ANNEXURE 22: SERVICE INFRASTRUCTURE MANAGEMENT PLAN

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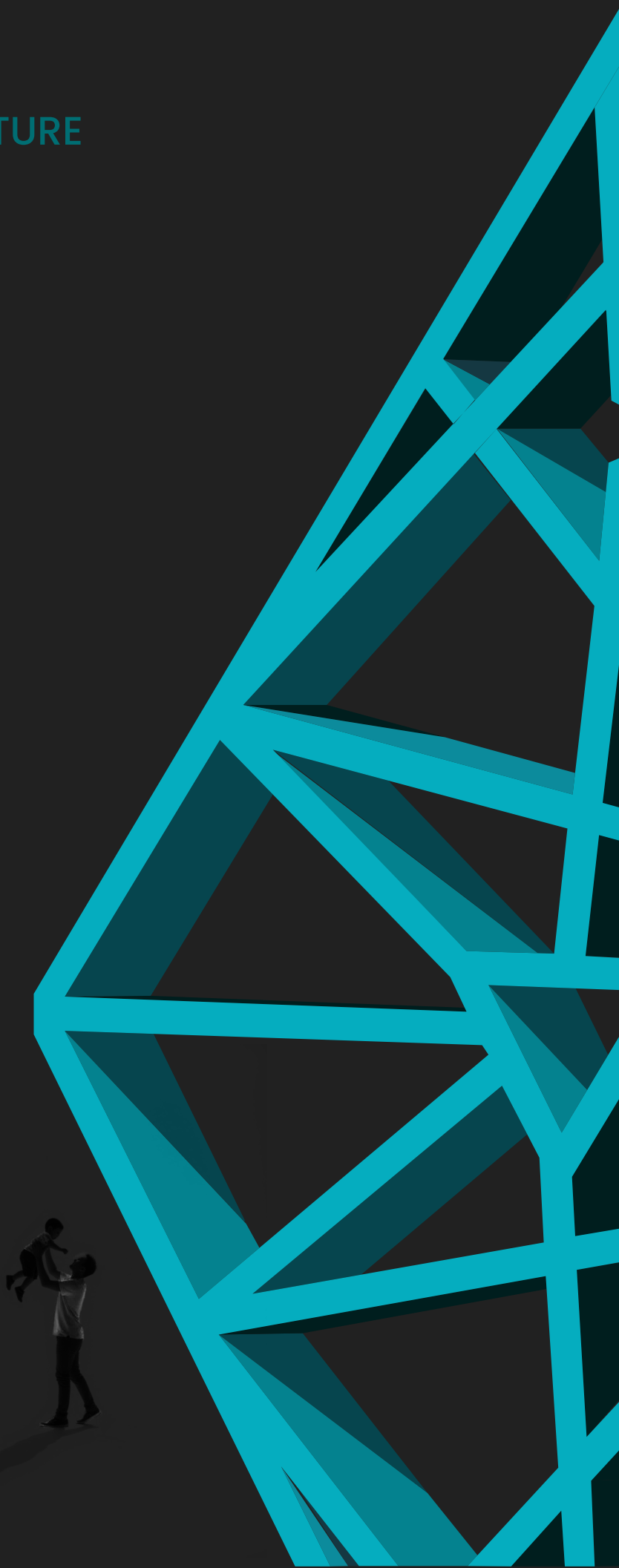
SERVICES INFRASTRUCTURE MANAGEMENT PLAN

Cape Winelands Airport

Reference: 1009533

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Glossary

Asset

A physical component of the water, stormwater or wastewater infrastructure system that has value and requires management throughout its lifecycle, including operation, maintenance, repair, and eventual replacement.

Asset Register

A structured record (typically Excel or CMMS-based) containing detailed information on each infrastructure asset, including installation date, capacity, condition, materials, maintenance history, warranties, and permits.

As-Built Drawings

Final engineering drawings that reflect the actual constructed condition of infrastructure following completion of construction and commissioning.

Availability (System Availability)

The percentage of time that a system or asset is operational and capable of delivering its intended service.

Borehole

A drilled groundwater abstraction point used as a supplementary or primary water source.

Critical Asset

An asset whose failure would result in significant consequences, including operational disruption, environmental impact, financial loss, or health and safety risks, regardless of the probability of failure.

Effluent

Treated wastewater discharged from a wastewater treatment system that must comply with applicable environmental and reuse standards.

Emergency Overflow Storage Pond

A containment facility designed to temporarily store excess wastewater during system failures, peak flows, or emergency events.

Estimated Useful Life (EUL)

The expected operational lifespan of an asset under normal operating conditions with appropriate maintenance.

Fire Water System

Infrastructure dedicated to firefighting supply, including storage tanks, pumps, and distribution mains.

Foul Sewer Gravity Main

A gravity-driven pipeline network used to convey untreated wastewater to treatment facilities.

Services Infrastructure Management Plan (SIMP)

A structured document that defines how infrastructure assets are operated, maintained, monitored, and managed over their lifecycle.

Lift Station / Pump Station

A facility containing pumps used to convey wastewater or water between different elevations within the system.

Non-Potable Water

Water not suitable for drinking but usable for purposes such as irrigation, flushing, or industrial processes.

Package Wastewater Treatment Plant

A modular, pre-engineered treatment facility used for treating wastewater at a small to medium scale.

Preventative Maintenance

Planned maintenance activities carried out to reduce the likelihood of asset failure and extend asset life.

Potable Water

Water that is safe for human consumption and complies with SANS 241 standards.

Redundancy

Provision of backup or duplicate systems (e.g., standby pumps) to ensure continued operation in the event of primary system failure.

Risk-Based Maintenance

A maintenance approach where assets are prioritised based on the consequences of failure rather than only likelihood of failure.

Sludge Processing Area

A designated area for handling, dewatering, and managing residual solids generated from wastewater treatment processes.

Telemetry System

A remote monitoring system used to collect and transmit operational data such as flow, pressure, levels, and alarms.

Water Treatment Plant (WTP)

A facility that treats raw water (e.g., borehole water) to meet potable water standards.

Abbreviations And Acronyms

Abbreviation	Meaning
CMMS	Computerised Maintenance Management System
COD	Chemical Oxygen Demand
DWS	Department of Water and Sanitation
E. coli	Escherichia coli (indicator organism for faecal contamination)
EUL	Estimated Useful Life
GRAP	Generally Recognised Accounting Practice
IIMM	International Infrastructure Management Manual
MCC	Motor Control Centre

Abbreviation	Meaning
MMP	Maintenance Management Plan
MS	Method Statement
NEMA	National Environmental Management Act
O&M	Operations and Maintenance
OEM	Original Equipment Manufacturer
pH	Potential of Hydrogen (measure of acidity/alkalinity)
SIMP	Service Infrastructure Management Plan
SANS	South African National Standard
SCADA	Supervisory Control and Data Acquisition
TSS	Total Suspended Solids
WTP	Water Treatment Plant
WULA SR	Water Use Licence Application Summary Report
WWTP	Wastewater Treatment Plant

1 INTRODUCTION

This Service Infrastructure Management Plan (SIMP) establishes the operational, maintenance, inspection, and servicing requirements for the water, stormwater and wastewater infrastructure associated with the Cape Winelands Airport development. The structure of the SIMP includes:

1. **Introduction** – Provides the purpose, scope, and context of the SIMP as a preliminary, evolving document aligned with project development stages and regulatory requirements.
2. **Asset Inventory** – Defines all infrastructure assets included in the SIMP and establishes the structured asset register for lifecycle management.
3. **Roles & Responsibilities** – Allocates governance, operational, and specialist duties to ensure clear accountability for system management.
4. **Asset Management Strategy** – Sets out the risk-based, preventative maintenance approach used to manage asset performance and lifecycle value.
5. **Key Processes & Schedules** – Defines operational procedures, monitoring requirements, and maintenance frequencies for all system components.
6. **Documentation & Record-Keeping** – Specifies the records required to support compliance, traceability, reporting, and asset management.
7. **Risks And Mitigation Measures** – Identifies key operational risks and outlines measures to reduce likelihood and impact of system failures.
8. **Financial Planning** – Provides lifecycle costing and budgeting guidance based on O&M needs and expected asset replacement timelines.

This SIMP is preliminary in nature and has been developed to align with the current stage of the project, based on available information and assumed operational requirements. As the project progresses through detailed design, construction, commissioning, and handover phases, the SIMP should be refined and updated to reflect design progression or final as-built conditions, confirmed equipment specifications, operational performance data, and commissioning outcomes. It is therefore intended as a living document that will be guided by inputs from the design team, construction contractors, commissioning specialists, and operations stakeholders to ensure that maintenance regimes, servicing frequencies, asset registers, and operational procedures are fully aligned with the completed infrastructure and actual site conditions.

The preliminary plan covers:

- Both the potable and non-potable water supply and drainage.
- Early alignment to relevant South African legislation and applicable standards.
- Considers activities which account for the protection of public health and the environment.
- Risk-based and preventative approach to address the long-term sustainability and operational efficiency of infrastructure assets.
- Intended for the reduction of unplanned failures, downtime, and emergency repairs.

The relevant legislation, standards, and reports guiding the activities in the SIMP includes, inter alia:

- National Water Act (Act 36 of 1998)
- Water Services Act (Act 108 of 1997)
- National Environmental Management Act (NEMA) (Act 107 of 1998)
- Occupational Health and Safety Act
- SANS 241 – Drinking Water Quality (2025)
- SANS 791 – Sewer and Drain Pipes
- Applicable municipal bylaws related to water provision and stormwater management
- Water Use License No. 01/G21E/ABCEGI/17483 (18/12/2025)

- Proposed Expansion of Cape Winelands Airport on P10/Farm 724, RE/Farm 724, P23/Farm 724, P7/Farm 942, RE/Farm 474, P3/Farm 474 & P4/Farm 474, Fisantekraal, Western Cape, July 2025 Maintenance Management Plan.
- Water Use Licence Application Summary Report for the Proposed Expansion of the Cape Winelands Airport (DWS REF: WU33620, July 2025)

Based on the environmental sensitivity of the area, maintenance where applicable must be conducted in accordance with the Maintenance Management Plan (MMP) and the Water Use Licence Application Summary Report (WULA SR). When conducting work within regulated areas which are:

- 32 m of the wetlands, the MMP and WULA SR applies.
- 500 m of the wetlands, the WULA SR applies.

2 ASSET INVENTORY

The assets listed in this document form part of the SIMP and constitute the core water, stormwater and wastewater infrastructure to be managed, operated, and maintained in accordance with its requirements.

In support of effective asset management, a structured asset register should be maintained, preferably in Excel or a basic Computerised Maintenance Management System (CMMS), to ensure accurate and up-to-date tracking of all infrastructure components. The asset register should, as a minimum, include key information such as installation dates, design capacities, materials of construction, current condition assessments, operating manuals, warranties, and all relevant permits or regulatory approvals. This register shall be continuously updated throughout the asset lifecycle to support maintenance planning, compliance reporting, financial forecasting, and informed decision-making.

After the construction phase concludes an initial baseline condition assessment (visual, performance tests) should be performed and repeated annually (or more frequently for high-risk assets) with critical assets prioritised (treatment plants, pumps, main pipelines).

The preliminary water and wastewater network assets are indicated below.

Water Network Assets:

- Potable Water Storage Tank (48H storage).
- Non-potable storage tank (48H storage).
- Fire water storage.
- Potable Water Mains.
- Sprinkler Main/Fire Water.
- Ground Water Storage Tank.
- Boreholes.
- Water Treatment Plant.
- Incoming supply line (CoCT water line excluded, internal supply line included)
- Water meters

Wastewater Network Assets:

- Treated Effluent Mains.
- Non-Potable Storage Tank.
- Package Waste water Treatment Plant.
- Primary Sewage Lift Station.
- Primary Sewer Pump Station.
- Brine Evaporation Pond.
- Sludge Processing Area.
- Emergency Overflow Storage Pond.
- Foul Sewer Gravity Mains.
- Sewer Rising main (Internal and external)

Stormwater

- Stormwater Gravity Mains.
- Stormwater Detention Pond
- Stormwater attenuation pond
- Open drains
- Catchpits, inlets and manholes

- Oil separators and litter traps

3 ROLES & RESPONSIBILITIES

The effective management of the water, stormwater and wastewater infrastructure requires clearly defined roles and responsibilities to ensure operational reliability, regulatory compliance, and sustainable asset performance. The following roles are required to support the SIMP:

- **Owner/Manager:** Overall accountability, budgeting, compliance reporting, annual reviews.
- **Operator/Technician (or contracted service provider):** Daily operations, monitoring, basic maintenance.
- **Specialists/Contractors:** Water/wastewater lab testing, pump servicing, electrical, geohydrologist (boreholes), certified wastewater treatment service providers; meter calibration; maintenance and replacement of assets as required.

4 ASSET MANAGEMENT STRATEGY

The following principles are applied to inform the asset maintenance approach:

- Preventative maintenance rather than reactive maintenance.
- Risk-based prioritization of critical assets.
- Assumption of redundancy of critical systems where feasible.
- Scheduled inspections and servicing.
- Continuous monitoring of operational performance.
- Legal compliance to authorisation conditions.

The maintenance type and approach for each asset are determined by considering:

- The nature of the asset group and the extent to which it lends itself to preventative maintenance;
- The extent of a particular group and of components per asset type; and
- The manufacturer or designer's recommended approach for maintenance, as well as industry best practice.

SANS 55002 (ISO 55002) Clause 6.2.2.1 recommends the application of a risk-ranking methodology to identify assets with the greatest potential to adversely affect the achievement of asset management objectives. Such assets are generally classified as "critical assets" due to the high consequences associated with their failure rather than the likelihood or probability of failure. Assets identified as highly critical consequently require increased management oversight, enhanced maintenance focus, and generally receive higher prioritisation in operational and capital budget allocation processes. Table 1 indicates the preliminary asset criticality ranking applied.

Table 1: Preliminary Asset Criticalities

Priority	Asset Name	Category	Criticality Reason	Maintenance Priority
1	Fire Water Storage	Fire Protection	Critical for airport certification and emergency response	Very High
2	Sprinkler Main / Fire Water	Fire Protection	Fire suppression for terminals, hangars, fuel farms & critical infrastructure	Very High

Priority	Asset Name	Category	Criticality Reason	Maintenance Priority
3	Package Wastewater Treatment Plant	Wastewater	Failure risks overflows, environmental violations, and operational shutdown	Very High
4	Primary Sewer Pump Station	Wastewater	Prevents sewer backups in terminals & facilities. Airport operations highly sensitive to overflows	Very High
5	Primary Sewage Lift Station	Wastewater	Critical for conveyance to municipal system	Very High
6	Potable Water Storage Tank	Water	Ensures continuous potable water for passengers, staff, catering & hygiene during disruptions	Very High
7	Water Treatment Plant	Water	Treats groundwater for potable use. High demand for drinking water safety standards	High
8	Potable Water Main	Water	Primary distribution to terminals, offices & facilities	High
9	Boreholes	Water	Groundwater augmentation	High
10	Non-potable Storage Tank	Water	Groundwater augmentation	High
11	Emergency Overflow Storage Pond	Wastewater	Contains sewage during peak loads or failures and prevents environmental & public health incidents	High
12	Treated Effluent Main	Wastewater	Conveys treated effluent to municipal wastewater system	High
13	Foul Sewer Gravity Mains	Wastewater	Main sewer collection network across the airport site	High
14	Brine Evaporation Pond	Wastewater	Handles reject water from treatment processes	Medium
15	Sludge Processing Area	Wastewater	Required for compliant sludge management	Medium
16	Ground Water Storage Tank	Water	Raw water buffer	Medium

5 KEY PROCESSES & SCHEDULES

5.1 Water Quality Management

5.1.1 Potable Water

Water quality monitoring, with minimum requirements indicated in Table 2, forms a critical component of the operational management of the system and is intended to verify treatment performance, identify potential contamination risks, support regulatory compliance, and enable timely corrective action where deviations occur (refer to SANS 241 standard). The below represents the minimum parameters

to be tested and their frequency and these requirements may be superseded by the applicable licencing authority requirements. All testing should be conducted by SANAS accredited laboratory.

Table 2: Minimum Monitoring Requirements - Water

Parameter	Frequency
pH	Daily
Turbidity	Daily
Free Chlorine Residual	Daily
E. coli	Monthly
Full Chemical Analysis	Annually

5.1.2 Wastewater and Effluent Management

Effective wastewater monitoring is essential to protect public health, prevent environmental contamination, maintain treatment process efficiency, and ensure the long-term sustainability of the wastewater infrastructure and support regulatory compliance. The wastewater treatment system therefore needs to be operated to ensure treated effluent complies with applicable discharge or reuse standards, with minimum monitoring requirements and effluent baseline quality limits for irrigation indicated in Table 3 and Table 4 respectively. Table 3 represents the minimum parameters to be tested and their frequency and these requirements may be superseded by the applicable licencing authority requirements.

Table 3: Minimum Monitoring Requirements - Wastewater

Parameter	Frequency
Flow Volumes	Daily
pH	Weekly
COD/BOD	Monthly
TSS	Monthly
E. coli	Monthly
Sludge Volumes	Weekly

Table 4: Effluent Baseline Quality Limits for Irrigation

Variables	Baseline Limits
pH	5.5-9.5
Chemical Oxygen Demand (COD) (mg/l)	75
Electrical Conductivity (Ms/m)	150
Ammonia (mg/l)	3
Nitrate/Nitrite as Nitrogen (mg/l)	15
Suspended Solids (SS) (mg/l)	25
Soap, Oil & Grease (mg/l)	≤2.5
Chloride as Free Chlorine (mg/l)	0.25
Total coliform	Do not exceed 1000 per 100ml
E coli	Do not exceed 1000 per 100ml
Sodium Absorption Ration (SAR) (mg/l)	5

5.2 Preventative Maintenance & Monitoring Schedule

Table 5 indicates a summary preventative maintenance schedule with defined frequencies. The preliminary schedule is anticipated to be refined during later stages of the project when more specific asset information is available and should consider OEM requirements for specific equipment. Table 5 provides a general summary with detail indicated in Appendix A to C.

Table 5: Preliminary Preventative Maintenance and Monitoring Schedule

Frequency	Asset / System	Activity / Description
Daily / Weekly	All Systems	Check pump runtimes, flow rates, pressures, storage levels, power supply Visual inspections of infrastructure, security, leaks, odours, overflows Record alarms, unusual noise/vibration
Daily	Water & Wastewater Treatment Plants	Monitor processes, clean screens/filters as needed, check chemical dosing Basic on-site tests (Chlorine residual, pH, turbidity for water; pH & visual for effluent)
Daily	Boreholes	Check pump operation and abstraction rates
Daily	Pump Stations / Lift Stations	Inspect pumps, floats, alarms, leaks
Daily	Storage Tanks	Check levels, overflows, visible leaks
Daily	Emergency Overflow Pond & Brine Pond	Check freeboard, integrity, lining condition and evaporation performance
Weekly	Pumps and Motors	Lubrication, vibration checks, impeller inspection (per manufacturer)
Weekly	Generators / Backup Power	Test run under load
Monthly	Water Treatment Plant	Calibrate instruments, replace/clean filters per supplier Full operational inspection and cleaning
Monthly	Package Wastewater Treatment Plant	Inspection by service provider Process optimization and basic monitoring
Monthly	Storage Tanks	Inspect for leaks/cracks/condition
Monthly	Boreholes	Record static and dynamic water levels
Monthly	Pipelines & Mains	Valve operation and leak detection
Monthly	Ponds (Brine, Overflow, Sludge)	Visual inspection for lining integrity, accumulation, odours
Quarterly	Storage Tanks	Internal inspection (Potable) / Cleaning & sediment removal (Non-potable)
Quarterly	Wastewater Treatment Plant	Mechanical and electrical inspection
Quarterly	Sewer Pump Stations / Lift Stations	Pump inspection (impellers, seals, bearings), check valves, electrical systems Clean wet wells
Quarterly	Pipelines (uPVC mains)	Leak detection survey, pressure testing as needed
Quarterly	Treated Effluent Main	Pressure and leak testing
Quarterly	Ponds	Embankment and liner inspection
Quarterly	Stormwater Ponds	Embankment/ layerworks and silt build up inspection

Frequency	Asset / System	Activity / Description
Quarterly	Boreholes	Water Quality
Every 6 Months	Package Wastewater Treatment Plant	Full service/maintenance (mechanical & electrical components)
Annually	Water Treatment Plant	Full OEM service, calibration, and comprehensive SANS 241 water quality testing
Annually	Package Wastewater Treatment Plant	Full service and process audit
Annually	Boreholes	Yield testing, pump servicing, and professional inspection, calibration of meters
Annually	Pumps and Motors	Major service and refurbishment inspection
Annually	Storage Tanks	Full draining, cleaning, and disinfection
Annually	Pipelines	Condition assessment, visual/acoustic surveys, pressure testing
Annually	Ponds (All)	Professional assessment and sludge removal/desludging
Annually	Electrical Systems & Instrumentation	Compliance inspection and calibration
Risk-based	Foul Sewer Gravity Mains	CCTV inspection and cleaning (high-risk sections annually; others 2–5 years) Visual/manhole checks quarterly
Risk-based	Stormwater Gravity Mains	CCTV inspection and cleaning (high-risk sections annually; others 2–5 years) Visual/manhole checks quarterly
Risk-based	Water Quality & Effluent	Laboratory testing (Potable: per SANS 241, e.g. monthly; Effluent: per permit)

6 DOCUMENTATION & RECORD KEEPING

6.1 General documentation

Comprehensive documentation and record keeping are essential to ensure effective operation, maintenance, compliance, and long-term management of the water and wastewater infrastructure. Accurate records support proactive maintenance planning, regulatory reporting, asset lifecycle management, budgeting, performance monitoring, and emergency response activities. All operational, maintenance, inspection, testing, and servicing activities are typically documented and retained in an organized and accessible format, whether electronically or in hard copy, as per the example requirements in Table 6.

Table 6: Suggested Documentation and Record-keeping

Record Type	Description
Maintenance Logs	Detailed records of all scheduled and unscheduled maintenance activities undertaken on pumps, treatment plants, storage tanks, pipelines, valves, electrical systems, generators, and associated infrastructure. Logs shall include dates, nature of work performed, parts replaced, personnel involved, and recommendations for follow-up actions.
Inspection Reports	Records of routine operational inspections and condition assessments for all infrastructure components, including findings, defects identified, corrective actions required, and completion status of repairs.

Record Type	Description
Water Quality Results	Laboratory and field test results for potable and non-potable water quality monitoring in accordance with SANS 241 and operational requirements. Records shall include sampling locations, dates, parameters tested, and corrective actions implemented where non-compliance is identified.
Effluent Quality Results	Records of wastewater and treated effluent monitoring, including compliance testing results for discharge or reuse standards, process performance monitoring, and sludge quality where applicable.
Pump Runtime Records	Operational runtime hours, duty cycles, start/stop frequencies, energy consumption, and performance trends for all pumps and mechanical equipment to support maintenance scheduling and asset performance evaluation.
Calibration Certificates	Certificates and records confirming the calibration and verification of flow meters, pressure gauges, dosing systems, water quality instruments, telemetry systems, and other monitoring equipment.
Incident Reports	Documentation of all operational incidents, failures, overflows, contamination events, alarms, breakdowns, environmental incidents, safety incidents, and emergency responses, including root cause analysis and corrective measures implemented.
Asset Register Updates	Ongoing updates to the infrastructure asset register reflecting new installations, replacements, refurbishments, condition assessments, expected useful life adjustments, and asset disposals.
Contractor Service Reports	Reports and service records provided by specialist contractors for annual servicing, inspections, repairs, calibration, electrical testing, pump refurbishment, and treatment plant maintenance activities.
As-Built Drawings and Technical Documentation	Approved as-built drawings, process flow diagrams, electrical schematics, operating manuals, equipment datasheets, warranties, and technical specifications for all infrastructure assets shall be maintained and updated following any modifications or upgrades.
Permits and Regulatory Documentation	Copies of all applicable licenses, permits, approvals, registrations, compliance certificates, and correspondence with regulatory authorities shall be retained and kept current.
Operational and Compliance Reports	Monthly, quarterly, and annual operational reports summarizing system performance, maintenance activities, water and effluent quality compliance, incidents, risks, and infrastructure performance trends.

6.2 Spare Parts

Even though most CMMS do include a form of spares management, a spare parts system is recommended for all the facilities where planned or unplanned maintenance is expected if not included in the CMMS. The record system used needs to include information on each asset's technical information and historical activities to provide an account of what spares can be required at a specific facility or for a specific asset type

7 RISKS AND MITIGATION MEASURES

Table 7 identifies the operational and infrastructure risks associated with the water and wastewater systems and outlines the primary mitigation and supporting measures implemented to reduce the likelihood and impact of service interruptions, environmental incidents, asset damage, and public health risks. The intent of the table is to provide a preliminary risk management framework that supports infrastructure resilience, operational continuity, regulatory compliance, and proactive maintenance planning through the implementation of redundancy, monitoring systems, emergency

preparedness, and preventative maintenance practices. In addition, all critical infrastructure should have as a minimum, fencing and lockable access.

- Very High priority assets (Treatment plants, Pump stations, Chemical storage, Electrical kiosks/MCCs) should ideally incorporate additional security measures.
- Controlled Access Procedures (e.g., key registers, visitor logs, staff access control) should be applied across all assets.

Table 7: Preliminary Key Asset Risks and Supporting Measures

Key Risk	Primary Mitigation Measures	Supporting Measures
Power outages	Backup generators	Alarm systems & telemetry, Emergency storage capacity
Pump failures	Duty/standby pumps, Preventative maintenance	Spare critical components, Alarm systems & telemetry
Borehole failure	Preventative maintenance, spare pumps (where applicable)	Emergency storage capacity, Backup generators
Water contamination	Preventative maintenance, Alarm systems & telemetry	Emergency response procedures, Emergency storage
Wastewater treatment failure	Preventative maintenance, Duty/standby pumps	Alarm systems & telemetry, Emergency response procedures
Sewer overflows	Preventative maintenance, Emergency storage capacity (Emergency Overflow Pond)	Alarm systems & telemetry, Emergency response procedures
Pipe bursts	Preventative maintenance, Spare critical components	Emergency response procedures, Emergency storage
Flooding	Emergency response procedures, Emergency storage capacity	Preventative maintenance (drainage systems)
Vandalism and theft	Alarm systems & telemetry	Preventative maintenance (security checks), Backup

8 FINANCIAL PLANNING

Table 8 provides a high-level financial and life cycle planning tool for the water and wastewater infrastructure assets. The table supports effective long-term infrastructure planning by linking each asset's expected operational lifespan with its routine annual operations and maintenance (O&M) budget requirement, expressed as a percentage of replacement value.

Asset Maintenance

- O&M Percentages (% of Replacement Value) are indicative ranges based on DPLG Guidelines for Infrastructure Asset Management, Water Research Commission (WRC) documents, and international benchmarks adapted for South Africa (e.g., IIMM principles). Mechanical and electrical-heavy assets (treatment plants, pump stations) typically require higher % due to energy, chemicals, and servicing needs.
- These figures support preventative maintenance budgeting and should be refined with actual replacement costs and site-specific data.

Asset Replacement

- The Estimated Useful Life (EUL) is the anticipated period (in years) that an asset is expected to remain in service and perform its required function, assuming it receives adequate maintenance and operation under normal conditions. In context of the SIMP, the EUL refers to the practical timing when the asset (or major components) is scheduled for replacement.

- Useful Lives follow common GRAP 17 practices and South African infrastructure guidelines. Actual lives depend on usage intensity, maintenance quality, water chemistry, and environmental factors. Regular condition assessments are required to revise remaining useful life.

Table 8: Indicative life cycle cost implications

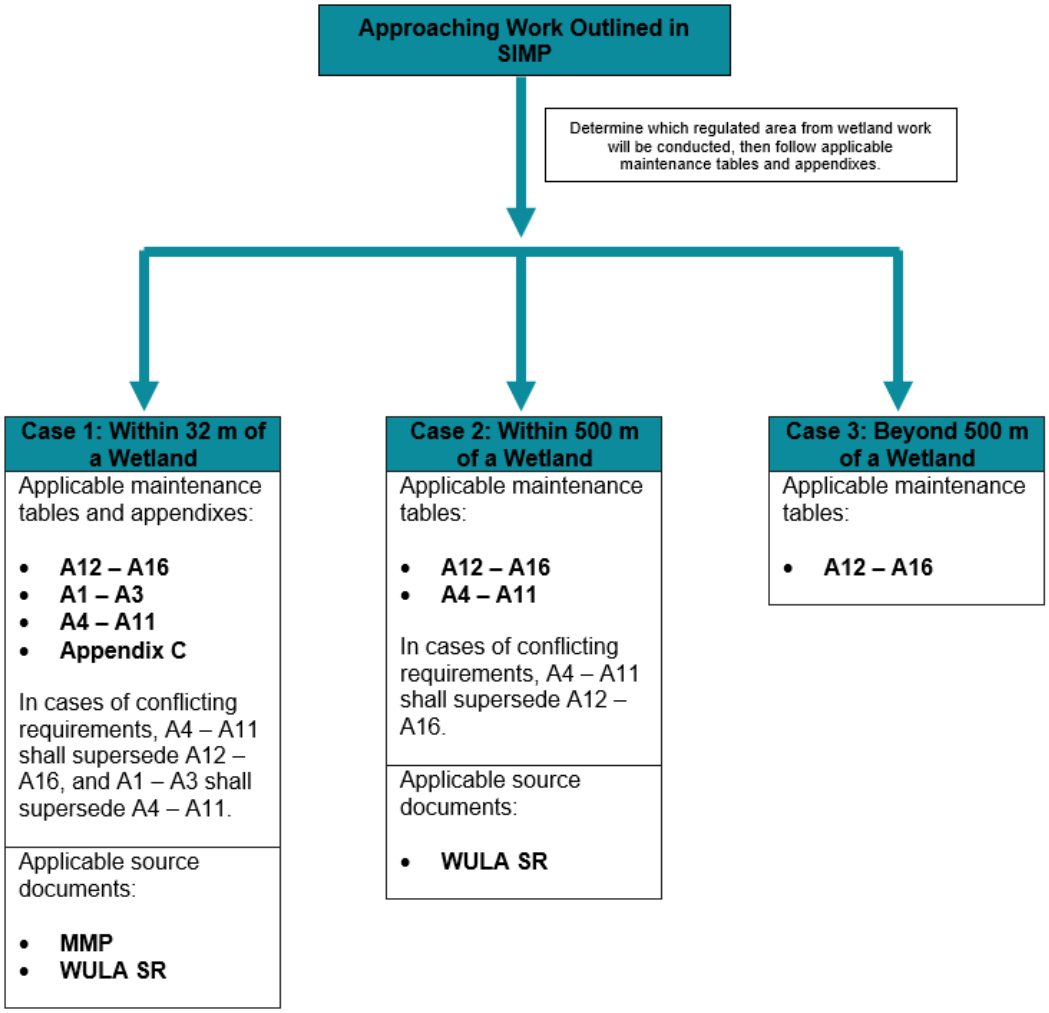
Asset Name	Category	Routine Annual O&M Budget	EUL
Fire Water Storage	Fire Protection	1.0 – 2.0%	40 – 50 years
Sprinkler Main / Fire Water	Fire Protection	1.5 – 2.5%	40 – 50 years (pipelines)
Package Waste Water Treatment Plant	Wastewater	3.0 – 5.0%	20 – 30 years (plant); 10 – 15 years (mechanical/electrical)
Primary Sewer Pump Station	Wastewater	3.0 – 4.5%	Structure: 40 – 50 years Pumps & Controls: 10 – 15 years
Primary Sewage Lift Station	Wastewater	3.0 – 4.5%	Structure: 40 – 50 years Pumps & Controls: 10 – 15 years
Potable Water Storage Tank	Water	1.0 – 2.0%	40 – 50 years
Water Treatment Plant	Water	3.0 – 5.0%	20 – 30 years (plant); 10 – 15 years (key equipment)
Potable Water Main	Water	1.0 – 2.0%	50+ years
Boreholes	Water	2.0 – 3.5%	20 – 40 years (depending on yield & water quality)
Non-potable Storage Tank	Water	1.0 – 2.0%	40 – 50 years
Emergency Overflow Storage Pond	Wastewater	1.5 – 2.5%	30 – 50 years (liners every 15 – 25 years)
Treated Effluent Main	Wastewater	1.0 – 2.0%	50+ years
Foul Sewer Gravity Mains	Wastewater	1.0 – 2.0%	50+ years
Brine Evaporation Pond	Wastewater	2.0 – 3.0%	25 – 40 years (liners every 10 – 20 years)
Sludge Processing Area	Wastewater	2.5 – 4.0%	20 – 30 years
Ground Water Storage Tank	Water	1.0 – 2.0%	40 – 50 years
Stormwater Gravity Main	Storm	1.0 – 2.0%	50+ years
Stormwater Pond	Storm	1.5 – 2.0%	30 – 50 years

Appendix A: Preventative Maintenance Schedules and Guidelines

Preliminary maintenance schedules for the water, wastewater, and stormwater assets at Cape Winelands Airport have been prepared for infrastructure which falls within the following zones:

- Within 32 m of a wetland (regulated area),
- Within 500 m of a wetland (regulated area), and
- Greater than 500 m from a wetland (not a regulated area)

The diagram below guides how to approach work conducted in each of the above areas.



A1: Generalized Guidelines that Apply to All Work Undertaken within 32 m Zone of Regulation (ZoR) from Wetlands (MMP pp. 53-55)

- The boundaries of footprint areas, including contractor laydown areas, are to be clearly defined and it should be ensured that all activities remain within defined footprint areas. Edge effects must be strictly controlled.
- Repairs and maintenance should be undertaken within the dry season, except for emergency maintenance works.
- Where at all possible, existing access routes should be used. In cases where none exist, a route should be created through the most degraded area avoiding sensitive/indigenous vegetation areas.
- It must be ensured that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage. All hazardous chemicals as well as stockpiles should be stored on bunded surfaces and have facilities constructed to control runoff from these areas.
- Appropriate sanitation facilities must be provided onsite for the duration of the construction, operational and maintenance phases of the development.
- An adequate number of waste and "spill" bins must be provided throughout the construction, operational and maintenance phases of the development.
- When machinery is involved, ensure effective operation with no leaking parts and refuel outside of the riparian area, at a safe distance from the watercourse to manage any accidental spillages and pose no threat of pollution.
- In the event of a vehicle breakdown, maintenance of vehicles must take place with care and the recollection of spillage should be practised near the surface area to prevent ingress of hydrocarbons into topsoil and subsequent habitat loss.
- All spills should they occur, should be immediately cleaned up and treated accordingly.
- At no time should the flow of the watercourse be blocked (temporary diversions may be allowed) nor should the movement of aquatic and riparian biota (noting breeding periods) be prevented during maintenance actions.
- No new berms may be created.
- In circumstances which require the removal of any top soil, this must be sufficiently restored through sustainable measures and practices.
- Concerted effort must be made to actively rehabilitate repaired or reshaped banks with indigenous local vegetation.
- No deepening of the watercourse beyond the original, pre-damage determined thalweg, unless such deepening is directly related to the natural improved functioning and condition of such a watercourse.
- The build-up of debris/sediment removed from a maintenance site may:
    - be utilised for the purpose of in-filling or other related maintenance actions related to managing erosion, which form part of an adopted MMP;
    - not be used to enlarge the height, width or any extent of existing berms;
    - not be deposited anywhere within the watercourse or anywhere along the banks of a river where such action is not part of the proposed maintenance activity (ies). Material that cannot be used for maintenance purposes must be removed out of the riparian area to a suitable stockpile location or disposal site. Further action and consideration may be required where the possibility of contaminated material may occur, such as in urban watercourses.
- The use of foreign material, such as concrete, rubble, woody debris and/or dry land based soil, is strictly prohibited from being used in maintenance actions, unless for the specific purpose of repairs to existing infrastructure, coupled with appropriate mitigation measures.
- On completion of the maintenance action, the condition of the site in terms of relative topography should be similar to the pre-damaged state (i.e. the shape of the riverbank should be similar or in a state which is improved to manage future damage). This ultimately dictates that the channel, banks and bed cannot be made narrower, higher or deepened respectively. Exceptions are considered for systems involved with the management of stormwater and improvements for water quality within the urban context.

A2: Preventative Maintenance Actions for Stormwater Infrastructure within 32 m Zone of Regulation (ZoR) from Wetlands (MMP pp. 26-27, MMP MS5)

Interval	Action
Immediate	- Repair any erosion or damage to the stormwater infrastructure, while ensuring design levels are maintained, which may involve vegetation removal, excavation, reshaping, and replanting
As needed	- Replant or reseed vegetation in degraded areas as needed and prune plants for optimal stormwater management
Post-rain Inspection	- Check embankments, reshape them if required to restore their original slope. - Check headwalls for unobstructed drainage by removing any blockages and trimming natural vegetation.
Monthly Inspections	- Remove sand, litter, and refuse from stormwater infrastructure, including kerbs and channels. - Remove refuse from pipes, along with sand and silt using high-pressure jetting. - Manage vegetation to maintain design levels. - Check covers and frames, and replace, reposition, or repair as needed. - Check embankments, reshape them if required to restore their original slope. - Check headwalls for unobstructed drainage by removing any blockages and trimming natural vegetation. - Check inlets, outlets, and basins for overflows, blockages, and sediment accumulation, with necessary corrective actions taken. - Remove refuse from headwalls in dry swales, along with sand and silt through the use of high-pressure jetting.
Bi-annually Inspections	- Check sedimentation forebay and outlet apron, especially before the first seasonal rains, to remove any accumulated silt and debris, ensuring proper disposal at suitable landfill sites without introducing silt into the stormwater system.
Annual Inspections	- Remove dead vegetation within and around the stormwater infrastructure before the growing season begins. - (Or as required) Remove sediment from inlets, outlets, and forebays.
Actions	

The following general sequence of actions are required:

1) Access stormwater ponds/channels with heavy vehicle (if required).

2) Remove silt and place on area adjacent to pond/channel.

3) Cut back vegetation from the channel/channel and place temporarily adjacent to channels on the bank area

4) Remove and dispose of vegetation and silt in suitable area

5) Rehabilitate area adjacent to pond/channel from where heavy vehicles gained accessed or where silt/vegetation was placed.

Essential Measures to Mitigate the Severity of the Impact

- Undertake maintenance activities during the dry summer months only.
- All vehicles are to remain within existing roads or previously determined routes, no new roads should be developed without prior authorisation. No indiscriminate movement of machinery within wetlands is allowed.
- Ensure that all excavators and other vehicles remain outside wetland systems and cross the drainage lines only on the existing road.
- Dispose of sediment outside of any watercourses or other areas of ecological sensitivity, and such that it will not wash into such watercourses.
- Ensure appropriate maintenance and refuelling of machinery and the appropriate containment of hazardous substances and chemicals (if required) at least 50m from the nearest watercourse, on a bunded surface.
- Restrict maintenance activities to outside of bird breeding season (November to end of March).
- Restrict vehicle and machinery operation to previously disturbed areas and ensure that material stockpiles are set-back from the watercourse by a minimum distance of 32m.
- Cobbles must be placed on all outlet structures and indigenous vegetation established to bind the soil of the bed, to prevent erosion and assist with energy dissipation.
- Prior to the onset of the winter rainy season, all stormwater infrastructure must be desilted, and any debris must be removed.
- Regular inspection of the stormwater outlet structures must be undertaken (specifically prior to the winter rains and after large storm events) to ensure unobstructed flow and monitor the occurrence of erosion. If erosion has occurred, it must immediately be rehabilitated through stabilisation of the embankments and revegetation, where applicable.
- All pipelines and attenuation ponds must be regularly cleaned, and all outlet structures (if any) checked to ensure there is no debris/blockages.
- The likelihood of erosion at the discharge points can be reduced provided that a higher surface roughness is implemented in the area from the discharge points down to the delineated freshwater ecosystems, allowing for water to enter the seep wetland 1, CVB wetland 3 and the surrounding environment at a lower velocity. This can be achieved through the placement of cobbles and ensuring that the area surrounding each discharge point is suitably vegetated.

A3: Preventative Maintenance Actions for Water Pipelines within 32 m Zone of Regulation (ZoR) from Wetlands (MMP MS2)

Actions

The following general sequencing of actions are required:

1) Identify and demarcate area of pipeline to be repaired/ replaced;

2) Clear area of debris or vegetation in order to access pipeline if required;

3) Replace/ repair pipeline and remove old pipeline debris or materials;

4) All water/material discharged from the pipeline should be collected directly into a tank or other waterproof collection device and disposed of appropriately where it will not contaminate any watercourse or soils;

5) Rehabilitate disturbed areas, remediate any erosion areas identified, suitably loosen any compacted and remove siltation if required;

6) Reshape areas and/or plant as required.

Measures to Mitigate the Severity of the Impact

- Implement a monitoring programme to detect and prevent the pollution of soils, surface water and groundwater.
- Conduct routine maintenance to minimize the risk of infrastructure failures that that could lead to substantial environmental impacts, avoiding the need for extensive interventions within regulated wetland areas.
- Implement the wetland monitoring programme outlined within the FEN Wetland Offset Study and Implementation Plan (February 2025).
- An emergency plan must be compiled to ensure a quick response and attendance to the matter in case of a leakage or bursting of a pipeline.
- Only existing roadways should be utilized during maintenance and repairs to avoid indiscriminate movement of vehicles within the wetlands.
- No vehicles are permitted to enter the freshwater ecosystems. Any maintenance works within wetlands must be undertaken by foot, or the relevant authorizations obtained beforehand.
- Any AIPs within the maintenance area must ideally be removed prior to the initiation of soil disturbing maintenance activities. This will assist in reducing the long-term AIP management requirements.
- The soil within 15 m of the freshwater ecosystems must be suitably loosened on completion of maintenance activities and revegetated to prevent erosion.
- Stockpiling of excavated materials may only be temporary (i.e. may only be stockpiled during the period of maintenance at a particular site). Soil must be stockpiled on the upgradient side of the trench to avoid sedimentation of the downgradient areas.
- Trenches must be backfilled as soon as infrastructure has been installed/repaired in any given section to reduce potential erosion of exposed soil.
- Limit routine maintenance activities to the dry summer months as far as possible.
- As far as possible, physical movement in the freshwater ecosystems by personnel must be limited.
- No stormwater generated during construction may be directly released into the freshwater environment.
- Under no circumstances must linear infrastructure be trenched within the CVB wetlands 2 and 3 or their conservation buffer.
- Any erosion, sedimentation or other damage to watercourses caused because of the above incidents/activities should be rectified immediately, with rehabilitation activities potentially including removal of sediment, reshaping of banks and replanting where it is deemed necessary.

A4: Generalized Guidelines that Apply to All Work Undertaken within 500 m Regulated Area from the Wetlands (WULA SR pp. 44-45)

- The boundaries of footprint areas, including contractor laydown areas, are to be clearly defined and it should be ensured that all activities remain within defined footprint areas. Edge effects must be strictly controlled.
- Repairs and maintenance should be undertaken within the dry season, except for emergency maintenance works.
- Where at all possible, existing access routes should be used. In cases where none exist, a route should be created through the most degraded area avoiding sensitive / indigenous vegetation areas.
- It must be ensured that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage. All hazardous chemicals as well as stockpiles should be stored on bunded surfaces and have facilities constructed to control runoff from these areas.
- Appropriate sanitation facilities must be provided onsite for the duration of the construction and operational phase of the development.
- An adequate number of waste and "spill" bins must be provided throughout the construction and operational phase of the development.
- When machinery is involved, ensure effective operation with no leaking parts and at a safe distance from any watercourses (minimum of 100m as far as feasibly possible) to manage any accidental spillages and pose no threat of pollution.
- In the event of a vehicle breakdown, maintenance of vehicles must take place with care and the recollection of spillage should be practised near the surface area to prevent ingress of hydrocarbons into topsoil and subsequent habitat loss.
- All spills should they occur, should be immediately cleaned up and treated accordingly.
- At no time should the flow of any watercourse be blocked nor should the movement of aquatic and riparian biota (noting breeding periods) be prevented during maintenance actions.
- No new berms may be created.
- In circumstances which require the removal of any topsoil, this must be sufficiently restored through sustainable measures and practices.
- Concerted effort must be made to actively rehabilitate repaired or reshaped banks with indigenous local vegetation.
- The build-up of debris/sediment removed from the site may:
    - be utilised for the purpose of in-filling or other related maintenance actions;
    - not be deposited anywhere within any watercourse.
    - Material that cannot be used for maintenance purposes must be removed to a suitable stockpile location or disposal site, at least 32 m from a watercourse.

A5: Preventative Maintenance Actions for Service Infrastructure within 500 m Regulated Area from the Wetlands (WULA SR MS5)

Actions

The following general sequence of actions are required:

- Identify and demarcate area of pipeline to be repaired/ replaced;
- Clear area of debris or vegetation in order to access pipeline if required;
- Replace/ repair pipeline and remove old pipeline debris or materials;
- All water/material discharged from the pipeline should be collected directly into a tank or other waterproof collection device and disposed of appropriately where it will not contaminate any watercourse or soils;
- Rehabilitate disturbed areas, remediate any erosion areas identified and remove siltation if required;

  Reshape areas and/or plant as required.

Measures to Mitigate the Severity of the Impact

- Implement a monitoring programme to detect and prevent the pollution of soils, surface water and groundwater.
- Implement the wetland monitoring programme outlined within the FEN Draft Wetland Offset Study and Implementation Plan (January 2025).
- Only existing roadways should be utilised during maintenance and repairs to avoid indiscriminate movement of vehicles within the wetlands.
- Routine pipeline repairs should be confined to the dry season– this measure does not apply in the case of a sudden burst or breakage.
- All pipes must be regularly monitored for leaks or potential damage. Any leaks and damage identified must be repaired immediately.
- An emergency plan must be compiled to ensure a quick response and attendance to the matter in case of a leakage or bursting of a pipeline or overtopping of sewage at the treatment plant and/or bio-digester.
- Should repair of the sewer infrastructure be required to address a leak, control measures relating to trenching and stockpiling must be implemented depending upon the location of the leak.
- Following repairs / replacement, areas of physical disturbance must be rehabilitated to their pre-repair condition or better, by:
    - Removing all construction associated stockpiles and waste from the area, as well as removing any damaged / waste pipeline or other waste material.
    - Planting the disturbed area, if necessary, with appropriate indigenous vegetation to stabilize the soils and deter alien vegetation.
    - The disturbance area must be minimized, particularly in the vicinity of the wetland.
    - Excavated soil must be carefully stockpiled outside of any watercourses, and such that it will not wash / fall into a watercourse.
    - On completion of repairs, any excess soil must be disposed of at least 32m away from the edge of any watercourses.
    - If chemical additives are required for pipe cleaning, then all water discharged from the pipeline should be collected directly into a tank or other waterproof collection device and disposed of appropriately where it will not contaminate any watercourse or soils – in the event of uncertainty, a water quality specialist or aquatic ecologist should be consulted;
    - Discharges from the pipeline during routine flushing should be attenuated and sediment or other material filtered out upstream of any watercourse – slow passage of attenuated water through a length of gravel filter at least 5m in length x 1m wide or over a densely vegetated filter strip (e.g. long lawn grass) at least 10m in length x 2m in width would be recommended as guidelines;
    - Any erosion, sedimentation or other damage to watercourses caused because of the above incidents / activities should be rectified immediately, with rehabilitation activities potentially including removal of sediment, reshaping of banks and replanting where deemed necessary.

A6: Preventative Maintenance Actions (sediment removal) for Stormwater Infrastructure within 500 m Regulated Area from the Wetlands (WULA SR MS7)

Actions
Several dry attention ponds, a wet detention ponds and a series of swales will be developed within the regulated area of a wetland. These will need to be maintained (e.g. removal of sediment) for the duration of the operational phase. Please refer to Table A8, A9, and A10 for more detail on maintenance activities that will be required. For maintenance purposes the following general sequence of actions are required: 1) Access stormwater pond with heavy vehicle and remove silt, 2) Place silt temporarily on area adjacent to stormwater pond, 3) Remove silt to area suitable for placement, 4) Rehabilitate the area adjacent to the stormwater pond from where heavy vehicles accessed the stormwater pond or where silt was placed.
Measures to Mitigate the Severity of the Impact
- All attenuation facilities must be constructed through excavation of the in-situ material, sloped to a ratio not steeper than 3:1 and lined with rocks and cobbles to assist with energy dissipation and prevent sedimentation and erosion as well as improve the aesthetic appeal of the attenuation ponds. - Attenuation ponds must be vegetated with indigenous obligate and facultative species suitable for seasonal saturation with input from a suitably qualified avifaunal specialist. Given the nature of the development, vegetating the dry attenuation ponds may not be possible. This will assist with energy dissipation and prevent sedimentation and erosion as well as improve habitat provision. - Cobbles must be placed on all outlet structures and indigenous vegetation established to bind the soil of the bed, to prevent erosion and assist with energy dissipation. - All materials used to construct the attenuation ponds must not generate toxic leachates or lead to significant changes in pH or dissolved salt concentrations. - No plastic lining may be used as part of the attenuation pond construction as this has various ecological impacts. - It is recommended that the attenuation ponds be vegetated with indigenous wetland and / or riparian vegetation (with input from a suitably qualified avifaunal specialist) to assist with water polishing, trapping nutrients and hydrocarbons from the proposed CWA development before this is released into the surrounding environment - Regular inspection of the stormwater outlet structures must be undertaken (specifically after large storm events) to monitor the occurrence of erosion. If erosion has occurred, it must immediately be rehabilitated through stabilisation of the embankments and revegetation, where applicable. - All pipelines and attenuation ponds must be regularly cleaned, and all outlet structures (if any) checked to ensure there is no debris/blockages - No development within the 15 m and 16 m operational phase conservation buffer of the CVB wetlands 2 and 3 and seep wetland 1, respectively, may be undertaken. - Maintenance activities should be undertaken during the dry summer months only. - All vehicles are to remain within existing roads or previously determined routes, no new roads should be developed without prior authorisation. No indiscriminate movement of machinery within wetlands is allowed. - Sediment removed must be suitably disposed such that is does not pose a risk to any watercourses. - Ensure appropriate maintenance and refuelling of machinery and the appropriate containment of hazardous substances and chemicals (if required) at least 50 m from the nearest watercourse, on a bunded surface. - Restrict vehicle and machinery operation to previously disturbed areas and ensure that material stockpiles are set-back from the watercourse by a minimum distance of 32 m.

A7: Preventative Maintenance Actions for the Removal of Alien Invasive Vegetation within 500 m Regulated Area from the Wetland (WULA SR MS8)

Actions
Removal of alien invasive vegetation within the 500m regulated area of a wetland: 1) Identify alien invasive species, 2) Cutting or pulling of target plants, 3) Treatment of plant remainders with appropriate herbicide or treatment of herbaceous plants that cannot be manually removed, 4) Removal of plant material from watercourses and surrounding conservation areas, 5) Follow-up work to prevent regrowth and the production of seed remaining in the soil, and 6) Revegetation of areas with indigenous vegetation where necessary
Measures to Mitigate the Severity of the Impact

- Identify alien plants to be removed.
- Avoid trampling or clearing indigenous vegetation by using established paths where possible.
- Clear alien vegetation according to the described alien vegetation removal methods for each invasive species according to the methods and herbicides/biological control guidelines on the Working for Water website: http://www.dwaf.gov.za/wfw/.
- When using herbicides, it is essential to apply the correct herbicide, in the right dose, at the right time, using the correct application method. Use only registered herbicides, follow manufacturer's instructions on the label, and wear the appropriate protective clothing during handling.
- Where necessary revegetate cleared areas with suitable indigenous vegetation. Planted areas may require irrigation and care for a period following planting. The irrigation requirements will be determined by the season in which planting takes place and the plant species planted. Planting of the new vegetation at the start of the wet season can assist in ensuring that the new vegetation is kept wet whilst establishing itself.
- Ongoing monitoring and clearing of regrowth of alien plants within these areas will be required.
- Remove all cleared material from sensitive areas such as watercourses or areas of terrestrial biodiversity importance. No cleared material may be stockpiled within 32 m from sensitive areas. All cleared material must either be removed from the site or responsibly utilized onsite.

A8: Preventative Maintenance Actions for Stormwater Infrastructure (Dry Attenuation Ponds) within 500 m Regulated Area from the Wetland (WULA SR pp. 66-67)

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Remove litter and debris	Monthly
	Manage vegetation	Monthly
	Inspect inlets, outlets, and overflows for blockages	Monthly
	Inspect inlets and basin for sediment accumulation. Determine appropriate frequencies.	Monthly, then as required
	Tidy dead vegetation before growth season	Annually
	Manage wetland plants in pools – where provided	Annually
Occasional maintenance	Reseed or replant in dilapidated areas	As required
	Prune and trim plants where necessary and remove cuttings	Every 2 years or as required
	Remove sediment from inlets, outlets and forebays	Annually, or as required
Remedial actions	Repair erosion or other damage	As required
	Repair or rehabilitate inlets, outlets, and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Realign riprap, gabions, and/or Reno mattresses	As required

In addition to the items listed above, some comments regarding maintenance procedures are provided below:

- Litter clearing: A litter clean-up is to take place monthly or as required.
- Cleaning of kerbs and channels: Sand, litter and refuse should be removed from kerbs and channels monthly or as required.
- Cleaning of pipes: Refuse should be removed from pipes monthly. Sand and silt should also be removed by using high pressure jetting.
- Cleaning of covers and frames: The covers and frames should be inspected monthly and need to be replaced, repositioned, or repaired where necessary.
- Earth embankment inspection: Embankments should be inspected monthly or after each rain. If the embankment is compromised, it should be reshaped to tie in with the original slope.
- Headwalls inspection: The headwalls should be inspected monthly or after each rain. Any blockage should be removed, and the natural vegetation trimmed to allow free drainage of water

A9: Preventative Maintenance Actions for Stormwater Infrastructure (Dry Swales) within 500 m Regulated Area from the Wetland (WULA SR pp. 67-68)

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Remove litter and debris	Monthly
	Manage vegetation, retain vegetation to design levels	Monthly
	Inspect inlets, outlets, and overflows for blockages	Monthly
	Inspect inlets and basin for sediment accumulation. Determine appropriate frequencies.	Monthly, then as required
	Tidy dead vegetation before growth season	Annually
	Manage wetland plants in pools – where provided	Annually
Occasional maintenance	Reseed or replant in dilapidated areas	As required
	Prune and trim plants where necessary and remove cuttings	Every 2 years or as required

Maintenance Schedule	Required Action	Typical Frequency
	Remove sediment from inlets, outlets and forebays	Annually, or as required
Remedial actions	Repair erosion or other damage	As required
	Repair or rehabilitate inlets, outlets, and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Realign Riprap, gabions, and/or Reno mattresses	As required

In addition to the items listed above, some comments regarding maintenance procedures are provided below:

- Litter clearing: A litter clean-up is to take place monthly or as required.
- Embankment inspection: Embankments should be inspected monthly or after each rain. If the embankment is compromised, it should be reshaped to tie in with the original slope.
- Cleaning of headwalls: Refuse should be removed from headwalls within the dry swale monthly. Sand and silt should also be removed by using high pressure jetting.
- Headwalls inspection: The headwalls should be inspected monthly or after each rain. Any blockage should be removed, and the natural vegetation trimmed to allow free drainage of water.

A10: Preventative Maintenance Actions for Stormwater Infrastructure (Detention Basins) within 500 m Regulated Area from the Wetland (WULA SR pp. 68-69)

Activity	Typical Frequency
Remove litter and debris from Inlet and outlet structures	Monthly
Mow vegetation (Side slopes)	Monthly
Inspect inlets, outlets, and overflows for blockages	Monthly
Inspect inlet and forebay for sediment accumulation	Semi-Annually
Inspect for invasive vegetation	Semi-Annually
Manage wetland plants in pools – where provided	Annually
Check for signs of Hydrocarbon buildup and remove appropriately	Inspection
Prune and trim plants where necessary and remove cuttings	Every 2 years or as required
Remove sediment from inlets, outlets and forebays	Annually, or as required
Inspect for damage paying attention to the variable outlet control structure	Annually
Remove sediment from forebay	5 to 7 years or when 50% of forebay capacity is lost
Repair undercut or eroded areas	As required
Realign riprap, gabions, and/or Reno mattresses	As required

In addition to the items listed above, additional maintenance procedures are provided below:

- Irrigation system: It will take some time for the vegetation in the pond to be fully established. As such, it is proposed that an irrigation system or procedure be put in place to ensure the vegetation survive the initial dry seasons. Suitable inspections to identify potential faulty elements should be conducted on the irrigation system to ensure its proper functioning.
- Litter clearing: A litter clean-up is to take place monthly or as required.
- Alien and problem vegetation: It is proposed that the pond must be inspected for invasive alien vegetation routinely by the appointed landscaper. As far as possible all alien vegetation should be manually removed. Where manual removal is not possible, alien vegetation should be treated with an appropriate herbicide using the correct application method and to the manufacturer's directions and specifications. Herbicides should not be applied when conditions are windy, so as to avoid spray drift. No herbicides should be applied when rain is forecast within 2 days. Colour dyes should be used with the herbicides to clearly mark areas that have been treated, taking exceptional care when working near water. It must be recognized that under certain conditions some indigenous vegetation may become problematic and may require intervention.
- Cleaning of silt traps: The sedimentation forebay as well as the apron of the outlet headwalls must be inspected every six months, with one of the inspections taking place just before the first seasonal rains. These must be inspected for build-up of silt, dirt, mud, and similar material. All silt and other material must be removed and disposed of at a suitable landfill site. Care must be taken to ensure that no silt enters the stormwater system during the cleaning process.

A11: Preventative Maintenance Actions for Storage Assets within 500 m Regulated Area from the Wetland (WULA SR Tbl. 38 and 40)

Infrastructure	Mitigation Measure
Wastewater Storage	- Spillages or leakages from the WWTW could contaminate the surrounding non-perennial freshwater systems and groundwater in the area. Therefore, the effluent containment ponds should be appropriately lined to avoid discharge into the subsurface, and potentially groundwater. - Solid waste should be stored on concrete bunded or lined surfaces and water drainage from the solid waste should be captured and returned to the WWTW. - It is recommended that Groundwater Management Plan be implemented to ensure the groundwater quality is not affected by the operations of the WWTW. - Monitoring of the WWTW infrastructure is required to ensure that there is no loss of water in the system; flow meters measuring influent and effluent must be installed, monitored and recorded. - Regular internal and external inspections and auditing of the facility must take place to ensure the infrastructure is in good working order.
Chemical Storage Associated with WWTW	- Spillages or leakages from the WWTW chemical storage areas could contaminate the groundwater in the area. Therefore, the chemical storage areas should be appropriately lined with additional bunding structures to avoid discharge into the subsurface, and potentially groundwater. - It is recommended that Groundwater Management Plan be implemented to ensure the groundwater quality is not affected by the operations of the WWTW. - Monitoring of the WWTW infrastructure is required to ensure that there is no loss of water in the system; flow meters measuring influent and effluent must be installed, monitored and recorded. - Regular internal and external inspections and auditing of the facility must take place to ensure the infrastructure is in good working order.

A12: Preventative Maintenance Actions for Pipelines Beyond 500 m of the Wetland

Interval	Action
Monthly Inspections	- Check for leakages in the system. - Check and clean chambers and ensure that chambers are locked. - Ensure that enough spares, tools, maintenance materials etc. are in stores. - Read meters and clean meter chambers - Bulk water meters need to be checked for leakages during meter readings. Meter chambers need to be cleaned and properly locked if required. Any bulk water meter inlet strainers need to be cleaned. - Hydrants need to be checked for leaks and functionality.
Annual Inspections	- Bulk water meters need to be calibrated annually to ensure accurate readings. - Check the flow rate of hydrants, maintain hydrant seals, valves etc. Ensure that markers and beacons are still in order and visible.
Two-year Inspections	- Service of control valves every 2 years.

A13: Preventative Maintenance Actions for Borehole Facilities Beyond 500 m of the Wetland

Interval	Action
Daily Inspections	- Operate pump starter and isolation valve. - Check reading on ammeter is normal – stop pump if electric motor is drawing too much current. - Verify whether adequate water is being delivered. - Continue to check voltmeter and ammeter readings during the day.
Monthly Inspections	- Clean the pump house. - Check for leaks in the rising main.
Annual Inspections	- Remove the pump from the well and inspect. - Check pipe threads and re-cut corroded or damaged threads, Replace badly corroded pipes. - Inspect electric cables and check insulation between cables. - Record servicing and maintenance in logbook. - De-silt borehole if required. - Check screen and clear as needed. - Calibration of meters

A14: Preventative Maintenance Actions for Pump Station Facilities Beyond 500 m of the Wetland

Interval	Action
Weekly Inspections	- Record pump run time hours for each pump. - Record kilowatt-hour meter reading for the pump station. - Run each pump by hand (manual control) to ensure pumps/motors are operating properly. - Inspect wet well/sump to determine need for cleaning. - Test panel lights and change as needed to ensure proper operation. - Place pump controls back in auto position prior to leaving station.

Interval	Action
	- Lock up station, including exterior power panels if required, prior to leaving.
Monthly Inspections	- Inspect and exercise check valves - Inspect and exercise isolation valves - Inspect wet well/sump for excessive build up and loose guide rails - Clean floats or level controls as needed - Test pumps for proper operation - Check controls for proper operation (starters, overloads, alternating relay, phase monitor)
Quarterly Inspections	- Check the pump glands and add packing as necessary. - Grease the motor bearings. - Check and test all pump protecting devices.
Bi-annual Inspections	- Check free movement of pump stuffing box gland. - Clean oil and gland box. Inspect pump gland packing to determine whether it requires replacement. - Check the pump/motor alignment and the condition of the belts. - Check the condition of oil pump bearings. - Inspect the motor and pump mountings.
Annual Inspections	- Pump out and clean the sumps to remove debris and grease build up. - Lock out/tag out power source. - For submersible pumps: Pull pump and ensure shaft will spin freely by hand. Inspect pumps and impellers to assure they are free of debris and in good operating condition. - Assess operating set points (on/off) for pumps and reset as necessary to improve system performance. - Inspect electrical motor control equipment to identify any potential issues, such as poor connections and worn parts. This inspection shall include appropriate scheduled panel maintenance. - Inspect, service, and calibrate instrumentation, such as SCADA instrumentation, level sensors, alarms, and run time meters to ensure reliable reporting of station operations. - Perform thermographic scan of control panels, motors, and bearings with infrared camera. - The motor is to be subjected to regular disassembly and inspection once a year.
2 - 5 Year Inspection	The pump is disassembled and checked once every five years for clear water pumps and every two years for raw water pumps

A15: Preventative maintenance actions for storage assets Beyond 500 m of the Wetland

Interval	Action
Daily Inspections	- Record the water level in the reservoir ensuring that it is within the required operating range. Inspect the water level measuring devices and monitor the recorded water levels, investigating any instances when the water level drops outside the required range. - Check for signs of overflow and leakage. If the storage tank or reservoir is overflowing, overfilling, there may be a problem with a pump, the water level recording equipment or the control system. - Check the system pressure. Daily monitoring of the system pressure may assist in the early identification of leaks, failing or open valves and pump problems.
Weekly Inspections	- Check water meters for proper operation and leakage - Ensure pumps and other mechanical components are functioning optimally. - Check pipework and reservoir structure for signs of leakage or reservoir overflow. - Check that the water level indicators are working correctly. - Maintain the area surrounding the reservoir, cut the grass, clear channels and pathways. - Take a sample of the water at the reservoir outlet and send for analysis.
Monthly Inspections	- Inspect valve and meter chambers. Clear any debris and service hinges and the locks of chamber lids. Ensure all equipment is functioning properly. - Inspect valves, checking for corrosion or other defects. - Check entrances and locks at pump station, access hatches at reservoir and other chambers. Service hinges and replace damaged items where necessary. - Ensure that all safety signs are in place and visible. - Record water meter readings and compare inlet and outlet meter readings to check for signs of water losses
Annual Inspections	- Inspect the reservoir structure for any defects or sanitary defects to combat water quality issues and excessive leakage. The annual inspection should include the following tasks: • All openings must be properly screened, unblocked and free of any tears to prevent the entry of small animals and other organic matter. • Check the reservoir floor and its walls for any signs of deterioration. Typical things to look out for would be large cracks in concrete structures and excessive pitting in steel tanks. • Removing any prominent silt build up.

A16: Preventative maintenance actions for general plant items Beyond 500 m of the Wetland

Interval	Action
Daily Inspections	- Check instrumentation for proper signal input/output including all devices which monitor flow rate, volume, pressure, level, etc. - Complete a daily security check of locks, hatches, doors, windows, vents, security lighting and alarms to ensure proper operation, routinely check for signs of intrusion or vandalism. Check that well caps, seals, and vents are intact and sealed. - Inspect testing equipment. Ensure the correct chemical reagents are being used for each type of application. Reagents should be safely stored and clearly marked with the name and date of preparation. Manufacturer-prepared reagents should be properly discarded when the expiration is reached.
Weekly Inspections	- Check the backup power source to ensure it will operate when needed.
Monthly Inspections	- Perform an inventory of spare parts, equipment, repair clamps, pipes, and valves, and always maintain the spare parts inventory.
Annual Inspections	- Inspect and exercise all valves inside the treatment plant and pump house routinely. The frequency depends on the type of valve but should be inspected at least twice a year and include completely closing, reopening, and re-closing the valve until it seats properly. Record the number and direction of turns to closure. Leaking or damaged valves should be scheduled for repair. - Inspect, clean, and repair control panels at least once a year for corrosion and other problems that could cause shorts or failures.

Appendix B: Initial Failure Modes and Effects

Preliminary FMEA to be refined during detailed design or operational readiness.

Asset	Failure Mode	Potential Effects (Airport Context)	Severity	Common Causes	Key Mitigations / Controls
Fire Water Storage	Tank rupture / major leak	Loss of fire-fighting water, non-compliance with SACAA/ICAO	Very High	Corrosion, structural failure, overpressure	Regular internal inspections, level alarms
Sprinkler Main / Fire Water	Pipe burst or blockage	Failure of fire suppression system in terminals/hangars	Very High	Corrosion, freezing, mechanical damage	Pressure monitoring, regular testing
Package Wastewater Treatment Plant	Complete process failure	Sewage overflows, odour, environmental fines, operational disruption	Very High	Power loss, mechanical breakdown, overload	Duty/standby equipment, alarms, telemetry
Package Wastewater Treatment Plant	Poor effluent quality	Municipal penalties, environmental damage	High	Equipment malfunction, incorrect dosing	Regular sampling, process monitoring
Primary Sewer Pump Station	Pump failure (both duty & standby)	Sewer backups into terminals, health & reputational risk	Very High	Mechanical wear, power outage, blockage	Duty/standby pumps, backup power, alarms
Primary Sewage Lift Station	Station failure	Local flooding with sewage, flight delays, terminal closure risk	Very High	Float switch failure, pump clogging	Regular cleaning, pump alternation
Potable Water Storage Tank	Tank failure / contamination	Loss of potable water supply, health risk to passengers & staff	High	Structural defect, biofilm growth	Annual cleaning & disinfection, level alarms
Water Treatment Plant	Treatment failure	Unsafe drinking water, closure of catering & ablution facilities	High	Filter breakthrough, disinfection failure	Online monitoring, daily testing
Boreholes x3	Borehole failure / reduced yield	Reduced water security during municipal supply interruptions	Medium-High	Pump failure, siltation, aquifer decline	Standby pumps, regular yield testing
Potable / Treated Effluent Mains	Major pipe burst	Loss of water supply or uncontrolled discharge	High	Pressure surge, ground movement, ageing	Pressure monitoring, valve isolation
Foul Sewer Gravity Mains	Blockage or collapse	Widespread sewer backups across the airport site	High	Grease, roots, foreign objects	Periodic CCTV, rodding
Emergency Overflow Storage Pond	Overflow / liner failure	Environmental spill, groundwater contamination	High	Excessive inflow, liner degradation	Level monitoring, regular inspections
Brine Evaporation Pond	Liner failure / overflow	Soil & groundwater contamination	Medium	UV degradation, mechanical damage	Monthly visual inspections

Appendix C: Monitoring and Reporting within the 32 m Zone of Regulation (ZoR) from Wetlands

Monitoring

Capewinelands Aero (Pty) Ltd is responsible for overseeing the monitoring of maintenance and management activities under the MMP. It is critical that all management actions outlined in the plan are strictly adhered to. Regular and thorough monitoring is essential to ensure compliance with MMP specifications, identify any issues of non-conformance, and implement corrective actions to minimize risks and prevent environmental damage.

Proactive, ongoing monitoring will address potential impacts to the ecological integrity of the associated aquatic ecosystems. Key monitoring activities include:

- **Structural Integrity Checks**: Routine inspection and maintenance of service, stormwater, and linear infrastructure associated with the CWA development to ensure structural stability and prevent potential disruptions.
- **Pollution Prevention Program**: An active monitoring system should be implemented to promptly identify and mitigate potential pollution sources that could impact soil, surface water, or groundwater quality.
- **Wetland Health Monitoring**: Regular assessments of potentially impacted wetlands to ensure ecological processes and functions are preserved or improved in line with Present Ecological State (PES) and Recommended Ecological Category (REC) goals. The Wetland Offset Study and Implementation Plan (FEN, February 2025) provides specific guidelines to maintain offset wetlands within desired ecological conditions (refer Appendix B to this report).
- **Alien Invasive Plant (AIP) Management**: Implement the Alien Vegetation Management Plan (PHS Consulting, March 2025), monitoring and removing invasive species to protect native vegetation and ecosystem balance.
- **Erosion and Sedimentation Control**: Frequent visual inspections across stormwater systems, roads, and natural areas to identify erosion or sediment buildup, with prompt corrective actions to prevent habitat degradation and downstream sedimentation impacts.

Monthly inspections should be carried out by a suitably qualified individual within the CWA Environmental Management Division (EMD) to verify the condition and functionality of critical infrastructure, including stormwater systems, service infrastructure, and fences. These checks serve as quality assurance and ensure alignment with the MMP. To facilitate effective monthly monitoring, monthly walk-through inspections should be carried out. These inspections should focus on identifying areas of concern related to:

- Erosion
- Sedimentation
- Infrastructure damage
- Waste/litter dumping
- Alien vegetation encroachment
- Soil compaction

Seasonal maintenance is essential for all stormwater infrastructure and access roads. Prior to the rainy season, thorough cleaning and inspection should be conducted, including clearing all culverts and drainage channels. Annual condition assessments should be undertaken for all infrastructure within the 32m Zone of Regulation (ZoR) and associated wetlands to identify longer-term repair needs. It should however be noted that these monitoring requirements are the minimum required to facilitate the implementation of the MMP. All service infrastructure must be maintained in accordance with manufactures' instructions and no less frequently than the manufactures statutory timeframes.

All activities undertaken outside the scope of the MMP, will be subject to Section 24(F) of NEMA and appropriate enforcement and compliance requirements will follow.

Reporting

Form A below must be completed by the relevant person(s) before maintenance activities are undertaken and Form B below after a maintenance activity has been completed. Form A should be completed at least 7 working days before the commencement of any maintenance activity and Form B a minimum of 3 working days after the completion of the maintenance activity(ies). At least two photographs are required from two different points of perspective (A and B) looking at the site (coordinates of these points are required). The type and reference code relates to the relevant detail within the adopted MMP.

Cape Winelands Aero (Pty) Ltd is responsible to ensure a record of all maintenance activities is recorded as per Form A & B. Copies of Form A and B must also be sent to the Provincial Department of Agriculture, Directorate: Sustainable Resource Management

DEA&DP may, within a reasonable notice period, request to evaluate the maintenance activities and assess the maintenance sites as per the adopted MMP.

FORM A

REPORTING FOR INTENT TO UNDERTAKE MAINTENANCE ACTIVITIES

Section A: Landowner Details	
Landowner Name & Surname	
Farm/Erf No	
Today's Date	
Section B: Details of proposed maintenance activity	
WUA/GA reference number:	
DEA&DP MMP reference number:	
Activity Type:	
Reference code (*make reference to MMP*):	
Footprint area (m^2):	
Volume of material (m^3):	
Equipment to be used:	
Description of method for planned activity:	
Date when work will commence:	
Date of last flood event for site:	
Note any further damage and comments regarding the state of the site:	
Section C: Photographs of activity location before maintenance	
Photo A – Before Maintenance Activities	
Coordinates:	
Photo B – After Maintenance Activities	
Coordinates:	

FORM B

REPORTING FOR COMPLETION OF MAINTENANCE ACTIVITIES

Section A: Landowner Details	
Landowner Name & Surname	
Farm/Erf No	
Today's Date	

Section B: Details of proposed maintenance activity				
WUA/GA reference number and DEA&DP reference number for MMP.	**Activity Type:**	**Reference code (*make reference to MMP*)**	**Footprint area (m^2)**	**Volume of material (m^3)**
WUA/GA reference number:				
DEA&DP MMP reference number:				
Activity Type:				
Reference code (*make reference to MMP*):				
Footprint area (m^2):				
Volume of material (m^3):				
Equipment to be used:				
Description of method for completed activity and if commence date changed:				
Date activity completed:				
Date of last flood event for site:				
Note any challenges or difficulties experienced in following the MMP method statement				

Section C: Photographs of activity location after maintenance
Photo A – Before Maintenance Activities
Coordinates:
Photo B – After Maintenance Activities
Coordinates:

Document prepared by:

Zutari (Pty) Ltd

Reg No 1977/003711/07

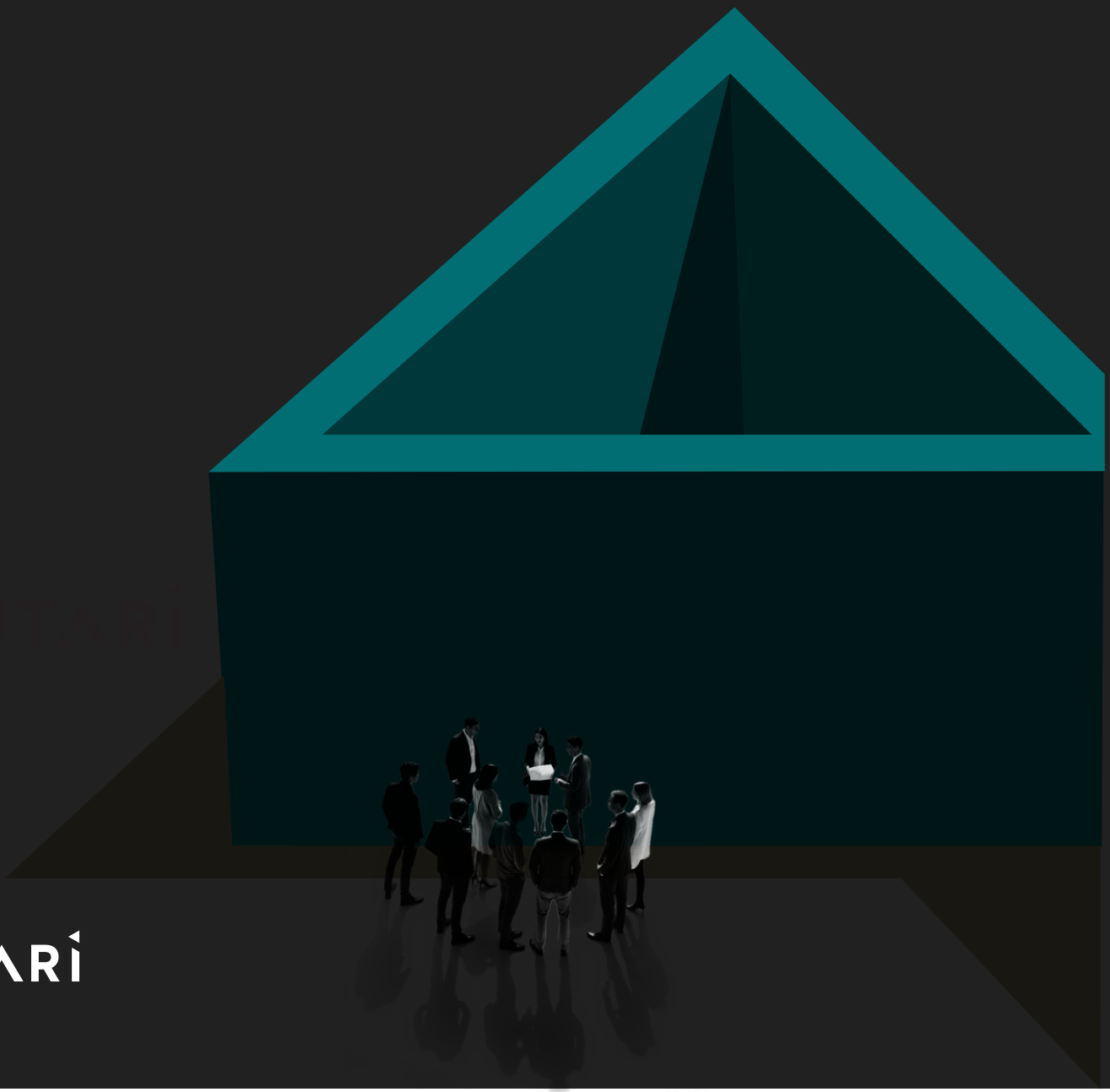
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