Attachment 3A: Environmental commissioning plan

Refer to Appendix H – Example Commissioning Plan, Factory Acceptance Test Report (FAT) and Site Acceptance Test Report (SAT), of the MAK6129 document for details. Main commissioning items have been summarised at a high level below.

Purpose

The purpose of the commissioning plan is for the Department of Water and Environmental Regulation works approval submission for the new wastewater treatment plant (WWTP) at Resource Accommodation Management Pty Ltd at Norseman, servicing Drive In Drive Out and Fly In Fly Out miners. Details in this report present the commissioning requirements for the WWTP.

This commissioning plan intends to identify and establish the tasks for commissioning the new wastewater treatment plant and is prepared to address the minimum requirements as follows:

- The sequence of commissioning activities to be undertaken;
- A summary of the timeframe associated with the identified commissioning activities;
- The inputs and outputs that will be used in the commissioning process
- The emissions and/or discharges expected to occur during commissioning
- The emissions and/or discharges that will be monitored and/or confirmed to establish or test a steady-state operation (e.g. identifying emissions surrogates, etc), including a detailed emissions monitoring program for the measurement of those emissions and/or discharges;
- The controls (including management actions) that will be put in place to address the expected emissions and/or discharges;
- Any contingency plans for if emissions exceedances or unplanned emissions and/or discharges occur; and
- How any of the above would differ from standard operations once commissioning is complete.

Commissioning sequence

The commissioning sequence is outlined below, along with the overall pre-construction, construction, commissioning and completion/handover stages.

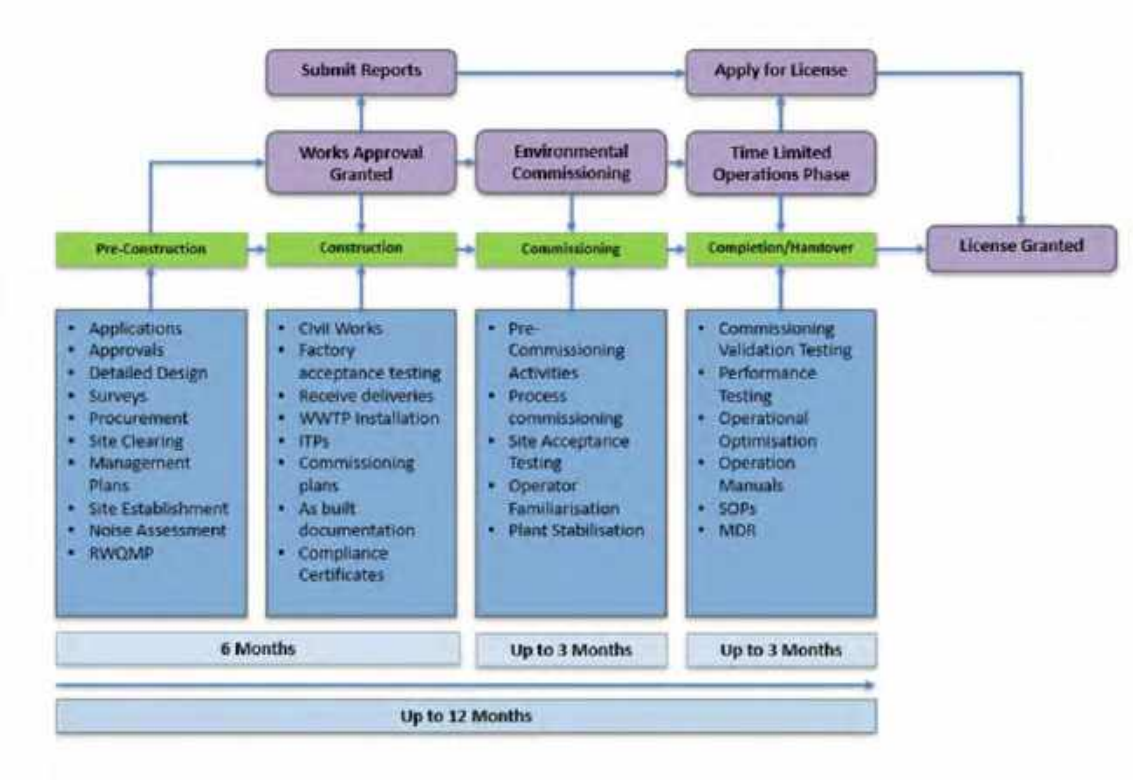

Figure 1: Commissioning Sequence (Source: Mak6129, Attachment 8)

Testing and commissioning

All works completed will have an associated Inspection and Test Plan (ITP) completed. This quality assurance procedure ensures that all aspects of the works during construction are completed by the responsible person. ITP's are specific to each task. Factory acceptance test results / report will be provided for the WWTP. Site acceptance and performance test results/reports will also be provided during the project's commissioning and handover phases.

Post construction, placement and connection of the plant and equipment, a commissioning process will be followed. The commissioning process will have the following stages:

1. Stage 1 – Construction Verification
2. Stage 2 – Pre-Commissioning
3. Stage 3 – Load Commissioning – Clean Water, then Raw Influent
4. Stage 4 – Practical Completion and Performance Testing

Please refer to Appendix H for a typical Commissioning Plan for an MBR plant, detailing the stages above.

Raw wastewater commissioning will not begin until pre-commissioning and clean water commissioning tests have been completed. During the final stage of the raw wastewater commissioning, volumes to the WWTP will gradually be increased until the system is proven to be stable and balanced correctly.

Handover to operations

Following completion of Stage 4 of the commissioning process, the plant will be handed over to Resource Accommodation Management Pty Ltd operational management. At this stage the following will be completed:

1. Ensure all project completion documents have been received

2. Ensure maintenance team has received the required product datasheets and documentation

3. Asset set up for maintenance programs

4. MDR completed

5. Validation testing program setup and executed

Continuation of wastewater treatment services during new plant commissioning and emissions contingency measures

The existing wastewater treatment plant will continue to operate throughout the construction and commissioning phase of the works approval. Although it has previously been suggested that the existing plant may be decommissioned once the new plant is operational, for this works approval, it is proposed that the large existing pond asset is retained for ongoing use. These assets would be subject to an asset condition assessment and, if required, refurbishment to enable their use in providing balancing capacity for wastewater flows and serving as a contingency measure in the event of downtime at the new wastewater treatment plant.

Emissions during commissioning activities

During plant stabilisation and validation, operations will be undertaken by Resource Accommodation Management Pty Ltd, supported remotely by water treatment specialists. Resource Accommodation Management will be responsible for the management of treated effluent generated during this period, including disposal, influent and effluent sampling, and laboratory testing. The existing wastewater treatment plant will remain in operation during the stabilisation period, ensuring that if treated effluent is significantly out of specification, no out-of-specification effluent is discharged during the commissioning period.

COMMISSIONING PLAN

MAK6129

mak water

The Smart Water People

water | wastewater | sewage

Clearmake
a mak water company

MAK WATER PROJECT NUMBER 6129

Resource Accommodation Norseman WWTP

Revision	Date	Prepared	Reviewed	Approved	Issue Purpose
A	28/04/2025	[redacted]	[redacted]	[redacted]	Issued for review
B	16/06/2025	[redacted]	[redacted]	[redacted]	Issued for Review

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1 REFERENCES

1.1 Legislation

- WA mining regulations

1.2 Client relevant standards

Document	Document Nr	Owner

1.3 Quality and Other Reference Documents

Document	Document Nr	Owner
ITP Site Installation - Mechanical	TBC	MAK Water
ITP Site Installation - Electrical	TBC	MAK Water
Electrical Installation and Test Reports	TBC	MAK Water
Hydrostatic Test Procedure	WOR-PRO-004	MAK Water
Energisation Plan	TBC	MAK Water
Site Acceptance Test	MAK6129-SAT	MAK Water
Functional Description	MAK6129-FDS	MAK Water
Operation and Installation Manual	MAK6129-OIM	MAK Water
Quality Manual	QAL-PRO-003	MAK Water

1.4 Reference Drawings

Drawing #	Description
Piping and Instrumentation Diagrams	
	P&ID set WWTP
General Layout Drawing Including Battery Limits	
	Site General Arrangement
Civil Layout Drawings	
	Site Civil Drawings
Electrical Schematics	
	Electrical Schematic Drawings

2 ACRONYMS

Acronym	Description
HV	High Voltage
LV	Low Voltage
IO	Input / Output
PLC	Programmable Logic Controller
P&IDs	Piping and Instrumentation Diagram
DCS	Distributed Control System
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
HSE	Health Safety Environment
WA	Western Australia
LOTO	Lock Out Tag Out
HAZID	Hazard Identification
P.O.	Purchase Order
PDC	Process Design Criteria
SAT	Site Acceptance Testing

3 COMMISSIONING SAFETY

During the commissioning of this circuit the project will adopt the safety procedures from the existing Site Occupational Hazard Management Plan and supplement this with system specific risk assessments covered by JSA and/or SWMS.

Safety is taken very seriously as it is intended to provide a safe working environment both during construction and commissioning.

3.1 Risks

Some of the risks associated with the commissioning process are as follows:

#	Task/Equipment	Risk	Typical Control Measures
1	Work Area	Process leaks adjacent operating plant Noise Environmental factors	Correct PPE Hearing protection Barriers, tape & signage
2	Power / control circuits testing	Live low voltage power Electric shock	Correct PPE Clearance certificates Correct tools and test equipment Commissioning Procedures/JSA/SWMS
3	Low Voltage switchgear, starter	Low voltage shock Equipment failure	Correct PPE LV Isolation work methods Clearance certificates Correct LV test equipment Commissioning procedures/JSA/SWMS
4	Motor / Pumps	Rotating equipment Mechanical failure Incorrect rotation	Equipment guards Isolation work methods Barriers, tape & signage Commissioning procedures/JSA/SWMS
5	Process fluid	High pressure water Pipe line failure / spillage Mechanical failure Electrical failure Biological Hazard	Equipment guards Barriers, tape & signage Commissioning procedures/JSA/SWMS Correct PPE Vaccinations up to date
7	Chemicals	Exposure to chemicals	Correct PPE JSA/SWMS

Reference is made to job specific JSAs/SWMS created for commissioning. Also reference the project risk assessment for detailed risks involved where required.

3.2 Energising & Isolating

Site energisation and isolation procedures shall be followed for all energisations and isolations required during commissioning.

4 PURPOSE AND SCOPE

This document outlines the plan for the commissioning activities of the Wastewater Treatment Plant (WWTP) at the Resource Accommodation Norseman, followed by ramp up to design capacity and handover to facilities maintenance personnel.

Following commissioning and hand over, RAMS will operate and maintain the WWTP, including servicing and maintenance of the equipment.

Construction verification and pre-commissioning will be noted for references purposes and to support the commencement of the commissioning processes.

4.1 Commissioning Plan summary

This plan covers the following Equipment

Sub System Equipment Description
Influent Screening
Balance tank including mixing
Plantroom including process equipment and MCC
Membrane Bioreactor System
Sludge Dewatering Press with Automatic Polymer Preparation System
Treated Effluent Discharge Equipment

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5 COMMISSIONING SEQUENCE

5.1 Stage 1 - Construction Verification

5.1.1 Purpose

This is the verification testing and checking of all newly supplied equipment – excluding any re-used equipment from the other water treatment plants on site already.

Key outcomes of stage 1:

- New rising main to WTP tested and signed off
- Connection to treated effluent outlet made and prepared for existing treated effluent transfer equipment to be moved over
- All other equipment has been built and installed in like with design drawings and specifications and complies with all applicable standards.
- All relevant documentation including ITPs has been signed off by the involved parties.
- Any and all required pre-energization checks have been completed

This is the verification testing and checking required to prove that the components and equipment within the system boundary have been constructed or assembled correctly and that it is mechanically and electrically complete. At this stage the equipment has not yet been energised by any energy source (electric, hydraulic or pneumatic) and is isolated from all supply of power, feed and discharge lines or points.

Key outcomes during Stage 1:

- Equipment has been built to design drawings, specifications (including vendor requirements) and complies with the applicable standards.
- Relevant documentation has been provided as part of the construction handover pack.
- Equipment is ready to have control supply applied for pre-commissioning checks.
- No urgent non-conformance items outstanding.
- Construction ITP/ITCs completed and signed off.

5.1.2 Punch listing

At the completion of stage 1 and prior to stage 2, (the issuing of any NOE's for equipment) a Punchlist walk around shall be carried out and shall include representation from nominated personnel from the relevant stakeholders, as required.

All critical punch list or non-conformance items must be completed before proceeding to stage 2, and all non-critical items must be either completed or scheduled for completion within an agreed timeframe with the Commissioning Manager.

5.1.3 Document Control

Document control inclusive of Red Line Drawings, Installation check sheets, ITPs

5.2 Stage 2 – Pre-Commissioning

5.2.1 Purpose

This Stage of Pre Commissioning would follow on from Stage 1, Construction Verification, and would be preceded by a Notice Of Energisation (NOE).

The NOE has a pre-defined checklist as defined by Bravus requirements.

After the NOE has been approved and released, (Blue & White) commissioning flags, or flagging as per project requirements, shall be attached to all pieces of equipment covered by the relevant NoE will indicate commissioning activities have commenced, and all equipment should be considered **LIVE**.

Area's where commissioning activities take place would be flagged off by (Blue & white) bunting tape, and signage placed indicating **Commissioning is Progress.**

Energisation is the process of applying a source of energy to equipment or a group of components. Energy sources include but are not limited to electrical power, control power, pressure in piping systems and accumulators, gravity systems (Including conveyor take-ups), and belt and rope tensions.

The function of this stage is to energise each item of equipment (individually) to test for component functionality to design.

Key outcomes during Stage 2:

- Equipment has been control supply checked (I/O checks completed to the PLC and Clearaccess).
- Sequences and interlocks have been tested with control power energised (i.e. primary supply power isolated).
- Equipment is clear of contaminants.
- Lubrication checked and carried out as required.
- Where required, equipment has been decoupled from the motor(s) and guards fitted ready for a direction check.
- All protection systems are in place. For example, guarding, emergency stops and local isolators.
- Equipment is ready to have energy sources (i.e. air, water, electricity) applied.
- Balance Tanks have been filled and hydrotested
- Equipment has been direction tested with power energised.
- All ancillary equipment is functional.
- Equipment is ready for load commissioning.
- Urgent and critical punch list items have been signed off.
- Construction will continue to undertake and complete any non-critical punch list work, non-conformances and any warranty repair work.
- All work from the stage 3 onwards will be undertaken in accordance with the commissioning isolation procedures.

5.3 Stage 3 – Load Commissioning

5.3.1 Purpose

The objective of this phase of commissioning will be to ensure the plant is ready for handover to the Operations team and that all site requirements are fulfilled to start commissioning. At this point construction is deemed completed and control is handed over to the Operations Team.

5.3.2 Prerequisites for Load Commissioning

Prerequisites that shall be in place prior to load commissioning:

Prerequisite	Status
Permit Approvals (As required)	
Client power and signals available and energized, by Others	
Influent supply shall be available	
Waste Skip Bins Provided (Under Influent Screen)	
Required chemicals shall be available and Dangerous Goods License (by others) in place	
Potable water supply shall be available	
Hydrotest water is ready to be used for commissioning	
Any required environmental approvals in place to operate the plant	
Aerobic Healthy Seeded Sludge Available @ >3500mg/l (~100kL), by Others to enable seeding of the MBR	

5.3.3 Load Commissioning Part 1 (Clean Water)

The objective of this phase of commissioning will be to set up the plant ready for water testing before process commissioning commences.

Key outcomes of Stage 3 Part 1:

- Trial start-up, shutdown and emergency procedures
- All interlocks (safety and control) are functional.
- All pre-start warning devices and safety devices are functional.
- All tanks hav been filled and hydrotested.
- Water from the Balance tank is progressively moved by gravity or pumped forward through the plant to fill all subsequent equipment and tanks for testing
- Individual equipment has been run under no load conditions, is fully checked with conditions recorded and is ready to accept water.
- Calcite Filter media has been loaded
- Instruments are setup and calibrated where required
- Chemicals have been loaded
- Plant operation is fully tested unloaded

5.3.4 Load Commissioning Part 2 (Raw Influent)

The objectives of this phase of commissioning will be to introduce feed water into the plants and to establish a level of steady state plant operation. It is at the commencement of this stage that Operations personnel will begin their full-time involvement in plant operations. The objectives of this phase are to:

- Introduce feed water into the plant.
- Drain clean water from MBR tanks and introduce aerobic seed
- Check and adjust automatic control, controller set points, alarms, trips etc.
- Adjust process variables to fine tune the performance of the plant.
- Instigate any minor plant changes considered necessary.
- Maintain detailed records of all levels of plant performance.
- Commence biological ramp-up of the MBR
- Familiarization and training of operating and maintenance team

5.3.5 Activities Sequence

Steps for No-Load and Load Commissioning are detailed in the Site Acceptance Documents for each plant section. Attached in Appendix.

5.4 Stage 4 – Practical Completion and Performance Testing

5.4.1 Purpose

Performance validation against design criteria is the process of testing that the newly commissioned plant is able to sustain design performance as put forward in the process design criteria.

This process also provides the first opportunity to establish baseline performance criteria for the new plant, which is important for future expansion plans, improvement projects and operations / maintenance budgeting.

Key outcomes of this stage:

- The system has run up, been held at full continuous production at nameplate capacity (if possible) for an extended period (nominal total duration 1 day).
- The system has been demonstrated as being to operate in a safe, reliable and efficient manner.
- All settings and operating data are recorded.
- Where required, sampling and laboratory testing has been performed to verify process parameters (By Client) Test parameters are detailed in each site acceptance document for each section.
- Operations technicians have familiarised themselves with the plant/process from working with the commissioning team and have completed training and are considered competent to run the operation with minimal assistance. Note: The MAK Water commissioning engineer will provide informal training/plant familiarisation for the client's operators; it is the client's responsibility to ensure the correct person(s) are onsite, and available to receive this training as commissioning is carried out. Formal training courses are available; please discuss your team training requirements with your MAK Water representative.
- The project works are complete with the exception of minor defects as agreed with the commissioning manager and client.
- All items of plant have been installed, completed, commissioned and in a usable condition.
- All documents and other information required for the use, operation and maintenance of the water treatment plant equipment have been supplied to RAMS.
- All training requirements have been completed.

Note: During stabilization and validation, the plant will be operated by the Client with remote assistance by MAK Water. Disposal of treated effluent produced during stabilisation, as well as influent/effluent sampling and lab testing, will need to be managed by the Client until the plant is validated.

After completion of the Commissioning Validation, routine monitoring (Operational Monitoring) is carried out by The Client in accordance with the Guidelines for the Non-potable Uses of Recycled Water in Western Australia (refer Table 8) / applicable local guidelines

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6 KEY PERSONNEL

The personnel listed in the table below will be responsible for the commissioning procedure. The various roles of each member are shown.

Name	Company	Role
[redacted]	MAK Water	Senior Process Engineer
[redacted]	MAK Water	Project Manager
[redacted]	MAK Water	Engineering Manager
[redacted]	MAK Water	Service Technician / Operators
	Client	Project Manager
	Client	Site Manager

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7 COMMISSIONING PLANNING

7.1 Scheduling

7.1.1 Commissioning Schedule

8 APPENDIX

8.1 Vendor Site Acceptance Procedures

MAK6129
FACTORY ACCEPTANCE TEST
(FAT)

mak water

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MAK6129

Resource Accommodation Management - Norseman MBR-0075 WWTP

DOCUMENT CONTROL

REVISION	DATE	PREPARED	REVIEWED	APPROVED	ISSUE PURPOSE
A	16/12/2025	[redacted]	[redacted]	PF	Issued for review

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1 Reference Documents

Document Title	Document Number
P & ID	MAK6129-VJ-001 to 005
GA	MAK6129-VA-001 to 004
Electrical	MAK6129-VE-001 to 013
SDS	MAK6129-SDS-001
Alarms list	MAK6129-AL-001
I/O list	MAK6129-IO-001

2 Introduction

This section to contain a brief description of the plant. Include flow rates, water quality etc.

Project	Norseman WWTP Expansion Project		
Location	Norseman, WA		
Influent quality	Type	Domestic strength Sewage as disclosed in Norseman WWTP Upgrade Scope of Works_Rev_0.pdf	
	Temperature	20~28°C	
	pH	6.5~8.5	
	BOD	<300 mg/L	
	TSS	<350 mg/L	
	T-N	<70 mg/L	
	T-P	<15 mg/L	
	TDS	<1,000 mg/L*	
Effluent quality	Risk Level	Medium	
	BOD	< 20 mg/L	
	TSS	<10 mg/L**	
	pH	6.5~8.5	
	T-N***	Standard Design	10 mg/L removal
		Enhanced Nutrient Removal	~70 mg/L removal
	T-P	8 mg/L depending on coagulant dose rate	
	Turbidity	<2 NTU (95%ile)	
	E.Coli	<10 CFU/100 mL**	
	Free Chlorine	0.2~2 mg/L	
	UV Dose	>40 mJ/cm2 @ 75% UVT	
Plant capacity	75 m^3/day		
Assembly	PE bioreactor with 20' containerised plant room		
Model No. offered	MBR-0075-R-X-E-U-S-I-P-X Sewage Treatment 2 x 45 kL Balance Tank 2 x 45 kL Treated Effluent Tank		

*Assumed Values
** The specification calls for TSS <30 mg/L, this plant will deliver a higher quality output
***Treated effluent specification TBC based on DoH / EA approval

The following FAT procedure outlines the method and parameters tested during the Factory Acceptance Test conducted at MAK Industrial premises. The purpose of the FAT is to operate the plant in a simulated mode using a representative feed solution. The ultimate items such as feed tanks and effluent water storage tanks cannot be assembled as per the site layout.

This facilitates the testing of as many plant functions and systems as possible. A separate site acceptance test (SAT) will be conducted once the plant is fully installed on site.

2.1 Setup

- Temporary water tank(s) will be set up to facilitate the recirculation/function of each pump
- The Bioreactor will be test-fit, but membranes will NOT be tested
- The pump station pumps and submersible aerators will not be tested during the FAT. They will be fully tested during SAT.
- Level switches and level transmitters for each tank will be connected temporarily for testing IO and PLC functions.
- No chemicals will be used. Dosing pumps will be primed and tested with potable water.
- No biological processes will be tested

Workshop Temporary Setup: As per current 6115 workshop setup

2.2 Documentation

This document serves to record the FAT readings and various registering of equipment functions and data. The software design specification will be used during the FAT to confirm that the specified sequences and system events are as specified. A signed off copy of the software design specification will serve as confirmation of FAT.

3 Factory Acceptance Test

Step	MAK Water	Client
Ensure the container is clean, barricading is in place and it is safe to commence factory acceptance test. Sign onto JHA		
Verify that the plant is ready for testing		
If testing open impellor style pumps, refer to SAF-SWMS-010 and ensure compliance		
Review ITP		
Ensure feed water tanks are suitably full to start testing. Check that temporary hoses are secure		
Check pipework, valves, and instruments are in the correct location as per IFC P&ID and GA. Mark up P&ID and GA in Appendix B		
Check that the instrument/equipment tagging is as per the P&ID		
Check that pipe work is secure and that additional supports are not required		
Verify that correct instruments are installed with the appropriate measuring range and IP rating as per equipment list		
Setup HMI and PLC (by KAPP Engineering) – Copy code across with thumb ride – Set up IP address on HMI as per register – Gateway as per register – Update date and time – Scale trends to suit – Set up alarm email and test (if modem fitted) – Confirm Clearaccess is working		
Check any tanks installed as per specification (Volume, Material, etc.) in the Equipment List, check flange locations are correct and redline fabrication drawing – Balance Tanks (Site) – Fiberglass bioreactor – MBR CIP tank – Dosing tanks – Pre-Anoxic Tank (Site) – Aeration Tank (Site) – Treated Effluent Tanks (Site)		
Check MBR Blowers installed on stands as per specification, drawings, Equipment List, check blower pipework and hoses are correct and redline fabrication drawings.		
Complete dimensional checks of platforms		
Verify MBR tank fabrication and assembly as per drawings: • Guiderails installed with correct centres • Level transmitter support installed and positioned to avoid hoses • MBR hoses have been checked for correct fitment/fittings at each end • MBR module bases fit into support studs at base of tank • MBR permeate pipework has sufficient unions to allow removal of MBR modules		
Verify dimensions of MBR guiderails are correct by installing MBR modules (dry) into the MBR tank and completing trial installation/removal		
Ensure all guards are in place including pump guards		

Step					MAK Water	Client
Ensure Victaulic/Camlock/Clamp fittings are tight, where applicable						
Complete pipework hydrostatic test as per project procedure						
Check external temporary hoses for leaks						
Where applicable, remove caps from instruments and install in pipework for use					Site	Site
Ensure valve orientation is correct, as per P&ID to start up plant, note valve orientation for manual valves and set correctly						
Ensure orientation of all non-return valves are correct						
Verify all 3-way valves are orientated correctly and the handle or actuator indicator is correct						
Verify that electrical testing has been completed and signed off						
Energise electrical supply to distribution board and control panel						
Verify that the emergency stop button is functioning and registers as an alarm						
Ensure all I/O functions correctly as per the I/O list in Appendix A.						
Check pumps and blowers are installed as per specification (Pump type, model No., etc.) in the Equipment List and verify all pumps/blowers start and stops manually and check direction of rotation of each motor is correct.						
NOTE: For some applications specifically utilising roto style pumps, it is acceptable to swap the inlet and outlet positions. This requires the motor to run in the opposite direction so make sure the direction arrow is changed to suit on the pump.						
Tag	**Description**	**Part Number**	**Starts / Stops**	**Correct Rotation Direction**		
PU-101A / PU-101B	Pump Station Pump A/B	APT VXC30/50F	A☐ B☐	A☐ B☐	Site	Site
PU-201	Bioreactor Feed Pump	32V-214-T63G (R=214mm)	☐	☐		
PU-202	Balance Tank Mixing Pump	50V-139-T23G (R=120mm)	☐	☐		
PU-203	Pre-anoxic mixing pump	32V-139-T23G (R=112mm)	☐	☐		
PU-301	MLR Pump	50V-174-T43G (R=160mm)	☐	☐		
PU-302	RAS/WAS Pump	50V-174-T43G (R=160mm)	☐	☐		
PU-401	MBR Permeate Pump	A40-110B/107mm	☐	☐		
PU-402	Treated Effluent Recirculation Pump	3LS 40-125/1.5	☐	☐		

Step					MAK Water	Client
PU-403	Treated Effluent Transfer Pump	TBC	☐	☐		
BL-301A / BL-301B	Submersible Aerators A/B	N/A – Site	Site	Site	Site	Site
BL-302	MBR Blower	ASC0210-2SP301-6	☐	☐		
Check dosing pumps are installed as per specification (Pump type, model No., dosing lines, dosing tanks, etc.) in the Equipment List. Verify that chemical dosing pumps start and stop manually from the PLC/HMI, analogue speed settings are functioning correctly and that the emergency stops inhibit device operation in the passive state, i.e. prevent the drive from starting.						

Tag	Description	Part Number	Starts / Stops	Pump mode	Pump 4-20 mA scaling	PLC HMI 4-20 mA scaling	Config as below		
PU-601	Coagulant Dosing Pump	DDA7.5-16AR	☐	☐	☐	☐	☐		
PU-603	pH Correction High Dosing Pump	DDA7.5-16AR	☐	☐	☐	☐	☐		
PU-604A	Chlorinating Agent Treated Effluent Recirc. Dosing Pump	DDA7.5-16AR	☐	☐	☐	☐	☐		
PU-604B	Chlorinating Agent MBR CIP Dosing Pump	DDA60-10	☐	☐	☐	☐	☐		

For all Grundfos **DDA** Dosing pumps, the following configuration applies: • Operation mode to Analogue 4-20 mA if applicable • Auto de-aeration for all dosing pumps: ON • Input / Output for all dosing pumps: o Relay 1: Alarm, NC contact o Relay 2: Warning, NC contact o External Stop: NO o Empty signal: NO o Low Level: NO		
Where applicable, verify that double containment conduit is provided for chemical dosing lines		
Check that all chemical dosing points are installed correctly, injection lance is installed correctly and all pump fittings are tight		
Where applicable, flush process pipework to remove construction swarf and debris		
Verify that all actuated valves open and close correctly, correspond correctly with the HMI/PLC and that all emergency stops inhibit device operation in the passive state, i.e. prevent the valve from opening.		

Tag	Description		
AV-301	MBR Air Scour Valve 1		
AV-302	MBR Air Scour Valve 2		
AV-303	MBR Air Purge Valve 1		
AV-304	MBR Air Purge Valve 2		

Step		MAK Water	Client
AV-305	RAS/WAS Outlet Valve		
AV-401	MBR Permeate Valve		
SV-101	Inlet Screen Compaction Zone Wash Valve		
SV-102	Inlet Screen Screening Zone Wash Valve		
SV-401	CIP Tank Water Supply Solenoid Valve		
SV-402	Analyser Cleaning Solenoid Valve		
Verify that instruments are installed correctly, register on HMI, scale and range is setup correctly, units are correct			
Verify that all **analytical** instruments are installed correctly, register on HMI, zero and span is setup correctly, units are correct and instrument / PLC HMI settings are aligned. Refer to Instrumentation summary in Appendix E for sign off.			
Verify that all **flow** instruments are installed correctly, register on HMI, zero and span is setup correctly, units are correct and instrument / PLC HMI settings are aligned. Refer to Instrumentation summary in Appendix E for sign off.			
Verify that all **flow totalisers** register on HMI, volume per pulse is setup correctly, units are correct and instrument PLC/HMI settings are aligned. Refer to Instrumentation summary in Appendix E for sign off.			
Verify that all **pressure** instruments are installed correctly, register on HMI, zero and span is setup correctly, units are correct and instrument / PLC HMI settings are aligned. Refer to Instrumentation summary in Appendix E for sign off.			
Verify that all **flow/pressure/proximity** switches are installed correctly, register on I/O and HMI correctly. Refer to Instrumentation summary in Appendix E for sign off.			
Verify that all **level** switches are installed correctly, gland tightened where applicable, register on I/O and HMI correctly. Refer to Instrumentation summary in Appendix E for sign off.			
Set alarm parameters and process settings as per Appendix E			
Open feed inlet valve(s) and start pumps in manual/maintenance mode and run for 15 minutes. Running VSDs at ~25% as required. Bleed air from the system.			
Startup Plant in manual/maintenance mode and run for 15 minutes.			
Check all flanged, threaded and socket weld connections/fittings for leaks.			
Ensure all leaks are rectified / recorded on the punch list			
Once the plant is manually tested, run the various sequences in automatic mode. Ensure plant starts as per SDS			
Put system in offline. Ensure plant stops as per SDS			
Start plant in auto, run for 30 minutes uninterrupted. Record all operating data in tables below			
Ensure all alarms activate as per alarms list in Appendix A			

Step	MAK Water	Client
Take good quality engineering photos of plant		

3.1 Data Logging (Typical)

Process Reading (taken once system is set in Automatic mode)		Units	Expected value	Logged value	MAK Water	Client (If attending)
PI-103	Sludge Pump Pressure Gauge	kPa	40 - 80			
PI-201	Balance Tank Mixing Pump Pressure Gauge	kPa	120 - 160			
PI-202	Bioreactor Feed Pump Pressure Gauge	kPa	30 - 80			
PI-203	Anoxic Tank Mixing Pump Pressure Gauge	kPa	100 - 150			
PI-301	MLR Pump Pressure Gauge	kPa	30 - 60			
PI-302	RAS/WAS Pump Pressure Gauge	kPa	20 - 50			
PI-303	MBR Blower Pressure Gauge	mbar	340 - 360			
PI-401	MBR Permeate Pump Pressure Gauge	kPa	50 - 100			
PI-402	Treated Effluent Recirculation Pressure Gauge	kPa	100 - 150			
PT-301	MBR Tank Level/Pressure Transmitter	kPa	20 - 30			
PT-302	MBR Permeate Pressure Transmitter	kPa	-5			
FIT-101	Raw Influent Flow	m^3/h	Site	Site	Site	Site
FIT-201	Bioreactor Feed Flow	m^3/h	Min: 2.5 Norm: 6.5 Max: 10.2			
FIT-301	MLR Flow	m^3/h	Min: 7.4 Norm: 22.3 Max: 32.8			
FIT-302	RAS/WAS Flow	m^3/h	Min: 7.4 Norm: 22.3 Max: 32.8			
FIT-401	MBR Permeate Flow	m^3/h	6.6			
FIQ-402	Treated Effluent Transfer Flow	m^3/h	4.4			
FI-401	MBR Permeate Turbidity Flow Indicator	m^3/h	TBC			

Process Reading (taken once system is set in Automatic mode)		Units	Expected value	Logged value	MAK Water	Client (If attending)
FI-402	Treated Effluent TSS Flow	m^3/h	TBC			
Note, AE301, 302, 303, 401, 402, 403, 404 and 405 are not recorded as values are not representative and will be tested on site						

VSD and Soft Starter Settings	
PU-201	
PU-202	
PU-301	
PU-302	
BL-301A	
BL-301B	
PU-401	
PU-403	

4 Sign Off

Signed & Completed By MAK Representative:

Name:

Signature: _____ Date: _____

The FAT has been completed to my satisfaction.

Signed & Completed By Client Representative:

Note: If client chooses not to attend, MAK Representative to add comment below reflecting this.

Name:

Signature: _____ Date: _____

The FAT has been completed to my satisfaction.

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5 Appendix A – Alarms List, I/O List

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6 Appendix B – Red Line P&ID

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7 Appendix C – Red Line GA

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8 Appendix E – Instrumentation Summary (Typical)

Instrument Tag	Description	Transmitter Range (4)	Unit	PLC Set-points (Note 3)				Comments (Note 1, 2)
				HH	H	L	LL	
AE301	Bioreactor Dissolved Oxygen Analyser	0 to 10.00	mg/L	10.00	8.00	0.50	0.20	
AE302	Bioreactor pH Analyser	0 to 14.00	pH	8.00	7.80	6.80	6.50	
AE303	Bioreactor MLSS Analyser	0 to 20.00	g/L	15.00	12.00	3.00	2.00	
AE401	MBR Permeate Turbidity	0 to 100.00	NTU	5.00	3.00	-	-	
AE402	Treated Effluent pH Analyser	1 to 12.00	pH	8.00	7.80	6.80	6.50	
AE403	Treated Effluent Chlorine Analyser	0 to 5.00	mg/L	2.00	1.80	0.30	0.20	
AE404	Treated Effluent TSS Analyser	0 to XXX.XX	mg/L	TBA	TBA	-	-	
AE405	Treated Effluent Nitrate Analyser	0 to XX.XX	mg/L	TBA	TBA	-	-	
FIQ101	Raw Influent Flow Totaliser	0.001 to 1.000	m3/pulse	-	-	-	-	Reset at 6AM
FIQ201	Bioreactor Feed Flow Totaliser TX	0.001 to 1.000	m3/pulse	-	-	-	-	Reset at 6AM
FIQ301	MLR Flow Totaliser TX	0.001 to 1.000	m3/pulse	-	-	-	-	Reset at 6AM
FIQ302	RAS/WAS Flow Totaliser TX	0.001 to 1.000	m3/pulse	-	-	-	-	Reset at 6AM
FIQ401	MBR Permeate Flow Totaliser	0.001 to 1.000	m3/pulse	-	-	-	-	Reset at 6AM
FIQ402	Treated Effluent Flow Totaliser	0.001 to 1.000	m3/pulse	-	-	-	-	Reset at 6AM
FIT101	Raw Influent Flow TX	0 to XX.00	m3/hr	TBA	TBA	-	-	
FIT201	Bioreactor Feed Flow TX	0 to XX.00	m3/hr	-	-	2.00	1.00	
FIT301	MLR Flow TX	0 to XX.00	m3/hr	-	-	2.00	1.00	
FIT302	RAS/WAS Flow TX	0 to XX.00	m3/hr	-	-	2.00	1.00	
FIT401	MBR Permeate Flow TX	0 to XX.00	m3/hr	-	-	2.00	1.00	
FS401	Treated Effluent Recirculation Low Flow Switch	ON = Flow	-	-	-	-	-	
LS101A	Pump Station Low-Low Level Switch	OFF = Low Low	-	-	-	-	-	
LS101B	Pump Station Low Level Switch	OFF = Low	-	-	-	-	-	
LS101C	Pump Station High Level Switch	ON = High	-	-	-	-	-	
LS101D	Pump Station High-High Level Switch	ON = High High	-	-	-	-	-	
LS102	Sludge Tank High Level Switch	ON = High	-	-	-	-	-	

Instrument Tag	Description	Transmitter Range (4)	Unit	PLC Set-points (Note 3)				Comments (Note 1, 2)
				HH	H	L	LL	
LS102	Sludge Tank Low Level Switch	OFF = Low	-	-	-	-	-	
LS401	MBR CIP Tank High Level Switch	ON = High	-	-	-	-	-	
LS402	MBR CIP Tank High-High Level Switch	ON = High High	-	-	-	-	-	
LS601	Coagulant Dosing Tank Low Level Switch	OFF = Low	-	-	-	-	-	
LS603	pH Correction High Dosing Tank Low Level switch	OFF = Low	-	-	-	-	-	
LS604A	Chlorinating Agent TE Dosing Tank Low Level Switch	OFF = Low	-	-	-	-	-	
LS604B	Chlorinating Agent MBR CIP Dosing Tank Low Level Switch	OFF = Low	-	-	-	-	-	
LT201	Balance Tank Level TX	0 to 100.0	%	95	92.5	12.5	10	
LI301 (via PT301)	MBR Tank Level TX	0 to 100.0	%	95	92.5	72.5	70	PIT301 LRV to PIT301 URV = 0 to 100%
LT401	Treated Effluent Tank Level TX	0 to 100.0	%	95	90	15	10	
PS102	Sludge Pump High Pressure Switch	ON = High	-	-	-	-	-	
PS201	Balance Tank Mixing Pump Low Pressure Switch	ON = Pressure	-	-	-	-	-	
PT301	MBR Tank Pressure	0 to XX.00	kPa	-	-	-	-	
PT302	MBR Permeate Pump Inlet Pressure	-100.0 to 100.0	kPa	-	-	-	-	
TMP301	Trans-membrane Pressure	0 to 50.0	kPa	18.0	15.0	-	-	Refer **Error! Reference source not found.** MBR Filtration / Relaxation Sequence
TS102	Sludge Pump High Temperature Switch	ON = High	-	-	-	-	-	

Notes:

- All instruments (Analogue and Digital) to be displayed on PLC HMI.
- All instruments (Analogue and Digital) to include Simulation provision
- All instruments (Analogue and Digital) to include Delay timers for all alarm/warning SP
- HMI Formatting as per Transmitter Range (Mitsubishi platforms only)

9 Appendix F – To Do list

These are minor items picked up during the build prior to issuing the Ready For Testing (RFT) form, that should not hold up testing and before the formal Punch List is used.

Item No.	Description	Resp.	Status	Sign

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10 Appendix F – Punch list

Item No.	Description	Resp.	Status	Sign

11 Appendix G – Notes

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PROJECT 6129
SITE ACCEPTANCE TEST (SAT)

The Smart Water People

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PROJECT NUMBER 6129

MBR-075
WWTP Upgrade
Resource Accommodation
Norseman

DOCUMENT CONTROL					
REVISION	**DATE**	**PREPARED**	**REVIEWED**	**APPROVED**	**ISSUE PURPOSE**
A	09/01/2026	[redacted]	[redacted]	[redacted]	Issued for review

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1 Reference Documents

Document Title	Document Number
P & ID	MAK6129-VJ-001 to 005
GA	MAK6129-VA-001 to 004
Electrical	MAK6129-VE-001 to 013
SDS	MAK6129-SDS-001
Alarms list	MAK6129-AL-001
I/O list	MAK6129-IO-001

2 Introduction

The following SAT procedure outlines the method and parameters tested during the Site Acceptance Test of a 7z5 m^3/d MBR Sewage Treatment plant.

The purpose of the SAT is to validate that the key elements of system performance are met. These test procedures are designed to verify that the system that is installed and commissioned on site meets required criteria in all respects of its design.

2.1 Setup

The system shall be fully installed on site. All equipment and instrumentation will be started up and tested.

The Balance tanks, Pre-anoxic tank, Aerobic tank, Post Anoxic Tank, MBR tank and Treated Effluent tanks shall be filled with clean water (By Others) for the first 1 -2 days of commissioning to allow for clean commissioning checks prior to introducing seed sludge, recirculation and subsequent raw sewage.

When ready, seed sludge from a similar activated sludge aerobic process with a MLSS of least 4,000mg/L (preferably higher) shall be introduced to the plant, subsequent to draining all water from the balance tanks, aerobic tanks and MBR tank. The seeded sludge shall be sourced by the Client or from an aerobic process, using a clean truck and introduced upstream of the Influent screens

2.2 Documentation

This document serves to record the SAT readings and various registering of equipment functions and data. The software design specification will be used during the SAT to confirm that the specified sequences and system events are as specified.

2.3 Test Equipment and sampling

Ensure suitable hand-held test equipment is available for testing on site based on project specific instruments. This includes:

- Handheld Myron meter (conductivity, pH, ORP, TDS)
- Chlorometer
- Buffer solutions for pH
- MLSS meter

2.4 Site procedures

All site-based procedures are to be followed which may include, but not be limited to the following:

- Job Safety Analysis
- Permit to Work / Lock-out & Tag-out
- Take 5 Checklists or equivalent
- Vehicle access
- Commissioning Procedures

3 Site Acceptance Test

3.1 Site Acceptance Test Procedure

Step	MAK Water	Client
Record any unclosed FAT punch list items or open punch list items in Appendix D.		
Section 1 – Pre-Commissioning Activities		
Complete installation of package according to drawings		
Verify chemicals, safety equipment, PPE is onsite and ready to use as required		
Verify the recommended commissioning spares are available		
Verify membranes have been stored and are onsite ready to install		
Verify safety showers and eyewash stations are installed and functional		
Verify seeded sludge is available and transport organized. Client responsibility to provide.		
Verify installation is complete, punch list closed, redline drawings completed Check battery limit connections, interconnecting pipework, cables are installed correctly as per GA's, P&IDs. Refer to the installation instructions in the IOM.		
Complete and signoff electrical test sheets for installation, electrical supply, instrumentation connections to package		
Where applicable, flush process pipework to remove construction swarf and debris		
Install commissioning tape or barriers around the area (if applicable)		
Ensure all guards are in place including pump guards		
Check all valve unions and pipe unions are tight after transport by checking tightness by hand		
Energise the package distribution board, control panel, PLC, HMI. Test voltages, check phase rotation is correct.		
De-isolate all systems required for commissioning		
Ensure site installed I/O functions correctly as per the I/O list in Appendix A. (IO within the plantroom was tested in FAT and not disconnected) (interconnection cables between containers and skids, tanks, pumps, interface with site PLC, alarm beacon)		
Check that tanks are clean and all construction debris are removed. Clean tanks with water if required.		
Ensure tank outlet and drain valves are closed after cleaning and flushing		
Fill the following tanks with clean water ready for testing: - Balance Tank ~50% fill (total ~50m3) - Pre-Anoxic tank ~100% fill (~13.5m^3) - Aeration tank ~100% fill (total 50m^3) - MBR tank ~80% fill (total ~12m^3), MBR fully submerged) - Treated Effluent Tank: 50% fill (~50m3)		
Install MBR membrane modules in the MBR tank using the guiderails provided. Client to organize crane for this.		
Decant chemical in the chemical tanks ready for use (or carboys for initial commissioning)		
Section 2 – Commissioning Activities		

Step				MAK Water	Client
Sign onto JHA and work permits specific to site					
Verify the Client has filled the balance tank with water					
Verify that all connections to MAK Water battery limits have been completed and are ready for operation.					
• Pumped Raw Sewage to Influent Screen					
• Influent Screen to Pump Station					
• Pump Station to Balance Tanks					
• Overflows to Pump Station					
• Bins and bagging units for solids discharge from Influent screen					
• Potable water to Potable water services					
• Potable Water services pump to Container services					
• Electrical Connections					
Ensure that all pipe unions and flanges are tight with gaskets/o-rings are installed					
Ensure all systems are de-isolated for commissioning					
Confirm electrical power supply is installed, tested and signed off. Energise all DB and MCC panels.					
Ensure manual valve orientation is correct as per P&ID to start up plant					
Ensure orientation of all non-return valves are correct					
Check all flanged, threaded and socket weld connections/fittings for leaks					
Verify all pump/blower/screen motors start and stops manually from the PLC HMI, direction of rotation of each motor is correct and that the emergency stop inhibits device operation in the passive state, i.e. prevent the drive from starting.					
If testing open impellor style pumps, refer to SAF-SWMS-010 and ensure compliance					
Tag	**Description**	**Starts / Stops**	**Correct Rotation Direction**		
PU101A	Screened Influent Pump A ** this requires the pump to be lifted from PS **				
PU101B	Screened Influent Pump B ** this requires the pump to be lifted from PS **				
SCR101	Influent Screen (bi-directional)				
PU201	Bioreactor Feed Pump				
PU202	Balance Tank Mixing Pump				
PU203	Pre-anoxic Tank Mixing Pump				
PU301	MLR Pump				
PU302	Post-Anoxic Tank Mixing Pump				
PU303	RAS/WAS Pump				

Step				MAK Water	Client
PU401	MBR Permeate Pump				
PU402	Treated Effluent Recirculation Pump				
PU-403	Treated Effluent Transfer Pump				
BL301A	Submersible Aerator A ** Bubbles = correct direction)				
BL301B	Submersible Aerator B ** Bubbles = correct direction)				
BL302	MBR Blower				

Verify that chemical dosing pumps start and stop manually from the PLC HMI, analogue speed settings are functioning correctly and that the emergency stops inhibit device operation in the passive state, i.e. prevent the drive from starting.							
Tag	**Description**	**Starts / Stops**	**Pump mode**	**Pump 4-20mA scaling**	**HMI 4-20mA scaling**		
PU601	Coagulant Dosing Pump						
PU603	pH Correction High MBR Dosing Pump						
PU604A	Chlorinating Agent Treated Effluent Recirc. Dosing Pump						
PU604C	Chlorinating Agent MBR CIP Dosing Pump						

For all Grundfos DDA Dosing pumps, the following configuration applies: • Auto de-aeration for all dosing pumps: ON • Input / Output for all dosing pumps: o Relay 1: Alarm, NC contact o Relay 2: Warning, NC contact o External Stop: NO o Empty signal: NO o Low Level: NO		
Prime all dosing pumps prime with water.		
Trace dosing lines with water to ensure pumps are connected to the correct dosing points		
Check that all chemical dosing points are installed correctly and all pump fittings are tight		
Tighten head screw tightness on all dosing pumps		
Confirm IBC Enclosure drain valves are closed		
Confirm Correct IBC hose fittings available		
Ensure I/O functions correctly as per the I/O list in Appendix A for all site installed and equipment/devices not Factory tested.		
Verify that all actuated valves open and close correctly, correspond correctly with the HMI/PLC and that all emergency stops inhibit device operation in the passive state, i.e. prevent the valve from opening.		
Tag	**Description**	
AV-301	Air Scour Valve 1	
AV-302	Air Scour Valve 2	

Step					MAK Water	Client
AV-303	Air Purge Valve 1					
AV-304	Air Purge Valve 2					
AV-305	RAS/WAS Outlet Valve					
AV-401	MBR Permeate Valve					
SV-101	Influent Screen Compaction Zone Wash Valve					
SV-102	Influent Screen Compaction Zone Wash Valve					
SV-401	CIP Tank Water Supply Solenoid Valve					
SV-402	Analyser Cleaning Solenoid Valve					
Open vents on pressure gauges to equalize pressure and ensure accurate readings						
Verify that all **analytical** instruments are installed correctly, register on HMI. Refer to Instrumentation summary in Appendix E for sign off.						
Verify that all **flow** instruments are installed correctly, register on HMI. Refer to Instrumentation summary in Appendix E for sign off.						
Verify that all **flow totalisers** register on HMI, volume per pulse is setup correctly. Refer to Instrumentation summary in Appendix E for sign off.						
Verify that all **pressure** instruments are installed correctly, register on HMI. Refer to Instrumentation summary in Appendix E for sign off.						
Verify that all **level** instruments are installed correctly, register on HMI, zero and span is setup correctly, units are correct and instrument / PLC HMI settings are aligned.						
Tag	**Description**	**TX LRV (Empty)**	**TX URV (Full)**	**TX/PLC Scale**		
LT-201	Balance Tank Level					
LI-301	MBR Tank Level					
LT-401	Treated Effluent Tank Level					
Verify that all **flow/pressure/proximity** switches are installed correctly, register on I/O and HMI correctly. Refer to Instrumentation summary in Appendix E for sign off.						
Verify that all **level** switches are installed correctly, gland tightened where applicable, register on I/O and HMI correctly. Refer to Instrumentation summary in Appendix E for sign off.						
Set alarm parameters and process settings as per Appendix E						
Confirm Analytical Instrument Cleaning valve is correctly set up in AIT301						
Where applicable, remove caps from instruments and install in flow assemblies for use						
Confirm Safety Shower/Eye Wash is installed, and Safety Shower/Eye Wash is functional.						
Confirm chemical IBCs are loaded in enclosures, connect chemical to dosing day tanks and prime dosing pumps. Refer to MSDS and ensure correct **PPE** is worn, refer to **MSDS**						
Startup Plant in manual/maintenance mode and run for 120 minutes						
Verify that the emergency stop interlocks all equipment/devices to the passive/safe state, i.e. an active test						
Put all sequences to AUTO and ensure plant starts and runs for 120 minutes un-interrupted on clean water						
Confirm Chemical dosing to MBR CIP tank operates correctly						

Step	MAK Water	Client
Perform an MBR CIP as per O&M manual		
Arrange for delivery of seed sludge from a similar of suitable quality		
• MLSS greater than 5,000 mg/L		
• Healthy aerobic activated sludge of coffee brown colour		
• Transfer truck is clean and free from oil, grease or any other unsuitable contaminant		
Drain clean water from all tanks and arrange for suitable disposal, a small amount of water is acceptable		
Load seeded sludge into the pump station tank and pump the seeded sludge into the balance tanks and bioreactor system (via the screen).		
Circulate the seeded sludge throughout the plant and start each process mode in automatic mode. Verify the MLSS is at least 5,000 mg/L		
Calibrate analytical instrumentation against buffer solutions or handheld instruments		
Setup chemical dosing rates as per design and optimise analytical PID loops		
Optimise influent screen wash timers to provide suitably clean screenings		
When the plant is stable, record all SAT operating data in tables below		
Record all punch-list items in Appendix D		
Mark-up P&ID and GA to As Built Status and attach in Appendix B and Appendix C		
With client's permission, take photos of the plant after SAT completed		
Complete site based training and operator familiarisation		

3.2 Datalogging – Typical (To be updated)

Process Reading (taken once system is set in Automatic mode)		Units	Expected value	Logged value	MAK Water	Client (If attending)
AE301	Bioreactor Dissolved Oxygen	mg/L	1.5 – 4			
AE-302	Bioreactor pH	pH	7 – 8			
AE-303	Bioreactor Suspended Solids (MLSS)	g/L	5 – 10			
AE-401	Treated Effluent Turbidity	NTU	<1.0			
AE-402	Treated Effluent pH	pH	6.5 – 8.5			
AE-403	Treated Effluent Free Chlorine	mg/L	0.5 – 2.0			
FI-401	Treated Effluent Turbidity Flow	L/h	<100			
FIT-201	Bioreactor Feed Flow 55m3/d, Fixed Target capacity	m^3/h	2.9			
FIT-301	MLR Flow 55m3/d, 400% MLR Factor	m^3/h	9.2			
FIT-302	RAS/WAS Flow 55m3/d, 400% RAS Factor	m^3/h	9.2			
FIT-401	MBR Permeate Flow 55m3/d, 120% Permeate Factor	m^3/h	3.5			
PI-201	Balance Tank Mixing Pump Pressure	kPa	150 – 175			
PI-202	Bioreactor Feed Pump Pressure	kPa	60 – 100			
PI-203	Pre-Anoxic Tank Mixing Pump Pressure	kPa	150 – 175			
PI-301	MLR Pump Pressure	kPa	30 – 50			
PI-302	Post-Anoxic Tank Mixing Pump Pressure	kPa	150 – 175			
PI-303	RAS/WAS Pump Pressure	kPa	30 – 50			
PI-303	MBR Blower Pressure	kPa	<30			
PI-401	MBR Permeate Pump Pressure	kPa	60 – 100			
PI-402	Treated Effluent Recirculation Pump Pressure	kPa	100 – 140			
PT-301	MBR Tank Level/Pressure	kPa	20 - 30			
PT-302	MBR Permeate Pressure	kPa	-10			

4 Sampling – By Others

Analyte	Units	Raw Influent	Treated Water
pH	pH units	✓	✓
Total Alkalinity	mg/L as $CaCO_3$	✓	
Biological Oxygen Demand – 5day (BOD5)	mg/L	✓	✓
Chemical Oxygen Demand (COD)	mg/L	✓	✓
Total Nitrogen (TN)	mg/L	✓	
Total Kjeldahl Nitrogen (TKN)	mg/L	✓	
Ammonia as N (NH3-N)	mg/L as N	✓	✓
Nitrate/Nitrite as N (NOx-N)	mg/L as N	✓	✓
Total Phosphorous as P (TP)	mg/L as P	✓	✓
Volatile Suspended Solids (VSS)	mg/L	✓	
Total Suspended Solids (TSS)	mg/L	✓	✓
Turbidity	NTU		✓
E. Coli	CFU/100ml		✓
Free Chlorine	mg/L as Cl_2		✓
Total Dissolved Solids	mg/L	✓	

5 Sign Off

Signed & Completed by MAK Representative:

Name:

Signature: _____ Date: _____

The SAT has been completed to my satisfaction.

Signed & Completed by Client Representative:

Name:

Signature: _____ Date: _____

The SAT has been completed to my satisfaction.

6 Appendices

6.1 Appendix A – Alarms List, I/O List

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6.2 Appendix B – Red Line P&ID

6.3 Appendix C – Red Line GA

6.4 Appendix D – SAT Punch list

Item No.	Description	Resp.	Status

6.5 Appendix E – SAT Notes

Item No.	Description

6.6 Appendix F – Instrumentation summary

Instrument Tag	Description	Transmitter Range (4)	Unit	PLC Set-points (Note 3)				Comments (Note 1, 2)
				HH	H	L	LL	
AE301	Bioreactor Dissolved Oxygen Analyser	0 to 10.00	mg/L	10.00	8.00	0.50	0.20	
AE302	Bioreactor pH Analyser	0 to 14.00	pH	8.00	7.80	6.80	6.50	
AE303	Bioreactor MLSS Analyser	0 to 20.00	g/L	15.00	12.00	3.00	2.00	
AE401	MBR Permeate Turbidity	0 to 100.00	NTU	5.00	3.00	-	-	
AE402	Treated Effluent pH Analyser	1 to 12.00	pH	8.50	8.30	6.70	6.50	
AE403	Treated Effluent Chlorine Analyser	0 to 5.00	mg/L	2.00	1.80	0.30	0.20	
FIT101	Raw Influent Flow TX	0 to 40.00	m3/hr	-	-	-	-	
FIQ101	Raw Influent Flow Totaliser	0.01	m3/pulse	-	-	-	-	Reset at 6AM
FIT201	Bioreactor Feed Flow TX	0 to 5.00	m3/hr	-	-	1.00	0.50	
FIQ201	Bioreactor Feed Flow Totaliser	0.01	m3/pulse	-	-	-	-	Reset at 6AM
FIT301	MLR Flow TX	0 to 20.00	m3/hr	-	-	1.00	0.50	
FIQ301	MLR Flow Totaliser	0.01	m3/pulse	-	-	-	-	Reset at 6AM
FIT302	RAS/WAS Flow TX	0 to 20.00	m3/hr	-	-	1.00	0.50	
FIQ302	RAS/WAS Flow Totaliser	0.01	m3/pulse	-	-	-	-	Reset at 6AM
FIT401	MBR Permeate Flow TX	0 to 10.00	m3/hr	-	-	1.00	0.50	
FIQ401	MBR Permeate Flow Totaliser	0.01	m3/pulse	-	-	-	-	Reset at 6AM
FIQ402	Treated Effluent Flow Totaliser	0.01	m3/pulse	-	-	-	-	Reset at 6AM
FS401	Treated Effluent Recirculation Low Flow Switch	ON = Flow	-	-	-	-	-	
LI301 (via PT301)	MBR Tank Level	0 to 100.0	%	97.5	95	72.5	70	PT301 LRV to PT301 URV = 0 to 100%
LS100A	Raw Influent Pump Station Low-Low Level Switch	OFF = Low Low	-	-	-	-	-	
LS100B	Raw Influent Pump Station Low Level Switch	OFF = Low	-	-	-	-	-	
LS100C	Raw Influent Pump Station High Level Switch	ON = High	-	-	-	-	-	
LS100D	Raw Influent Pump Station High-High Level Switch	ON = High High	-	-	-	-	-	
LS101A	Screened Influent Pump Station Low-Low Level Switch	OFF = Low Low	-	-	-	-	-	
LS101B	Screened Influent Pump Station Low Level Switch	OFF = Low	-	-	-	-	-	
LS101C	Screened Influent Pump Station High Level Switch	ON = High	-	-	-	-	-	

Instrument Tag	Description	Transmitter Range (4)	Unit	PLC Set-points (Note 3)				Comments (Note 1, 2)
				HH	H	L	LL	
LS101D	Screened Influent Pump Station High-High Level Switch	ON = High High	-	-	-	-	-	
LS103	Influent Screen High Level Switch	ON = High	-	-	-	-	-	
LS401	MBR CIP Tank High Level Switch	ON = High	-	-	-	-	-	
LS402	MBR CIP Tank High-High Level Switch	ON = High High	-	-	-	-	-	
LS601	Coagulant Dosing Tank Low Level Switch	OFF = Low	-	-	-	-	-	
LS603	pH Correction High Dosing Tank Low Level switch	OFF = Low	-	-	-	-	-	
LS604	Chlorinating Agent Dosing Tank Low Level Switch	OFF = Low	-	-	-	-	-	
LT201	Balance Tank Level TX	0 to 100.0	%	95	92.5	12.5	10	
LT401	Treated Effluent Tank Level TX	0 to 100.0	%	95	92.5	12.5	10	
PS201	Balance Tank Mixing Pump Low Pressure Switch	ON = Pressure	-	-	-	-	-	
PT301	MBR Tank Pressure	0 to	kPa	-	-	-	-	
PT302	MBR Permeate Pump Inlet Pressure	-100.0 to 100.0	kPa	-	-	-	-	
TMP301	Trans-membrane Pressure	0 to 50.0	kPa	18.0	15.0	-	-	
XS101	Influent Screen Cover Proximity Switch	OFF = Open	-	-	-	-	-	

6.7 Appendix G – Training Attendance

Course: Plant Familiarisation and IOM Review for Site Personnel

Date:

Facilitator:

Name	Position	Signature