrical cable is not pinched/bent sharply				x						Relocate where required
Spray the mixer winch with protective spray				x						WD-40 Spray
Spray the mixer pull and safety wire with spray				x						WD-40 Spray
Grease the mixer winch with protective grease				x						AP3 Grease
Inspect the mixer winch wire for wear/tear				x						Replace where required
Inspect the mixer pull and safety wire for wear				x						Replace where required
Check for any "abnormal" noises and vibrations				x						Rectify immediately
Change gearbox oil every 3.000 hours or 1 year						x				Alpha SP 150 Oil
Change the submersible mixer shaft seal						x				
Inspect the submersible mixer internal parts						x				Replace where required
Inspect the submersible mixer ball bearings						x				Replace where required

All lubricants are Castrol unless otherwise noted

2.23 SECONDARY TREATMENT GENERAL EQUIPMENT – INFORMATION

Equipment Description	Supplier Information
 Endress + Hauser Model CPM Analyser Indicating Transmitter	Endress + Hauser (Australia) Pty Ltd 8/277 Lane Cove Road NORTH RYDE NSW 2113 Phone: (02) 8877 7000 Fax: (02) 8877 7099 www.au.endress.com/
 Kelco Model KU10 Float Type Level Switch	Kelco Engineering Pty Ltd 9/9 Powells Road BROOKVALE NSW 2100 Phone: (02) 9905 6425 Fax: (02) 9905 6420 www.kelco.com/au
 Royce Water Technologies Model 9200 Analyser Indicating Transmitter	Royce Water Technologies Pty Ltd 2 Bimbil Street ALBION QLD 4010 Phone: (04) 2857 1234 Fax: (07) 3857 1236 www.roycewater.com/au

2.24 SECONDARY TREATMENT EQUIPMENT – DRAWINGS

REFER TO THE QUEENSLAND URBAN UTILITIES TAG OUT/LOCK OUT GUIDE FOR CORRECT COMPANY TAG OUT/LOCK OUT PROCEDURES

- 486/5/5 – 0094-006 – Bioreactor, Anaerobic and Anoxic Zones – P & ID
- 486/5/5 – 0094-007 – Bioreactor, Aerobic, De-Aeration and Post Anoxic Zones – P & ID
- 486/5/5 – 0094-015 – Blowers and Compressors – P & ID
- 486/5/5 – 0094-226 – Secondary Treatment – Anaerobic Reactor General Arrangement
- 486/5/5 – 0094-227 – Secondary Treatment – R-Recycle Pump Station Pipework Arrangement
- 486/5/5 – 0094-229 – Secondary Treatment – Aeration System General Arrangement
- 486/5/5 – 0094-230 – Secondary Treatment – Aeration System Header Removal Procedure
- 486/5/5 – 0094-231 – Secondary Treatment – Aeration System AquaBlade Procedure
- 486/5/5 – 0094-235 – Secondary Treatment – Aeration System Air Main Arrangement
- 486/5/5 – 0094-238 – Secondary Treatment – S-Recycle Pump Station Arrangement (Plan)
- 486/5/5 – 0094-239 – Secondary Treatment – S-Recycle Pump Station Arrangement (Sections)
- 486/5/5 – 0094-242 – Secondary Treatment – A-Recycle Pump Station Arrangement (Plan)
- 486/5/5 – 0094-243 – Secondary Treatment – A-Recycle Pump Station Arrangement (Sections)

2.25 SECONDARY TREATMENT EQUIPMENT – ISOLATION VALVES

Sections For Maintenance	Manual Isolation Valves
Ingersoll Rand HH S2H52 Blower (BL_-0650-001)	DN100 Keystone F612 Butterfly Valve (VV_-0650-012)
Ingersoll Rand HH S2H52 Blower (BL_-0650-002)	DN100 Keystone F612 Butterfly Valve (VV_-0650-013)
Ingersoll Rand HH S2H52 Blower (BL_-0650-003)	DN100 Keystone F612 Butterfly Valve (VV_-0650-014)
Ingersoll Rand HH S2H52 Blower (BL_-0520-001)	DN100 Keystone F612 Butterfly Valve (VV_-0650-015)
Australian Water Company AquaBlade Model Number – AQB1001750	DN100 Keystone F612 Butterfly Valve (VV_-0511-011) DN100 Keystone F612 Butterfly Valve (VV_-0511-012) DN100 Keystone F612 Butterfly Valve (VV_-0511-013)

2.26 SECONDARY TREATMENT EQUIPMENT – ISOLATION VALVES

Sections For Maintenance	Manual Isolation Valves
Grundfos SEV.80.80 (Submersible) Pump R-Recycle (PU_-0540-101)	DN80 Keystone F952 Knifegate Valve (VV_-0540-001) DN80 Keystone F952 Knifegate Valve (VV_-0540-003)
Grundfos SEV.80.80 (Submersible) Pump R-Recycle (PU_-0540-102)	DN80 Keystone F952 Knifegate Valve (VV_-0540-002) DN80 Keystone F952 Knifegate Valve (VV_-0540-004)
Endress + Hauser 50W2H Flowmeter R-Recycle (FITQ_-0540-001)	DN80 Keystone F952 Knifegate Valve (VV_-0540-003) DN80 Keystone F952 Knifegate Valve (VV_-0540-004) DN100 Keystone F952 Knifegate Valve (VV_-0540-007)
Grundfos SE1.100.150 (Submersible) Pump A-Recycle (PU_-0540-201)	DN150 Keystone F952 Knifegate Valve (VV_-0540-011) DN250 Keystone F952 Knifegate Valve (VV_-0540-013)
Grundfos SE1.100.150 (Submersible) Pump A-Recycle (PU_-0540-202)	DN150 Keystone F952 Knifegate Valve (VV_-0540-012) DN250 Keystone F952 Knifegate Valve (VV_-0540-014)
Endress + Hauser 50W2H Flowmeter A-Recycle (FITQ_-0540-011)	DN250 Keystone F952 Knifegate Valve (VV_-0540-013) DN250 Keystone F952 Knifegate Valve (VV_-0540-014) DN250 Keystone F952 Knifegate Valve (VV_-0540-017)
Grundfos SE1.100.150 (Submersible) Pump S-Recycle (PU_-0540-301)	DN150 Keystone F952 Knifegate Valve (VV_-0540-021) DN200 Keystone F952 Knifegate Valve (VV_-0540-023)
Grundfos SE1.100.150 (Submersible) Pump S-Recycle (PU_-0540-302)	DN150 Keystone F952 Knifegate Valve (VV_-0540-022) DN200 Keystone F952 Knifegate Valve (VV_-0540-024)
Endress + Hauser 50W2H Flowmeter S-Recycle (FITQ_-0540-021)	DN200 Keystone F952 Knifegate Valve (VV_-0540-023) DN200 Keystone F952 Knifegate Valve (VV_-0540-024) DN200 Gemu (Pneumatic) Diaphragm Valve (FCV_-0540-027)

3 MBR SYSTEM

3.1 MBR SYSTEM PROCESS OVERVIEW

The membrane bioreactor zone achieves complete solids separation using submerged microfiltration-membranes to produce high quality treated effluent. In addition, the membrane cleaning via air scouring provides oxygen to maintain the biomass in suspension.

There are two (2) Membrane Trains – with each separate train comprising the following;

- Three (3) Kubota model ES200 submerged microfiltration-modules.

With each separate submerged microfiltration-module comprising the following;

- Coarse bubble diffuser for membrane cleaning and aeration.
- 200 Flat Sheet Panels and Permeate Collection Pipe.

Any/all permeate pipework – dedicated to each tank comprises the following;

- (Actuated-modulating) Flow Control Valve.
- Pressure Transmitter.
- Flowmeter.
- Level Transmitter.
- (Diffuser-flushing) Control Valve.

During permeation the membrane tanks are On-line, the (duty) Ingersoll Rand model HH S2H52 (positive displacement type) are operating and the permeate flow control valves are modulating.

The required membrane airflows are based on airflow for normal operation of 120 Nm^3/hour with (peak) air flow for the membrane relaxation sequence being 180 Nm^3/hour for each membrane unit.

Following are several operational “Modes” – available to the operator – concerning the membrane system and include;

- (Background) Mode – Low Flow.
- Coarse Bubble Diffuser Flushing.
- Permeation – Normal Operation (Level).
- Permeation – Normal Operation (Flow).
- Permeation – Wasting.
- Membrane Relaxation.
- Alternating MBR Tank.
- Both MBR Tanks On-Line.
- One (1) MBR Tank Off-Line (Maintenance Mode).
- Membrane Chemical Clean (Mode).

3.2 MBR SYSTEM EQUIPMENT

The MBR process comprises the following equipment;

- Six (6) Kubota model ES200 submerged microfiltration-modules (FLT_-0641-001, FLT_-0641-002, FLT_-0641-003, FLT_-0642-001, FLT_-0642-002 and FLT_-0642-003).

3.3 KUBOTA (SUBMERGED) MICROFILTRATION-MODULE – GENERAL INFORMATION

Make/Description:	Kubota (Submerged) Microfiltration-Modules
Model:	ES200
Supplier:	Aquatec-Maxcon Pty Ltd 119 Toongarra Road IPSWICH QLD 4305 Phone: (07) 3813 7100 Fax: (07) 3813 7199 http://www.aquatecmaxcon.com.au/

3.4 KUBOTA (SUBMERGED) MICROFILTRATION-MODULE – MAINTENANCE SCHEDULE

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
KUBOTA MODEL ES200 DIFFUSER										
Check all membrane pipework for leaks		x								Repair immediately
Clean the membrane diffusers		x								“Clean valve” process
Clean the membrane cartridges					x					“In-situ” process
Replace the membrane retaining rubbers								x		
Replace the membrane permeate tubing								x		
Replace the membrane cartridges								x		

3.5 MBR SYSTEM GENERAL EQUIPMENT – INFORMATION

Equipment Description	Supplier Information
 VEGA Model Vegawells 51 Level Transmitter	VEGA (Australia) Pty Ltd 398 The Boulevarde KIRRAWEE NSW 2232 Phone: (02) 9542 6662 Fax: (02) 9542 6665 www.vega.com/au

3.6 MBR SYSTEM EQUIPMENT – DRAWINGS

NOTE

REFER TO THE QUEENSLAND URBAN UTILITIES TAG OUT/LOCK OUT GUIDE FOR CORRECT COMPANY TAG OUT/LOCK OUT PROCEDURES

- 486/5/5 – 0094-008 – MBR System – Membrane Bioreactor – P & ID
- 486/5/5 – 0094-009 – MBR System – Permeate Storage and Service Water – P & ID
- 486/5/5 – 0094-253 – MBR System – MBR Tank Arrangement (Sheet I of II)
- 486/5/5 – 0094-254 – MBR System – MBR Tank Arrangement (Sheet II of II)
- 486/5/5 – 0094-255 – MBR System – Submerged Membrane Water Pipework Arrangement
- 486/5/5 – 0094-256 – MBR System – Submerged Membrane Air Pipework Arrangement
- 486/5/5 – 0094-258 – MBR System – MBR Tank Vacuum System Arrangement
- 486/5/5 – 0094-259 – MBR System – MBR Tank Vacuum Tank Arrangement
- 486/5/5 – 0094-260 – MBR System – MBR Tank MBR Zone Feed Pipework Arrangement
- 486/5/5 – 0094-262 – MBR System – Submerged Membrane Air Pipework Arrangement
- 486/5/5 – 0094-264 – MBR System – MBR Permeate System Vacuum Vessel Arrangement
- 486/5/5 – 0094-282 – MBR System – Scum System Scumbox Arrangement
- 486/5/5 – 0094-284 – MBR System – Scum System Pump Station Arrangement
- 486/5/5 – 0094-285 – MBR System – Scum System Spray Arrangement

3.7 MBR TANK I SYSTEM EQUIPMENT – ISOLATION VALVES

Sections For Maintenance	Manual Isolation Valves
MBR Tank 1 (TK_-0641-001) Main Inlet (Pneumatic) Isolation Valve	DN300 Keystone F952 Knifegate Valve (FCV_-0641-020)
MBR Tank 1 (TK_-0641-001) (Module I) Air Diffuser Inlet Isolation	DN80 Keystone F612 Butterfly Valve (VV_-0641-001)
MBR Tank 1 (TK_-0641-001) (Module II) Air Diffuser Inlet Isolation	DN80 Keystone F612 Butterfly Valve (VV_-0641-002)
MBR Tank 1 (TK_-0641-001) (Module III) Air Diffuser Inlet Isolation	DN80 Keystone F612 Butterfly Valve (VV_-0641-003)
MBR Tank 1 (TK_-0641-001) (Module IV) Air Diffuser Inlet Isolation	DN80 Keystone F612 Butterfly Valve (VV_-0641-004)
MBR Tank 1 (TK_-0641-001) (Module I) Permeate Outlet Isolation	DN80 Keystone F612 Butterfly Valve (VV_-0641-005)
MBR Tank 1 (TK_-0641-001) (Module II) Permeate Outlet Isolation	DN80 Keystone F612 Butterfly Valve (VV_-0641-006)
MBR Tank 1 (TK_-0641-001) (Module III) Permeate Outlet Isolation	DN80 Keystone F612 Butterfly Valve (VV_-0641-007)
MBR Tank 1 (TK_-0641-001) (Module IV) Permeate Outlet Inlet Isolation	DN80 Keystone F612 Butterfly Valve (VV_-0641-008)
MBR Tank 1 (TK_-0641-001) S-Recycle (Pneumatic) Isolation Valve	DN200 Keystone F952 Knifegate Valve (VV_-0641-033)
MBR Tank 1 (TK_-0641-001) (Inlet Valve) Compressed Air Isolation	DN15 Keystone F152 Ball Valve (VV_-1011-033)
MBR Tank 1 (TK_-0641-001) (Diffuser Valve) Compressed Air Isolation	DN15 Keystone F152 Ball Valve (VV_-1011-035)
MBR Tank 1 (TK_-0641-001) (S-Recycle Valve) Compressed Air Isolation	DN15 Keystone F152 Ball Valve (VV_-1011-037)
MBR Tank 1 (TK_-0641-001) (Permeate Valve) Compressed Air Isolation	DN15 Keystone F152 Ball Valve (VV_-1011-039)
Endress + Hauser 50W80 Flowmeter Permeate (FITQ_-0660-011)	DN150 Keystone F612 Butterfly Valve (VV_-0660-012) DN80 Keystone F612 Butterfly Valve (VV_-0660-013)

3.8 MBR TANK II SYSTEM EQUIPMENT – ISOLATION VALVES

Sections For Maintenance	Manual Isolation Valves
MBR Tank 2 (TK_-0641-002) Main Inlet (Pneumatic) Isolation Valve	DN300 Keystone F952 Knifegate Valve (FCV_-0642-020)
MBR Tank 2 (TK_-0641-002) (Module I) Air Diffuser Inlet Isolation	DN80 Keystone F612 Butterfly Valve (VV_-0642-001)
MBR Tank 2 (TK_-0641-002) (Module II) Air Diffuser Inlet Isolation	DN80 Keystone F612 Butterfly Valve (VV_-0642-002)
MBR Tank 2 (TK_-0641-002) (Module III) Air Diffuser Inlet Isolation	DN80 Keystone F612 Butterfly Valve (VV_-0642-003)
MBR Tank 2 (TK_-0641-002) (Module IV) Air Diffuser Inlet Isolation	DN80 Keystone F612 Butterfly Valve (VV_-0642-004)
MBR Tank 2 (TK_-0641-002) (Module I) Permeate Outlet Isolation	DN80 Keystone F612 Butterfly Valve (VV_-0642-005)
MBR Tank 2 (TK_-0641-002) (Module II) Permeate Outlet Isolation	DN80 Keystone F612 Butterfly Valve (VV_-0642-006)
MBR Tank 2 (TK_-0641-002) (Module III) Permeate Outlet Isolation	DN80 Keystone F612 Butterfly Valve (VV_-0642-007)
MBR Tank 2 (TK_-0641-002) (Module IV) Permeate Outlet Inlet Isolation	DN80 Keystone F612 Butterfly Valve (VV_-0642-008)
MBR Tank 2 (TK_-0641-002) S-Recycle (Pneumatic) Isolation Valve	DN200 Keystone F952 Knifegate Valve (VV_-0642-033)
MBR Tank 2 (TK_-0641-002) (Inlet Valve) Compressed Air Isolation	DN15 Keystone F152 Ball Valve (VV_-1012-033)
MBR Tank 2 (TK_-0641-002) (Diffuser Valve) Compressed Air Isolation	DN15 Keystone F152 Ball Valve (VV_-1012-035)
MBR Tank 2 (TK_-0641-002) (S-Recycle Valve) Compressed Air Isolation	DN15 Keystone F152 Ball Valve (VV_-1012-037)
MBR Tank 2 (TK_-0641-002) (Permeate Valve) Compressed Air Isolation	DN15 Keystone F152 Ball Valve (VV_-1012-039)
Endress + Hauser 50W80 Flowmeter Permeate (FITQ_-0660-021)	DN150 Keystone F612 Butterfly Valve (VV_-0660-022) DN80 Keystone F612 Butterfly Valve (VV_-0660-023)

4 VACUUM SIPHON SYSTEM

4.1 VACUUM SIPHON SYSTEM PROCESS OVERVIEW

By evacuating air from the permeate headers – along the MBR tank and the main header – a low-pressure environment is created in the pipework inducing the permeation process.

The vacuum system evacuates the permeate line and draws “permeate” from the permeate tank till a high level is achieved in the vacuum vessel.

Two (2) Elmo Nash model 2BL2041 (vacuum) blowers – functioning in either “Start/Stop” mode – will commence operations with low levels in the vacuum vessel and will shut down upon reaching a high level in the vacuum vessel.

The two (2) Elmo Nash model 2BL2041 (vacuum) blowers will operate in a duty/standby configuration.

4.2 VACUUM SIPHON SYSTEM EQUIPMENT

The vacuum siphon process comprises the following equipment;

- Two (2) Elmo Nash model 2BL2041 (vacuum) blowers (PU_-0660-001 and PU_-0660-002).

4.3 ELMO NASH (VACUUM) BLOWER – GENERAL INFORMATION

Make/Description:	Elmo Nash (Vacuum) Blower
Model:	2BL2041
Supplier:	Gardener Denver Nash (Australia) Pty Ltd 13 Arnott Place WETHERILL PARK NSW 2164 Phone: (02) 9725 5199 Fax: (02) 9725 5128 http://www.gdnash.com/

4.4 ELMO NASH (VACUUM) BLOWER – MAINTENANCE SCHEDULE

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
ELMO NASH MODEL 2BL BLOWER										
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Check all vacuum blower pipework for leaks	x									Repair immediately
Thoroughly clean the vacuum pump cooling fins				x						
Thoroughly clean the vacuum pump separator				x						
Replace the vacuum pump water cooler						x				
Replace the vacuum pump air filter						x				

4.5 VACUUM SIPHON SYSTEM GENERAL EQUIPMENT – INFORMATION

Equipment Description	Supplier Information
 Endress + Hauser Model PMC51 Level Transmitter	Endress + Hauser (Australia) Pty Ltd 8/277 Lane Cove Road NORTH RYDE NSW 2113 Phone: (02) 8877 7000 Fax: (02) 8877 7099 www.au.endress.com/
 Endress + Hauser Model MinicapFTC260 Level Switch	Endress + Hauser (Australia) Pty Ltd 8/277 Lane Cove Road NORTH RYDE NSW 2113 Phone: (02) 8877 7000 Fax: (02) 8877 7099 www.au.endress.com/
 Elmo Rietschle Model 2BX5 Level Switch	Gardner Denver Industries (Australia) Pty Ltd Unit 3/ 10 Fortune Street GEEBUNG QLD 4034 Phone: (07) 3633 0711 Fax: (07) 3633 0622 www.gdnash.com/

4.6 VACUUM SIPHON SYSTEM EQUIPMENT – DRAWINGS

NOTE

REFER TO THE QUEENSLAND URBAN UTILITIES TAG OUT/LOCK OUT GUIDE FOR CORRECT COMPANY TAG OUT/LOCK OUT PROCEDURES

- 486/5/5 – 0094-008 – MBR System – Membrane Bioreactor – P & ID
- 486/5/5 – 0094-009 – MBR System – Permeate Storage and Service Water – P & ID
- 486/5/5 – 0094-258 – MBR System – MBR Tank Vacuum System Arrangement
- 486/5/5 – 0094-259 – MBR System – MBR Tank Vacuum Tank Arrangement

4.7 VACUUM SIPHON SYSTEM EQUIPMENT – ISOLATION VALVES

Sections For Maintenance	Manual Isolation Valves
Elmo Nash 2BL2041 (Vacuum) Blower (PU_-0660-001)	DN50 George Fischer F546 Ball Valve (VV_-0660-041)
Elmo Nash 2BL2041 (Vacuum) Blower (PU_-0660-002)	DN50 George Fischer F546 Ball Valve (VV_-0660-042)
Vacuum Tank (TK_-0660-003)	DN50 George Fischer F546 Ball Valve (VV_-0660-036)

5 CHEMICAL DOSING SYSTEM

5.1 CHEMICAL DOSING SYSTEM PROCESS OVERVIEW

Essentially, there are four (4) chemical dosing systems including;

- Alum Dosing,
- Caustic Dosing,
- Sugar Dosing and
- Sodium Hypochlorite Dosing.

All the above dosing systems include a dedicated chemical loading panel allowing the operator to select a time-batched mode of operation for flow-pacing.

The four (4) chemical dosing systems include storage and dosing system comprising the following components;

- One (1) chemical storage tank (TK_-0584-001) for alum dosing, (TK_-0585-001) for caustic dosing, (TK_-0586-001) for sugar dosing and (TK_-0671-001) for sodium hypochlorite dosing,
- One (1) level indicating transmitter (LIT-0584-001) for alum dosing, (LIT-0585-001) for caustic dosing, (LIT-0586-001) for sugar dosing and (LIT-0671-001) for sodium hypochlorite dosing,
- One (1) level switch indicating High High level (LIT-0584-002) for alum dosing, (LIT-0585-002) for caustic dosing, (LIT-0586-002) for sugar dosing and (LIT-0671-002) for sodium hypochlorite dosing,
- One (1) Grundfos model DDI 209 dosing pump (PU-0584-001) for alum dosing, (PU-0585-001) for caustic dosing, and (PU-0586-001) for sugar dosing,
- One (1) Grundfos model DDI 222 dosing pump (PU-0710-001) for sodium hypochlorite dosing and
- Associated isolation valves, pressure loading valves and calibration cylinders.

One (1) storage tank – per dosing system – is provided to accept tanker delivery with the specific (digital type) dosing pump fitted with integral high/low pressure detection providing fault status alarms.

One (1) overflow system – per chemical tank – is provided to ensure any overflow event is clearly visible to the operator.

5.2 CHEMICAL DOSING SYSTEM EQUIPMENT

The chemical dosing processes comprise the following equipment;

- One (1) Grundfos model DDI 209 dosing pump (PU-0584-001) for alum dosing.
- One (1) Grundfos model DDI 209 dosing pump (PU-0585-001) for caustic dosing.
- One (1) Grundfos model DDI 209 dosing pump (PU-0586-001) for sugar dosing.
- One (1) Grundfos model DDI 222 dosing pump (PU-0710-001) for sodium hypochlorite dosing.

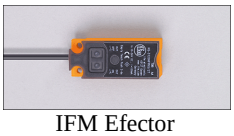
5.3 ALLDOS/GRUNDFOS (DIAPHRAGM) DOSING PUMP – GENERAL INFORMATION

Make/Description:	Grundfos (Dry Mount) Submersible Pump
Model:	DDI 209 and DDI 222
Supplier:	Grundfos Pumps (Australia) Pty Ltd 2/68 Murdoch Circuit ACACIA RIDGE QLD 4110 Phone: (07) 3272 1980 Fax: (07) 3273 8735 http://www.grundfos.com.au/web/homeaunz.nsf

5.4 ALLDOS/GRUNDFOS (DIAPHRAGM) DOSING PUMP – MAINTENANCE SCHEDULE

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
ALLDOS MODEL DDI DOSING PUMP										
Verify correct operation of the diaphragm pump	x									
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Inspect/verify correct oil level in the dosing pump		x								Alldos DHG 68 Oil
Inspect all dosing pump fasteners						x				
Carry out complete inspection of dosing pump						x				
Check integrity of all protective coatings						x				
Verify operation of and clean all pump valves						x				Replace where necessary
Verify operation of dosing pump diaphragms						x				Replace where necessary
Replace dosing pump oil						x				Alldos DHG 68 Oil

5.5 CHEMICAL DOSING SYSTEM GENERAL EQUIPMENT – INFORMATION

Equipment Description	Supplier Information
 VEGA Model Vegason SN61 Level Transmitter	VEGA (Australia) Pty Ltd 398 The Boulevarde KIRRAWEE NSW 2232 Phone: (02) 9542 6662 Fax: (02) 9542 6665 www.vega.com/au
 IFM Efector Model KQ6002 Level Switch	Ifm Efector (Australia) Pty Ltd Suite 3 – 745 Springvale Road MULGRAVE VIC 3170 Phone: (1300) 365 088 Fax: (1300) 365 070 www.ifm.com

5.6 CHEMICAL DOSING SYSTEM EQUIPMENT – DRAWINGS

NOTE

REFER TO THE QUEENSLAND URBAN UTILITIES TAG OUT/LOCK OUT GUIDE FOR CORRECT COMPANY TAG OUT/LOCK OUT PROCEDURES

- 486/5/5 – 0094-010 – Chemical Dosing – Caustic, Sugar, Hypo Dosing – P & ID
- 486/5/5 – 0094-011 – Chemical Dosing – Alum Dosing – P & ID
- 486/5/5 – 0094-245 – Chemical Dosing – Caustic Doing System General Arrangement
- 486/5/5 – 0094-248 – Chemical Dosing – Alum Dosing System General Arrangement
- 486/5/5 – 0094-249 – Chemical Dosing – Sugar Dosing System General Arrangement
- 486/5/5 – 0094-251 – Chemical Doing – Hypo Dosing System General Arrangement

5.7 CHEMICAL DOSING SYSTEM EQUIPMENT – ISOLATION VALVES

Sections For Maintenance	Manual Isolation Valves
Grundfos DDI 209 (Alum) Dosing Pump (PU-0584-001)	DN15 George Fischer F546 Ball Valve (VV_-0584-011) DN15 George Fischer F546 Ball Valve (VV_-0584-013)
Grundfos DDI 209 (Caustic) Dosing Pump (PU-0585-001)	DN15 George Fischer F314 Diaphragm Valve (VV_-0585-011) DN15 George Fischer F314 Diaphragm Valve (VV_-0585-013)
Grundfos DDI 209 (Sugar) Dosing Pump (PU-0586-001)	DN15 George Fischer F546 Ball Valve (VV_-0586-011) DN15 George Fischer F546 Ball Valve (VV_-0586-013)
Grundfos DDI 222 (Hypo) Dosing Pump (PU-0710-001)	DN15 George Fischer F314 Diaphragm Valve (VV_-0710-011) DN15 George Fischer F314 Diaphragm Valve (VV_-0710-013) DN15 George Fischer F314 Diaphragm Valve (VV_-0671-014) DN15 George Fischer F314 Diaphragm Valve (VV_-0671-016)
Chemical Dosing – Safety Shower No. 1	DN25 Keystone F152 Ball Valve (VV_-1020-001)
Chemical Dosing – Safety Shower No. 2	DN25 Keystone F152 Ball Valve (VV_-1020-002)
Chemical Dosing – Safety Shower No. 3	DN25 Keystone F152 Ball Valve (VV_-1020-003)

6 SERVICE WATER

6.1 SERVICE WATER PUMP STATION PROCESS OVERVIEW

Two (2) Grundfos model CRI15-06 (vertical multi-stage) service water pumps operating in a duty/standby configuration provide recycle water for onsite use including;

- Wash down hoses.
- Cleaning screens.
- Any/all washwater requirements for the belt filter press, membrane cleaning etc.

Any/all level, flow and pressure values are continuously monitored with a back-up potable water system available in the event of a lack of water supply.

The two (2) Grundfos model CRI15-06 (vertical multi-stage) service water pumps operate via a PID loop to maintain pressure in the service water “supply” pipework.

Both “High-High” pressure and “Low-Low” level interlocks will interlock the Grundfos service water pumps.

In the event the service water pump station is “running dry”, the potable water supply will direct flow to the service water system.

6.2 SERVICE WATER PUMP STATION EQUIPMENT

The service water pump station comprises the following equipment;

- Two (2) Grundfos model CRI15-06 (vertical multi-stage) service water pumps (PU_-1030-001 and PU_-1030-102).
- One (1) Endress + Hauser model 50W50 (service water) flowmeter (FITQ_-1030-003).

6.3 GRUNDFOS (VERTICAL) SERVICE WATER PUMP – GENERAL INFORMATION

Make/Description:	Grundfos (Vertical) Multi-Stage Pump
Model:	CRI15-06
Supplier:	Grundfos Pumps (Australia) Pty Ltd 2/68 Murdoch Circuit ACACIA RIDGE QLD 4110 Phone: (07) 3272 1980 Fax: (07) 3273 8735 http://www.grundfos.com.au/web/homeaunz.nsf

6.4 GRUNDFOS (VERTICAL) SERVICE WATER PUMP – MAINTENANCE SCHEDULE

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
GRUNDFOS MODEL CRI PUMP										
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Check gearbox unit for oil leakage		x								
Check tightness of all holding down bolts		x								
Inspect pump for general operation and alignment		x								
Check pump drive for abnormal temperature/noise		x								
Inspect pump internal components							x			Replace as necessary
Inspect pump lower bearings								x		Replace as necessary
Inspect pump motor bearings								x		Replace as necessary

6.5 SERVICE WATER PUMP STATION GENERAL EQUIPMENT – INFORMATION

Equipment Description	Supplier Information
 VEGA Model Vegason SN61 Level Transmitter	VEGA (Australia) Pty Ltd 398 The Boulevarde KIRRAWEE NSW 2232 Phone: (02) 9542 6662 Fax: (02) 9542 6665 www.vega.com/au

6.6 SERVICE WATER PUMP STATION SYSTEM EQUIPMENT – DRAWINGS

NOTE

REFER TO THE QUEENSLAND URBAN UTILITIES TAG OUT/LOCK OUT GUIDE FOR CORRECT COMPANY TAG OUT/LOCK OUT PROCEDURES

- 486/5/5 – 0094-009 – MBR System – Permeate Storage and Service Water – P & ID
- 486/5/5 – 0094-300 – Service Water – Service Water Pump Station Arrangement

6.7 SERVICE WATER PUMP STATION SYSTEM EQUIPMENT – ISOLATION VALVES

Sections For Maintenance	Manual Isolation Valves
Grundfos CRI15-06 (Vertical) Pump Service Water (PU_-1030-001)	DN80 Keystone F152 Ball Valve (VV_-1030-001) DN50 Keystone F152 Ball Valve (VV_-1030-005)
Grundfos CRI15-06 (Vertical) Pump Service Water (PU_-1030-102)	DN80 Keystone F152 Ball Valve (VV_-1030-002) DN50 Keystone F152 Ball Valve (VV_-1030-006)
Endress + Hauser 50W50 Flowmeter Service Water (FITQ_-1030-003)	DN50 Keystone F152 Ball Valve (VV_-1030-005) DN50 Keystone F152 Ball Valve (VV_-1030-006) DN50 George Fischer F546 Ball Valve (VV_-1030-010)

7 COMPRESSED AIR

7.1 COMPRESSED AIR PROCESS OVERVIEW

Two (2) Atlas Copco model LFX 1.5-10 (piston) air compressors operating in a duty/standby configuration provide compressed air to maintain air pressure in the main air receiver.

Additionally, compressed air is required for the sludge dewatering system and providing instrument quality air to any/all pneumatic-actuated valves.

One (1) Atlas Copco FX1 air dryer reduces the moisture content in the compressed air.

7.2 COMPRESSED AIR EQUIPMENT

The compressed air process comprises the following equipment;

- Two (2) Atlas Copco model LFX 1.5-10 (piston) air compressors (CP_-1011-001 and CP_-1011-002) complete with air receiver (PV_-1011-001).
- One (1) Atlas Copco model FX1 air dryer (AD_-1011-001).
- One (1) Atlas Copco model DD17 pre-filter (FLT_-1011-001) complete with differential pressure indicator (PDF_-1011-001).
- One (1) Atlas Copco model DD17 post-filter (FLT_-1011-002) complete with differential pressure indicator (PDF_-1011-002).

7.3 ATLAS COPCO (PISTON) AIR COMPRESSOR – GENERAL INFORMATION

Make/Description:	Atlas Copco (Piston) Air Compressor
Model:	LFX 1.5-10
Supplier:	Atlas Copco Compressors (Australia) Pty Ltd 88 Stradbroke Street HEATHWOOD QLD 4110 Phone: (07) 3723 6966 Fax: (07) 3278 9954 http://www.atlascopco.com.au/auus/

7.4 ATLAS COPCO (PISTON) AIR COMPRESSOR – MAINTENANCE SCHEDULE

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
ATLAS MODEL LFX COMPRESSOR										
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Inspect bioreactor pipework for leaks	x									
Drain any/all condensate from the receiver	x									
Visually inspect compressor air filter			x							Clean/Replace
Replace the air compressor pre-air filter						x				
Replace the air compressor post-air filter						x				
Replace the air compressor electric motor							x			
Replace the air compressor element							x			
Inspect any/all air compressor gaskets							x			Replace as necessary
Inspect any/all air compressor o-rings							x			Replace as necessary
Inspect any/all air compressor washers							x			Replace as necessary

7.5 COMPRESSED AIR EQUIPMENT – DRAWINGS

NOTE

REFER TO THE QUEENSLAND URBAN UTILITIES TAG OUT/LOCK OUT GUIDE FOR CORRECT COMPANY TAG OUT/LOCK OUT PROCEDURES

- 486/5/5 – 0094-015 – Blowers and Compressors – P & ID
- 486/5/5 – 0094-302 – Compressed Air – Compressed Air System Arrangement (Sheet I of II)
- 486/5/5 – 0094-303 – Compressed Air – Compressed Air System Arrangement (Sheet II of II)

7.6 COMPRESSED AIR EQUIPMENT – ISOLATION VALVES

Sections For Maintenance	Manual Isolation Valves
Atlas Copco LFX 1.5-10 (Air) Compressor (CP_-1011-001)	DN15 Keystone F152 Ball Valve (VV_-1011-005)
Atlas Copco LFX 1.5-10 (Air) Compressor (CP_-1011-002)	DN15 Keystone F152 Ball Valve (VV_-1011-006)
Compressed Air Accumulator (TK_-1011-001)	DN15 Keystone F152 Ball Valve (VV_-1011-005) DN15 Keystone F152 Ball Valve (VV_-1011-006) DN15 Keystone F152 Ball Valve (VV_-1011-013)
Atlas Copco DD17 (Pre) Filter (FLT_-1011-001) Complete with Differential Pressure Indicator (PDF_-1011-001)	DN15 Keystone F152 Ball Valve (VV_-1011-013) DN15 Keystone F152 Ball Valve (VV_-1011-014)
Atlas Copco FX1 (Air) Dryer (AD_-1011-001)	DN15 Keystone F152 Ball Valve (VV_-1011-015) DN15 Keystone F152 Ball Valve (VV_-1011-016)
Atlas Copco DD17 (Post) Filter (FLT_-1011-002) Complete with Differential Pressure Indicator (PDF_-1011-002)	DN15 Keystone F152 Ball Valve (VV_-1011-017) DN15 Keystone F152 Ball Valve (VV_-1011-018)

7.7 COMPRESSED AIR EQUIPMENT – ISOLATION VALVES

Sections For Maintenance	Manual Isolation Valves
DN150 Gemu (Pneumatic) Diaphragm Valve (FCV_-0230-004)	DN15 Keystone F152 Ball Valve (VV_-1011-031)
DN80 Gemu (Pneumatic) Diaphragm Valve (FCV_-0540-030)	DN15 Keystone F152 Ball Valve (VV_-1011-032)
DN300 Keystone (Pneumatic) Knifegate Valve (FCV_-0641-020)	DN15 Keystone F152 Ball Valve (VV_-1011-033)
DN300 Keystone (Pneumatic) Knifegate Valve (FCV_-0642-020)	DN15 Keystone F152 Ball Valve (VV_-1011-034)
DN80 Keystone (Pneumatic) Butterfly Valve (FCV_-0641-021)	DN15 Keystone F152 Ball Valve (VV_-1011-035)
DN80 Keystone (Pneumatic) Butterfly Valve (FCV_-0642-021)	DN15 Keystone F152 Ball Valve (VV_-1011-036)
DN200 Keystone (Pneumatic) Knifegate Valve (FCV_-0641-022)	DN15 Keystone F152 Ball Valve (VV_-1011-037)
DN200 Keystone (Pneumatic) Knifegate Valve (FCV_-0642-022)	DN15 Keystone F152 Ball Valve (VV_-1011-038)
DN80 Keystone (Pneumatic) Butterfly Valve (FCV_-0660-010)	DN15 Keystone F152 Ball Valve (VV_-1011-039)
DN80 Keystone (Pneumatic) Butterfly Valve (FCV_-0660-020)	DN15 Keystone F152 Ball Valve (VV_-1011-040)
DN50 Keystone (Pneumatic) Ball Valve (FCV_-0660-030)	DN15 Keystone F152 Ball Valve (VV_-1011-041)
DN50 Keystone (Pneumatic) Ball Valve (FCV_-0660-040)	DN15 Keystone F152 Ball Valve (VV_-1011-042)
DN150 Keystone (Pneumatic) Butterfly Valve (FCV_-0650-001)	DN15 Keystone F152 Ball Valve (VV_-1011-043)
DN150 Keystone (Pneumatic) Butterfly Valve (FCV_-0650-002)	DN15 Keystone F152 Ball Valve (VV_-1011-044)
DN150 Keystone (Pneumatic) Butterfly Valve (FCV_-0650-003)	DN15 Keystone F152 Ball Valve (VV_-1011-045)

8 SCUM REMOVAL, SLUDGE WASTEING / DEWATERING

8.1 SCUM REMOVAL (EXISTING BIOREACTOR)

Scum is drawn from the (existing) bioreactor via the bellmouth to the aerobic tank – with an (automated) scum spray system equipped with the solenoid valve (SV_-1030-038) – to assist scum removal into the new bioreactor along with the main mixed liquor flow stream.

8.2 SCUM REMOVAL (NEW BIOREACTOR)

Scum from both the (existing) bioreactor and (new) bioreactor flows with the main mixed liquor flow stream into either of the MBR tanks – scum is drawn from either of the MBR tanks into the scum collection tanks over a fixed weir.

(The MBR reverts to a fixed level control to draw scum into the collection tank)

An (automated) scum spray system equipped with the solenoid valves (SV_-1030-031 and SV_-1030-032) – to assist scum removal from the new bioreactor.

8.3 WAS/SCUM PUMPS

Two (2) Mono model C14K (variable speed) positive displacement WAS/scum pumps will be used to maintain a set flowrate – via the Endress + Hauser model 50W WAS flowmeter (FIT-0410-001) into the dewatering system.

The flowrate is operator-adjustable – provided the mechanical variators on the Andritz model PP-G 1000 belt filter press (BFP_-0420-003) / Andritz model PD-M 1000 gravity drainage deck (GDD_-0420-001) combination unit are suitably adjusted.

The Mono model C14K (variable speed) positive displacement WAS/scum pumps will start once the MBR is operating in WAS mode – provided no other interlocks are active.

8.4 WAS/SCUM PUMPS EQUIPMENT

The WAS/scum pump station comprises the following equipment;

- Two (2) Mono model C14K (variable speed) positive displacement WAS/scum pumps (PU_-0530-001 and PU_-0530-002).
- One (1) Endress + Hauser model 50W2H (WAS/scum) flowmeter (FITQ_-0410-001).

8.5 MONO (POSITIVE DISPLACEMENT) WAS/SCUM PUMP – GENERAL INFORMATION

Make/Description:	Mono (Variable Speed) Positive Displacement Pump
Model:	C14K
Gearmotor Make/Model:	Nord SK372.1F-100L4
Supplier:	Mono Pumps (Australia) Pty Ltd 12 Glentanna Street KEDRON QLD 4031 Phone: (07) 3350 4582 Fax: (07) 3350 3750 http://www.monopumps.com.au/en-au/mono-australia

8.6 MONO (POSITIVE DISPLACEMENT) WAS/SCUM PUMP – MAINTENANCE SCHEDULE

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
MONO MODEL C14K PUMP										
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Check gearbox oil temperature			x							
Check gland packing for excessive leakage			x							Rectify and/or replace
Change gearbox oil after initial 100 running hours										Alpha SP 220 Oil
Check gearbox oil level				x						
Inspect gearbox oil for colour consistency				x						
Check gearbox unit for oil leakage				x						
Lubricate coupling rod drive joints					x					AP3 Grease
Check tightness of all holding down bolts						x				
Clean/inspect/repack or replace the motor bearings								x		AP3 Grease
Change gearbox oil every 10,000 hours or 3 years								x		Alpha SP 220 Oil
General inspection for pump and motor overhaul									x	

All lubricants are Castrol unless otherwise noted

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
NORD MODEL SK372 GEAR UNIT										
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Check gearbox oil temperature			x							
Change gearbox oil after initial 100 running hours										Alpha SP 220 Oil
Check gearbox oil level				x						
Inspect gearbox oil for colour consistency				x						
Check gearbox unit for oil leakage				x						
Check tightness of all gearmotor fasteners						x				
Clean, inspect, repack/replace the motor bearings								x		AP3 Grease
Change gearbox oil every 10,000 hours or 3 years								x		Alpha SP 220 Oil

All lubricants are Castrol unless otherwise noted

8.7 POLYMER DOSING SYSTEM

One (1) Siemens model PB 16 polymer system (PU_-0461-001) is provided for polymer mixing (and dosing) into the sludge line prior to the Andritz model PP-G 1000 belt filter press (BFP_-0420-003) / Andritz model PD-M 1000 gravity drainage deck (GDD_-0420-001) combination unit.

The Siemens model PB 16 polymer system (PU_-0461-001) is complete with the following;

- One (1) polymer metering pump (PU_-0461-001),
- One (1) potable water inlet solenoid valve (SV_-1020-023),
- One (1) potable water rotameter (FE_-1020-002),
- One (1) polymer activation chamber (TK_-0461-002),
- One (1) polymer activation mixer (MX_-0461-001) and
- One (1) inline static mixer (MX_-0461-002).

8.8 POLYMER DOSING SYSTEM EQUIPMENT

The polymer dosing process comprises the following equipment;

- One (1) Siemens model PB 16 polymer system (PU_-0461-001).

8.9 SIEMENS POLYMER SYSTEM – GENERAL INFORMATION

Make/Description:	Siemens Polymer System
Model:	PB 16
Supplier:	Siemens (Australia) Pty Ltd 153 Campbell Street BOWEN HILLS QLD 4006 Phone: (07) 3332 8356 Fax: (07) 3332 8301 http://www.siemens.com.au

8.10 SIEMENS POLYMER SYSTEM – MAINTENANCE SCHEDULE

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
SIEMENS MODEL PB1 POLYMER SYSTEM										
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Inspect the dosing system pipework for leaks	x									Repair immediately
Thoroughly clean the dosing flowmeter				x						
Thoroughly clean the dosing chamber					x					
Thoroughly clean the dosing injection valve					x					
Thoroughly clean the dosing suction valve					x					
Thoroughly clean the dosing discharge valve					x					
Check the tightness of all dosing system fasteners					x					
Check all safety equipment operates correctly					x					

8.11 SLUDGE CONVEYOR AND SLUDGE BIN

One (1) Sanwest model MR35-5.7 (inclined) conveyor (CV_-0420-003) transfers dewatered sludge from the Andritz model PP-G 1000 belt filter press (BFP_-0420-003) to the Spirotainer model STU355 sludge bin (TK_-0420-001) for collection.

The Spirotainer model STU355 sludge bin (TK_-0420-001) is complete with a screw conveyor (CV_-0420-004) and a high level switch (LS_-0420-006).

The dewatering system is unavailable should the following events be in effect;

- High level switch (LS_-0420-006) is active,
- The Sanwest model MR35-5.7 (inclined) conveyor (CV_-0420-003) is unavailable and
- The Spirotainer model STU355 sludge bin screw conveyor (CV_-0420-004) is unavailable.

8.12 SLUDGE CONVEYOR AND SLUDGE BIN EQUIPMENT

The sludge conveyor and sludge bin process comprises the following equipment;

- One (1) Sanwest model MR35-5.7 (inclined) conveyor (CV_-0420-003).
- One (1) Spirotainer model STU355 sludge bin (TK_-0420-001) complete with screw conveyor (CV_-0420-004).

8.13 SPIRAC SLUDGE BIN – GENERAL INFORMATION

Make/Description:	Spirac Sludge Bin
Model:	STU355
Gearmotor Make/Model:	SEW-Eurodrive KA67DRE90L4
Supplier:	Spirac (Australia) Pty Ltd Unit 43/5-7 Inglewood Place BAULKHAM HILLS NSW 2153 Phone: (02) 9839 3700 Fax: (02) 9838 3777 http://www.spirac.com/

8.14 SPIRAC SLUDGE BIN – MAINTENANCE SCHEDULE

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
SPIRAC MODEL STU355 SLUDGE BIN										
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Check bell housing packing box temperature	x									>60^0 Check grease level
Wash down the interior of the conveyor trough			x							
Wash down the exterior of the conveyor trough			x							
Check/verify conveyor liner for wear			x							Replace as necessary
Check bell housing packing box for leaks			x							
Check conveyor spiral is not damaged/deformed			x							Replace as necessary
Check the tightness of all conveyor fasteners					x					Tighten as necessary
Check/inspect all conveyor welding					x					
Check all safety equipment operates correctly					x					

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
SEW MODEL KA67 GEAR UNIT										
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Check gearbox oil temperature			x							
Change gearbox oil after initial 100 running hours										Alpha SP 220 Oil
Check gearbox oil level				x						
Inspect gearbox oil for colour consistency				x						
Check gearbox unit for oil leakage				x						
Check tightness of all gearmotor fasteners						x				
Clean, inspect, repack/replace the motor bearings								x		AP3 Grease
Change gearbox oil every 10,000 hours or 3 years								x		Alpha SP 220 Oil

All lubricants are Castrol unless otherwise noted

8.15 SANWEST (INCLINED) CONVEYOR – GENERAL INFORMATION

Make/Description:	Sanwest (Inclined) Conveyor
Model:	MR35-5.7
Supplier:	Sanwest Conveyors (Australia) Pty Ltd 60 Beringarra Avenue MALAGA WA 6090 Phone: (08) 9249 1133 Fax: (08) 9249 1144 http://www.sanwest.com.au/

8.16 SANWEST (INCLINED) CONVEYOR – MAINTENANCE SCHEDULE

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Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
SANWEST MODEL MR35-5.7 CONVEYOR										
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Check any/all dislodged carrier rollers			x							Return original position
Check any/all dislodged return rollers			x							Return original position
Check the conveyor belt for directional flow				x						Adjust as necessary
Check the conveyor belt for correct tension				x						Adjust as necessary
Thoroughly clean the conveyor belt				x						
Thoroughly clean the conveyor head pulley				x						
Thoroughly clean the conveyor tail pulley				x						
Thoroughly clean the conveyor carrier rollers				x						
Thoroughly clean the conveyor return rollers				x						
Thoroughly clean the conveyor head scraper				x						
Thoroughly clean the conveyor tail scraper				x						
Grease the conveyor motor pulley gear						x				Esso EP350 Grease
Check the drive pulley motor resistance						x				1Ω @ 500v
Thoroughly clean the conveyor electric motor						x				
Check all safety equipment operates correctly						x				

8.17 COMBINED GDD/BFP SYSTEM

The Andritz model PP-G 1000 belt filter press (BFP_-0420-003) / Andritz model PD-M 1000 gravity drainage deck (GDD_-0420-001) combination unit has a dedicated local control panel (LCP) and human machine interface (HMI) to operate the unit.

The pre-requisites – to start the unit/s – include the following;

- The availability of sludge space, in the Spirotainer model STU355 sludge bin (Not high level) (LS_-0420-006),
- The availability of the Grundfos model CRI15 service water pump/s (PU_-1030-001 and/or PU_-1030-002),
- The availability of the Grundfos model CR15 (washwater) booster pump (PU_-0420-005),
- The availability of the Sanwest model MR35-5.7 (inclined) conveyor (CV_-0420-003),
- The availability of the Spirotainer model STU355 sludge bin screw conveyor (CV_-0420-004),
- The availability of the Siemens model PB 16 polymer system (PU_-0461-001) and
- The availability of the Grundfos model SEV.80.80 filtrate pump/s (PU_-0420-001 and/or PU_-0420-002).

8.18 COMBINED GDD/BFP EQUIPMENT

The combined GDD/BFP process comprises the following equipment;

- One (1) Andritz model PP-G 1000 belt filter press (BFP_-0420-003).
- One (1) Andritz model PD-M 1000 gravity drainage deck (GDD_-0420-001).

8.19 ANDRITZ BELT FILTER PRESS – GENERAL INFORMATION

Make/Description:	Andritz Belt Filter Press
Model:	PP-G 1000
Supplier:	Andritz (Australia) Pty Ltd 21 Kalinya Close CAMERON PARK NSW 2285 Phone: (02) 4914 4017 Fax: (02) 4955 3788 http://www.andritz.com/au

8.20 ANDRITZ BELT FILTER PRESS – MAINTENANCE SCHEDULE

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
ANDRITZ MODEL PP-G 1000 BFP										
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Hose down the drainage zone (Below the BFP)	x									
Inspect the belt for cracks/wear and/or folding	x									Replace as necessary
Ensure the belt is tracking centrally in the BFP	x									Adjust as necessary
Inspect the deflector blades for cracks and/or wear	x									Replace as necessary
Inspect the pneumatic hoses for leaks	x									Repair immediately
Inspect the sealing strips for cracks and/or wear	x									Replace as necessary
Inspect the press rolls for uneven wear	x									Replace as necessary
Thoroughly clean the BFP rolls	x									
Thoroughly clean the BFP cleaning unit	x									
Inspect the BFP mountings for security		x								Fasten as necessary
Grease the BFP bearing assemblies		x								Castrol Spheerol EPL 2
Grease the BFP belt regulator and belt tensioner		x								Castrol AP3 Grease

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
SEW MODEL SA57 GEAR UNIT										
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Check gearbox oil temperature			x							
Change gearbox oil after initial 100 running hours										Alpha SP 220 Oil
Check gearbox oil level				x						
Inspect gearbox oil for colour consistency				x						
Check gearbox unit for oil leakage				x						
Check tightness of all gearmotor fasteners						x				
Clean, inspect, repack/replace the motor bearings								x		AP3 Grease
Change gearbox oil every 10,000 hours or 3 years								x		Alpha SP 220 Oil

All lubricants are Castrol unless otherwise noted

8.21 ANDRITZ GRAVITY DRAINAGE DECK – GENERAL INFORMATION

Make/Description:	Andritz Gravity Drainage Deck
Model:	PD-M 1000
Supplier:	Andritz (Australia) Pty Ltd 21 Kalinya Close CAMERON PARK NSW 2285 Phone: (02) 4914 4017 Fax: (02) 4955 3788 http://www.andritz.com/au

8.22 ANDRITZ GRAVITY DRAINAGE DECK – MAINTENANCE SCHEDULE

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
ANDRITZ MODEL PD-M 1000 GDD										
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Hose down the drainage zone (Below the GDD)	x									
Inspect the belt for cracks/wear and/or folding	x									Replace as necessary
Ensure the belt is tracking centrally in the GDD	x									Adjust as necessary
Inspect the deflector blades for cracks and/or wear	x									Replace as necessary
Inspect the pneumatic hoses for leaks	x									Repair immediately
Inspect the sealing strips for cracks and/or wear	x									Replace as necessary
Inspect the press rolls for uneven wear	x									Replace as necessary
Thoroughly clean the GDD rolls	x									
Thoroughly clean the GDD cleaning unit	x									
Inspect the GDD mountings for security		x								Fasten as necessary
Grease the GDD bearing assemblies		x								Castrol Spheerol EPL 2
Grease the GDD belt regulator and belt tensioner		x								Castrol AP3 Grease

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
SEW MODEL SA57 GEAR UNIT										
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Check gearbox oil temperature			x							
Change gearbox oil after initial 100 running hours										Alpha SP 220 Oil
Check gearbox oil level				x						
Inspect gearbox oil for colour consistency				x						
Check gearbox unit for oil leakage				x						
Check tightness of all gearmotor fasteners						x				
Clean, inspect, repack/replace the motor bearings								x		AP3 Grease
Change gearbox oil every 10,000 hours or 3 years								x		Alpha SP 220 Oil

All lubricants are Castrol unless otherwise noted

8.23 WASH WATER SUPPLY

Service water supply is controlled via the Grundfos model CR15 (washwater) booster pump (PU_-0420-005) and service water solenoid valve (SV_-0420-002) pressurising supply water for the Andritz model PP-G 1000 belt filter press (BFP_-0420-003) / Andritz model PD-M 1000 gravity drainage deck (GDD_-0420-001) combination unit.

The low pressure switch (PS_-0420-004) indicates failure to meet the pressure requirements.

8.24 WASH WATER EQUIPMENT

The service water process comprises the following equipment;

- One (1) Grundfos model CR15 (washwater) booster pump (PU_-0420-005).

8.25 MONO (POSITIVE DISPLACEMENT) WASHWATER PUMP – GENERAL INFORMATION

Make/Description:	Mono (Variable Speed) Positive Displacement Pump
Model:	C15K
Gearmotor Make/Model:	Nord SK372.1F-100L4
Supplier:	Mono Pumps (Australia) Pty Ltd 12 Glentanna Street KEDRON QLD 4031 Phone: (07) 3350 4582 Fax: (07) 3350 3750 http://www.monopumps.com.au/en-au/mono-australia

8.26 MONO (POSITIVE DISPLACEMENT) WASHWATER PUMP – MAINTENANCE SCHEDULE

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
MONO MODEL C15K PUMP										
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Check gearbox oil temperature			x							
Check gland packing for excessive leakage			x							Rectify and/or replace
Change gearbox oil after initial 100 running hours										Alpha SP 220 Oil
Check gearbox oil level				x						
Inspect gearbox oil for colour consistency				x						
Check gearbox unit for oil leakage				x						
Lubricate coupling rod drive joints					x					AP3 Grease
Check tightness of all holding down bolts						x				
Clean/inspect/repack or replace the motor bearings								x		AP3 Grease
Change gearbox oil every 10,000 hours or 3 years								x		Alpha SP 220 Oil
General inspection for pump and motor overhaul									x	

All lubricants are Castrol unless otherwise noted

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
NORD MODEL SK372 GEAR UNIT										
Check for any "abnormal" noises and vibrations	x									Rectify immediately
Check gearbox oil temperature			x							
Change gearbox oil after initial 100 running hours										Alpha SP 220 Oil
Check gearbox oil level				x						
Inspect gearbox oil for colour consistency				x						
Check gearbox unit for oil leakage				x						
Check tightness of all gearmotor fasteners						x				
Clean, inspect, repack/replace the motor bearings								x		AP3 Grease
Change gearbox oil every 10,000 hours or 3 years								x		Alpha SP 220 Oil

All lubricants are Castrol unless otherwise noted

8.27 SPIRAC SLUDGE BIN GENERAL EQUIPMENT – INFORMATION

Equipment Description	Supplier Information
 Siemens Model Pointek ULS200 Level Switch	Siemens (Australia) Pty Ltd 153 Campbell Street BOWEN HILLS QLD 4006 Phone: (07) 3332 8356 Fax: (07) 3332 8301 www.siemens.com.au

8.28 SCUM REMOVAL, SLUDGE WASTING / DEWATERING EQUIPMENT – DRAWINGS

NOTE

REFER TO THE QUEENSLAND URBAN UTILITIES TAG OUT/LOCK OUT GUIDE FOR CORRECT COMPANY TAG OUT/LOCK OUT PROCEDURES

- 486/5/5 – 0094-013 – Sludge Dewatering and Polymer Dosing – P & ID
- 486/5/5 – 0094-287 – Sludge Dewatering – Sludge Dewatering General Arrangement
- 486/5/5 – 0094-288 – Sludge Dewatering – Sludge Dewatering Access Platform Arrangement
- 486/5/5 – 0094-291 – Polymer Dosing – Polymer Dosing General Arrangement
- 486/5/5 – 0094-297 – Sludge Dewatering – Sludge Dewatering Conveyor Arrangement

8.29 WAS/SCUM PUMPS EQUIPMENT – ISOLATION VALVES

Sections For Maintenance	Manual Isolation Valves
Mono C14K (Variable Speed) Pump WAS/Scum Pump (PU_-0530-001)	DN50 Keystone F952 Knifegate Valve (VV_-0530-013) DN50 Keystone F952 Knifegate Valve (VV_-0530-016) DN50 Keystone F952 Knifegate Valve (VV_-0530-023)
Mono C14K (Variable Speed) Pump WAS/Scum Pump (PU_-0530-002)	DN50 Keystone F952 Knifegate Valve (VV_-0530-013) DN50 Keystone F952 Knifegate Valve (VV_-0530-023) DN50 Keystone F952 Knifegate Valve (VV_-0530-026)
Endress + Hauser 50W2H Flowmeter WAS/Scum (FITQ_-0410-001)	DN50 George Fischer F546 Ball Valve (VV_-0420-021) DN50 George Fischer F546 Ball Valve (VV_-0420-022)

8.30 POLYMER DOSING SYSTEM EQUIPMENT – ISOLATION VALVES

Sections For Maintenance	Manual Isolation Valves
Siemens PB 16 Polymer Dosing System (PU_-0461-001)	DN50 Keystone F152 Ball Valve (VV_-1020-020)

8.31 SPIRAC SLUDGE BIN – ISOLATION VALVES

Sections For Maintenance	Manual Isolation Valves
Spirotainer STU355 Sludge Bin (TK_-0420-001) Complete with Screw Conveyor (CV_-0420-004)	DN50 George Fischer F546 Ball Valve (VV_-0420-022) DN25 Keystone F152 Knifegate Valve (VV_-0420-006) DN25 Keystone F152 Knifegate Valve (VV_-0420-007) DN25 Keystone F152 Knifegate Valve (VV_-0420-008)

8.32 SANWEST (INCLINED) CONVEYOR – ISOLATION VALVES

Sections For Maintenance	Manual Isolation Valves
Sanwest MR35-5.7 (Inclined) Conveyor (CV_-0420-003)	DN50 George Fischer F546 Ball Valve (VV_-0420-022) DN25 Keystone F152 Knifegate Valve (VV_-0420-006) DN25 Keystone F152 Knifegate Valve (VV_-0420-007) DN25 Keystone F152 Knifegate Valve (VV_-0420-008)

8.33 COMBINED GDD/BFP – ISOLATION VALVES

Sections For Maintenance	Manual Isolation Valves
Andritz PP-G 1000 Belt Filter Press (BFP_-0420-003)	DN50 George Fischer F546 Ball Valve (VV_-0420-022) DN25 Keystone F152 Ball Valve (VV_-0420-006) DN25 Keystone F152 Ball Valve (VV_-0420-007) DN15 Keystone F152 Ball Valve (VV_-0420-012)
Andritz PD-M 1000 Gravity Drainage Deck (GDD_-0420-001)	DN50 George Fischer F546 Ball Valve (VV_-0420-022) DN25 Keystone F152 Ball Valve (VV_-0420-008)

8.34 WASH WATER PUMP EQUIPMENT – ISOLATION VALVES

Sections For Maintenance	Manual Isolation Valves
Grundfos CR15 (Vertical) Pump Washwater Booster (PU_-0420-005)	DN50 George Fischer F546 Ball Valve (VV_-0420-001) DN50 George Fischer F546 Ball Valve (VV_-0420-003)

9 FILTRATE PUMP STATION

9.1 FILTRATE PUMP STATION PROCESS OVERVIEW

Two (2) Grundfos model SEV.80.80 (submersible) pumps, operating in a duty/standby configuration, will be used to return collected onsite wastewater to the inlet works – with both level and flow values continuously monitored.

The (duty) Grundfos model SEV.80.80 (submersible) pump will start (and stop) to signals received as discrete levels are attained including;

- Low Low Level – Both pumps interlock to prevent from running dry.
- Low Level – Duty pump “Stop” level during normal operation.
- High Level – Duty pump “Start” level during normal operation.
- High High Level (Both on the level instrument and high level switch) – Filtrate Pump Overflow Alarm.

In the event of excessive stop/starts ,of the (duty) Grundfos model SEV.80.80 (submersible) pump – should the pump start/stop more than eleven (11) times within an hour – an alarm will be raised with the standby pump commencing operations.

9.2 FILTRATE PUMP STATION EQUIPMENT

The filtrate pump station comprises the following equipment;

- Two (2) Grundfos model SEV.80.80 (submersible) pumps (PU_-0450-001 and PU_-0450-002).
- One (1) Endress + Hauser model 50W80 (filtrate) flowmeter (FITQ_-0450-026).

9.3 GRUNDFOS SUBMERSIBLE (FILTRATE) PUMP – GENERAL INFORMATION

Make/Description:	Grundfos (Dry Mount) Submersible Pump
Model:	SEV.80.80
Supplier:	Grundfos Pumps (Australia) Pty Ltd 2/68 Murdoch Circuit ACACIA RIDGE QLD 4110 Phone: (07) 3272 1980 Fax: (07) 3273 8735 http://www.grundfos.com.au/web/homeaunz.nsf

9.4 GRUNDFOS SUBMERSIBLE (FILTRATE) PUMP – MAINTENANCE SCHEDULE

Description	Daily	Weekly	Monthly	3 Monthly	6 Monthly	Yearly	2 Yearly	3 Yearly	5 Yearly	Lubricant/Comments
GRUNDFOS MODEL SEV.80.80 PUMP										
Check gearbox oil level				x						Shell Ondina 917 Oil
Inspect gearbox oil for colour consistency				x						
Check gearbox unit for oil leakage/contamination				x						Replace the shaft seal
Check electrical cable is not pinched/bent sharply				x						Relocate where required
Check for any "abnormal" noises and vibrations				x						Rectify immediately
Change gearbox oil every 3.000 hours or 1 year						x				Shell Ondina 917 Oil
Change the submersible pump shaft seal						x				
Inspect the submersible pump internal parts						x				Replace where required
Inspect the submersible pump ball bearings						x				Replace where required

All lubricants are Castrol unless otherwise noted

9.5 FILTRATE PUMP STATION SYSTEM EQUIPMENT – DRAWINGS

NOTE

REFER TO THE QUEENSLAND URBAN UTILITIES TAG OUT/LOCK OUT GUIDE FOR CORRECT COMPANY TAG OUT/LOCK OUT PROCEDURES

- 486/5/5 – 0094-014 – Filtrate – Filtrate Pump Station – P & ID
- 486/5/5 – 0094-295 – Filtrate – Filtrate Pump Station Arrangement

9.6 FILTRATE PUMP STATION SYSTEM EQUIPMENT – ISOLATION VALVES

Sections For Maintenance	Manual Isolation Valves
Grundfos SEV.80.80 (Submersible) Pump Filtrate (PU_-0450-001)	DN80 Keystone F952 Knifegate Valve (VV_-0450-026)
Grundfos SEV.80.80 (Submersible) Pump Filtrate (PU_-0450-002)	DN80 Keystone F952 Knifegate Valve (VV_-0450-027)
Endress + Hauser 50W80 Flowmeter Filtrate (FITQ_-0450-026)	DN80 Keystone F952 Knifegate Valve (VV_-0450-026) DN80 Keystone F952 Knifegate Valve (VV_-0450-027) DN80 Keystone F952 Knifegate Valve (VV_-0450-028)

10 POTABLE WATER

10.1 POTABLE WATER PROCESS OVERVIEW

Town mains pressure potable water is provided to the plant – being required for the following functions;

- Site amenities.
- Safety Showers and eyewashes.
- Make up water for the polyelectrolyte via the solenoid valve (SV_-1020-023).
- Service water make-up via the solenoid valve (SV_-1020-013).

The two (2) solenoid valves open (and close) as required by the respective processes.

10.2 POTABLE WATER SYSTEM EQUIPMENT – DRAWINGS

NOTE

REFER TO THE QUEENSLAND URBAN UTILITIES TAG OUT/LOCK OUT GUIDE FOR CORRECT COMPANY TAG OUT/LOCK OUT PROCEDURES

- 486/5/5 – 0094-009 – MBR System – Permeate Storage and Service Water – P & ID
- 486/5/5 – 0094-014 – Dosing System – Chemical Unloading Area – P & ID
- 486/5/5 – 0094-295 – Sludge Dewatering System – Sludge Dewatering and Polymer – P & ID

11 VALVES

11.1 GEMU VALVES – GENERAL INFORMATION

Equipment Description	Supplier Information
 Gemu Figure 600 (Pneumatic) Diaphragm Valve	Gemu (Australia) Pty Ltd 8 Yandina Road GOSFORD WEST NSW 2250 Phone: (02) 4323 4493 Fax: (02) 4323 4496 www.gemu.com.au/

11.2 GEORGE FISCHER VALVES – GENERAL INFORMATION

Equipment Description	Supplier Information
 George Fischer Figure 546 Ball Valve	George Fischer Valves Pty Ltd Unit 1 – 100 Belmore Road North RIVERWOOD NSW 2210 Phone: (02) 9502 8000 Fax: (02) 9502 8090 www.georgefischer.com.au
 George Fischer Figure 314 Diaphragm Valve	George Fischer Valves Pty Ltd Unit 1 – 100 Belmore Road North RIVERWOOD NSW 2210 Phone: (02) 9502 8000 Fax: (02) 9502 8090 www.georgefischer.com.au

11.3 KEYSTONE VALVES – GENERAL INFORMATION

Equipment Description	Supplier Information
 Keystone Figure F952 Knifegate Valve	Tyco Flow Control (Australia) Pty Ltd 1189 Kingsford Smith Drive EAGLE FARM QLD 4009 Phone: (07) 3260 2444 Fax: (07) 3260 2140 www.tycoflowcontrol.com/
 Keystone Figure F152 Ball Valve	Tyco Flow Control (Australia) Pty Ltd 1189 Kingsford Smith Drive EAGLE FARM QLD 4009 Phone: (07) 3260 2444 Fax: (07) 3260 2140 www.tycoflowcontrol.com/
 Keystone Figure F87L Check Valve	Tyco Flow Control (Australia) Pty Ltd 1189 Kingsford Smith Drive EAGLE FARM QLD 4009 Phone: (07) 3260 2444 Fax: (07) 3260 2140 www.tycoflowcontrol.com/
 Keystone Model A72 Pressure Relief Valve	Tyco Flow Control (Australia) Pty Ltd 1189 Kingsford Smith Drive EAGLE FARM QLD 4009 Phone: (07) 3260 2444 Fax: (07) 3260 2140 www.tycoflowcontrol.com/

11.4 KEYSTONE ACCESSORIES – GENERAL INFORMATION

Equipment Description	Supplier Information
 Keystone Figure F79U (Pneumatic) Actuator	Tyco Flow Control (Australia) Pty Ltd 1189 Kingsford Smith Drive EAGLE FARM QLD 4009 Phone: (07) 3260 2444 Fax: (07) 3260 2140 www.tycoflowcontrol.com/
 Keystone Figure F738 (Pneumatic) Actuator	Tyco Flow Control (Australia) Pty Ltd 1189 Kingsford Smith Drive EAGLE FARM QLD 4009 Phone: (07) 3260 2444 Fax: (07) 3260 2140 www.tycoflowcontrol.com/