

12.0



Improving Resiliency

12.1 OPERATIONAL OPTIMISATION

ISO 17025 ACCREDITED LABORATORY SERVICES ASSURING WATER QUALITY

Four modern ISO/IEC 17025 accredited laboratories make up the entity's Laboratory Services. These are Chemistry, Microbiology, Hydrobiology and soil testing, all with a long established reputation of meeting international standards. Highly skilled and dedicated scientists, technicians, and laboratory support staff, utilising modern analytical techniques enable this facility to provide a world-class service 365 days a year.

During the year, the laboratory supported core business activities through:

- ▶ Providing assurance that the entity produces potable water that complies with drinking water standards,
- ▶ Assuring that treated effluent complies with wastewater and effluent discharge limits,

- ▶ Assuring, via the above, public health protection from water-borne diseases and water related health impacts,
- ▶ Undertaking research and development and generation of scientific data for new infrastructure developments,
- ▶ Supporting/auditing water treatment for process selection and optimisation, and
- ▶ Undertaking catchment and river health monitoring to assess the status of water resources and quality of raw water supply.

Water samples from the entire supply system (catchment to consumer) are collected by a team of dedicated sampling officers on a daily basis throughout Umgeni Water's operational area, and are assessed in terms of its physical, chemical and microbiological characteristics.

The analytical results are produced within specified times that forms part of a Service Level Agreements with end users. Supported by its new LabWare Laboratory Information Management System (LIMS), water quality results are captured, validated, stored and reported. In addition, direct access is provided to external users via the



Midmar WTW Upgrade

Electronic Water Quality Management System (eWQMS), the Blue Drop System (BDS) and the Green Drop System (GDS).

Early warnings and alerts are provided to stakeholders immediately that a breach of quality standards is detected. An incident management protocol is followed, to contain and remedy the breach. The laboratory generates 20 000 to 30 000 analyses per month.

In addition to assuring the quality of bulk water produced, the Laboratory Services provides water testing and sampling services to municipalities and various private sector clients. This valuable service supports and assists municipalities to improve their Blue and Green Drop compliance. This service also enables the laboratory to create temporary employment opportunities assisting with job creation. Laboratory Services are provided to eThekweni MM, Harry Gwala DM, Ugu DM, uMgungundlovu DM, Msunduzi LM and Alfred Nzo DM, the Department of Water and Sanitation, Mhlathuze Water, Amatola Water, uThukela Water and various private clients and institutions throughout the country.

The laboratory has a moderate facility for undertaking research and development in the fields of analytical chemistry, microbiology, hydrobiology and soil sciences. Despite its limited size, it has produced high powered innovative work as detailed in **Table 12.1**.

RESEARCH AND INNOVATION

Umgeni Water plays a role in contributing to research and development that benefits the sector as a whole through active participation in various Water Research Commission (WRC) projects. A large portion of the knowledge gained in new technology and processes is also through the Innovation, Research and Development (IRD) projects that are undertaken in partnership with academia, notably through the Umgeni Water–University of KwaZulu-Natal Chair of Water Resource Management. The outcomes are expected to benefit the organisation in providing sustainable solutions to the challenges faced by the sector and also advance Human Capital development through research training in post graduate (MSc/ PhD) studies.

Major projects in 2015/2016 are shown in **Tables 12.1** and **12.2**.

Table 12.1: Major research projects and progress made in 2015/2016.

	Research Project	Objectives	Progress 2015/2016
1.	Evaluation of Alternative Technologies for Treatment of Sludge from Potable Water Works	To identify and investigate alternative lower cost technologies and methods for treatment and disposal of sludge from potable water works at Umgeni Water.	Literature review identifying most viable technologies is complete. Procurement of equipment is being finalised. Technology evaluation will take place at Durban Heights Water Treatment Works.
2.	Ultrafiltration Full Scale Evaluation	To investigate Ultrafiltration technology for low turbidity waters on full scale.	A 10 Ml/day UF membrane plant is to be constructed at the Wiggins Water Treatment Works to evaluate Ultrafiltration technology on full scale. Preliminary design has been completed and detailed design is in progress.
3.	Rural Disinfection Dosing System with Real Time Telemetry Feedback	To test an innovative design that will allow for improved final water quality in terms of residual chlorine and timeous operator intervention at remote rural locations.	The project has been successfully implemented in Maphumulo as a test case. The design includes a real time telemetry feedback system which reports system failures and process values via SMS using GSM technology.
4.	Soil testing	To develop, validate and accredit soil tests for routine application as per legislation.	Seven soil test methods have been fully validated and the data has been submitted to SANAS for audit for ISO 17025 accreditation. Routine testing is in progress.
5.	Real Time Polymerase Chain Reaction (PCR)	To set up a test method for quantification of Salmonella in river water by PCR.	The test method has been developed. The quantification aspect is now being addressed.
6.	Endocrine Disrupting Compounds	To setup a test method to measure some selected steroid oestrogens in raw and treated waste water.	The ELISA test method is being developed and validated evaluated as a routine test for these compounds.
7.	Radioactive screening	To setup a test method to measure Uranium in drinking water.	The test for uranium in water is now setup in-house at Laboratory Services for routine screening/quantification.
8.	On-line COD	To do COD testing on-line to get real time data to enable process optimisation.	The sourcing of suitable instrumentation from the market, to be followed by technical evaluations, with an intention to recommend a suitable analytical solution to Operations, is in progress.
9.	Sea water testing/analysis	Assess viability of conducting sea water analyses in-house.	In-house method development and analysis was identified as the most feasible option. Work is in progress.
10.	Oil-grease analysis	To evaluate the Soxhlet extraction -gravimetry (Soxtherm equipment) as an alternative to the liquid-liquid extraction method.	Preliminary results look promising. Further validation is to continue.

Table 12.2: Umgeni Water-UKZN Collaboration Research Projects.

Project Title	Objectives
1. Harnessing Vermi-Composting for Management of Dewatered Activated Sludge from Howick and Darvill Wastewater Works'	<ul style="list-style-type: none"> ▶ To determine the effects of vermin-composting and domestic sewage sludge type on stabilisation, fertiliser value and composition of coliforms in sludge. ▶ To determine whether vermin-composting is an appropriate sludge waste management strategy.
2. The effect of age on the friction of large diameter potable water cement mortar lined pipes	<ul style="list-style-type: none"> ▶ To establish the relationship between pipe age and friction for mortar-lined steel pipes transporting potable water treated with chlorine or chloramine.
3. Optimisation of Biogas production in the Darvill Digesters:	<ul style="list-style-type: none"> ▶ To assess maintenance of a stable microbial community via safeguarding appropriate process parameters to enable a reliable, continuous production of methane from the organic waste treatment.
4. River Health Programme (RHP) 2014 to 2016	<ul style="list-style-type: none"> ▶ To evaluate the state of the ecological well-being of selected bio-physical components of the rivers at 43 sites in KwaZulu-Natal.
5. A comparative life cycle assessment (LCA) for the provision of potable water from alternative sources - seawater and wastewater - in South Africa	<ul style="list-style-type: none"> ▶ To investigate water treatment technologies - desalination and wastewater recycling - in order to improve the overall environmental performance of these processes.
6. UW-UKZN Statistical Analysis Project	<ul style="list-style-type: none"> ▶ To assess the statistical relevance (likelihood) of rare microbiological non-compliances at large bulk water treatment works (Durban Heights, Wiggins, Midmar, DV Harris). ▶ To assess appropriate statistical analysis methods that provides information about relationships between microbiological out-of-range data (Total Coliforms, E. coli and Heterotrophic Plate Counts (HPC) and other measurable variables. ▶ To assess the relationship between microbiological out-of-range data and associated water quality data (free and total chlorine, pH, turbidity, sample temperature) in treated water samples. ▶ To assess whether the extensive historical (time series) microbiological and other water quality databases be used to improve our understanding of the efficacy of the water treatment process and the risk to public health? ▶ To assess whether a decision-support tool can be developed to assist with verification of future microbiological data. ▶ To develop appropriate data presentation techniques to display statistical information to non-statistical and management.
7. Development of a predictive mass balance model of chlorine and flocculant consumption in water treatment systems	<ul style="list-style-type: none"> ▶ To develop a system for estimating the optimal amount of chemicals required for water purification.

ASSURANCE THROUGH ROBUST INFORMATION AND COMMUNICATIONS TECHNOLOGY SYSTEMS

The implementation of the SAP ERP system has been a significant entity-wide focus during the reporting period. ERP is an industry acronym for Enterprise Resource Planning. The implementation of an ERP system will enable automation and integration of the core business processes within the entity.

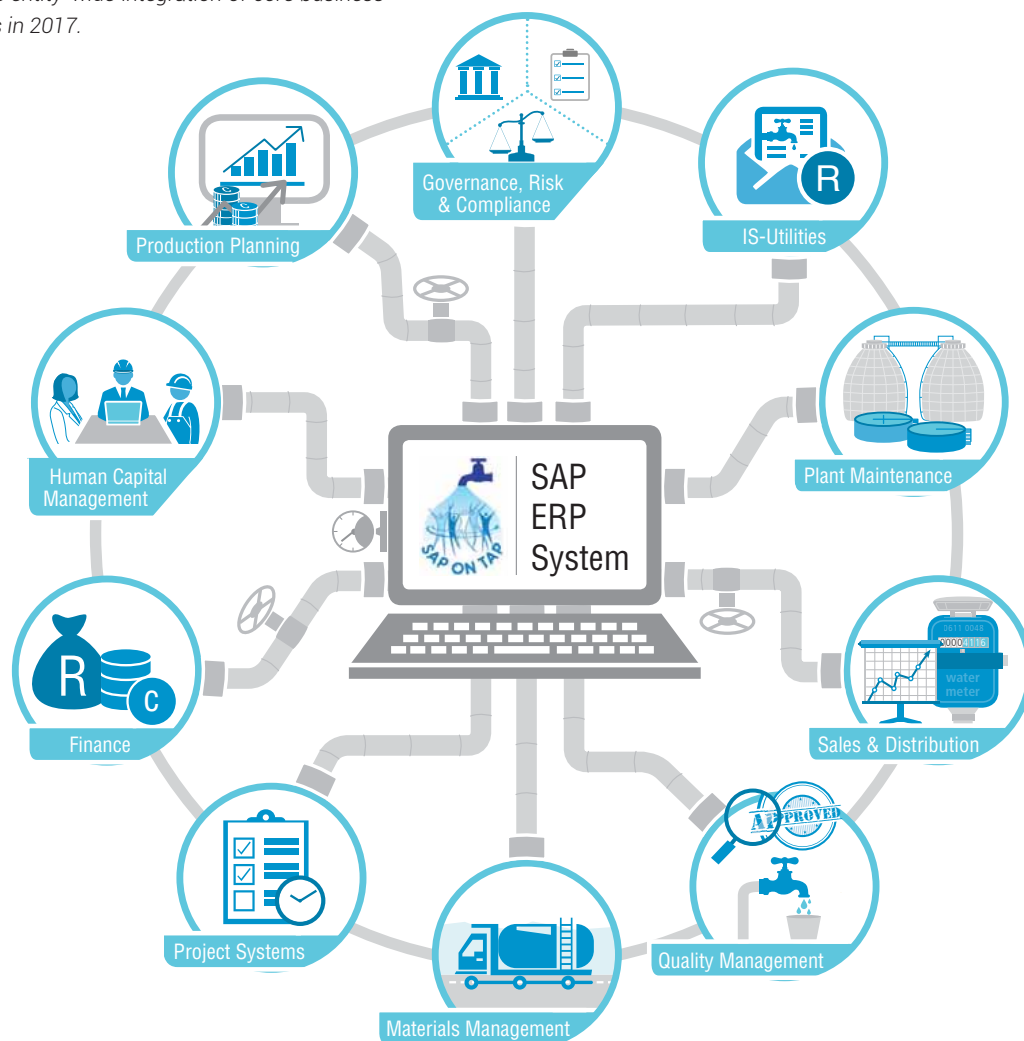
Umgeni Water core business processes entail responding to customer and stakeholder requirements, effectively scheduling operations, managing and maintaining assets, managing projects, procurement and inventory records, enabling human resources and managing financial data, amongst many other business processes. The ERP system is intended to drive huge improvements in our operational efficiency and effectiveness. These include:

- ▶ Assisting the entity to better define and review its business processes,
- ▶ Ensuring business processes are complied with throughout the process value chain,

- ▶ Planning of workloads based on existing orders and forecasts, such as asset maintenance,
- ▶ Providing tools to ensure the entity can provide a high level of service to customers,
- ▶ Protecting critical business data through well-defined roles and security access, and
- ▶ Translating data into decision making information for all levels of stakeholders.

Implementing the SAP ERP system is a major undertaking for Umgeni Water – is among the most sophisticated enterprise process interventions undertaken in its history of existence – and has therefore received support from the highest levels in the entity. Its successful implementation, targeted for 2017 will ensure the entity is well positioned for its current water board business and future business success as a regional water entity.

Figure 12.1: Schematic of SAP ERP System that will enable entity-wide integration of core business processes in 2017.



12.2 RISK MANAGEMENT

Umgeni Water defines risk as any exposure to the consequences of uncertainty that could affect the entity's ability to meet its strategic objectives. Risk management is guided by an Integrated Risk Management Framework which is aligned to strategy, thereby ensuring a focused and directed process of risk management in the organisation. The risk appetite and tolerance framework is reviewed and approved on an annual basis.

The entity's strategic risks are shown in **Table 12.3** and show the link to strategic perspectives, objectives and outcomes as well as how the risks have been treated / mitigated.

Of a total of ten (10) strategic risks, 90% have been managed to a level equal to or above 60% (reasonable) overall control strength and 80% of risks to a level equal or above 70% (good) overall control strength. One strategic risk is outside the entity's risk appetite and tolerance level.

Table 12.3 Strategic Risks as at 30 June 2016

Risk #	Risk Name, Score and Status	Cause, Context and Treatment	Main Strategic, Perspective, Objectives and Outcomes Impacted
1	<p>Short-term water resources availability.</p> <ul style="list-style-type: none"> Overall Control Strength: Poor 40% Severity: Catastrophic: 400 Probability: 91% Virtually certain and/ or already occurred <p>Risk Owner: GM Engineering and Scientific Services</p> <p>SCORE</p> <p>364 HIGH</p> <p>Risk Appetite and Tolerance</p> <ul style="list-style-type: none"> Outside Appetite Outside Tolerance 	<p>Cause and Context: Dam levels are such that there is a threat of non-supply if mitigation measures are not put in place. (Restrictions, emergency schemes).</p> <p><i>Treatment Approach: Commissioning of the emergency scheme at target sites completed or in progress. On-going short-term water resources and demand management initiatives. Implementation of appropriate operating rules. Water rationing implemented as per target percentages for all systems. Collaboration and partnerships to pool efforts, such as Joint Operating Committees.</i></p>	<p><u>Customer and Stakeholder Perspective:</u> SO1: Increase services and customers. SO2: Increase customer and stakeholder value.</p> <p><u>Organisational Capacity Perspective:</u> SO8: Increase water resources sustainability.</p> <p>Outcomes: Water Resources Adequacy Customer Satisfaction Stakeholder Understanding and Support Community and Environmental Sustainability.</p>
2	<p>Infrastructure investment to meet service delivery mandate and growth plans.</p> <ul style="list-style-type: none"> Overall Control Strength: Reasonable 60% Severity: Moderate: 19 Probability: 70% Likely and/or could occur within 1 year Risk Owner: GM Engineering and Scientific Services <p>SCORE</p> <p>13.3 LOW</p> <p>Risk Appetite and Tolerance</p> <ul style="list-style-type: none"> Outside Appetite Within Tolerance 	<p>Cause and Context: Alignment and prioritisation of the infrastructure plan and budget to increase capacity to meet demand, improve service levels and for growth.</p> <p>Inaccurate demand estimates obtained leading to inefficiency in infrastructure project planning and design.</p> <p><i>Treatment Approach: Critical supply infrastructure is annually identified, aligned, prioritised, funded and implemented as part of the entity's capital infrastructure programme linked to strategy.</i></p> <p><i>Details of major infrastructure initiatives and progress with these are outlined in the Infrastructure Chapter of this annual report.</i></p>	<p><u>Customer and Stakeholder Perspective:</u> SO1: Increase services and customers. SO2: Increase customer and stakeholder value.</p> <p><u>Organisational Capacity Perspective:</u> SO7: Improve and increase infrastructure assets.</p> <p>Outcomes Infrastructure Stability Product Quality Customer Satisfaction Stakeholder Understanding and Support Community and Environmental Sustainability.</p>

Table 12.3 Strategic Risks as at 30 June 2016 ...continued

Risk #	Risk Name, Score and Status	Cause, Context and Treatment	Main Strategic, Perspective, Objectives and Outcomes Impacted
3	<p>Performance of bulk wastewater infrastructure assets.</p> <ul style="list-style-type: none"> Overall Control Strength: Good 75% Severity: Moderate-Low: 15 Probability: 72% Likely and/or could occur within 1 year Risk Owner: GM Operations <p>SCORE 10.8 LOW</p> <p>Risk Appetite and Tolerance</p> <ul style="list-style-type: none"> Outside Appetite Within Tolerance 	<p>Cause and Context: Influent quality- illegal discharges from industries and storm water infiltration. Capacity and technology constraints, resulting in non-compliance with effluent discharge requirements.</p> <p><i>Treatment Approach: Initiatives planned and implemented at each WWTW and critical refurbishment and upgrades of major works included and implemented as part of capital programme by target dates. These include the Darvill Wastewater Treatment Works (WWTW) upgrade, Ixopo WWTW clarifier development and Howick WWTW Bridge pumpstation upgrade plan.</i></p>	<p><u>Customer and Stakeholder Perspective:</u> SO2: Increase customer and stakeholder value.</p> <p><u>Organisational Capacity Perspective:</u> SO7: Improve and increase infrastructure assets.</p> <p>Outcomes Infrastructure Stability Product Quality Customer Satisfaction Stakeholder Understanding and Support Community and Environmental Sustainability.</p>
4	<p>Breach of materiality and significance framework.</p> <ul style="list-style-type: none"> Overall Control Strength: Reasonable 60% Severity: Minor: 5 Probability: 80% Likely &/or could occur within 1 year Risk Owner: GM Finance <p>SCORE 4.0 LOW</p> <p>Risk Appetite and Tolerance</p> <ul style="list-style-type: none"> Outside Appetite Within Tolerance 	<p>Cause and Context: Incurring irregular expenditure as a result of lack of understanding and adherence to Supply Chain Management policies and procedures.</p> <p><i>Treatment Approach: Supply Chain Management policies and procedures reviewed, simplified and linked to legislation. Bid Committee oversight and assurance of compliance through on-going assessment of control effectiveness.</i></p>	<p><u>Process Perspective:</u> SO6: Improve service delivery systems.</p> <p>Outcomes: Operational optimisation Operational resiliency</p>
5	<p>Sustainable Tariff</p> <ul style="list-style-type: none"> Overall Control Strength: Good 70% Severity: Minor-High: 7 Probability: 51% Even probability and/or could occur within 1- 2 years Risk Owner: GM Finance <p>SCORE 3.6 LOW</p> <p>Risk Appetite and Tolerance</p> <ul style="list-style-type: none"> Within Appetite Within Tolerance 	<p>Cause and Context: Constraints on ability to charge a tariff that will ensure financial viability and protection of operating cash flows against operating risk including volatile sales volumes, above inflation input costs (major cost drivers) and high energy costs. Impacted by changes in operating rules, significant capital investments with low returns and high impairment costs. Uncertainty around tariff approval process.</p> <p><i>Treatment Approach: Tariff policy ensures transparency and formal tariff process. Scenario analysis on the impact of operational risk factors on financial viability. On-going optimisation of funding mix from tariff, grants and borrowing for capital programme. Enhanced stakeholder engagement to secure grant funding for developmental projects.</i></p>	<p><u>Customer and Stakeholder Perspective:</u> SO1: Increase services and customers. SO2: Increase customer and stakeholder value.</p> <p><u>Financial Perspective:</u> SO4: Increase financial sustainability.</p> <p><u>Organisational Capacity Perspective:</u> SO7: Improve and increase infrastructure assets.</p> <p>Outcomes: Financial Viability Infrastructure Stability Customer Satisfaction Stakeholder Understanding and Support Community and Environmental Sustainability.</p>

Table 12.3 Strategic Risks as at 30 June 2016 ...continued

Risk #	Risk Name, Score and Status	Cause, Context and Treatment	Main Strategic, Perspective, Objectives and Outcomes Impacted
6	<p>Protection and safeguarding of assets.</p> <ul style="list-style-type: none"> Overall Control Strength: Reasonable 65% Severity: Minor: 5 Probability: 65% Even probability and/or could occur within 1- 2 years Risk Owner: GM Corporate Services <p>SCORE 3.3 LOW</p> <p>Risk Appetite and Tolerance</p> <ul style="list-style-type: none"> Outside Appetite Within Tolerance 	<p>Cause and Context: Illegal settlements and unauthorised construction on properties and servitudes. Potential land claims on existing registered and servitudes to be acquired. Umgeni Water's right of access limited. General encroachment and impact on assets. Remote locations are difficult to secure or monitor resulting in an increase in theft and vandalism with damage to third party property and injury to staff. Increase in theft of ICT related assets.</p> <p><i>Treatment Approach: Implementation of servitude management procedure. Safety and security measures to protect staff and public. Innovative solutions implemented for strengthening of infrastructure and improvement in the internal control environment for ICT-related assets. Properties and servitudes maintained and monitored. Disposal of property no longer in use.</i></p>	<p><u>Customer and Stakeholder Perspective:</u> SO2: Increase customer and stakeholder value.</p> <p><u>Organisational Capacity Perspective:</u> SO7: Improve and increase infrastructure assets.</p> <p>Outcomes Infrastructure Stability Stakeholder Understanding and Support Community and Environmental Sustainability.</p>
7	<p>Ability to deliver projects on time and within budget.</p> <ul style="list-style-type: none"> Overall Control Strength: Good 70% Severity: Minor: 5 Probability: 51% Even probability and/or could occur within 1- 2 years Risk Owner: GM Engineering and Scientific Services <p>SCORE 2.5 LOW</p> <p>Risk Appetite and Tolerance</p> <ul style="list-style-type: none"> Within Appetite Within Tolerance 	<p>Cause and Context: Actual cost and delivery time of projects may significantly differ from approved plans. The variation may lead to undesirable impacts such as reputational damage and financial costs.</p> <p><i>Treatment Approach: Continued effective engineering, procurement and construction management (EPCM) process alignment within the specified time-frames.</i></p>	<p><u>Customer and Stakeholder Perspective:</u> SO1: Increase services and customers. SO2: Increase customer and stakeholder value.</p> <p><u>Organisational Capacity Perspective:</u> SO7: Improve and increase infrastructure assets.</p> <p>Outcomes Infrastructure Stability Product Quality Customer Satisfaction Stakeholder Understanding and Support Community and Environmental Sustainability.</p>
8	<p>Ability to secure funding to meet developmental goals.</p> <ul style="list-style-type: none"> Overall Control Strength: Good 80% Severity: Minor: 5 Probability: 40 % Fairly poor and/or could possibly occur within 2 years Risk Owner: GM Finance <p>SCORE 2 LOW</p> <p>Risk Appetite and Tolerance</p> <ul style="list-style-type: none"> Within Appetite Within Tolerance 	<p>Cause and Context: Inability to secure required project grant funding. Delayed receipt of funding resulting in projects not being delivered on time. Budgetary pressure, rising cost of capital and cost cutting due to macro-economic pressures.</p> <p><i>Treatment Approach: Enhanced stakeholder engagement to secure grant funding for developmental projects. On-going optimisation of funding mix from tariff, grants and borrowing.</i></p>	<p><u>Customer and Stakeholder Perspective:</u> SO1: Increase services and customers SO2: Increase customer and stakeholder value</p> <p><u>Financial Perspective:</u> SO3: Increase mobilisation of funds</p> <p><u>Organisational Capacity Perspective:</u> SO7: Improve and increase infrastructure assets</p> <p>Outcomes Infrastructure Stability Customer Satisfaction Stakeholder Understanding and Support Community and Environmental Sustainability Financial Viability.</p>

Table 12.3 Strategic Risks as at 30 June 2016 ...continued

Risk #	Risk Name, Score and Status	Cause, Context and Treatment	Main Strategic, Perspective, Objectives and Outcomes Impacted
9	<p>Long-term water resources availability.</p> <ul style="list-style-type: none"> Overall Control Strength: Good 70% Severity: Minor: 4 Probability: 45% Fairly poor and/or could possibly occur within 2 years Risk Owner: GM Engineering & Scientific Services <p>SCORE</p> <p>1.8 LOW</p> <p>Risk Appetite and Tolerance</p> <ul style="list-style-type: none"> Outside Appetite Within Tolerance 	<p>Cause and Context: Mgeni, Hazelemere, South Coast and Ixopo systems have insufficient capacity to meet projected demand. Reluctance of customer to pay, inability to control full value chain.</p> <p><i>Treatment Approach: Integrated planning and implementation for medium and long-term augmentation of systems with stakeholders. Water conservation and demand management initiatives. Review of water resources mix including reuse and desalination. Timely completion of target water resources projects including:</i></p> <ul style="list-style-type: none"> - Mgeni system: Completion of the uMkhomazi Water Project is projected for 2024. - North Coast system: Completion of the Lower Thukela Bulk Water Supply Scheme by September 2016. - South Coast system: Following the evaluation of the two options of the East Coast Desalination (southern site) and the Lower uMkhomazi BWSS, design of the South Coast Bulk Water Supply Scheme is scheduled for completion by June 2018. 	<p><u>Customer and Stakeholder Perspective:</u> SO2: Increase customer and stakeholder value.</p> <p><u>Organisational Capacity Perspective:</u> SO7: Improve and increase infrastructure assets.</p> <p>Outcomes Infrastructure Stability Stakeholder Understanding and Support Community and Environmental Sustainability.</p>
10	<p>Performance of bulk potable water infrastructure assets.</p> <ul style="list-style-type: none"> Overall Control Strength: Excellent 95% Severity: Minor-Low: 3 Probability: 35 % Doubtful and/or unlikely to occur within next 2 years Risk Owner: GM Operations <p>SCORE</p> <p>1 LOW</p> <p>Risk Appetite and Tolerance</p> <ul style="list-style-type: none"> Within Appetite Within Tolerance 	<p>Cause and Context: Process failures, capacity and technology constraints at water treatment plants resulting in final water non-compliance with potable water standard.</p> <p><i>Treatment Approach: Initiatives planned and implemented at each WTW and critical refurbishment and upgrades of works included and implemented as part of asset programme.</i></p>	<p><u>Customer and Stakeholder Perspective:</u> SO2: Increase customer and stakeholder value.</p> <p>Outcomes: Product Quality Customer Satisfaction Stakeholder Understanding and Support Community and Environmental Sustainability.</p>

Financial risks are detailed in the annual financial statement section of this annual report.

MITIGATED RISKS

Mitigated risks refer to risks that have been treated to an acceptable level with continual monitoring by Internal Audit to ensure the controls in place are still effective and efficient. The following strategic risks are mitigated:

- Liquidity risk: existing controls are sufficient to mitigate this risk. There is an approved short-medium-long term funding strategy in place which meets the on-going cash requirements of the business in line with the five-year financial business plan. In addition Umgeni

Water has an adequate liquidity buffer and is currently operating within the borrowing limits approved by National Treasury.

- Fraud risks: controls are in place to mitigate this risk and there is constant monitoring by the Ethics and Audit committees.

EMERGING RISKS

The entity regularly reviews the internal and external landscapes with a view to identifying emerging risks. Climate change remains on the radar as an emerging risk.