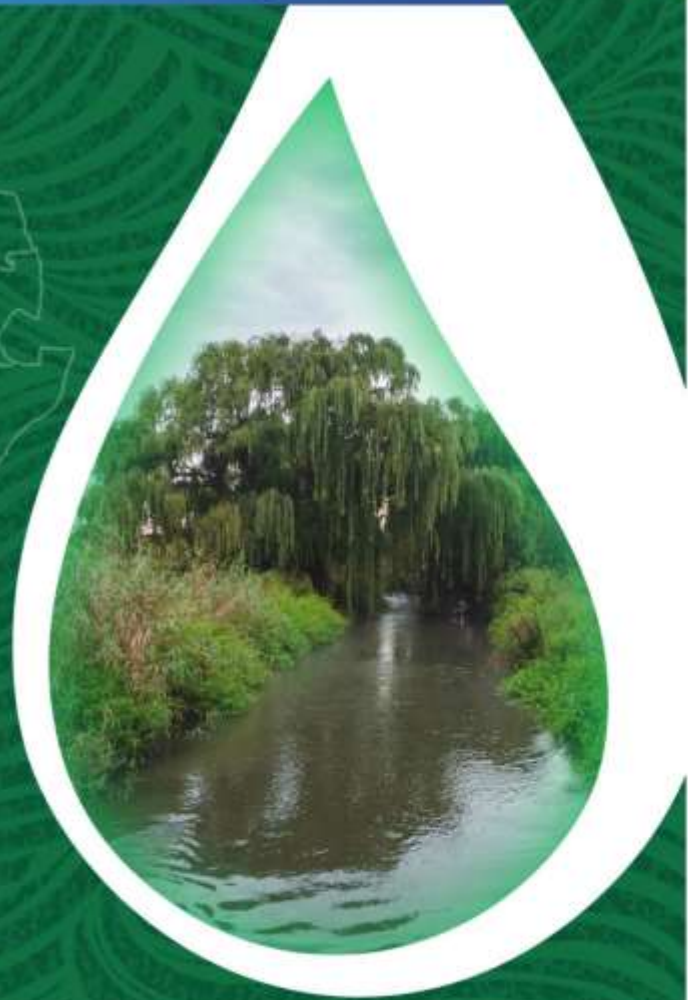


GREEN DROP

Northern Cape

2022



" Water is Life, Sanitation is Dignity "



water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA



green drop
CERTIFICATION
waste water service
REGULATION



It gives me pleasure to present this 2022 Green Drop report. The President announced the relaunch of the Green Drop Certification programme in his State of the Nation Address, and we are pleased to have delivered on this commitment. We recognised that as a flagship project, this incentive-based regulation programme has the power to mobilise the wastewater sector on a path to improvement.

Wastewater management and sanitation are paramount to the dignity of our people and integrity of the environment and it is therefore important that we strive for excellence in these fields. Even though the Green Drop programme has been at the centre of much of the improvement in the sector over the years and has brought about change and reignited the passion amongst our wastewater specialists, the results of this report serves as a scientifically calculated indicator that there is still a mammoth task ahead of us.

It remains unacceptable that sewage spillages and failing wastewater treatment works are detrimentally impacting our environment as well as the livelihood and health of many of our communities on a daily basis in the year 2022. It is of great concern that there are so many systems with scores below 31%, indicating a dismal state of wastewater management, posing a risk to both environment and public health. I am therefore making the call to political, public, and private leadership to declare their commitment to use this report as the turning point towards sustainable improvement, because everyone can make a difference within their sphere of influence. I need to make it clear that action will be taken against those municipalities that flagrantly put the lives of our people and environment at risk. As Minister of Water and Sanitation, I am engaging the Minister of Cooperative Governance to ensure that as National Government we take drastic intervention measures towards the improvement of water services.

We will use this report as the baseline for the Water Services Improvement Programme (10-point plan) from where we will measure the sustainable turn-around which we aspire to.

However, we are proud of those municipalities who have displayed their commitment towards effective wastewater management, even in the absence of the Green Drop programme over the past few years. The Green Drop scores achieved prove that excellence in the field of wastewater management is a realistic possibility and will remain the performance target for all to plan towards.

A special congratulations to the leadership, management and staff of those systems that attained the prestigious Green Drop status.

We move forward knowing that we do not accept 'being good' as the norm for the South African wastewater industry instead, we endeavour towards excellence.

Minister for Water and Sanitation: Mr Senzo Mchunu



It is a privilege to be part of the release of this Green Drop 2022 report, and I am encouraged by the few pockets of excellence that exist in the wastewater space in our country. It speaks volumes of those women and men who proudly conducted the important work they do in the background over the audit period. We will encourage Municipal Management and Leadership to support them to continue on their path to higher levels of excellence.

We will also call upon on all municipal leadership to note the results of the wastewater systems in their areas of responsibility; to take keen interest in ensuring improvement.

The reality of sewer spillages demands decisive leadership from all of us in order to protect our communities and safeguard our environment. It is going to take a team effort to ensure that future Green Drop reports will present all round improvement in the management of wastewater services.

Deputy Minister for Water and Sanitation: Ms Dikeledi Magadzi



This report should trigger a passion and commitment in all of us to transform our thinking of wastewater treatment systems. These plants demands the merging of scientific and engineering skills to ensure that we have the capability to treat used water to acceptable water quality standards, which allows the reuse of our precious resource.

However, the results of this report indicate that too many of our systems are not being managed according to expectations, resulting into a detrimental impact on our water resources. We cannot allow this to continue. The Green Drop Standards serve as a clear guide towards excellent wastewater management, and we would encourage all responsible to invest in upgrading your operational philosophies with clear objectives, to prevent sewer spillages, to treat effluent to acceptable standards, and to ensure effective sludge management.

I salute those who displayed commendable discipline and commitment towards protecting our environment by managing their wastewater systems according to the standards set by the Green

Drop Certification Programme.

Deputy Minister for Water and Sanitation: Mr David Mahlobo



The Green and Blue Drop Programmes lie at the heart of our vision to provide “safe water for all, forever” and our mission to “effectively manage the nation’s water resources to ensure equitable and sustainable socio-economic development and universal access to water”. These programmes not only support achievement of our strategic objectives but also align with our effort towards the United Nation’s Sustainable Development Goals for clean water and sanitation, and climate action. It is therefore reassuring that the number of WSIs achieving Green Drop Certification has not materially fallen off, despite the lag since the 2013 GD process.

This year’s results may not have shown the progressive improvements that we saw in previous cycles, but I am confident that we will get back on the right trajectory. This year’s assessment has provided us with a baseline and the platform to launch the turnaround. As in previous years, the programme was widely embraced and the general euphoria around the process tends to spark improvements in subsequent cycles. Despite the process being compulsory, participation was driven more from

deeper institutional commitment to progress and achieve excellence using the audit process as a barometer for change.

We have received international acclaim in the past and it will be important to re-establish the programme as the international benchmark for incentive-based regulation. We continued to innovate over the years through strengthening the scorecard and other regulatory tools. This year, we were able to introduce the “Very Rough Order of Measurement” (VROOM) model as part of the Green Drop Technical Site Assessments. At a high level, the VROOM provides insights on the state of the key elements of the wastewater treatment infrastructure and provides an order of magnitude estimate of cost to return the infrastructure to a functional condition. It is this kind of valuable insight gained from the GD process that can inform a coordinated response by DWS and other sector players.

As a department, we have continued to build internal regulatory capacity. We trained 96 of lead and assistant inspectors who were deployed as part of the 2021 GD Audits and hope to have influenced the 995 WWTWs (850 WSAs, 115 DPW & 30 privates) through our consultative audit process. We are committed to making the process as seamless and painless as possible for all Water Services Institutions and will incorporate the lessons learnt into the process for the subsequent cycles. We would like to see the GD process embedded and outcomes informing the planning, budgeting and professionalisation of the wastewater sector.

I would also like to express my appreciation to all the WSIs leaders and their officials who participated in the process. It is only through our combined efforts that we can improve the state of wastewater management in the country.

Director-General for Water and Sanitation: Dr Sean Douglas Phillips



The history of water will be measured not by its quantity but its quality...
Institute for Water Quality Management, 1970's.



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1. INTRODUCTION

The history of water will be measured not by its quantity but its quality...

*Lucas van Vuuren
Institute for Water Quality Management, 1970's*



Purpose and Intent of Green Drop Certification

Since its inception in 2008, the Green Drop regulation programme sought to identify and develop the core competencies that, if strengthened, would gradually and sustainably improve the standard of wastewater management in South Africa. The intention was to align the minimum requirements and best practice as a new Green Drop standard to raise the bar for wastewater management. The programme is therefore not based on the results of a limited number of random samples but evaluates the entire wastewater management services over a one-year audit period.

The Green Drop process is recognised as an international best practice and has received both local and international accolade. It is based on a consultative audit process that seeks to empower those responsible for wastewater management to deliver according to the set standards. It is also a transparent process, with clearly defined criteria that is geared to protect consumers from potentially unsustainable and unsafe services, as well as protecting the country's water resources.

The Green Drop audit criteria are designed to complement the efforts of other government and stakeholder programmes. They provide essential information to inform planning by sectoral partners, with the shared objective of achieving functional wastewater systems in the short term and excellence in wastewater management in the longer term.

The Green Drop audit process is intended to inspire a path that brings about sustainable compliant wastewater services through competent people, disciplined thought, and collective action which can be measured and reported to South African citizens every year.

*Greatness is not a function of circumstance.
Greatness, it turns out, is largely a matter
of conscious choice, and discipline*

Jim Collins

*This report acknowledges those institutions that aim and plan for progress and greatness
...and rewards those that achieve it.*

Incentive-based Regulation in South Africa

(Green Drop Certification)

Incentive-based regulation has gained significant momentum and support in the South African Water Sector, since its inception on 11 September 2008 (Minister of Water Affairs, National Municipal Indaba, Johannesburg). The concept was initially defined by two programmes: *Blue Drop Certification* for Drinking Water Quality Management Regulation; and *Green Drop Certification* for Wastewater Quality Management Regulation. *No Drop Certification* was added in 2014 that focused on water conservation and demand management in the municipal sector.

The Green Drop Wastewater Services Audit measures and compares the results of the performance of Water Service Institutions, and subsequently rewards (or penalises) the institution based on evidence of excellence (or failures) when measured against the defined standards. Benchmarks are used to help WSIs to identify gaps between their standard and industry norms. The report is designed to give comparative analysis and diagnostics to assist WSIs to focus on specific areas for improvement. Awareness of this performance is intended to hold WSIs to account, with pressure from consumers, media, politicians, business, and NGOs.

Each Green Drop audit cycle is marked by incremental change in the audit criteria, guided by the status and priorities of wastewater sector. It is therefore important for WSIs to note that merely maintaining the previous cycle's Green Drop evidence and performance will not warrant the same Green Drop score.

Whilst the *Green Drop assessment* focuses on the entire value chain (sewer collector, pumping, treatment, discharge) of the wastewater business within the municipalities (or other WSIs), the *Cumulative Risk assessment* focuses on the wastewater treatment function specifically. The latter approach allows the Regulator to have a database of the risk status and indicators for each treatment system in South Africa. As a 'sister' programme to Green Drop audits, risk-based regulation allows a WSI to identify and prioritise the critical risk areas within its wastewater treatment process and to take corrective measures to mitigate these. Risk analysis is done annually via the full Green Drop audit process, as well as in the alternate years via the Green Drop Progress Assessment (PAT) assessment. The results are published in the biennial Green Drop Report, as well as the Green Drop Progress (PAT) Report every alternate year.

The Department of Water and Sanitation integrates risk analysis as part of the audit process with the aim of quantifying, prioritising, and managing the risks to ensure targeted regulation of high-risk municipalities. The Wastewater Risk Abatement Plan (W₂RAP) is the tool whereby risks are identified and corrected, following a similar process of the reputed Water Safety Plan (WSP). A W₂RAP guideline is available to assist users (Water Research Commission, WRC TT 489/11).

Green Drop Scores

The main outputs from the Green Drop 2021 audit cycle are:

- ◆ A Green Drop audit score for each wastewater system assessed, which is aggregated into an organisational (overall) score, expressed as a percentage (%)
- ◆ A Cumulative Risk Rating for each wastewater treatment works, expressed as a percentage (%)
- ◆ Technical Site Assessment (TSA) score for selected collector and treatment systems inspected, expressed as a percentage (%)
- ◆ A collective VROOM cost for all treatment systems within each WSI, expressed in Rand.

Each indicator and its reference elements, can be described as follows:

- ◆ **Green Drop Audit Score:** A Green Drop % is awarded to an individual wastewater system based on the results from the audit process which measures performance against 5 Key Performance Areas (KPA), plus a suite of bonuses and penalties. The individual audit scores aggregate as a single (weighted) institutional Green Drop audit score. The score is weighted against the design capacities of the individual treatment plants. This score serves as a Performance Indicator of the capacity, compliance, and good practice that the institution attains against the Green Drop Standards, which again have been derived from national and international standards. A wastewater system that achieves $\geq 90\%$ Green Drop score, is regarded as excellent. A system that achieved $< 31\%$ is regarded as a dysfunctional system which would require appropriate interventions. **[Note: The audit covers the sewer network and treatment systems. On-site sanitation is not part of the audit].**
- ◆ **Green Drop Certified and Green Drop Contenders:** A wastewater system that achieves an overall $\geq 90\%$ Green Drop score and $\geq 90\%$ for microbiological and chemical effluent qualities, is regarded as excellent and is thereby "Green Drop Certified". A system that achieves an overall $\geq 90\%$ Green Drop score but did not meet the $\geq 90\%$ final effluent quality standards, is a "Green Drop Contender". In such case, the Green Drop score is adjusted to 89%.
- ◆ **Green Drop PAT:** The Green Drop Progress Assessment Tool is an instrument whereby the Department confirms and updates functional information and completes a risk assessment for each registered treatment works. The tool assesses risk via a weighted formula: $CRR = (A \times B) + C + D$, whereby the four risk indicators are comprised of the treatment plant's design capacity, operational inflow, technical skills, and final effluent quality. The results are published in a biennial Green Drop Progress (PAT) Report in the alternate year to the full Green Drop Report and includes a historic comparison of the plants' risk movement since 2009 to the current PAT year.
- ◆ **Cumulative Risk Rating:** Risk is calculated for each system using a formula: $CRR = (A \times B) + C + D$, where:
A = Hydraulic design capacity of the treatment plant in Ml/day
B = Operational flow as % of the installed design capacity
C = Number of non-compliant effluent quality parameters at point of discharge to receiving water body
D = Number of technical skills gaps (supervision, operation, maintenance) in terms of Reg. 2834 & Draft Reg. 813.

Institutions that achieve $\geq 90\%$, are Green Drop Certified in acknowledgement of excellence



Each risk element carries a different weight in proportion to the severity of the risk element (Annexure A).

CRR% deviation is calculated to show the variance between the baseline CRR and the maximum CRR value that could potentially be reached if all 4 risk indicators are in a critical state. *Example 1:* a 95% CRR %deviation value means the plant has only 5% space remaining before the system will reach its maximum critical state (100%) – this is an undesirable state. *Example 2:* a 25% CRR %deviation value means the plant holds a low and manageable risk position and that the 4 risk indicators are individually and collectively mitigated – this is a desirable state.

◆ **Technical Site Inspection Score:** A physical inspection is done at 1 to 2 sites to confirm the findings of the desktop audit. These sites are chosen based on their size, technology, and audit findings to best represent the potential state of the remainder of the sewer networks and treatment works. The TSA percentage reflects the physical condition of the sewer collector network, pumping stations, treatment plant and point of discharge. The intention of the TSA is to verify the evidence presented and findings of the Green Drop audit by undertaking a physical inspection of the selected site/s. Such inspections consider the:

- Appearance of the plant terrain and buildings
- Condition of structures, equipment, and process units
- Health and safety defects
- Operational knowledge and monitoring
- Workplace satisfaction.

The scorecard (*right*) provides the scoring criteria used for each inspection point.

1	Ideal performance and fully functional
0.75	Fully functional, but with minor corrections to be made
0.5	Partially functional and average performance
0.25	Partial performance with major corrections to be made
0	Failure and poor performance
NA	In case of a process unit absent / not part of the plant design, assign NA = Not Applicable

◆ **VROOM costing:** The Very Rough Order of Measurement (VROOM) is an estimation of the funding required to restore existing infrastructure to its original design capacity and operations, by addressing civil, mechanical, and electrical defects. The cost is derived through an algorithm that uses the Green Drop Inspector’s impression of the condition of the hardware, coupled with the system-specific design capacity and Green Drop score to derive an aggregated score for all treatment works within the organisation. The algorithm uses the refurbishment cost estimate of 1 to 2 systems and extrapolates it according to the other input values to arrive at an institutional cost, i.e. VROOM estimation. **NOTE: It does not constitute a specification, schedule of quantities or a definite refurbishment figure, but rather an indicative amount to inform a budget and hardware requirements.**

Further terminologies that support the above concepts are as follows:

◆ **WSI:** A Water Services Institution is defined as “...an entity, utility, or authority that provides water services to consumers or to another water services institution, and thereby is subject to compliance with the water laws of South Africa. WSI also means a water services authority, a water services provider, a water board, and a water services committee...”

◆ **WSA:** A Water Services Authority is any District, Metropolitan or Local Municipality that is responsible for providing water services to end users.

◆ **Wastewater System:** A wastewater system is defined as the pipes, sewers, pumping stations and treatment works that collect, reticulate, and treat wastewater from residents, businesses, and industries before releasing or reusing the final treated effluent and biosolids.

Two different scorecards are used during the audit process, depending on the treatment technology employed:

- Basic system: This is typically a treatment works with entry level technology, limited/no mechanical components, such as evaporation ponds, oxidation ponds, maturation ponds, sludge lagoons, wetlands, and reedbeds. Basic systems are less complex, have less stricter requirements, and generally hold lesser risk to the environment and customer
- Advanced system: This is typically a works that employs more advanced forms of technology and comprise of several electrical, mechanical and instrumentation components, such as screening, de-gritting, biological filters, activated sludge systems, extended aeration, membranes, filters, belt presses, anaerobic digesters, UV disinfection, and pump stations. Advanced systems are generally more complex, hold potentially higher risk to the receiving environment, and are subject to stricter legal standards.

◆ **IRIS:** The Integrated Regulatory Information System (IRIS) is a web-based application used by the Department of Water & Sanitation to facilitate the relationship between Regulation and Management of water supply and wastewater systems, while also keeping relevant stakeholders informed on compliance trends of registered supply systems. Information is uploaded by the Water Services Institution onto IRIS to allow the Inspector to assess evidence before, during and after the

audit event. IRIS contains an inventory of information on all registered wastewater systems, tracks historic system performance, and provides the platform to register wastewater treatment works and operations staff.

- ◆ **Diagnostic:** A suite of key diagnostic themes covers a number of strategic areas of importance to the South African water industry. Diagnostics allows deeper examination of the data and a better understanding of the causes of behaviours and patterns, in answering pressing questions of “why did it happen?” and guide recommendations on “what correction or intervention is needed?”.

Green Drop Reporting

This Green Drop Report 2022 upholds the Minister’s commitment to provide the water sector and its stakeholders with **ongoing, current, accurate, verified, and relevant** information on the status of wastewater services in South Africa. It follows on a series of Green Drop Reports from 2009 to 2013, by providing feedback and progress pertaining to the current status of municipal, public, and selected private and state-owned wastewater facilities.



The Green Drop Report 2022 provides information on three different levels:

1. **System specific** data and information pertaining to the performance of each sewer network and treatment system at WSI level
2. **Province specific** data and information that highlight the strengths, weaknesses, and historic trends for the respective WSIs within a Province (WSA) or Region (DPW)
3. **National overview** that collates the findings from a provincial, regional and system levels to give an aggregated national perspective of wastewater service performance. Historic trends are provided to gain insight into the success of provincial and national strategies to improve wastewater management and to inform future strategies and interventions.

The final proof of greatness lies in being able to endure criticism without resentment.

Elbert Hubbard

2. GREEN DROP STANDARDS 2021

*The Stockdale paradox:
Confront the brutal truth of the situation, yet at the
same time, never give up hope.*



The Green Drop Audits were conducted by 24 audit panels comprising of qualified wastewater professionals. Each panel consisted of a Lead Inspector and 1-2 Inspectors. All inspectors underwent rigorous training and were required to achieve a threshold examination score to qualify for involvement in the audit process.

WSIs were supported and capacitated through the audit process. Provincial symposia, attended by WSIs from that province, were held prior to the audit to share information on the audit process and criteria. Information was also shared on the role of IRIS and introduction to the IRIS Helpdesk. WSIs were also notified in advance of the audit date, audit criteria and the required portfolio of evidence (PoE) for the audit to assist with their preparation. The period under review for the 2021 audit cycle was: 1 July 2020 to 30 June 2021.

The audit scorecard was designed to consider evidence against 5 Key Performance Areas (A-E). The Green Drop KPAs, weights, and standards are summarised in the section below. Each KPA and sub-criteria carry a different weighting and are based on the relative regulatory priorities. Annexure B provides guidance on the format and interpretation of the Report Card.

Green Drop 2021 Audit Period : 1 July 2020 – 30 June 2021

Green Drop Standards

KPA A: Capacity Management (15%)

A1) Registration of Wastewater Treatment Plant	The wastewater treatment facility is registered as per the requirements of Regulation 2834 or as per Green Drop Standard (Draft Regulation 813)
A2) Registration of Process Controllers and Supervisor	Process controllers and supervisors are classified as per Regulation 2834 or Draft Regulation 813 (Green Drop Standard). These requirements will apply for all shifts of a specific wastewater system.
A3) Maintenance Capacity	The wastewater system must be served by a competent maintenance team (internal or outsourced), executing the maintenance work according to an acceptable maintenance plan/schedule.
A4) Engineering Management Capacity	The WSI must ensure that a competent engineering specialist oversee wastewater treatment operations, maintenance, and general asset management.
A5) (Advanced Systems Only) Scientific Capacity (Sampling and Laboratory Information Management)	The WSI must ensure that a suitably qualified professional scientist oversee the implementation of the operational and compliance monitoring programme (sampling and analyses).

KPA B: Environmental Management (15%)

B1) Wastewater Risk Management	The WSI shall conduct a detailed environmental risk assessment for the entire sewer collection system, wastewater treatment (both effluent liquid and sludge) and identify adequate control measures to implement for each risk identified. This process should be collated in form of an implemented system specific Wastewater Risk Abatement Plan (W ₂ RAP) as per the Water Research Commission (WRC) guideline.
B2) Operational Monitoring	Each WWTW shall have an operational monitoring programme in place which informs the operational efficacy (as per the required frequency) of the treatment facility as per the Authorisation.
B3) Compliance Monitoring (Effluent)	Each WWTW shall have a compliance monitoring programme in place (implemented) which informs on the compliance with the site-specific Authorisation requirements (as per the required frequency, determinands and sampling sites) of the treatment facility as per the Authorisation.
B4) (Advanced Systems Only) Sludge Classification and Monitoring	Sludge management (including sludge monitoring) must be implemented as per the Authorisation requirements.

B5) Laboratory Credibility	All compliance monitoring samples must be analysed at a credible laboratory (either accredited according to SANAS requirements or participating in a Proficiency Testing scheme with acceptable z-scores) for the required determinands, with an acceptable turnaround time.
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KPA C: Financial Management (20%)

C1) Wastewater Operations Cost Determination	The WSI must determine the actual operations and maintenance cost per wastewater scheme and express this in R/m ³ . Specific cost drivers need to inform the budget, including energy.
C2) Energy Demand	WSI must have proof of Energy Efficiency Management by providing Specific Power Consumption (SPC), energy unit cost (R/kWh), and express energy treatment cost in (R/m ³)
C3) Operations & Maintenance Budget	WSI must provide an annual O&M budget per wastewater system (for sewer collection network and wastewater treatment system).
C4) Operations & Maintenance Expenditure	WSI must provide proof of the wastewater system O&M expenditure per annum (to be measured in relation to the original budget).
C5) (Advanced Systems Only) Supply Chain Management of Services and Treatment Products	There must be appropriate supply chain management processes in place to ensure continuous availability of treatment chemicals (and related consumables), maintenance and spares.

KPA D: Technical Management (20%)

D1) Wastewater Treatment Works Design Capacity Management	For each wastewater treatment works, there must be continuous monitoring of daily hydraulic and organic loading in terms of the Average Dry Weather Flow (ADWF) and Chemical Oxygen Demand (COD) and compared with the design capacity.
D2) Process Audit	A wastewater treatment facility must be subjected to an annual condition assessment and/or a Process Audit (conducted by a duly qualified professional person) to inform functionality of the infrastructure. Risk findings must be incorporated in the W ₂ RAP process.
D3) Sewer Main Inspection	The Sewer Collection System must be subjected to an annual asset condition assessment (conducted by a duly qualified professional person), which includes a sewer pump-station functionality assessment and wastewater flow balance. Risk findings must be incorporated in the W ₂ RAP process.
D4) Wastewater Asset Register	Wastewater Infrastructure must be included in the WSI Asset Register (as per AGSA requirements), detailing: <ul style="list-style-type: none"> a) relevant equipment and infrastructure b) asset description c) location d) condition e) remaining useful life f) replacement value.
D5) (Advanced Systems Only) Bylaws and Enforcement (Local Regulation)	Municipalities must have enforceable bylaws in place which will safeguard advanced wastewater treatment technologies from harmful influent which would pose a risk to biological treatment processes and receiving environment (where authorised decentralised systems are being used).

KPA E: Effluent and Sludge Compliance (30%)

E1) Monitoring Data Submission to DWS	A WSI must ensure that all Compliance Monitoring data is submitted on a monthly basis to the Department of Water and Sanitation on the required Regulatory System (IRIS).
E2) Water Use Authorisation	The Section 21 water use must be authorised in terms of the National Water Act (Act 36 of 1998)
E3) Effluent Quality Compliance	The effluent quality must comply to 90% (in total) with the authorised limits for the respective categories: <ul style="list-style-type: none"> a) 90% Microbiological Compliance b) 90% Chemical Compliance c) 90% Physical Compliance

E4) (Advanced Systems Only) Sludge Quality Compliance	The solids/sludge must be classified as per WRC Sludge Guideline
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Bonuses (Maximum of 15%)

F1) Process Control Training	Process controllers and supervisory staff must be subjected to relevant training over the past 24 months as from the date of audit. Cross-pollination and in-house training will be acknowledged as non-accredited capacity building.
F2) Stormwater Management	The WSI must have a Stormwater Ingress Management Plan detailing how stormwater (and other extraneous flow e.g. groundwater) entry is quantified, managed, and monitored to prevent entry into sewer systems.
F3) Water Demand Management	WSI shall formulate and implement a Water Conservation and Water Demand Management Plan which provides a strategy and work plan that identify, quantify, monitor, and manage leakages and water losses of any kind that may create an artificial water demand due to higher hydraulic loading of wastewater collection and treatment infrastructure.
F4) Wastewater and Sewer Capital Projects planned for upgrades or refurbishment	An approved business plan for sewer and/or wastewater upgrades or refurbishment, with secured/confirmed funding.
F5) Sludge Reuse	Plant-specific initiatives that contribute to wastewater resource recovery and climate resilience objectives: energy efficiency, energy generation, beneficial use of sludge, effluent, nutrients, etc.
F6) Additional Impact Monitoring	Plant-specific monitoring of environmental or control sites/location, e.g. groundwater, up-stream / downstream impact monitoring, and soil analysis

Penalties (Maximum of 15%)

G1) Wastewater Treatment Works operating beyond hydraulic design capacity	See D1. <i>Note: If the plant operates above its installed capacity, but the effluent quality complies on ALL 3 categories, only 50% of the penalty will be applied.</i>
G2) Any Sewer Collector & Pump-station dysfunctionality causing long term spillage	See D3. <i>Note: Should a WSI have proof of a response to a reported spillage as per its own Incident Management Protocol, within 7 days, then the penalty will not apply. If evidence of a long-term spill is observed during the TSA check of the network, a penalty will be applied, and possibly replicated to other systems in this WSI jurisdiction (Inspector discretion).</i>
Disqualifier	H1) Withholding or falsifying information
	H2) Directive Status (Non reaction to a Directive issued by the Department)

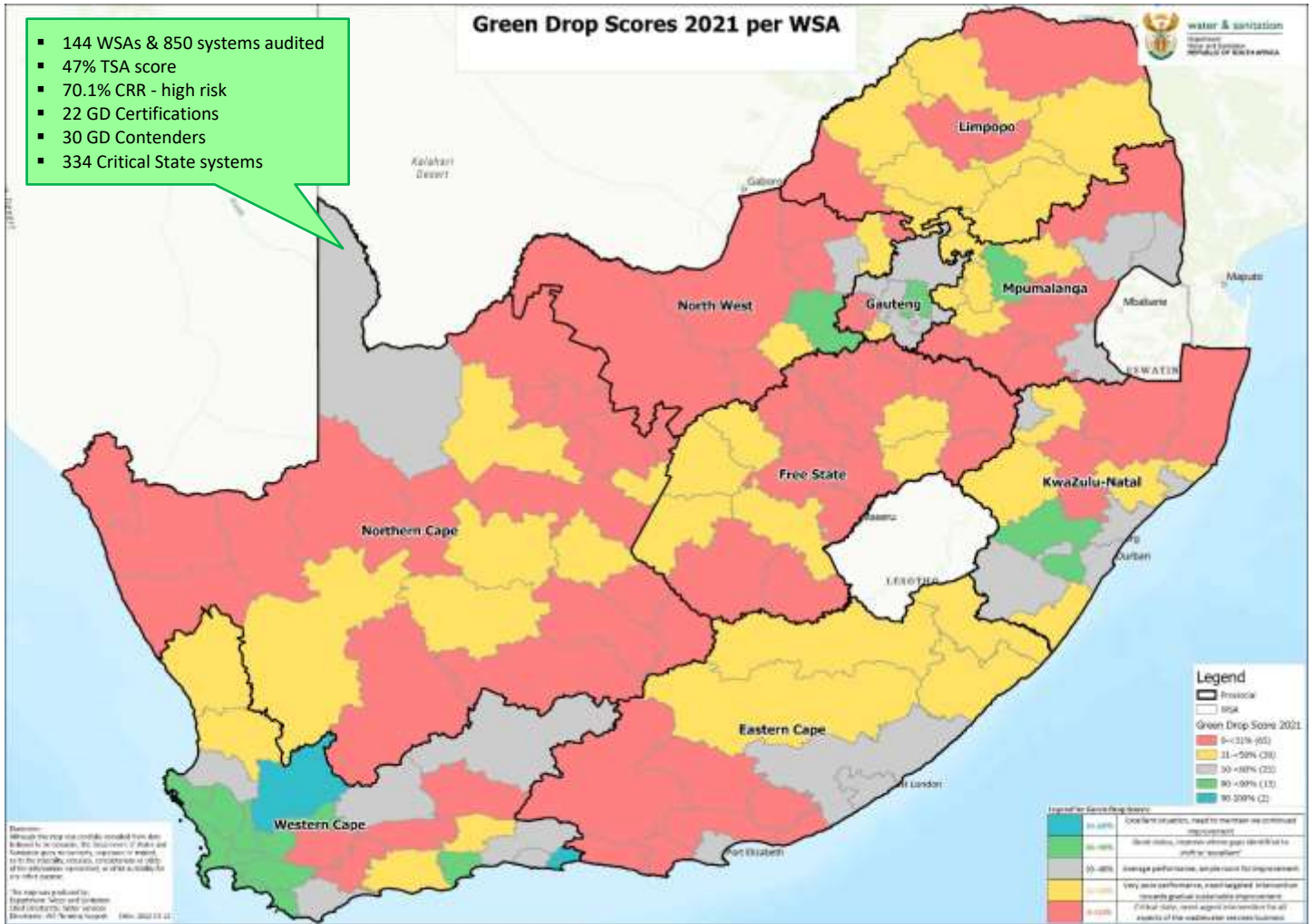
A final **effluent quality disqualifier** is applied during the 2021 audit. Wastewater systems qualify for Green Drop Certification status when achieving an audit score of $\geq 90\%$. However, if such system fails to achieve $\geq 90\%$ in microbiological and/or chemical compliance, the system would be disqualified from Certification and the score adjusted to 89%. The system will then be acknowledged as a Green Drop Contender. The adjustment will transfer to the institutional Green Drop score as well. The purpose of the disqualifier is to ensure that the credibility of the programme stays intact **in pursuit of excellence**. A system is only regarded as excellent if final effluent quality meets the excellence standards.

- ✘ Microbiological quality is selected for its importance in safeguarding the health of the downstream user and the integrity of the water resource. The presence of pathogens and bacteriological indicators in the final effluent implies that disinfection and nutrient removal operations of a treatment works are not optimised or functional.
- ✘ Chemical quality is selected for its negative impact on the water quality of the receiving waterways into which treatment works release final effluent. The presence of nitrogen and phosphate causes enrichment of inland and coastal waters. This leads to low-oxygen waters and dominance of certain algae and organisms, which leads to biodiversity losses, loss of fishery resources, seagrass, corals, and other aquatic life.

“If you are going to achieve excellence in big things, you develop the habit in little matters. Excellence is not an exception, it is a prevailing attitude.”

Colin Powell

3. NATIONAL PERFORMANCE OVERVIEW OF MUNICIPAL WASTEWATER MANAGEMENT



National Green Drop Report 2022

The National Green Drop Report 2022 is available from the Department of Water and Sanitation homepage. It can be accessed via www.dws.gov.za that will route the user to <https://ws.dws.gov.za/IRIS/LatestResults.aspx>

The Northern Cape Green Drop Report 2022 is a sub-set of the national report and provides a provincial perspective with detailed results and findings of each WSI.

The national report also contains conclusions, recommendations, and way forward for the country and for provinces/regions as a collective.

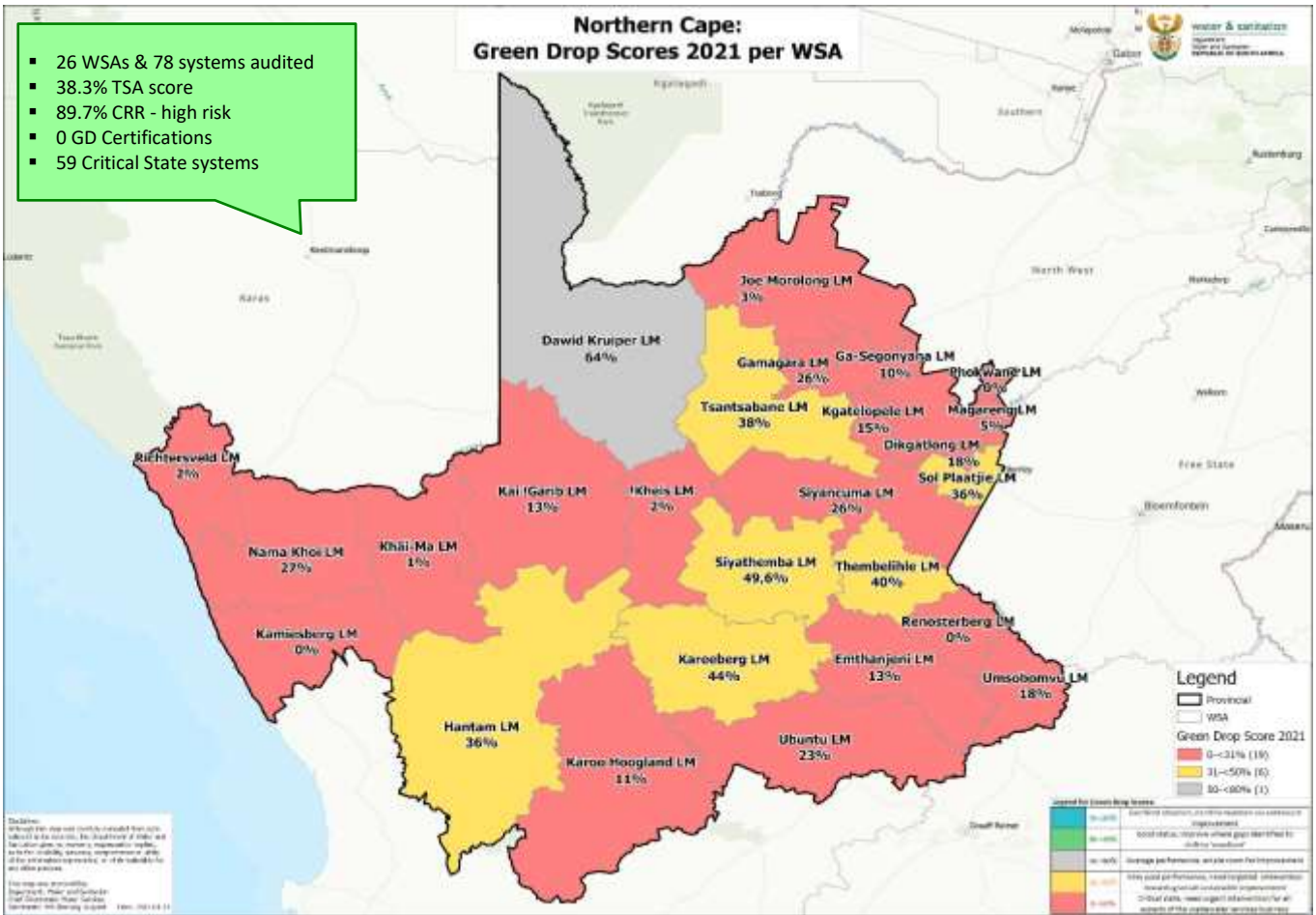


We will use this report as the baseline for the Water Services Improvement Programme (10-point plan) from where we will measure the sustainable turn-around which we aspire to. We move forward knowing that we do not accept 'being good' as the norm for the South African wastewater industry instead, we endeavour towards excellence.

Minister for Water and Sanitation: Mr Senzo Mchunu

4. NORTHERN CAPE PROVINCE: MUNICIPAL WASTEWATER MANAGEMENT PERFORMANCE

- 26 WSAs & 78 systems audited
- 38.3% TSA score
- 89.7% CRR - high risk
- 0 GD Certifications
- 59 Critical State systems



Provincial Synopsis

An audit attendance record of 100% affirms the Northern Capes WSA's commitment to the Green Drop national incentive-based regulatory programme.

The Regulator determined that no wastewater systems scored a minimum of 90% when measured against the Green Drop standards for the audited period and thus no WSA qualified for the prestigious Green Drop Certification. This compares lower than the one system being awarded Green Drop Status in 2013 but is recognised for its inherent value to establish an accurate, current baseline from where improvement can be driven, and excellence be incentivised.

Five (5) of the 26 WSAs improved on their 2013 scores – Siyathemba, Kareeberg, Siyancuma, Umsobomvu and Karoo Hoogland. Dawid Kruiper is the best performing Water Services Authority in the Province. Siyathemba made the best overall progress from a 38% in 2013 to a municipal score of 49.6% in 2021. Fifty-nine (59) systems were identified in critical state, compared to 33 in 2013. The full range of Green Drop KPAs require attention from all the municipalities, with some exceptions noted for Dawid Kruiper.

The provincial Risk Ratio for treatment plants regressed considerably from 78.4% in 2013 to 89.7% in 2021. The most prominent risks were observed on treatment level, and pointed to works that exceeded their design capacity, dysfunctional processes, and equipment (especially disinfection), and effluent and sludge non-compliance.

The Regulator is hopeful that the 2021 audits will set a baseline from where a positive trajectory for wastewater services and improved performance will follow. Municipalities are encouraged to start preparation for the 2023 Green Drop audit. The 2021 Green Drop status are summarised in Table 1, indicating no Green Drop Certifications, but several systems in critical state.

Table 1 - 2021 Green Drop Summary

WSA Name	2013 GD Score (%)	2021 GD Score (%)	GD Certified ≥90% 	GD Contenders (89%)	Critical State (<31%)
Dawid Kruiper: Khara Hais LM	60	64			
Mier LM	1				
Siyathemba LM	38	49.6↑			
Kareeberg LM	21	44↑			2 of 3 plants
Thembelihle LM	56	40↓			
Tsantsabane LM	83	38↓			Jen haven
Hantam LM	52	36↓			Brandvlei
Sol Plaatje LM	56	36↓			Richie-Rietvale
Nama Khoi LM	34	27↓			6 of 8 plants
Siyancuma LM	17	26↑			2 of 3 plants
Gamagara LM	42	26↓			3 of 4 plants
Ubuntu LM	24	23↓			All 3 plants
Umsobomvu LM	13	18↑			All 3 plants
Dikgatlong LM	39	18↓			All 3 plants
Kgatelopele LM	78	15↓			Danielskuil
!Kai !Garib LM	34	13↓			All 4 plants
Emthanjeni LM	66	13↓			All 3 plants
Karoo Hoogland LM	5	11↑			All 3 plants
Ga-Segonyana LM	64	10↓			Both plants (2)
Magareng LM	34	5↓			Warrenton
Joe Morolong LM	39	3↓			Both plants (2)
!Kheis LM	25	2↓			All 5 plants
Richtersveld LM	9	2↓			Port Nolloth
Khai-Ma LM	28	1↓			All 4 plants
Phokwane LM	53	0↓			All 3 plants
Kamiesberg LM	0	0→			Both plants (2)
Renosterberg LM	1	0↓			All 3 plants
Khara Hais LM	60				
Mier LM	1				
Totals	-	-	0	0	59

The Department of Water and Sanitation acknowledges the excellence in wastewater management achieved for the Green Drop Audit year of 2021.



No Green Drop Certificates are awarded to WSAs in the Province

Background to Northern Cape Wastewater Infrastructure

There are 26 WSAs, delivering wastewater services through a sewer network comprising of 78 wastewater treatment systems, 207 network pumpstations and 1,040 km outfall and main sewer pipelines. The sewer network excludes the pipelines of 17 municipalities who could not provide data. There is a total installed treatment capacity of 164.61 MI/d, with most of this capacity residing in 51 small to medium-sized treatment plants.

Table 2 - Summary of WWTW capacity and flow distribution according to plant sizes

	Micro Size Plants	Small Size Plants	Medium Size Plants	Large Size Plants	Macro Size Plants	Unknown (NI)*	Total
	<0.5 MI/day	0.5-2 MI/day	2-10 MI/day	10-25 MI/day	>25 MI/day		
No. of WWTW	20 (26%)	33 (42%)	18 (23%)	2 (3%)	1 (1%)	4 (5%)	78
Total Design Capacity (MI/day)	4.14	28.88	57.60	26.00	48.00	4	164.61
Total Daily Inflow (MI/day)	0.84	3.43	18.18	19.3	NI	57	41.75
Use of Design Capacity (%)	20%	12%	32%	74%	0%	-	25%

"Unknown" means the number of WWTWs with NI (No Information) on design capacity or daily inflow

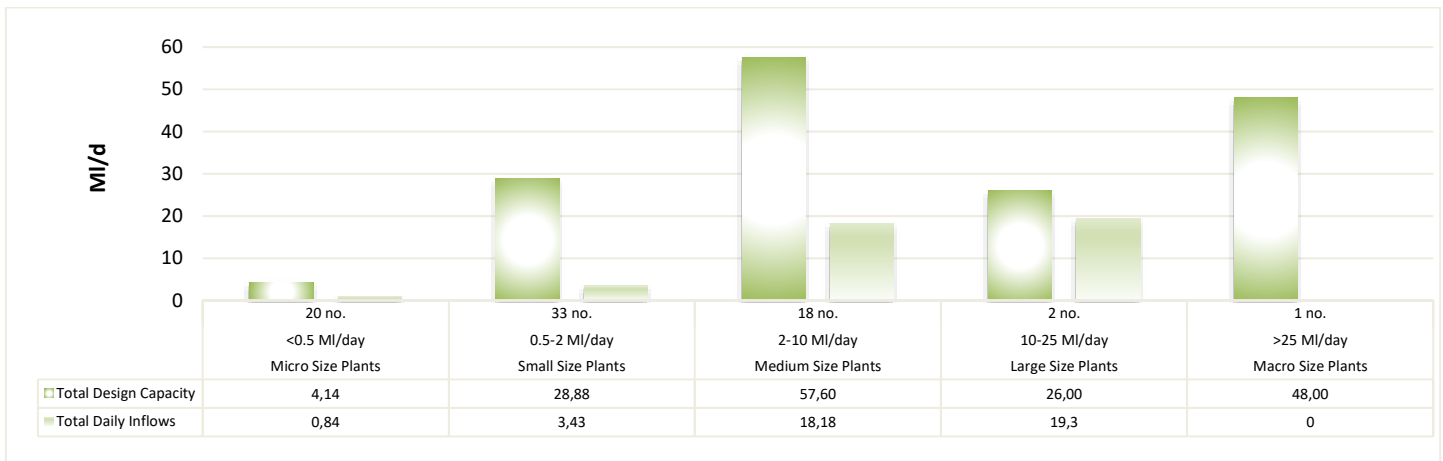


Figure 1 - Design capacities and operational inflow to micro to large sized WWTWs (a) and macro sized WWTWs

Based on the current operational flow of 41.8 MI/d, the treatment facilities are operating at 25% of the total design capacity. The three largest contributors are Sol Plaatje, Dawid Kruiper and Gamagara. The 25% figure implies that a spare capacity of 75% is available to meet the medium-term demand. However, 57 of 78 (73%) do not monitor the inflow to their WWTWs. The spare capacity is therefore inaccurate and can only be confirmed once all WWTWs measure their inflow (Refer to Diagnostic 3). This capacity may also be compromised at systems where some of the processes are non-operational due to dysfunctional equipment and/or structures especially in the collector network. The VROOM Cost Diagnostic 7 reports on the refurbishment requirements to restore such capacity and functionality. The "available" capacity translates to 122.9 MI/day, which would be sufficient to service an additional 512,083 to 768,125 persons (Red Book, 2019: 40-60% of 400 l/c/d).

The audit data shows that 1 system with known design capacity is hydraulically overloaded. This figure will be higher as there are 57 systems that are not measuring their inflows and hence it is not possible to determine whether these systems are hydraulically overloaded as well. The systems with known design capacities, that are hydraulically overloaded, are as follows:

- Sol Plaatje: 1 of 3 systems (Beaconsfield) – Inflows not recorded for the other 2 systems.

The predominant treatment technologies employed at Northern Cape WWTWs comprise predominantly of pond & lagoons, activated sludge and variations thereof (for effluent treatment), and solar drying beds and belt press dewatering (for sludge treatment). The next audit will need to verify sludge treatment technologies, as insufficient information (“None”) is observed in this area.

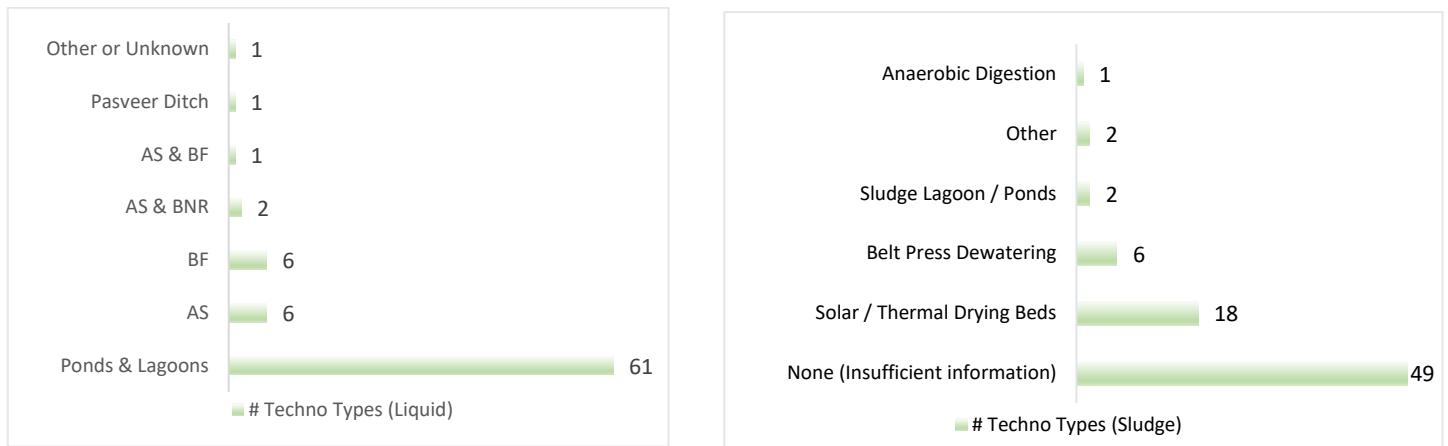


Figure 2 - Treatment technologies for wastewater effluent (a) and sludge (b)

Table 3 - Summary of Collection Network Pump Stations and Sewer Pipelines

WSA Name	# WWTWs	Pump Stations (#)	Sewer Pipelines (km)
Dawid Kruiper	4	15	6
Hantam	4	4	7
Kai Garib	4	8	NI
Kamiesberg	2	2	NI
Karoo Hoogland	3	2	NI
Khai Ma	4	2	15
Nama Khoi	8	8	NI
Richtersveld	1	9	NI
!Kheis	5	0	NI
Joe Morolong	2	6	NI
Siyathemba	3	3	64
Dikgatlong	3	5	NI
Emthanjeni	3	3	107
Kareeberg	3	4	31
Magareng	1	2	NI
Phokwane	3	0	NI
Renosterberg	3	0	NI
Sol Plaatje	3	35	748
Thembelihle	2	4	49
Ubuntu	3	6	NI
Umsobomvu	3	5	NI
Ga-Segonyana	2	13	NI
Gamagara	3	50	NI
Kgatelopele	1	10	NI
Tsantsabane	2	6	NI
Siyancuma	3	5	13
Totals	78	207	1,040

The sewer network consists of the sewer mains and pumpstations as summarised in Table 3. Sol Plaatje manages the bulk of the sewer collector infrastructure, approximately 748 km and 35 sewer pumpstations. Seventeen (17) of 26 municipalities could not provide information on sewer pipelines, indicating asset management information limitations.

Provincial Green Drop Analysis

The 100% response from the 26 municipalities audited during the 2021 Green Drop process demonstrates a firm commitment to wastewater services in the Province. Local Government reforms resulted in the merging of Khara Hais LM and Mier LM into Dawid Kruiper LM, which means that there were 26 WSAs audited in 2021 compared to the 27 WSAs in 2013.

Table 4 - Green Drop Comparative Analysis from 2009 to 2021

GREEN DROP COMPARATIVE ANALYSIS					
Performance Category	2009	2011	2013	2021	Performance trend 2013 and 2021
Incentive-based indicators					
Municipalities assessed (#)	13 (45%)	27 (100%)	27(100%)	26 (100%)	→
Wastewater systems assessed (#)	35	71	79	78	↓
Average Green Drop score	29%	26.1%	33.8%	19.2%	↓
Green Drop scores ≥50% (#)	20/35 (43%)	9/71 (13%)	20/79 (25%)	4/78 (5%)	↓
Green Drop scores <50% (#)	15/35 (57%)	62/71 (87%)	59/79 (75%)	74/78 (95%)	↓
Green Drop Certifications (#)	0	0	1	0	↓
Technical Site Inspection Score (%)	NA	37.0%	47.0%	38.3%	↓
<i>NA = Not Applied NI = No Information</i> ↑ = improvement, ↓ = regress, → = no change					

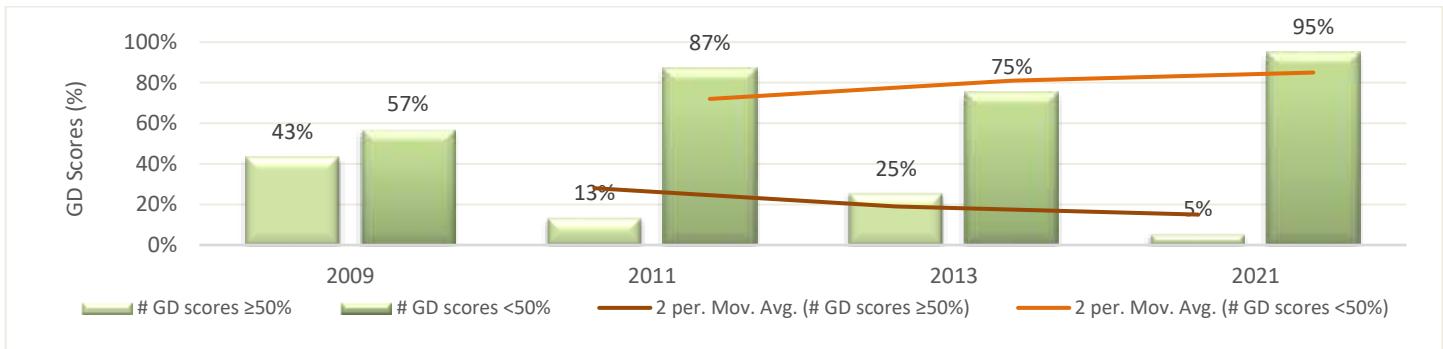


Figure 3 - Green Drop trend analysis over the period 2009 to 2021, indicating the percentage GD scores above and below 50%

The trend analysis indicates that:

- The number of systems audited has increased from 35 systems in 2009, when the first assessments were undertaken, to 78 systems in 2021
- Despite an upward trend in previous GD assessments, 26% in 2011, 34% to 2013, there was a drop-off to 19% in 2021
- Similarly, the number of systems with GD scores of ≥50% increased between from 9 (13%) in 2011 to 20 (25%) in 2013 but decreased to 4 (5%) in 2021
- This trend was also mirrored in the Technical Site Assessment score, which had increased from 37% in 2011 to 47% in 2013 but decreased to 38% in 2021
- This trend was balanced by the number of systems with GD score of ≤50% decreasing from 62 (87%) in 2011 to 59 (75%) in 2013, followed a regress to 74 (95%) in 2021
- The Green Drop Certifications decreased from 1 award in 2013 and to no awards in 2021
- An overall regressive performance pattern is noted from 2013 to 2021, which signal the benefit of repeat/regular audits to ensure continued improvement. Performance decreases when there are significant time lapses or irregular interaction.

The analysis for the period 2009, 2011, 2013 and 2021, indicates that the majority of the system scores are in the 0-<31% (Critical state) space, with the 31-<50% (Poor Performance) being the next largest category. The most concerning data point is that 59 systems are in critical state (<31%) which is a sharp increase compared to 33 systems in this space in 2013.

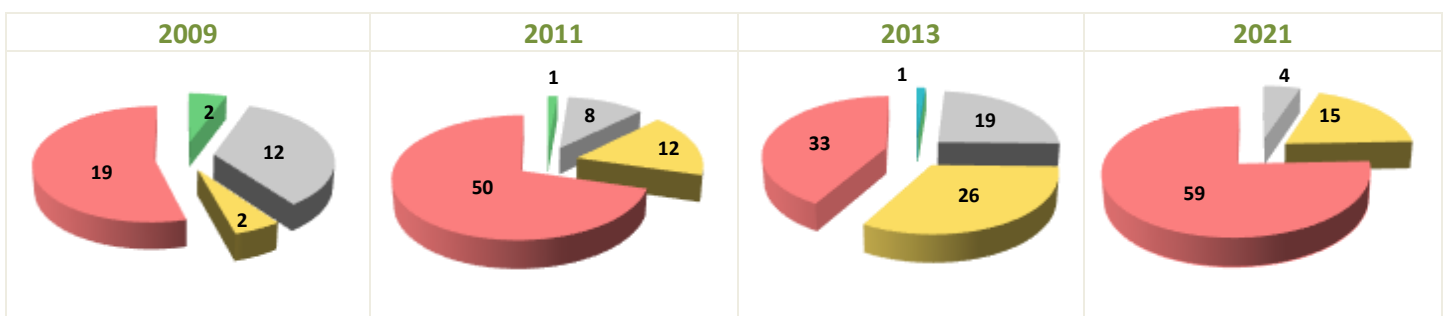


Figure 4 - No. WWTWs in the Green Drop score categories over the period 2009 to 2021 (graph legend to right)

90 – 100% Excellent	
80-<90% Good	
50-<80% Average	
31-<50% Poor	
0-<31% Critical state	

In summary, trends over the years 2013 and 2021 indicate as follows:

- o Systems in a 'poor state' decreased from 26 systems in 2013 to 15 systems in 2021
- o Systems in a 'critical state' increased from 33 systems in 2013 to 59 systems in 2021
- o Systems in the 'excellent and good state' decreased from 20 systems in 2013 to 4 systems in 2021.

Provincial Risk Analysis

Green Drop risk analysis (CRR) focuses on the treatment function specifically. It considers 4 risk indicators, i.e. design capacity, operational flow, technical capacity, and effluent quality. The CRR values do not factor risks associated with sanitation- or wastewater network and collector systems.

Table 5 - Cumulative Risk Comparative Analysis from 2009 to 2021

CUMULATIVE RISK COMPARATIVE ANALYSIS					
Performance Category	2009	2011	2013	2021	Performance Trend 2013 to 2021
Highest CRR	23	28	17	32	↑
Average CRR	14.4	14.1	13.5	15.9	↓
Lowest CRR	6	5	4	10	↓
Design Rating (A)	1.1	1.1	1.1	1.1	→
Capacity Exceedance Rating (B)	3.4	4.1	4.1	4.4	↓
Effluent Failure Rating (C)	7.9	6.5	6.1	7.8	↓
Technical Skills Rating (D)	2.8	3.0	3.1	3.1	→
CRR% Deviation	78.4	75.8	78.4	89.7	↓

↑ = improvement, ↓ = regress, → = no change

The concept of risk management has still not been embedded within the municipal sector of the Northern Cape. Table 5 shows a considerable regression in the CRR% deviation from 2013 to 2021, underscored by an unchanged design capacity rating (A) and technical skills rating (D), but with increased risk in the capacity exceedance rating (B), and a considerable increase in risk in the final effluent failures rating (E). Individual systems show high deviations in specific risk categories, as highlighted under **“Regulator’s Comment”**. The CRR analysis in context of the Green Drop results suggests that future improvements should focus on 1) capacity exceedance at plants which are hydraulically overloaded or approaching its design lifespan, 2) effluent quality failures, especially for microbiological compliance, and 3) strengthening of technical skills and operational competency, especially related to sludge management.

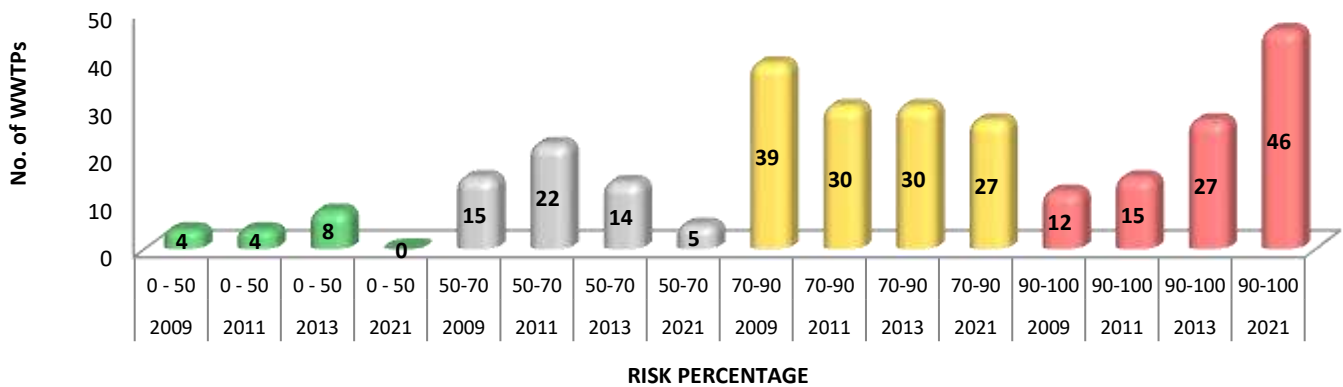


Figure 5 - a) WWTW Risk distribution and trends from 2009 to 2021; b) Colour legend

90 – 100% Critical risk WWTWs	
70 - <90% High risk WWTWs	
50-<70% Medium risk WWTWs	
<50% Low risk WWTWs	

Trend analysis of the CRR ratings for the period 2009 to 2021 reveals that:

- o The most prominent movement in risk can be seen between 2013 and 2021, when a high number of plants moved from low, medium, and high-risk positions to critical positions, indicating a regressive state for the WWTWs
- o The CRR decline has been consistent from 2011 to 2021
- o The 2021 assessment cycle highlighted regressive shifts with a decrease in the number of low (8 to 0), medium (14 to 5) and high risk (30 to 27) WWTWs, and an increase in critical risk WWTWs (27 to 46).

Regulatory Enforcement

Wastewater systems which failed to achieve the minimum Green Drop target of 31%, are placed under regulatory focus. The Regulator requires these municipalities to submit a detailed corrective action plan within 60 days of publishing of this report.

Twenty-three (23) municipalities and fifty-nine (59) wastewater systems that received Green Drop scores below 31%, are to be placed under **regulatory surveillance**, in accordance with the Water Services Act (108 Of 1997). In addition, these municipalities will be compelled to ringfence water services grant allocation to rectify/restore wastewater collection and treatment shortcomings identified in this report.

Table 6 - WWTWs with <31% Green Drop scores

WSA Name	2021 Municipal GD Score	WWTWs with <31% score
Kareeberg LM	44%	2 of 3 plants
Tsantsabane LM	38%	Jen haven
Hantam LM	36%	Brandvlei
Sol Plaatje LM	36%	Richie-Rietvale
Nama Khoi LM	27%	6 of 8 plants
Siyancuma LM	26%	2 of 3 plants
Gamagara LM	26%	3 of 4 plants
Ubuntu LM	23%	All 3 plants
Umsobomvu LM	18%	All 3 plants
Dikgatlong LM	18%	All 3 plants
Kgatelopele LM	15%	Danielskuil
!Kai !Garib LM	13%	All 4 plants
Emthanjeni LM	13%	All 3 plants
Karoo Hoogland LM	11%	All 3 plants
Ga-Segonyana LM	10%	Both plants (2)
Magareng LM	5%	Warrenton
Joe Morolong LM	3%	Both plants (2)
!Kheis LM	2%	All 5 plants
Richtersveld LM	2%	Port Nolloth
Khai-Ma LM	1%	All 4 plants
Phokwane LM	0%	All 3 plants
Kamiesberg LM	0%	Both plants (2)
Renosterberg LM	0%	All 3 plants

The following municipalities and their associated wastewater treatment plants are in high CRR risk positions, which means that some or all the risk indicators are in a precarious state, i.e. operational flow, technical capacity, and effluent quality. WWTWs in high risk and critical risk positions poses a serious risk to public health and the environment. The following municipalities will be required to assess their risk contributors and develop corrective measures to mitigate these risks.

Table 7 - %CRR/CRR_{max} scores and WWTWs in critical and high-risk space

WSA Name	2021 Average CRR/CRR _{max} % deviation	WWTWs in critical and high-risk space	
		Critical Risk (90-100%CRR)	High Risk (70-<90%CRR)
Siyathemba LM	68.6%		Prieska, Niekerkshoop
Dawid Kruiper LM	70.0%		Askham, Rietfontein
Hantam LM	72.1%		Brandvlei, Loeriesfontein
Gamagara LM	81.1%	Olifantshoek	Kathu, Dibeng
Richtersveld LM	82.4%		Port Nolloth
Thembelihle LM	82.4%		Hopetown New, Strydenburg New
Siyancuma LM	86.3%	Schmidtsdrift	Douglas, Griekwastad
Kareeberg LM	88.2%	Van Wyksvlei, Vosburg	Carnarvon
Magareng LM	88.2%		Warrenton
Tsantsabane LM	88.2%	Jenn-Haven	Postmasburg
Nama Khoi LM	90.4%	Bergsig, Concordia, Komaggas, Nababeep	Springbok, Carolusberg, Okiep, Steinkopf
Sol Plaatje LM	90.7%	Homevale, Rietvale-Richie	Beaconsfield
Emthanjeni LM	92.2%	Hanover, Britstown	De Aar
Umsobomvu LM	92.2%	Noupoort, Norvalspont	Colesburg

WSA Name	2021 Average CRR/CRRmax % deviation	WWTWs in critical and high-risk space	
		Critical Risk (90-100%CRR)	High Risk (70-<90%CRR)
!Kai! Garib LM	92.6%	Keimoes, Kenhardt, Vredesvallei	Kakamas
!Kheis LM	94.1%	Grootdrink, Topline, Wegdraai	Groblerstroom, Brandboom
Ga-Segonyana LM	94.1%	Both plants (2)	
Joe Morolong LM	94.1%	Both plants (2)	
Kgatelopele LM	94.1%	Danielskuil	
Khai-Ma LM	97.1%	Aggenys, Pella, Onseepkans	Pofadder
Ubuntu LM	98.0%	All 3 plants	
Dikgatlong LM	100.0%	All 3 plants	
Kamiesberg LM	100.0%	Both plants (2)	
Karoo Hoogland LM	100.0%	All 3 plants	
Phokwane LM	100.0%	All 3 plants	
Renosterberg LM	100.0%	All 3 plants	

Good practice risk management requires that the W₂RAPs are informed by meaningful Process and Condition Assessments, supported by zealous implementation of corrective measures and ongoing monitoring of risk movement. No municipality can be commended for maintaining all their treatment facilities in low and medium risk positions.

Performance Barometer

The **Green Drop Performance Barometer** presents the individual Municipal Green Drop Scores, which essentially reflects the level of mastery that a municipality has achieved in terms of its overall municipal wastewater services business. The bar chart below indicates the GD scores for 2013 in comparison to GD 2021, from highest to lowest performing WSI. Dawid Kruiper is the only municipality that maintains an average performance. Tsantsabane moved from a good performance score of 83% in 2013 to a poor performance score of 38% in 2021. Other municipalities that moved from an average performance score to a poor performance or critical state are Thembelihle, Hantam, Sol Plaatje, Kgatelopele, Emthanjeni and Phokwane.

The **Cumulative Risk Log** expresses the level of risk that a municipality poses in respect its wastewater treatment facility. It is based on the **individual Cumulative Risk Ratios**. Figure 6b presents the cumulative risks in ascending order – with the low-risk municipalities on the left and critical risk municipalities to the far right. The analysis reveals that there 16 critical risk municipalities and 9 high-risk municipalities in the Province. Only Siyathemba resides in the medium risk position.

The remainder of the municipalities received <50% Green Drop scores.

Provincial Best Performer

Dawid Kruiper LM is the **BEST SCORING** municipality in the Province:

- ✓ 64% Municipal Green Drop Score
- ✓ 2013 Green Drop Scores of 60% (Khara Hais LM) and 1% (Mier LM)
- ✓ 2 of 4 (50%) plants in the medium risk positions
- ✓ Technical Site Assessment score of 55% (Upington-Kameelmond)

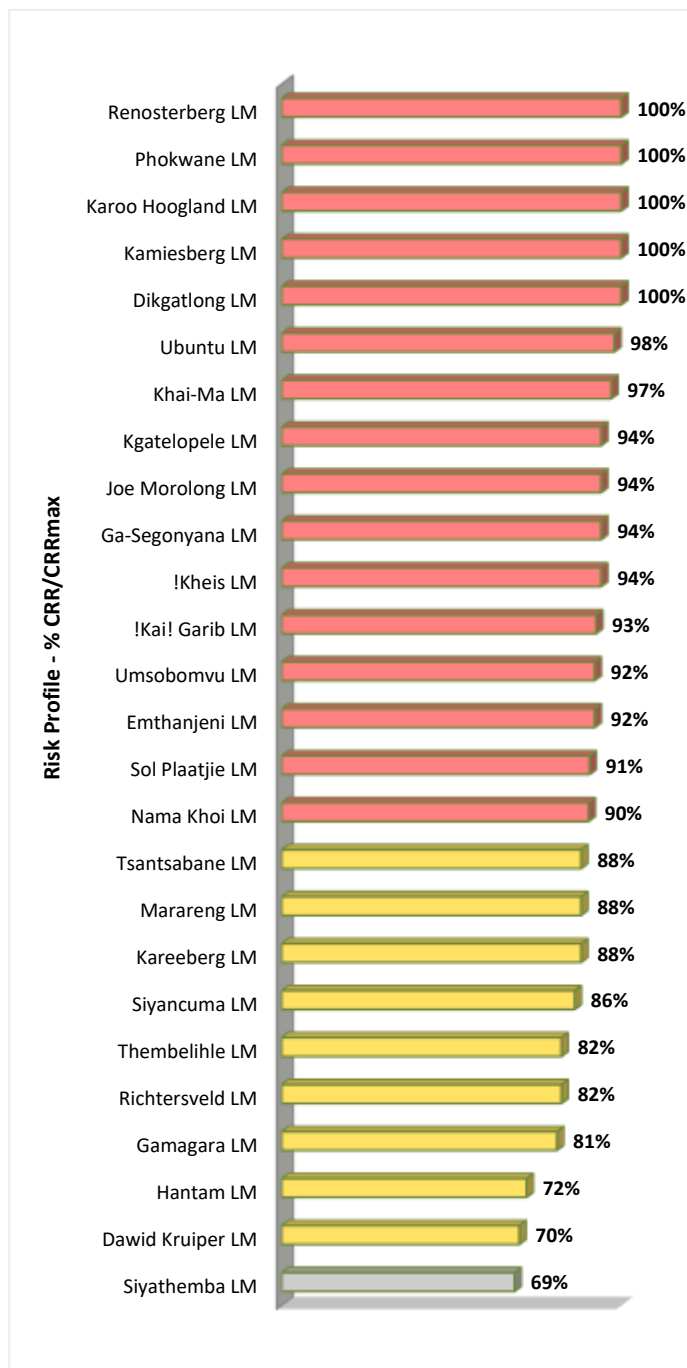
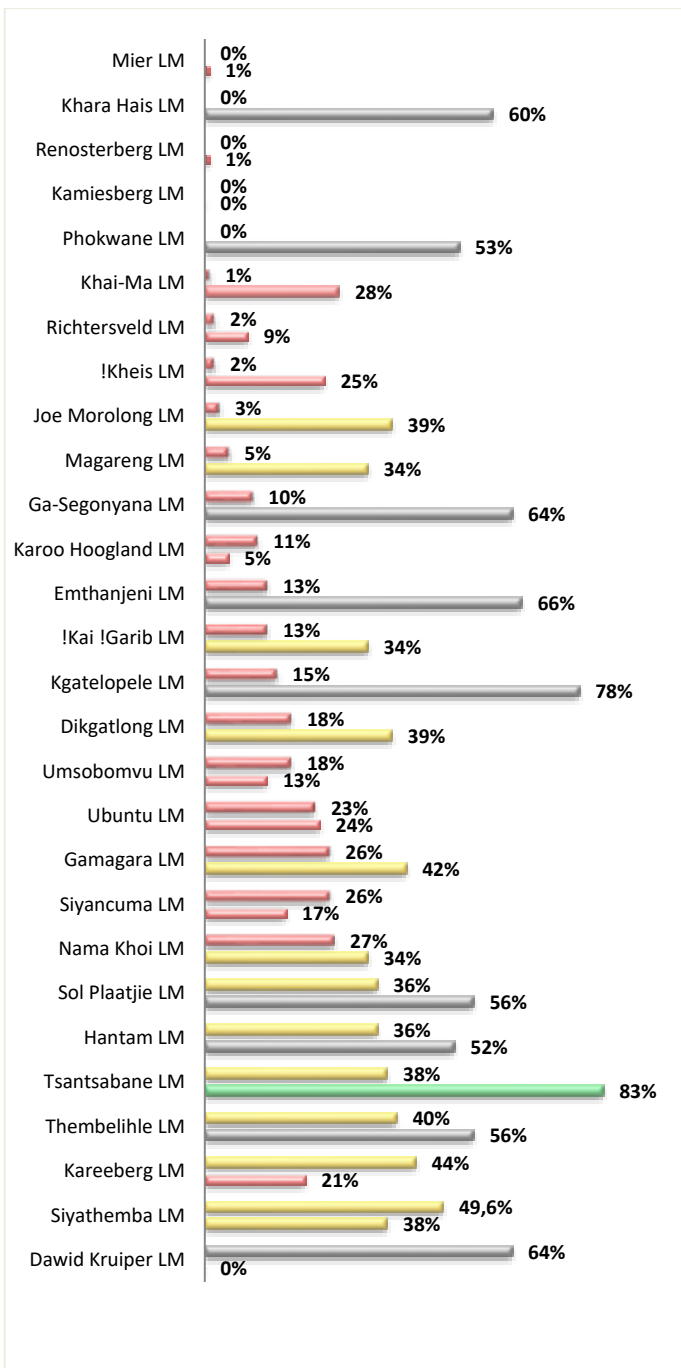


Figure 6 - a) Green Drop scores 2013 (bottom bar) and 2021 (top bar), with colour legend inserted; b) %CRR/CRRmax Risk Performance Log 2021 with colour legends inserted

90 – 100% Excellent	90 – 100% Critical risk WWTPs
80-<90% Good	70 - <90% High risk WWTPs
50-<80% Average	50-<70% Medium risk WWTPs
30-<50% Poor	<50% Low risk WWTPs
0-<31% Critical state	

KPA Diagnostics

The Green Drop Audit process collects a vast amount of data that yield valuable insight on the state of the wastewater sector in each Province. These insights have been captured into 7 thematic areas or 'Diagnostics', as discussed below.

Table 8 - Summary of the key diagnostic themes and reference to the respective Green Drop KPAs

Diagnostic #	Diagnostic Description	Diagnostic Reference
1	Green Drop KPA Analysis	KPAs A-E
2	Technical Competence	KPA A, B & Bonus
3	Treatment Capacity	KPA D

Diagnostic #	Diagnostic Description	Diagnostic Reference
4	Wastewater Monitoring and Compliance	KPA B & D & Bonus
5	Energy Efficiency	KPA C & Bonus
6	Technical Site Assessments	TSA
7	Operation, Maintenance and Refurbishment of Assets	KPA C, D & Bonus

Diagnostic 1: Green Drop KPA Analysis

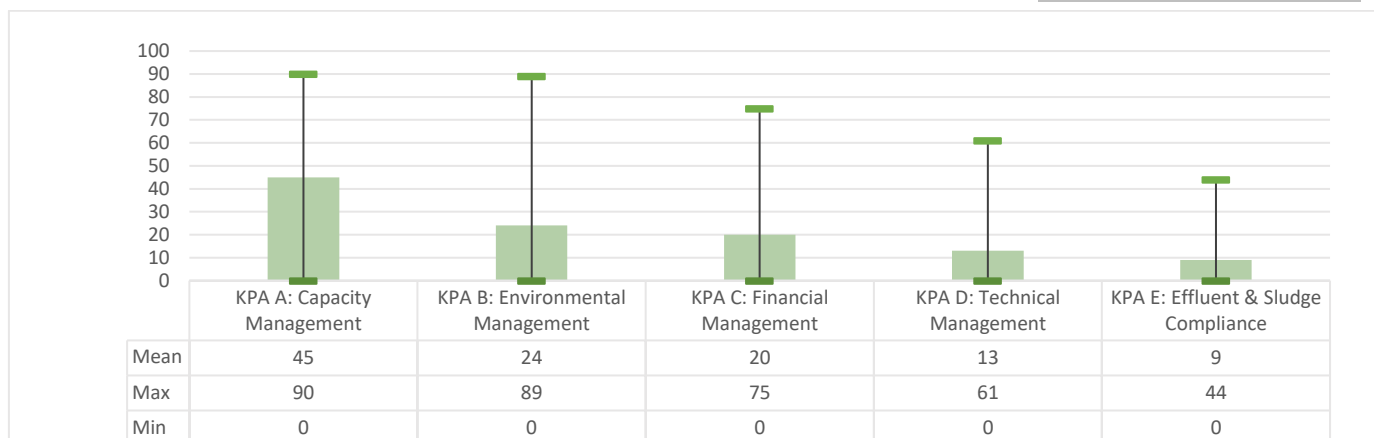
Aim: Analysis of technical skills, environmental plans, financial management, technical capacity, and regulatory compliance provides insight to the strengths and weaknesses that distinguish the Provinces' wastewater industry. These insights in return, may inform appropriate interventions and strategies to improve the individual KPAs and ultimately, collective KPA performance.

Findings: The WSAs are characterised by a highly variable KPA profile. A good KPA profile typically depicts a high mean GD score, coupled with a low Standard Deviation (SD) between the outer parameters (min and max). Similarly, a well performing system is one which has most/all systems in the >80% bracket and no systems in the <31% bracket.

Table 9 - Green Drop scores KPA profiles (graph legend included)

KPA #	Key Performance Area	Weight	Minimum GD Score (%)	Maximum GD Score (%)	Mean GD Score (%)	# Systems <31%	# Systems ≥80%
A	Capacity Management	15%	0%	90%	45%	11 (14%)	5 (6%)
B	Environmental Management	15%	0%	89%	24%	20 (26%)	1 (1%)
C	Financial Management	20%	0%	75%	20%	19 (24%)	0 (0%)
D	Technical Management	20%	0%	61%	13%	23 (29%)	0 (0%)
E	Effluent and Sludge Compliance	30%	0%	44%	9%	25 (32%)	0 (0%)

90 – 100% Excellent	■
80-<90% Good	■
50-<80% Average	■
30-<50% Poor	■
0-<31% Critical state	■



Note: The High and low lines represent the Min and Max range, and the shaded green represents the Mean

Figure 7 - Maximum, minimum, and mean Green Drop KPA scores

The KPA distribution indicates as follows:

- Capacity Management (KPA A) depicts the highest mean of 45%, the highest maximum of 90%, and the highest Standard Deviation (SD) of 91%. These results indicate pockets of strengths pertaining to the registration of WWTWs, maintenance plans and records, maintenance teams, and registered, qualified staff (process controllers, supervisors, scientists, technicians, engineers)
- Effluent and Sludge Quality Compliance (KPA E) received the lowest mean of 9%, indicating a deficiency in data management, IRIS upload, effluent quality compliance, and sludge quality compliance
- This was followed by the Technical Management (KPA D) that received the next lowest mean of 13%, indicating a vulnerability in basic design information, inflow, outflow, meter reading credibility, process and condition assessments, site inspection reports, asset registers, asset values, bylaws, and enforcement
- Uniquely, the mean averages decreased steadily from KPA A to KPA E.

The GD bracket performance distribution echoes the above findings:

- **KPA Score $\geq 80\%$:** Capacity Management (KPA A) is the best performing KPA with 6% of systems achieving $>80\%$, followed by Environmental Management (KPA B) with a distant 1%. For all the remaining KPAs, no system achieved $>80\%$.
- **KPA Score $<31\%$:** Effluent & Sludge Compliance (KPA E) represents the worst performing KPA with 32% of systems lying in the 0-31% bracket, followed by Technical Management (KPA D) with 29%, and Environmental Management (KPA B) with 26%.

Diagnostic 2: Technical Competence

Aim: This focus area assesses the human resources (technical) capacity to manage wastewater systems. Theory suggests a correlation between human resources capacity (sufficient number of appropriately qualified staff) and a municipality's performance- and operational capability. It is projected that high HR capacity would translate to compliant wastewater services and protection of scarce water resources.

Findings: According to regulations, wastewater plants are classified as Class A, B, C, D or E plants. Similarly, Process Controllers and Plant Supervisors are registered as Class I, II, III, IV, V or VI operators. High classed plants require a higher level of operators due to their complexity and strict regulatory standards. Technical compliance of PCs and Supervisors is determined against Green Drop standards, as defined by Reg. 2834 and draft Reg. 813 of the National Water Act 1998.

Note: "Compliant staff" means qualified and registered staff that meets the GD standard for a particular Class Works. "Staff shortfall" means staff that does not meet the GD standard for a particular Class of works (+1 for a shift) and/or staffing gaps exist at the respective WWTWs.

Table 10 - No. compliant versus shortfall in Supervisor and Process Controller staff

WSA Name	# WWTWs	# Compliant staff		# Staff Shortfall		Ratio*	WSA 2021 GD Score (%)
		Supervisor	PCs	Supervisor	PCs		
Dawid Kruiper	4	1	7	1	3	2.0	64%
Hantam	4	1	2	0	3	0.8	36%
Kai Garib	4	1	0	0	5	0.3	13%
Kamiesberg	2	0	0	1	2	0.0	0%
Karoo Hoogland	3	1	0	0	5	0.3	11%
Khai Ma	4	0	0	1	4	0.0	1%
Nama Khoi	8	0	0	2	10	0.0	27%
Richtersveld	1	0	0	1	1	0.0	2%
IKheis	5	0	0	1	5	0.0	2%
Joe Morolong	2	1	0	0	3	0.5	3%
Siyathemba	3	0	4	1	1	1.3	50%
Dikgatlong	3	0	0	1	5	0.0	18%
Emthanjeni	3	0	3	1	2	1.0	13%
Kareeberg	3	1	2	0	2	1.0	44%
Magareng	1	0	4	1	0	4.0	5%
Phokwane	3	0	0	1	5	0.0	0%
Renosterberg	3	0	0	1	4	0.0	0%
Sol Plaatje	3	1	3	2	8	1.3	36%
Thembelihle	2	2	4	0	0	3.0	40%
Ubuntu	3	0	2	1	2	0.7	23%
Umsobomvu	3	0	3	1	2	1.0	18%
Ga-Segonyana	2	0	1	1	3	0.5	10%
Gamagara	3	1	4	0	3	1.7	26%
Kgatelopele	1	0	1	1	0	1.0	15%
Tsantsabane	2	0	0	1	4	0.0	38%
Siyancuma	3	0	0	1	3	0.0	26%
Totals	78	10	40	21	85		

* The single number Ratio depicts the number of qualified staff divided by the number of WWTWs operated by this number of staff. E.g., Dawid Kruiper has 8 qualified staff to operate 4 WWTWs, thus $8/4 = 2$ ratio

Competent human resources is a vital enabler to ensure efficient and sustainable management of treatment processes and infrastructure. For the Northern Cape, operational competencies are not on par with regulatory expectations, as illustrated by the high shortfalls against the Green Drop standards.

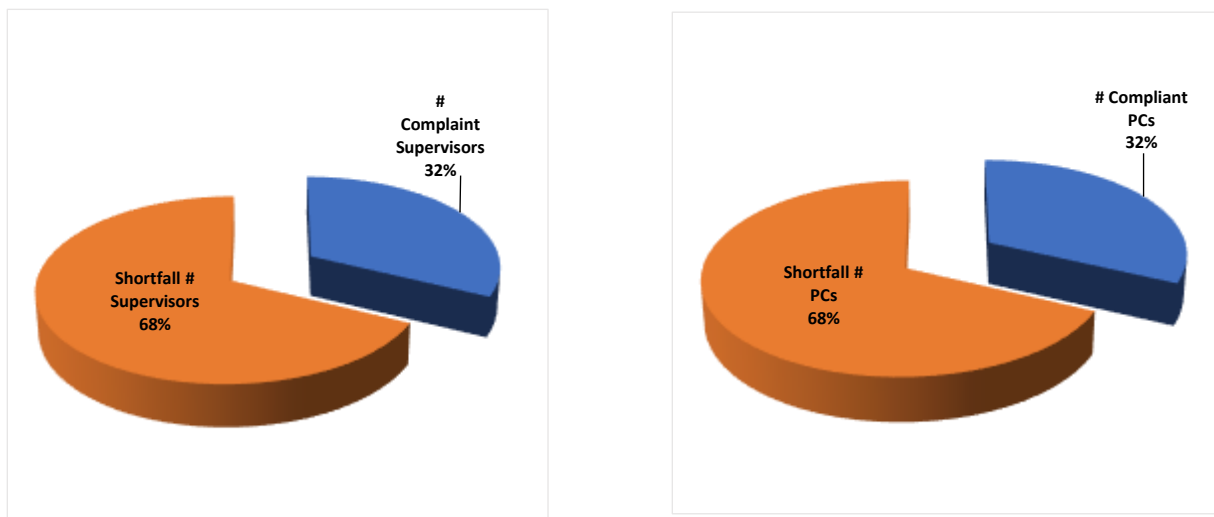


Figure 8 - Schematic illustration of compliant versus non-compliant Supervisors (a) and Process Controllers (b)

Plant Supervisors: The pie charts indicate that 32% (10 of 31) of Plant Supervisors complies with the Green Drop standard, with zero shortfall for 7 of 26 municipalities. A 68% (21 of 31) shortfall is noted for Supervisors overall, with the highest shortfall seen at Nama Khoi and Sol Plaatje (2 no. each). A shortfall in one roaming Supervisor for most of the municipalities.

Process Controllers: Similarly, 32% (40 of 125) of the PC staff is compliant for the Northern Cape, with a zero shortfall for Magareng, Thembelihle and Kgatelopele. There is a 68% (85 of 125) shortfall in PCs with the highest shortfall for the Nama Khoi (10 no.), Sol Plaatje (8 no.), and Kai Garib, Karoo Hoogland, Kheis, Dikgatlong and Phokwane (5 no. each).

Green Drop standards require of Class A and B plants to employ dedicated Supervisors and Process Controllers per shift per works, whereas Class C to E Works may consider sharing of staff across works. The introduction of shifts is necessary to ensure that expensive assets are not left unsupervised during night times, especially considering issues of operations and vandalism. Telemetry also relieves the requirement for on-site staff during night shifts, but any relaxations need to be resolved with DWS.

It is anticipated, but never tested before, that a correlation would exist between the competence of an operational team and the performance of a treatment plant, as measured by the GD score. The results from the ratio analysis indicate high ratios for Magareng, Thembelihle and Dawid Kruiper, and low ratios from Hantam to Siyancuma (Figure 9).

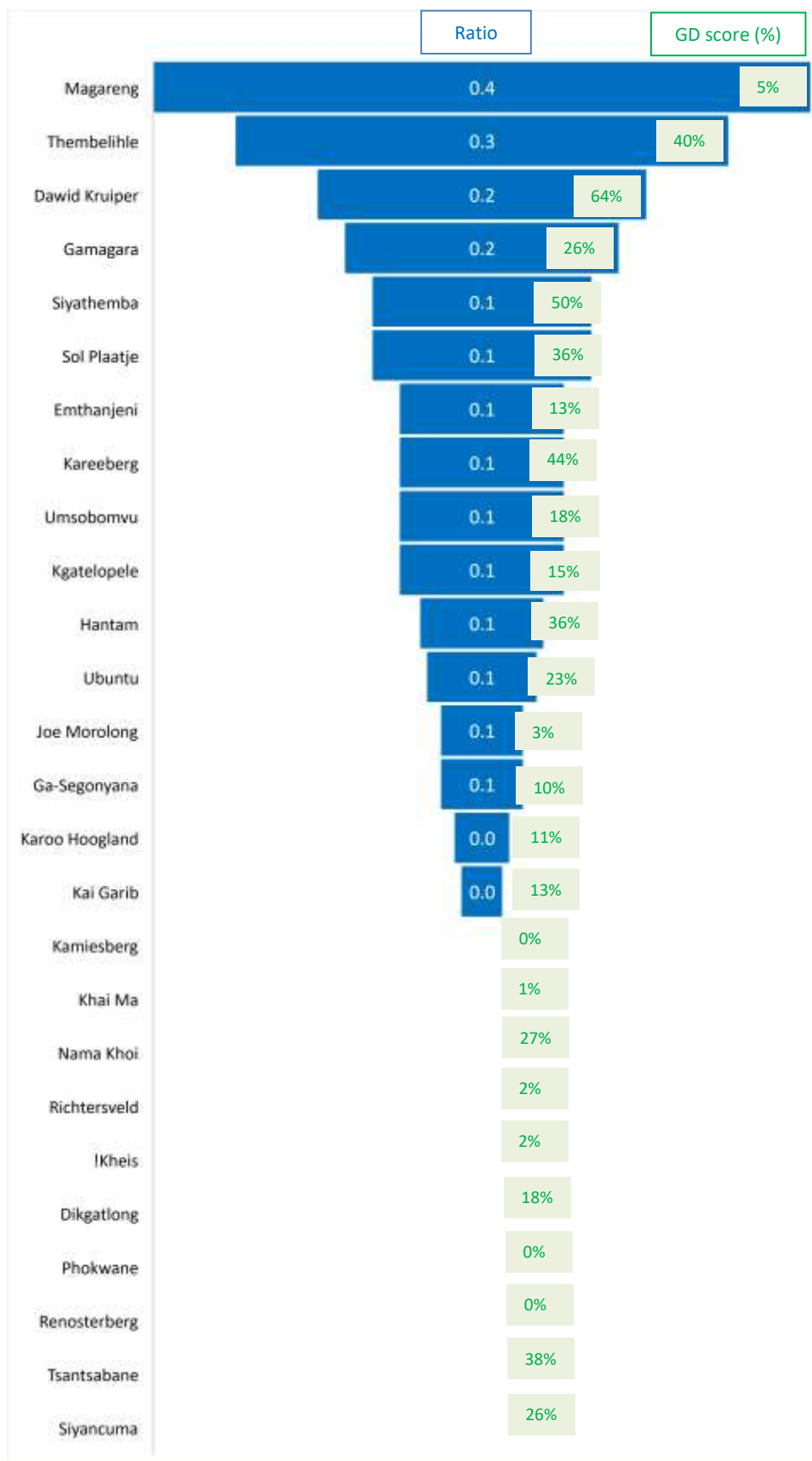


Figure 9 - Ratio of compliant operational staff to no. of WWTWs and Comparison of Ratios with GD scores

Overall, the comparative bar chart confirms a high correlation between high ratios and higher GD scores. Some anomalies include Magareng that has a high ratio with 4 staff managing 1 WWTW only. Also, municipalities with higher ratios and low GD scores like Emthanjeni, Umsobomvu and Kgatelopele, and vice versa for municipalities with lower ratio and higher GD scores like Tsantsabane, Siyancuma and Nama Khoi.

In addition to operational capacity (above), good management practice also requires access to qualified engineers, technicians, technologists, scientists, and maintenance capability. Such competencies could reside in-house or accessible through term contracts and external specialists.

Table 11 - Summary of the maintenance capacity and no. of qualified and shortfall of Engineering, Technical and Scientific staff

WSA Name	# WWTW	Maintenance Arrangement	Qualified Technical Staff (#)				Technical Shortfall (#)	Qualified Scientists (#)	Scientists Shortfall (#)	Ratio*	WSA 2021 GD Score (%)
			Engineers	Technologists	Technicians	Total					
Dawid Kruiper	4	Internal + Specific Outsourcing	2	1	0	3	0	0	1	0.8	64%
Hantam	4	Internal + Specific Outsourcing	1	0	0	1	0	0	1	0.3	36%
Kai Garib	4	Internal + Term Contract: Internal + Specific Outsourcing	1	0	0	1	0	0	1	0.3	13%
Kamiesberg	2	Internal Team (Only)	0	0	0	0	0	0	1	0.0	0%
Karoo Hoogland	3	Internal Team (Only)	0	0	2	2	2	0	1	0.7	11%
Khai Ma	4	Internal Team (Only)	0	0	2	2	2	0	1	0.5	1%
Nama Khoi	8	Internal Team (Only)	0	0	0	0	0	0	1	0.0	27%
Richtersveld	1	Internal + Specific Outsourcing	1	1	0	2	0	0	1	2.0	2%
IKheis	5	Internal Team (Only): Internal + Term Contract: Inadequate Capacity	0	0	2	2	2	0	1	0.4	2%
Joe Morolong	2	Partially Capacitated: Internal Team (Only)	0	0	2	2	2	0	1	1.0	3%
Siyathemba	3	Internal Team (Only)	1	1	0	2	0	0	1	0.7	50%
Dikgatlong	3	No Capacity: Internal + Specific Outsourcing	0	0	2	2	2	0	1	0.7	18%
Emthanjeni	3	Internal + Specific Outsourcing	0	4	0	4	0	0	1	1.3	13%
Kareeberg	3	No Capacity: Internal + Specific Outsourcing	0	1	0	1	0	0	0	0.3	44%
Magareng	1	Internal + Specific Outsourcing	0	0	2	2	2	1	0	2.0	5%
Phokwane	3	No Capacity	0	0	2	2	2	0	1	0.7	0%
Renosterberg	3	No Capacity	0	0	2	2	2	0	1	0.7	0%
Sol Plaatje	3	Internal + Specific Outsourcing	0	1	0	1	0	6	0	0.3	36%
Thembelihle	2	Internal + Specific Outsourcing	0	1	0	1	0	0	1	0.5	40%
Ubuntu	3	Internal Team (Only)	0	1	0	1	0	0	1	0.3	23%
Umsobomvu	3	Internal + Specific Outsourcing	0	3	0	3	0	1	0	1.0	18%
Ga-Segonyana	2	Internal + Specific Outsourcing	0	0	2	2	2	0	1	1.0	10%
Gamagara	3	Internal Team (Only)	3	1	0	4	0	0	1	1.3	26%
Kgatelopele	1	Internal + Term Contract	0	0	2	2	2	0	1	2.0	15%
Tsantsabane	2	Internal + Term Contract: Internal Team (Only)	0	1	0	1	0	0	1	0.5	38%
Siyancuma	3	Internal Team (Only)	0	1	0	1	0	0	1	0.3	26%
Totals	78		9	17	20	46	20	8	23		

* The single number Ratio is derived from the number of qualified staff divided by the number of WWTWs operated by this number of staff. E.g., for Dawid Kruiper, 3 qualified staff is available to support 4 WWTW, thus 3/4 = 0.8 ratio

Note 1: "Qualified Technical Staff" means staff appointed in positions to support wastewater services, and who has the required qualifications. "Technical Shortfall" is calculated based on a minimum requirement of at least 2 Engineers/Technologists/Technicians and at least one 1 Scientist per WSI.

Note 2: "Qualified Scientists" means professional registered scientists (SACNASP) appointed in positions to support wastewater services. "Scientist's shortfall" means that the WSA does not have at least one qualified, SACNASP registered scientist in their employ or contracted.

The Northern Cape has access to a pool of qualified technical staff:

- A total of 9 engineers, 17 technologists, 20 technicians (qualified) and 8 SACNASP registered scientists are assigned to the 26 municipalities, totalling 54 qualified staff for the province
- A total shortfall of 43 persons is identified, consisting of 20 technical staff and 23 scientists
- 10 of 26 municipalities have some shortfall in qualified technical staff
- 10 of 26 (38%) municipalities have access to credible laboratories which complies with Green Drop standards.

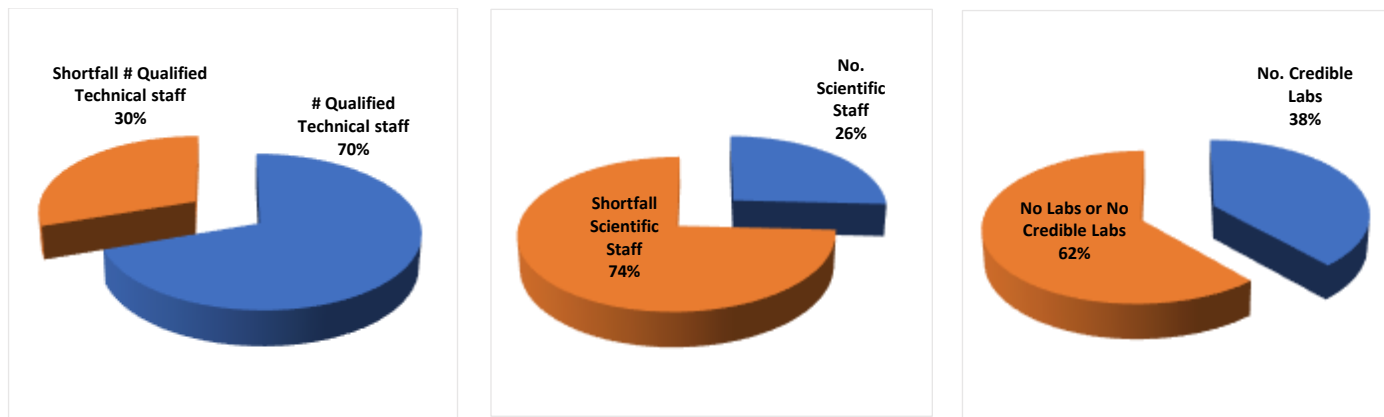


Figure 10 - Graphic illustration of the number and %: a) qualified engineering/technical staff; b) professional scientists; c) access to credible laboratory services that complies with Green Drop standards

Ratio analysis has also been done to determine the number of qualified technical and scientific staff assigned per WWTW. It is expected, but never tested before, that a higher ratio would correspond with well-performing and maintained wastewater systems, as represented by the GD score.

Dissimilar to the operational staff ratios, no pattern or correlation is evident between high ratios and high GD scores (Figure 11). There appear to be many anomalies between the ratios and the GD scores. These results suggest that wastewater performance may be less sensitive towards engineering, technical and scientific staff, and more dependent on operational competencies (Superintendents and PCs).

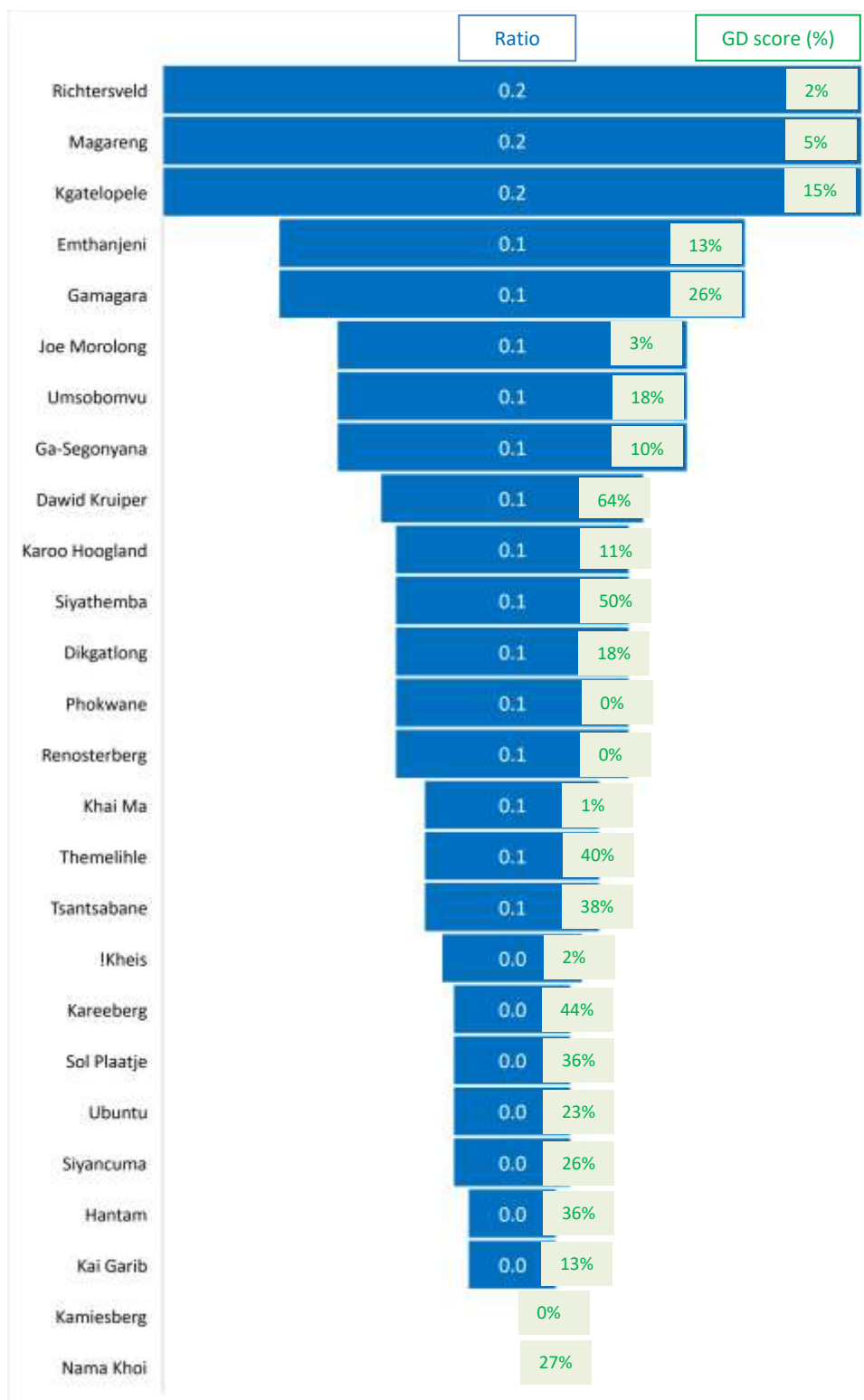


Figure 11 - Ratio of compliant technical staff to no. of WWTWs and Comparison of Ratios with GD scores

In terms of maintenance capacity, the Northern Cape has a reasonable contingent of qualified maintenance staff for at least 22 of the 26 municipalities, with the current qualified maintenance staff from a collective of inhouse, contracted or outsourced personnel. The data indicates that:

- 22 of 26 municipalities have in-house maintenance teams
- 3 of 26 municipalities have internal maintenance teams supplemented with term contracts
- 12 of 26 municipalities have internal maintenance teams supplement with specific outsourced services.

One manner of enhancing operational capacity is via dedicated training programmes. The Green Drop audit incentivise appropriate training of operational staff over a 2-year period prior to the audit date. The results are summarised as follows:

Table 12 - No. of WWTWs with operational staff sent on training over the past 2 years and vice versa

WSA Name	# of WWTW staff attending training over past 2 years	# of WWTW without training over past 2 years
Dawid Kruiper	4	0
Hantam	0	4
Kai Garib	3	1
Kamiesberg	0	2
Karoo Hoogland	0	3
Khai Ma	0	4
Nama Khoi	0	8
Richtersveld	0	1
IKheis	0	5
Joe Morolong	0	2
Siyathemba	0	3
Dikgatlong	0	3
Emthanjeni	0	3
Kareeberg	0	3
Magareng	1	0
Phokwane	0	3
Renosterberg	0	3
Sol Plaatje	3	0
Thembelihle	0	2
Ubuntu	0	3
Umsobomvu	0	3
Ga-Segonyana	0	2
Gamagara	0	3
Kgatelopele	0	1
Tsantsabane	0	2
Siyancuma	0	3
Totals	11 (14%)	67 (86%)

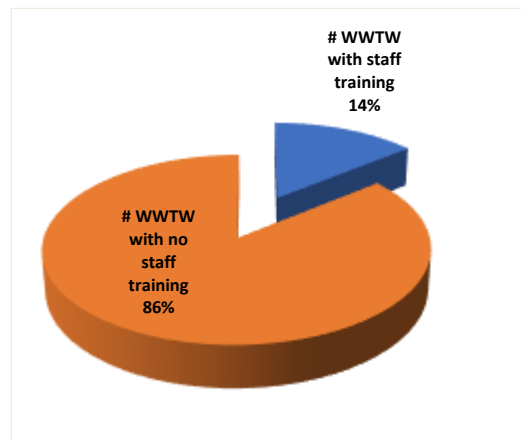


Figure 12 - %WWTWs that have trained operational staff over the past two years

The results confirmed that less than only 11 (14%) of the WWTWs had operational staff that attended training over the past 2 years. Significant training gaps are observed, which would require a concerted effort to strengthen training initiatives of Supervisors and Process Controllers. Recent training events focussed primarily on chlorine handling and NQF, and need to be expanded to operation of technology, sludge treatment and energy efficiency.

Diagnostic 3: Treatment Capacity

Aim: A capable treatment plant requires adequate design capacity and functional equipment to deliver a quality final water. If the plant capacity is exceeded by way of inflow volume or strength, a plant will not be capable to achieve its compliance standards. Capacity is typically exceeded when the demand exceeds the installed design capacity, or when processes or equipment is not operational or dysfunctional, or when the electrical supply cannot support the treatment infrastructure. This diagnostic assesses the status of plant capacity and operational flows to the plants.

Findings: Analysis of the hydraulic capacities and operational flows indicate a total design capacity of 164.7 Ml/d for the Province, with a total inflow of 41.7 Ml/day - considering that 57 systems are not measuring their inflows. Theoretically, this implies that 25% of the design capacity is used with 75% available to meet additional demand. However, the full 164.7 Ml/d is not available as some infrastructure is dysfunctional, leaving 95.3 Ml/d available. The reduced capacity means that the Northern Cape Province is closer to its total available capacity (44%) with a 56% surplus available. The lack of flow monitoring would further impact on this availability. The consequence of insufficient capacity is that new housing and industrial developments would be impeded, which would counter local socio-economic initiatives. *It must be noted that many municipalities do not report or have knowledge of reduced capacity.*

For the WSAs in general, most plants are operating within their design capacities, with the exception one system in Sol Plaatje. Sol Plaatje, Richtersveld and Khai Ma reported a low % use of their capacity. Treatment systems with low % use may have been affected by breakdown in sewer networks or pump stations whereby all sewage is not reaching the treatment works. The Green Drop audit requires a wastewater flow balance to identify and quantify possible losses from the network and/or ingress into the sewers. Most municipalities do not have flow balances that follow the wastewater trail from consumer to treatment plant.

Table 13 - Summary of WWTWs design and available capacities, inflows, % use design capacities, and inflows measured per WWTW

WSA Name	# WWTWs	Design Capacity (MI/d)	Available Capacity (MI/d)	Operational Flow (MI/d)	Variance (MI/d)	% Use Design Capacity	Inflow measured #
Sol Plaatje	3	59.0	9	9.4	49.6	16%	1
Dawid Kruiper	4	17.7	17.7	14.1	3.6	80%	4
Gamagara	3	12.1	12.1	6.4	5.7	53%	2
Phokwane	3	7.9	2.7	NI	7.9	NI	NI
Ubuntu	3	7.4	7.4	NI	7.4	NI	NI
Nama Khoi	8	7.0	6	NI	7.0	NI	NI
Ga-Segonyana	2	6.4	6.3	NI	6.4	NI	NI
Tsantsabane	2	5.8	5.8	4.0	1.8	69%	1
Emthanjeni	3	5.6	1.6	NI	5.6	NI	NI
Siyancuma	3	4.4	4.4	2.3	2.1	52%	2
Dikgatlong	3	3.7	3.7	NI	3.7	NI	NI
Khai Ma	4	3.4	0	0.2	3.2	6%	1
Siyathemba	3	3.3	3.3	2.6	0.7	80%	3
Kai Garib	4	3.2	3.2	NI	3.2	NI	NI
Richtersveld	1	3.0	3	1.0	2.0	33%	1
Umsobomvu	3	2.7	2.7	NI	2.7	NI	NI
Hantam	4	2.2	2.2	1.1	1.1	51%	4
Thembelihle	2	2.1	0.8	NI	2.1	NI	NI
Magareng	1	2.0	0.2	NI	2.0	NI	NI
Kareeberg	3	1.4	0.6	NI	1.4	NI	NI
Renosterberg	3	1.2	0.7	NI	1.2	NI	NI
Karoo Hoogland	3	0.9	0	NI	0.9	NI	NI
!Kheis	5	0.7	0.7	0.6	0.1	83%	2
Kgatelopele	1	0.7	0.7	NI	0.7	NI	NI
Kamiesberg	2	0.5	0.5	NI	0.5	NI	NI
Joe Morolong	2	0.4	0	NI	0.4	NI	NI
Totals	78	164.7	95.3	41.7	123	25%	21

The audit data shows that 1 system with known design capacity is hydraulically overloaded. This figure will be higher as there are 57 systems that are not measuring their inflows and hence it is not possible to determine whether these systems are hydraulically overloaded as well. New housing and industrial developments planned in these drainage areas would not be able to proceed, without expansion of the capacity. The systems with known design capacities, that are hydraulically overloaded, are as follows:

- Sol Plaatje: 1 of 3 systems (Beaconsfield) – inflows not recorded for the other 2 systems.

Lastly, Water Use Authorisations mandate municipalities to install meters and monitor inflows, whilst GD requires WSAs to report inflows on IRIS and to calibrate meters annually.

The audit results indicate that 27% (21 of 78) of municipalities monitor their inflow, with the balance of 73% (57 of 78) not monitoring their inflow (16 of the 26 municipalities). The majority of WSAs calibrate or verify their flow meters on an annual basis, thereby meeting good practice standards.

The Northern Cape does not fare well in terms of monitoring inflow and outflows, i.e. hydraulic loads to the treatment works, and few municipalities know their organic design capacity and do not monitor organic loading to the works. This presents a gap that would impede on forward planning and system optimisation strategies.

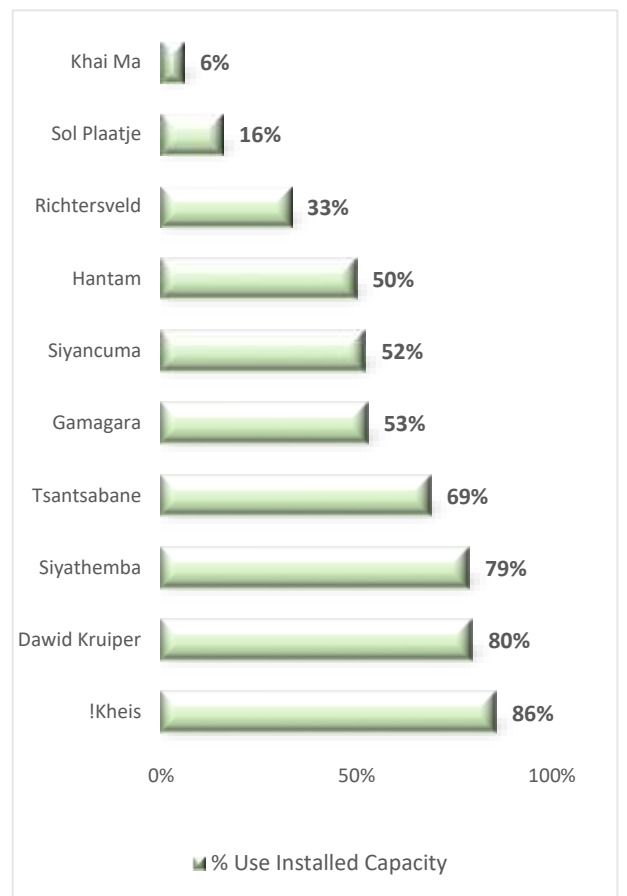
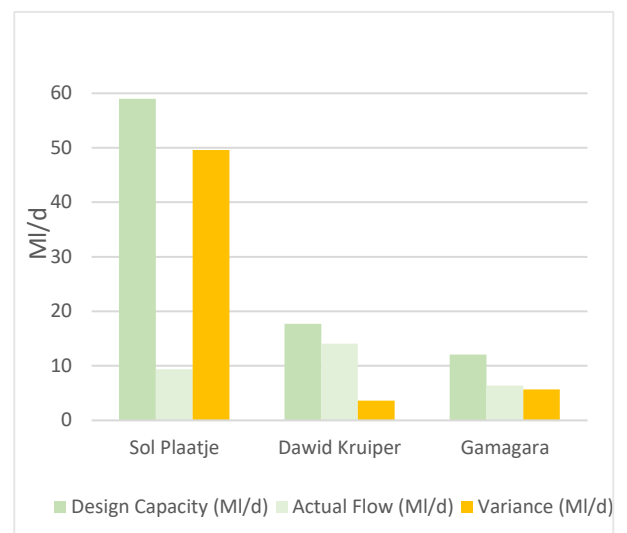
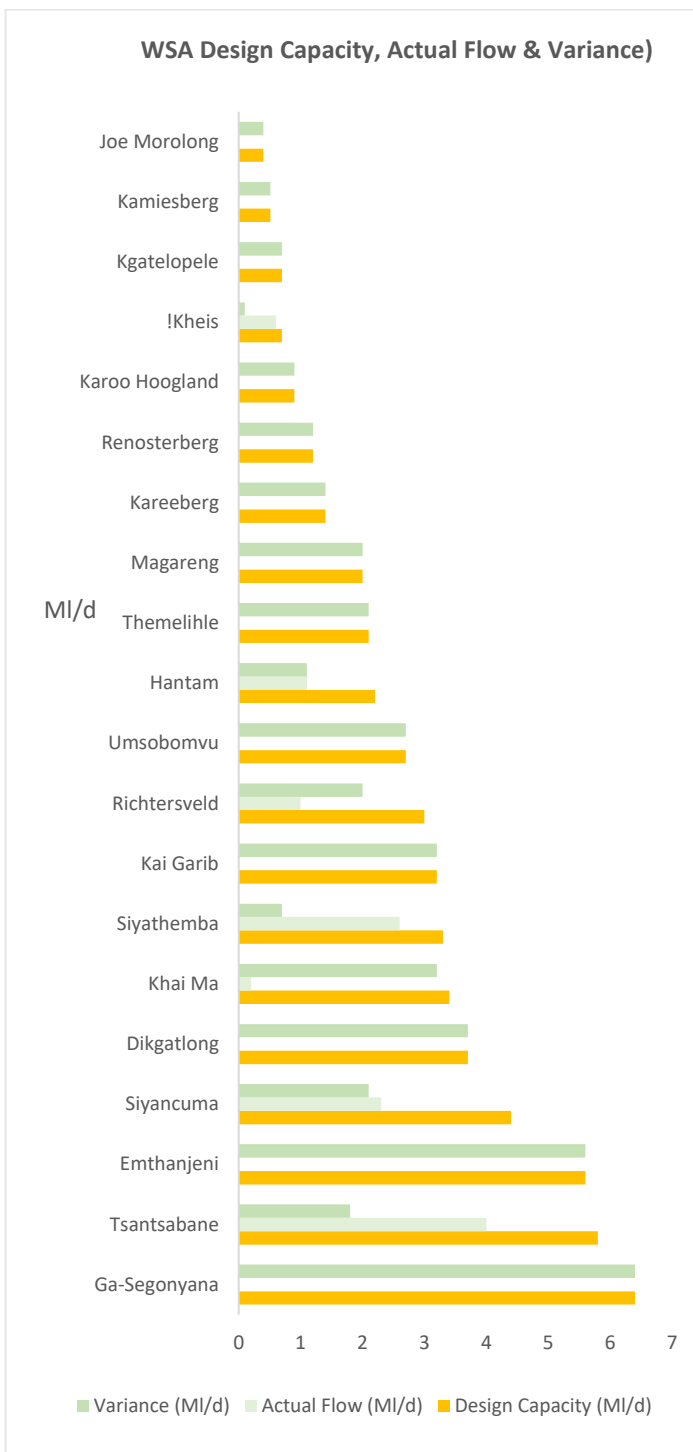


Figure 13 - a) WSA design capacity, actual flow, and variance in Ml/d for WWTWs, b) WSA % use of installed design capacity

Diagnostic 4: Wastewater Monitoring and Compliance

Aim: “To measure is to know” and “To know is to manage”. The primary objective of a wastewater treatment plant is to produce final effluent and biosolids to a safe standard. This standard cannot be measured or managed if operational- and compliance monitoring is lacking. This diagnostic assesses the monitoring status and final effluent compliance against each WWTW’s mandatory standards.

Findings: For operational monitoring, a satisfactory level of 90% is applied as the benchmark, to give weight to the importance of monitoring. For compliance monitoring, the audit evaluates the sampling point, sampling frequency, final effluent quality, biomonitoring, heavy metals, and any specific condition that the DWS may have included in the water use license. Final effluent quality compliance is calculated against the mandatory limits as listed under “Authorisation Status”. A >90% compliance figure confirms high quality final effluent, whereas a <30% indicate poor effluent quality. The enforcement measures are summarised in the column to the far right and include legal Notices and Directives issued, criminal cases opened, and court interdicts granted during the period 1 April 2019 to 30 June 2021.

Table 14 - Summary of the WSA operational and compliance monitoring status

WSA Name	# WWTW	Operational monitoring (KPA B2)		Compliance monitoring (KPA B3)	
		Satisfactory [GD score ≥90%]	Not Satisfactory [GD score <90%]	Satisfactory [GD score ≥90%]	Not Satisfactory [GD score <90%]
Dawid Kruiper	4	0	4	0	4
Hantam	4	0	4	4	0
Kai Garib	4	0	4	0	4
Kamiesberg	2	0	2	0	2
Karoo Hoogland	3	0	3	0	3
Khai Ma	4	0	4	0	4
Nama Khoi	8	0	8	0	8
Richtersveld	1	0	1	0	1
IKheis	5	0	5	0	5
Joe Morolong	2	0	2	0	2
Siyathemba	3	3	0	3	0
Dikgatlong	3	0	3	0	3
Emthanjeni	3	0	3	0	3
Kareeberg	3	0	3	1	2
Magareng	1	0	1	0	1
Phokwane	3	0	3	0	3
Renosterberg	3	0	3	0	3
Sol Plaatje	3	0	3	0	3
Thembelihle	2	0	2	0	2
Ubuntu	3	0	3	0	3
Umsobomvu	3	0	3	0	3
Ga-Segonyana	2	0	2	0	2
Gamagara	3	0	3	0	3
Kgatelopele	1	0	1	0	1
Tsantsabane	2	0	2	0	2
Siyancuma	3	0	3	0	3
Totals	78	3 (4%)	75 (96%)	8 (10%)	70 (90%)

The performance recorded in Table 14 stems from performance data as measured against the Green Drop Standard expressed in KPAs B2 and B3. The data indicates that only 3 of 78 plants (4%) are on par with good practice for operational monitoring of raw sewage and the respective units responsible for the processing effluent and sludge. Siyathemba is the only municipality that meets the Green Drop standard for operational and compliance monitoring.

An overall unsatisfactory monitoring regime is observed for both operational- and compliance sampling and analysis (96% and 90% dissatisfaction). Compliance monitoring is a legal requirement and the only means to measure performance of a treatment facility. Operational monitoring is the cornerstone of day-to-day process adjustments and optimisation to ensure treatment is efficient and deliver qualify effluent/sludge that meet design expectations. Sludge monitoring is essential as poor sludge handling is the root cause of many WWTWs failing to meet final effluent standards. The results indicate that the Northern Cape on average, is not achieving regulatory- and industry standards.

The following table summarises the results of KPA E, which also carries the highest Green Drop scoring weight. Note that averages shown as '0%' under Effluent Compliance, include actual 0% compliance plus systems with no information or insufficient data.

Table 15 - Summary of authorisation status, effluent compliance status, and directives/notices issued

WSA Name	Authorisation Status	Effluent Compliance									Enforcement Measures*
		Microbiological Compliance (%)			Chemical Compliance (%)			Physical Compliance (%)			
		Ave. (%)	# WWTWs >90%	# WWTWs <30%	Ave. (%)	# WWTWs >90%	# WWTWs <30%	Ave. (%)	# WWTWs >90%	# WWTWs <30%	
Dawid Kruiper	1 WUL; 3 Not authorised	25%	1	3	19%	0	2	23%	0	3	1
Hantam	1 WUL; 3 GA	81%	1	0	13%	0	4	32%	0	1	0
Kai Garib	4 Not authorised	0%	0	4	0%	0	4	0%	0	4	1
Kamiesberg	1 WUL; 1 Unknown	0%	0	2	0%	0	2	0%	0	2	2

WSA Name	Authorisation Status	Effluent Compliance									Enforcement Measures*
		Microbiological Compliance (%)			Chemical Compliance (%)			Physical Compliance (%)			
		Ave. (%)	# WWTWs >90%	# WWTWs <30%	Ave. (%)	# WWTWs >90%	# WWTWs <30%	Ave. (%)	# WWTWs >90%	# WWTWs <30%	
Karoo Hoogland	1 WUL; 2 Not authorised	0%	0	3	0%	0	3	0%	0	3	0
Khai Ma	4 Not authorised	0%	0	4	0%	0	4	0%	0	4	0
Nama Khoi	1 GA; 1 Not authorised; 6 Unknown	16%	1	7	6%	0	7	22%	0	4	2
Richtersveld	1 WUL	0%	0	1	0%	0	1	0%	0	1	0
!Kheis	2 WUL; 2 GA; 1 Not authorised	0%	0	5	0%	0	5	0%	0	5	1
Joe Morolong	2 Not authorised	0%	0	2	0%	0	2	0%	0	2	1
Siyathemba	3 GA	12%	0	3	34%	0	1	54%	0	0	0
Dikgatlong	3 Unknown	0%	0	3	0%	0	3	0%	0	3	0
Emthanjeni	3 Unknown	0%	0	3	0%	0	3	0%	0	3	0
Kareeberg	1 Not authorised; 2 Unknown	28%	0	2	21%	0	2	14%	0	2	0
Magareng	1 Not authorised	0%	0	1	0%	0	1	0%	0	1	1
Phokwane	1 WUL; 1 GA; 1 Unknown	0%	0	3	0%	0	3	0%	0	3	2
Renosterberg	1 WUL; 1 GA; 1 Unknown	0%	0	3	0%	0	3	0%	0	3	0
Sol Plaatje	1 WUL; 1 GA; 1 Not authorised	0%	0	3	0%	0	3	0%	0	3	0
Thembelihle	1 WUL; 1 Not authorised	0%	0	2	0%	0	2	0%	0	2	1
Ubuntu	3 Not authorised	0%	0	3	0%	0	3	0%	0	3	0
Umsobomvu	1 WUL; 2 GA	0%	0	3	0%	0	3	0%	0	3	1
Ga-Segonyana	2 GA	0%	0	2	0%	0	2	0%	0	2	0
Gamagara	1 WUL; 2 GA	0%	0	3	0%	0	3	0%	0	3	0
Kgatelopele	1 GA	0%	0	1	0%	0	1	0%	0	1	0
Tsantsabane	2 GA	0%	0	2	0%	0	2	0%	0	2	0
Siyancuma	1 GA; 2 Not authorised	46%	0	1	0%	0	3	0%	0	3	1
Totals		8%	3	69	4%	0	72	6%	0	66	14

* The enforcement measures (notices or directives issued) are taken over a two-year financial period from July 2019 to June 2021

On average, the Northern Cape municipalities failed to meet final effluent quality compliance, with an average of 8% compliance with microbial effluent quality, 4% with chemical-, and 6% with physical effluent quality. For the microbiological compliance category, only 3 of 78 systems achieved >90% and 69 of 78 systems fell below 30%. For the chemical compliance category, 0 of 78 systems achieved >90% and 72 of 78 systems fell below 30%. For the physical compliance category, 0 of 78 systems achieved >90% and 66 of 78 systems fell below 30%.

A total of 14 Directives/Notices have been issued to 11 municipalities. Kamiesberg, Nama Khoi and Phokwane (2 no. each) have the highest number of enforcement measures initiated by the Regulator, which require municipal leadership intervention and correction.

In terms of sludge compliance status, it is found that:

- 2 of the 78 plants (3%) classify their biosolids according to the WRC Sludge Guidelines, with 2 plants only (Dawid Kruiper and Tsantsabane)
- None of the plants monitor sludge streams
- 1 of 78 plants (1.5%) have Sludge Management Plans in place (1 plant with Dawid Kruiper)
- 3 of 78 plants (4.5%) use sludge for landfill and thermal sludge practice.

In closing of this diagnostic, the data confirmed that only 10 of 26 (38%) of the municipalities have access to credible laboratories for compliance and operational analysis. These in-house or contracted laboratories have been verified to be accredited and/or have Proficiency Testing Schemes with suitable analytical methods and quality assurance. At 38%, the Northern Cape is not meeting the regulatory expectation that all municipalities have access to analytical services for compliance, operational and sludge monitoring.

Diagnostic 5: Energy Efficiency

Aim: The wastewater industry offers many opportunities to respond to climate change challenges by improving energy efficiency, reducing greenhouse gasses, and generating energy. The energy cost of sophisticated treatment technologies are in the order of 25-40% of the O&M budget (cited WRC 2021). This diagnostic investigates the status of energy efficiency management at a provincial and municipal level with an aim to motivate for improved operational wastewater treatment efficiency.

Findings: The audit results suggest no energy management awareness in the Province. No baseline audits have been done and no WSA could account for CO₂ equivalents associated with energy efficiency, had knowledge of their energy tariffs (R/kWh) or energy cost (R/m³), and no energy efficiency measures and/or plans were in place. It was noted that 1 WWTW (Dawid Kruiper) reported a SPC value.

Benchmark 1: Estimated energy intensity for large WWTW is in order of 0.258-0.485 kWh/m ³					
<ul style="list-style-type: none"> • 0.177 kWh/m³ for trickling filter • 0.272 kWh/m³ for activated sludge • 0.314 kWh/m³ for advanced treatment • 0.412 kWh/m³ for advanced treatment with nitrification 					
Benchmark 2: Energy requirements per plant size					
Plant capacity, Ml/d	<0.5	2	10	25	100
Trickling filter, kWh/m ³	0.48	0.48	0.25	0.18	0.16
Activated sludge, kWh/m ³	0.59	0.59	0.37	0.32	0.29
Tariffs are typically (depends on time of day and season use):					
<ul style="list-style-type: none"> • Peak rate: 388.03 - 126.56 c/kWh • Off-peak time: 63.81 - 55.28 c/kWh • Standard time: 117.57 - 87.12 c/kWh 					
<i>(OMRE 2021, Feng, 2012, NEWRI, 2010)</i>					

It is evident that municipalities have not established a specific report to monitor energy as part of the wastewater business. Understandably, most of the Northern Cape WWTWs are ponds systems, with very little to no energy demand. It would, however, be wise to start embedding energy efficiency optimisation in the provincial municipal sector, as cost savings and environmental gains could be realised via the sewer network, considering the 207 pumping stations.

Diagnostic 6: Technical Site Assessments

Aim: The Green Drop process makes provision for the desktop audit being followed by a Technical Site Assessment (TSA) to verify the desktop evidence. The assessment includes physical inspection of the sewer network, pump stations, and treatment facility, coupled with asset condition checks to determine an approximate cost to restore existing infrastructure to functional status (VROOM).

Findings: The results of the Province TSAs are summarised in Table 16. A deviation of >10% between the GD and TSA score indicate a misalignment between the administrative aspects and the work on the ground. The Regulator regards a wastewater system with a TSA score of >80% as one that have an acceptable level of process control and functional equipment, where 90% would represent an excellent plant that complies with most of the Green Drop TSA standards.

Table 16 - Summary of the WWTW Technical Site Assessments scores and hardware problems and %deviation between GD and TSA scores

WSA Name	TSA WWTW Name	WWTW GD Score (%)	%TSA	Key Hardware Problems	Difference between TSA & GD score
Ga-Segonyana	Kuruman	11%	4%	1. Sand replacement; 2. Vandalism of infrastructure, especially pump stations; 3. Aged civil infrastructure including buildings; 4. Submersible pump at degritting unit; 5. RBC motor faulty; 6. Office building burnt, no documentation, no data storage	7%
Gamagara	Kathu	28%	55%	1. Spares for replacement; 2. Monitoring sensors; 3. BNR, manholes; 4. Cable theft, vandalism, degritting	27%
Kgatelopele	Danielskuil	15%	31%	Screening, fence, vandalism, staff facilities, inlet works, flowmeters absent	16%
Tsantsabane	Postmasburg	41%	78%	Mechanical screen, pumps, aerators	37%
Siyancuma	Douglas	33%	60%	1. Screens; 2. Flow meters; 3. Trickling Filter pumps; 4. Humus Tank pump; 5. OHS contraventions	27%
Siyathemba	Marydale	50%	82%	1. No security presence; 2. Vandalism; 3. No serious defects	32%
Ikheis	Wegdraai	0%	0%	1. Vandalism; 2. WWTW not operational; 3. No flow to plant, all process units dry	0%
Richtersveld	Port Nolloth	2%	29%	1. Vandalism; 2. Ponds lining; 3. Flow metering	27%
Nama Khoi	Springbok	29%	18%	1. Lining of the ponds; 2. Proper office and ablution facilities; 3. New inlet works with screen and flow meter; 4. Proper site for disposal of screenings	9%

WSA Name	TSA WWTW Name	WWTW GD Score (%)	%TSA	Key Hardware Problems	Difference between TSA & GD score
Kamiesberg	Garies	0%	27%	1. The ponds could not be inspected because the gate was locked; 2. A building should be provided for amenities on site	27%
Hantam	Calvinia	37%	71%	1. Collapsed wall of a horizontal flow reed bed; 2. Stabilisation of eroded wall; 3. Repair of fencing (not extensive)	34%
Karoo Hoogland	Fraserburg	12%	57%	1. Office and ablutions; 2. Vandalism; 3. Flow metering; 4. Signage at plant	45%
Kai Garib	Kakamas	18%	27%	1. Lining of the ponds; 2. Provide a site building (office, toilet); 3. Rehabilitation of the pond embankments; 4. Improvement of the roads; 5. Provide fencing	9%
Khai Ma	Pofadder	0%	15%	1. The ponds have reduced retention time; 2. The ponds are not lined and pollutes the groundwater; 3. There is no fencing which creates hazards for humans and animals; 4. There is no inlet works; 5. There is no building with amenities on site	15%
Dawid Kruiper	Kameelmond-Upington	66%	55%	1. New SST required; 2. Bioreactor needs to be upgraded; 3. Biofilters require refurbishment; 4. Maturation ponds require refurbishment	11%
Phokwane	Hartswater	1%	19%	1. Newly constructed reactor basin, including return flows, and SST to be to be commissioned; 2. Chlorine disinfection to be reinstated	18%
Magareng	Warrenton	5%	18%	1. Screening; 2. Grit removal; 3. Chlorine disinfection; 4. Screening bypass channel; 5. Dysfunctional aerator equipment.	13%
Dikgatlong	Barkly-West	18%	41%	1. Screening – consider automated screens at the head of works; 2. Grit removal not effective; 3. Chlorine disinfection; 4. Discharge point to be cleaned up	23%
Sol Plaatje	Beaconsfield	32%	53%	1. Only one mechanical screen is installed; 2. The primary tank mechanical, which are the original drive units installed; 3. Smaller secondary settling tank broken desludge pipe; 4. The secondary tank mechanical, which are the original drive unit installed 5. Chlorine disinfection	21%
Thembelihle	Hopetown (New)	43%	57%	1. Screening channels to be constructed; 2. Flowmeter to be calibrated; 3. No disinfection in place, LM stated zero discharge	14%
Emthanjeni	De Aar	11%	16%	1. Calibrate flow meters; 2. Consider automating the screening process; 3. Grit removal not effective; 4. AS plant to urgently be reinstated to prevent untreated wastewater spillages; 5. Chlorine disinfection need to be reinstated	5%
Renosterberg	Petrusville	0%	10%	1. Tanker dumping facility and inlet works to be constructed; 2. Oxidation ponds to be relined; 3. Fencing around the WWTW requires upgrading	10%
Umsobomvu	Colesberg	18%	48%	1. Screening not effective - consider automated screens at the head of works; 2. Grit removal not effective; 3. Chlorine disinfection need to be reinstated	30%
Ubuntu	Victoria West	21%	10%	1. Tanker dumping site and inlet works to be reconstructed; 2. Ponds are not lined; 3. Flow meters to be installed; 4. Fencing to be upgraded	11%
Kareeberg	Carnarvon	45%	42%	1. No disinfection is in place; 2. Additional treatment capacity is required	3%
Joe Morolong	Hotazel	0%	40%	1. Hand rake screens bars to be refurbished; 2. Flow meter to be replaced; 3. Magnetic flow meter to be installed at Dwars Street pump station; 4. Refurbish, repair and/or service all four aeration compressors; 7. Repair all SBR decanting valves; 8. Recommission chlorination	40%
Totals	26				0% to 45%

A total of 26 site assessments were conducted, with 1 to 2 inspections per municipality. One system in Siyathemba (Marydale) scored 82%, which is regarded to be a satisfactory TSA score. Seventeen (17) systems scored <50%, which indicate that a high number of wastewater systems failed to meet operational, asset functionality, and workplace safety standards.

A high difference is evident between GD and TSA scores for most WSIs, some of the more pronounced differences being for Karoo Hoogland (45%), Joe Morolong (40%), Tsantsabane (37%), Hantam (34%), Siyathemba (32%) and Umsobomvu (30%), and a further 6 municipalities in the 20-29% deviation range. A high difference implies misalignment between wastewater administration and the condition of processes and infrastructure in the field. Some focal points include:

- Siyathemba impressed with the highest TSA score of 82%, however a substantial difference was found between the good TSA score and low GD score of 50% (32% deviation)
- 12 of 26 municipalities had >20% deviations between their TSA and GD scores, which indicate misalignment between the administration and the actual field conditions.

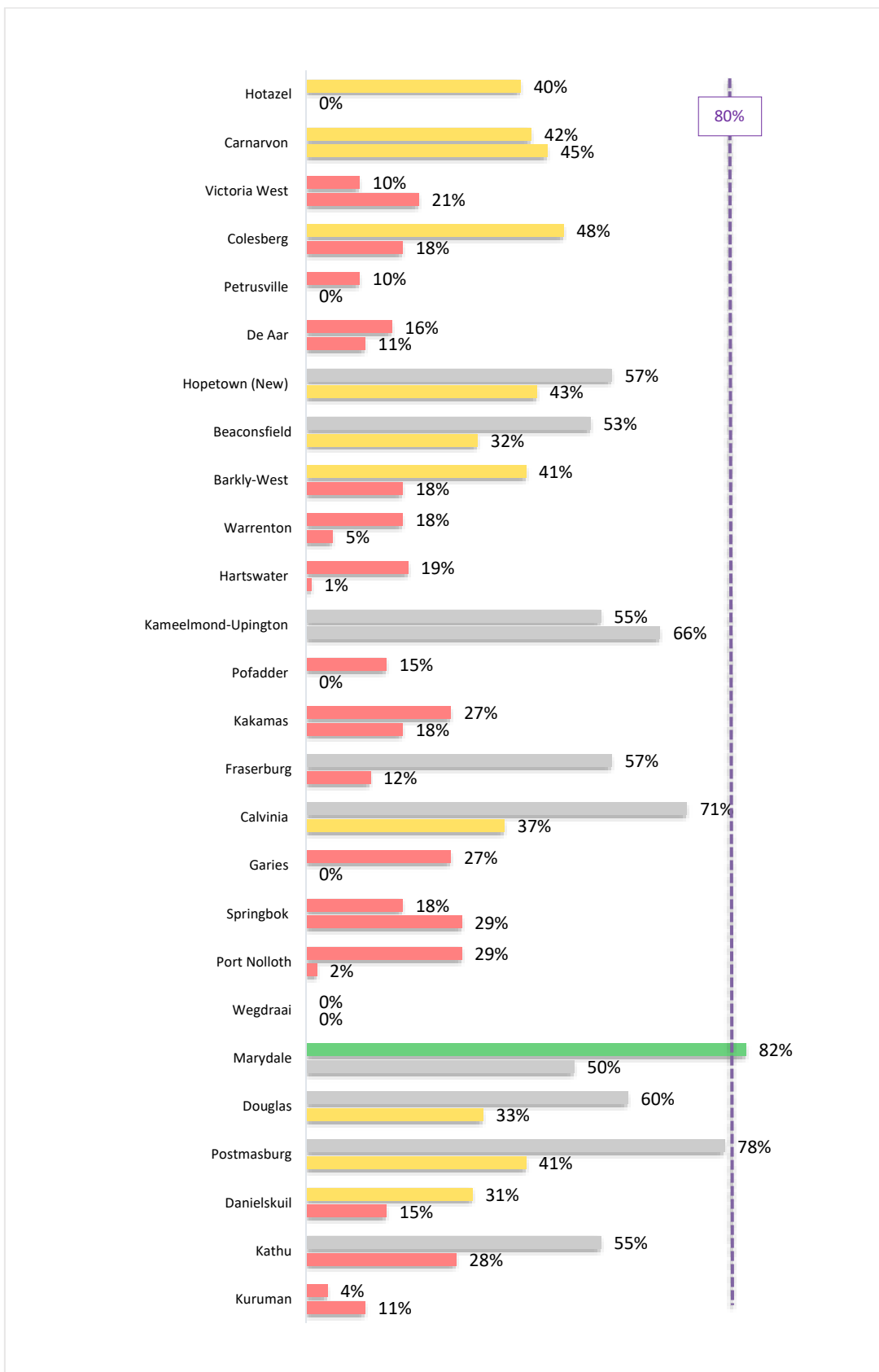


Figure 14 - Municipal GD (bottom bar) and System TSA (top bar) score comparison (colour legends as for GD)

The VROOM cost presents a “very rough order of measurement” cost to return a WWTWs functionality to its original design. For the Northern Cape, a total budget of R504 million is estimated, with the bulk of the work going towards restoration of mechanical equipment (78%).

Table 17 - VROOM cost split for civil, mechanical, and electrical and total VROOM cost estimate

WSA	Civil cost estimate	Mechanical cost estimate	Electrical & C&I cost estimate	Total VROOM cost
Ga-Segonyana	R1,235,968	R12,559,616	R4,380,416	R18,176,000
Gamagara	R10,528,456	R14,989,666	R4,223,279	R29,741,400
Kgatelopele	R977,962	R716,688	R119,750	R1,814,400
Tsantsabane	R708,296	R2,454,328	R955,376	R4,118,000
Siyancuma	R120,868	R1,969,264	R857,868	R3,564,000
Siyathemba	R37,907,280	R333,732,720	R0	R371,640,000
Ikheis	R422,928	R307,584	R551,088	R1,281,600
Richtersveld	R907,500	R3,765,300	R226,380	R628,320
Nama Khoi	R7,472,990	R84,560	R3,012,450	R10,570,000
Kamiesberg	R157,480	R0	R0	R157,480
Hantam	R4,179,483	R251,282	R697,435	R5,128,200
Karoo Hoogland	R404,544	R0	R317,856	R722,400
Kai Garib	R642,000	R0	R0	R642,000
Khai Ma	R2,940,600	R0	R0	R2,940,600
Dawid Kruiper	R10,051,616	R757,163	R164,601	R10,973,380
Phokwane	R980,153	R520,847	R0	R1,501,000
Magareng	R46,800	R197,640	R115,560	R360,000
Dikgatlong	R476,338	R843,452	R198,727	R1,517,000
Sol Plaatje	R10,569,260	R19,575,020	R1,125,720	R31,270,000
Thembelihle	R707,427	R462,042	R275,310	R1,197,000
Emthanjeni	R665,728	R224,896	R5,376	R896,000
Renosterberg	R51,000	R40,680	R28,320	R120,000
Umsobomvu	R749,414	R673,690	R13,056	R1,305,600
Ubuntu	R490,620	R103,600	R146,520	R740,000
Kareeberg	R567,000	R0	R0	R567,000
Joe Morolong	R1,377,423	R638,493	R375,444	R2,391,360
Ga-Segonyana	R1,235,968	R12,559,616	R4,380,416	R18,176,000
Gamagara	R10,528,456	R14,989,666	R4,223,279	R29,741,400
Kgatelopele	R977,962	R716,688	R119,750	R1,814,400
Tsantsabane	R708,296	R2,454,328	R955,376	R4,118,000
Totals	R95,339,134	R394,868,531	R17,790,532	R503,962,740
% Distribution	19%	78%	3%	100%

The key hardware problems are listed in Table 16, with predominant defects in electrical cables, primary- and secondary sludge, disinfection, sludge pumps, sludge treatment, and power backup. Mechanical defects typically include dysfunctional flow meters, aerators, sludge and effluent pumps, mixers, screens, degritters, and disinfection equipment. Vandalism and theft, long procurement lead times, lack of management involvement, lack of maintenance, and lack of budget are the main reasons for dysfunctional assets.

Diagnostic 7: Operation, Maintenance and Refurbishment of Assets

Aim: Insufficient financial resources are often cited as a root cause to dysfunctional or non-compliant wastewater systems. Knowledge and monitoring of fiscal spending are therefore a critical part of wastewater management. This diagnostic investigates the status of financial information as pertaining to O&M budgets and expenditure, asset figures, and capital funding.

Findings: A substantial amount of financial information was presented during the audit process. Unfortunately, the evidence was presented in different formats, levels of detail, or absent for some municipalities. It was observed that municipal teams with financial officials present during the audits typically performed better and had a good understanding of the wastewater challenges experienced by their technical peers.

Discrepancies observed included: generic or non-ringfenced budgets, contract lump sums for Service Providers presented as budgets, outdated or incomplete asset registers, some cost drivers are lacking (mostly electricity), etc. The Regulator grouped data into different certainty levels, as can be summarised at the end of this Diagnostic.

It must be noted that there were limitations with the financial and asset information. Not all WSAs submitted current information or complete financial data sets.

The result of each financial portfolio is discussed hereunder.

Vroom Cost Analysis

The VROOM costs breakdown is discussed under the TSA Diagnostic but is further illustrated as follows.

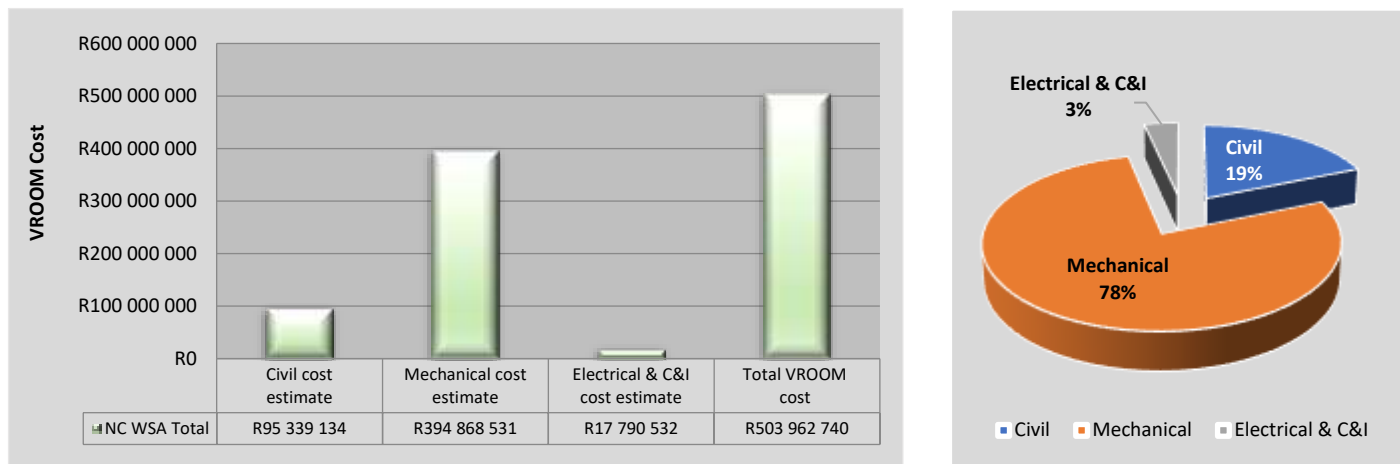


Figure 15 - Graphic illustration of the total cost estimated to restore functionality to existing assets (a), broken down to civil, mechanical, and electrical components

The total cost of R504 million is estimated to restore existing treatment works to their design capacity and functionality - consisting of R395 million for mechanical repairs, R18 million for electrical repairs, and R95 million for civil structures.

Table 18 indicates that a capital budget of R329 million has been secured over 1-3 years to address infrastructural needs, which does not adequately cover the R504 million VROOM refurbishment need and by implication, does not allow any surplus for other capital projects. The R504 million estimated VROOM cost constitutes 137% of the total asset value of R367.2 million. Furthermore, the WATCOST-SALGA figures provides for an annual 2.14% of the asset value required to maintain these assets. This constitutes an amount of R7.9 million required by the various WSA's annually to maintain the assets, while a once-off R504 million is required to restore existing assets.

Capital, O&M Budget and Actual, and Asset Value

The capital budgets, O&M budgets, O&M actual expenditure, and current asset values are summarised below.

Table 18 - Summary of the capital budgets, O&M budgets, O&M actual expenditure, and current asset values

WSA	Capital budget available	O&M budget (2020/21)	O&M expended (2020/21)	% Expended	Total Current Asset Value
Ga-Segonyana	R10,350,000	NI	NI	NI	NI
Gamagara	NI	NI	NI	NI	NI
Kgatelopele	R40,282,080	NI	NI	NI	NI
Tsantsabane	NI	NI	NI	NI	NI
Siyancuma	NI	NI	NI	NI	NI
Siyathemba	NI	NI	NI	NI	NI
Ikheis	NI	NI	NI	NI	NI
Richtersveld	NI	NI	NI	NI	NI
Nama Khoi	NI	R22,117,000	R16,451,000	74%	NI
Kamiesberg	NI	NI	NI	NI	NI

WSA	Capital budget available	O&M budget (2020/21)	O&M expended (2020/21)	% Expended	Total Current Asset Value
Hantam	NI	R5,978,000	R2,843,000	48%	NI
Karoo Hoogland	R30,000,000	NI	NI	NI	NI
Kai Garib	R60,300,000	NI	NI	NI	NI
Khai Ma	R10,000,000	NI	NI	NI	NI
Dawid Kruiper	R65,000,000	R25,573,610	R27,264,130	107%	NI
Phokwane	NI	NI	NI	NI	NI
Magareng	NI	R8,067,000	R7,926,000	98%	NI
Dikgatlong	R2,949,000	R4,000,000	R4,000,000	100%	NI
Sol Plaatje	NI	R84,500,000	R86,000,000	102%	NI
Thembelihle	R47,096,000	R79,000	R95,000	120%	R47,060,000
Emthanjeni	R62,830,860	R22,003,370	R22,003,370	100%	R57,807,000
Renosterberg	NI	NI	NI	NI	NI
Umsobomvu	NI	NI	NI	NI	NI
Ubuntu	NI	R5,300,910	R5,263,030	99%	R244,228,740
Kareeberg	NI	R2,833,817	R2,738,817	97%	R18,117,780
Joe Morolong	NI	NI	NI	NI	NI
Totals	R328,807,940	R180,452,707	R174,584,347	97%	R367,213,520

The Green Drop process provides a bonus (incentive) in cases where a municipality provide evidence of capital projects with secured funding since this is deemed as a definitive means of addressing wastewater services inadequacies. This incentive encourages wastewater infrastructure investment. A total capital budget of R329 million has been reported for the refurbishment and upgrades of wastewater infrastructure for all the municipalities over a 1-to-3-year fiscal period. The largest capital budgets are observed for Dawid Kruiper (R65m), Emthanjeni (R63m) and Kai Garib (R60m).

For the 2020/21 fiscal year, the total O&M budget reported for the Northern Cape was R180m, of which R175m (97%) has been expended. Small %deviations in over-expenditure was observed for 3 municipalities and low expenditure was observed for 1 municipality. The provincial figures exclude 16 municipalities who did not have financial information.

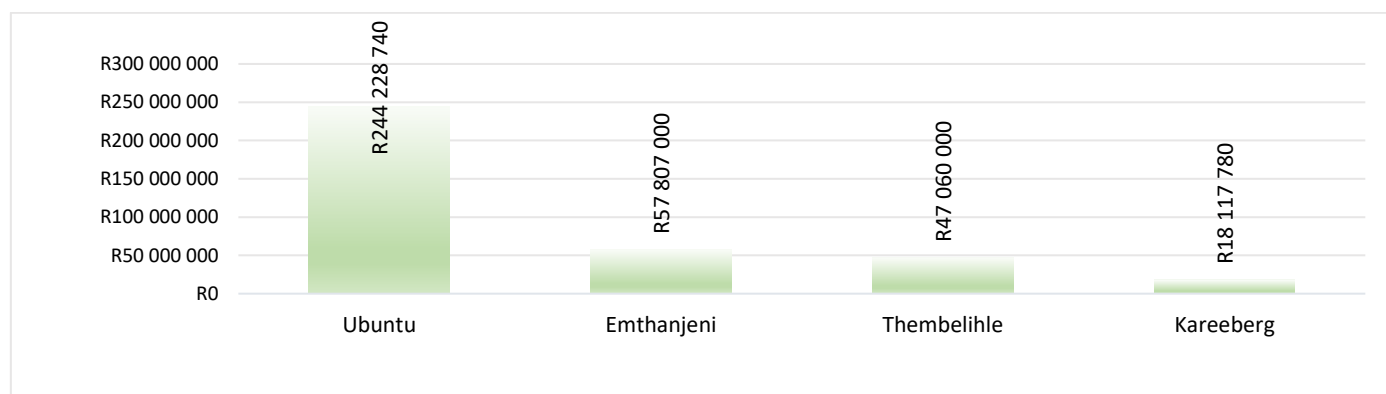


Figure 16 - Total current asset value reported by municipalities with information

The total current asset value for wastewater infrastructure (networks, pumpstations, treatment plants) is reportedly R367 million (excluding 22 of 26 municipalities with no information). The highest asset value is observed for Ubuntu (R244m).

O&M Cost Benchmarking

By combining the SALGA and WRC WATCOST models, an estimation of the maintenance cost required per asset type can be done, i.e. civil, buildings, pipelines, mechanical, electrical, and instrumentation. The maintenance benchmark departs from the basis that 15.75% of the asset value is required to maintain these assets.

Table 19 - SALGA-WRC annual maintenance budget guideline and cost estimation

Description	% of Current Asset Value	Asset Value Estimate	Modified SALGA Maintenance Guideline	Annual Maintenance Budget Guideline
Current Asset Value estimate	100%	R367,213,520	15.75%	R7,858,369
<i>Broken down into:</i>				
1. Civil Structures	46%	R168,918,219	0.50%	R844,591
2. Buildings	3%	R11,016,406	1.50%	R165,246
3. Pipelines	6%	R22,032,811	0.75%	R165,246
4. Mechanical Equipment	35%	R128,524,732	4.00%	R5,140,989
5. Electrical Equipment	8%	R29,377,082	4.00%	R1,175,083
6. Instrumentation	2%	R7,344,270	5.00%	R367,214
Totals	100%	R367,213,520	15.75%	R7,858,369
Minus 20% P&Gs and 10% Installation				R2,357,511
Total				R5,500,859

The model estimates that R7.9 million (2.14%) is required per year to maintain the assets valued at R367 million. Notably, this maintenance estimate assumes that all *assets are functional*. The VROOM cost represents the monies needed to get assets functional, from which basis route maintenance could then focus on maintaining the assets.

Table 20 indicates the SALGA maintenance cost estimation in relation to the VROOM cost, O&M budget, and O&M actual expended.

Table 20 - O&M cost estimates by the SALGA and VROOM models versus actual budget and expenditure figures

Cost Reference	O&M Cost Estimate	Period
Modified SALGA	R7,858,369	Annually, estimation
O&M Budget	R180,452,707	Actual for 2020/21
O&M Spend	R174,584,347	Actual for 2020/21
VROOM	R503,962,740	Once off estimation

The cost dynamics can be summarised as follows:

- The SALGA estimations for O&M budgets is 4% of the actual reported budgets for the 2020/21 fiscal year. This figure is influenced by the 22 of 26 municipalities with no information of their asset values
- The actual O&M budget could not be compared with the SALGA guideline, due to insufficient information
- The VROOM cost represents an estimation of the refurbishment cost to restore WWTWs functionality and design capacity.

Production Cost and Comparison

It is good business practice to monitor and manage the production costs of wastewater treatment in Rand/m³ treated, and to compare such cost with industry norms. Published benchmarks is not currently available for typical treatment (production) costs, but significant cost increases are expected since 2013, given the variable input factors such as Covid, and cost of chemicals, transport, and electricity. From an economic perspective, it would be valuable to compare production cost budgeted with actual production costs. However, due to scarce information, it is not possible to provide insight as to possible shortfalls from an economic perspective.

Based on the lack of data, no production costs for wastewater treatment could be concluded for the Northern Cape. Only Dawid Kruiper provided production costs for one of their systems, whilst Sol Plaatje provided information for the total municipality. Readers may view the results obtained for Gauteng, KwaZulu Natal, Eastern Cape and Western Cape, to obtain a sense of typical production costs at South African wastewater treatment facilities.

Data Certainty

Data certainty is expressed at different levels for the financial and asset figures reported within this Diagnostic. Certainty levels may differ from system to system, hence the repeat of some WSAs as the data provided for is variable or inconsistent or limited or non-existent (NI). Municipalities that were identified under the category "High Certainty", presented consistent and verifiable evidence in the form of budgets, expenditure, asset registers, and unit costs.

Table 21 - Levels of certainty associated with financial and asset information reported by municipalities

Data Certainty	Description	WSA
No certainty	Absent data or no certainty in data presented - not ringfenced for WWTW & Network	Ga-Segonyana, Gamagara, Kgatelopele, Tsantsabane, Siyancuma, Siyathemba, Kheis, Richtersveld, Kamiesberg, Karoo Hoogland, Kai Garib, Khai Ma, Phokwane, Renosterberg, Umsobomvu, Joe Morolong
Low certainty	Minor or little certainty in the data - partially ringfenced for WWTW only or data as extreme outliers	Nama Khoi, Hantam, Dawid Kruiper, Magareng, Dikgatlong, Sol Plaatje
Reasonable/good certainty	Reasonable to good level of certainty in the data - ringfenced for WWTW and/or Network and data falls within/close to expected parameters	Thembelihle, Emthanjeni, Ubuntu, Kareeberg
High certainty	High level of certainty in the data - ringfenced for WWTW and Network and data falls within expected parameters	None

DISCLAIMER

The '*Regulator's Comment*' that follows is verbatim provided by the Lead Inspector that audited the wastewater system.

4.1 Dikgatlong Local Municipality

Water Service Institution	Dikgatlong Local Municipality			
Water Service Provider	Dikgatlong Local Municipality			
Municipal Green Drop Score	VROOM Impression (Towards restoring functionality): 1. Screening not effective 2. Grit removal not effective 3. Chlorine disinfection to be reinstated VROOM Estimate: - R1,517,000			
2021 Green Drop Score				18%↓
2013 Green Drop Score				39%
2011 Green Drop Score				16%
2009 Green Drop Score				0%

Key Performance Area	Weight	Windsorton	Delportshoop	Barkly-Wes
A. Capacity Management	15%	50.0%	25.0%	40.0%
B. Environmental Management	15%	9.4%	9.4%	7.5%
C. Financial Management	20%	46.3%	46.3%	57.0%
D. Technical Management	20%	0.0%	0.0%	0.0%
E. Effluent & Sludge Compliance	30%	0.0%	0.0%	0.0%
F. Bonus		0.0%	0.0%	30.0%
G. Penalties		-10.0%	0.0%	-25.0%
H. Disqualifiers		None	None	None
Green Drop Score (2021)		16%	13%	18%
2013 Green Drop Score		57%	56%	33%
2011 Green Drop Score		9%	9%	17%
2009 Green Drop Score		0%	0%	0%
Design Capacity	MI/d	0.5	0.2	3
Design Capacity Utilisation (%)		NI	NI	NI
Resource Discharged into		Vaal River	No Discharge	Vaal River
Microbiological Compliance	%	No monitoring	No monitoring	No monitoring
Chemical Compliance	%	No monitoring	No monitoring	No monitoring
Physical Compliance	%	No monitoring	No monitoring	No monitoring
Wastewater Risk Rating (CRR% of CRR_{max})		Windsorton	Delportshoop	Barkly-Wes
CRR (2011)		52.9%	NA	52.9%
CRR (2013)		64.7%	NA	64.7%
CRR (2021)		100.0%	100.0%	100.0%

Regulator's Comment:

The Dikgatlong Local Municipality has regressed from 39% in 2013 to 18% in 2021. Despite this low score, the Municipality showed appreciation of the consultative audit process and engaged actively.

Regrettably, the team was not well prepared and the lack of evidence on key aspects such as final effluent compliance, functional laboratory services, IRIS data, and operational knowledge. Despite the presentation of very good process audits, asset registers, O&M manuals, and sludge management plans, none of these were implemented or used to inform improvement strategies. Although the Regulator values the development of these plans, the audit leans towards higher scores if implementation can be proofed.

Skills development in the operations and management of wastewater processes and infrastructure is advised for further improvement of staff capabilities. Credible data from the laboratory and field instrumentation is an eminent risk and needs to be addressed via the W₂RAP process.

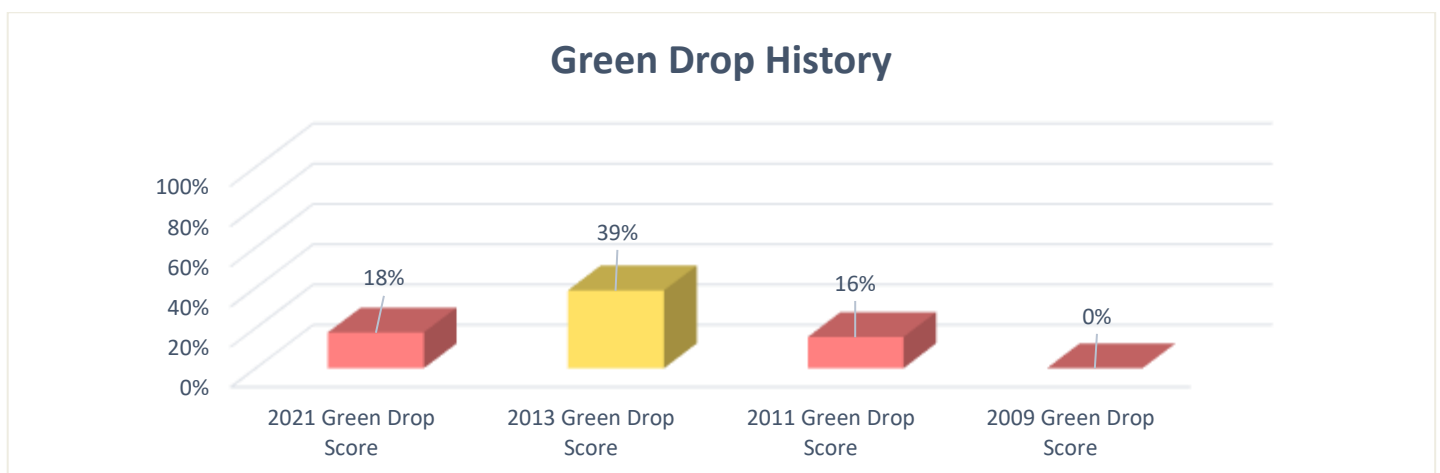
Commitment and oversight by senior management needs to be intensified, starting with the implementation of final effluent compliance monitoring and flow measurement as minimal requirements. The Dikgatlong Local Municipality is encouraged to further develop and implement the W₂RAP process as tool for active identification, prioritisation, and correction of higher risks and as a good and sustainable turnaround strategy. The state of the landfill site windblown waste to the WWTWs need to be included in the W₂RAP and addressed with the Solid Waste Department.

The poor status of wastewater management, as is evident by all 3 systems in the critical state, as well as all 3 WWTWs in critical risk space, places Dikgatlong on the regulator’s priorities for intervention. Municipal leadership must note this undesirable status, and implement turnaround plans with immediate effect, in order to be ready for the 2023 Green Drop audit.

Green Drop findings:

1. No Supervisor and Process Controllers are registered, and they do not comply with Reg. 2834 or Draft Reg. 813
2. No operational or compliance monitoring could be presented
3. O&M budgets and expenditure were confirmed during the confirmation audit, but most of the necessary financial information and planning strategies was absent
4. Flow measuring devices are in place, but flow data is not recorded and interpreted to inform process optimisation or to determine the loads to the WWTWs
5. None of the plants have a Water Use Authorisation, and limited process and compliance monitoring is taking place
6. The treatment plants does not have final effluent compliance monitoring, and by default do not comply with effluent quality standards, thereby impacting negatively on the receiving environment and public health
7. No asset register is available for any of the systems
8. No bylaws are in place and implemented
9. No plants audits, capacity and condition assessment/audit on reticulation network and pump stations was conducted
10. No sludge management occurs on site. Sludge classification and monitoring plan should be developed and implemented
11. All plants are in the critical risk positions
12. A capital project is in place supported by business plans:
 - R850,000,000: Barkly West refurbishment, MIG funding.
 - R0.00: Windsorton
 - R0.00: Delports Hoop.

The Regulator is concerned about the overall poor state of wastewater services at Windsorton, Delportshoop and Barkly-Wes and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Barkly-Wes WWTW **41%**

The **Barkly-Wes WWTW** was inspected to verify the Green Drop audit findings:

- The network was operational and conveyed sewage to the treatment facility
- PFD and incident management protocols were not displayed, and operational and maintenance logbooks were lacking

- General site cleaning remained a challenge as the site’s location is adjacent to the solid waste disposal site and informal settlements, leading to windblown waste on site
- The terrain was fenced
- Flow meters have been vandalised and not operational
- No raw sewage quality or extraneous flows were monitored
- No operational monitoring was done, and design limits of the process units were not known to the PCs or Supervisor
- Desludging of settling tank is considered to be inadequate. Sludge drying beds were not utilised, not operated with no data recorded
- The reactor unit was being refurbished, due to poor effluent delivery
- Chlorine equipment has been vandalised and no disinfection was occurring, which would lead to high microbiological counts in the final water
- Process Controllers did not adhere to basic OHS standards.

		
<p><i>Open discharge of final effluent onto land is not acceptable and causes pollution in the surrounding environment and poses a direct health and safety risk to the public</i></p>	<p><i>Maintenance and refurbishment done at reactor</i></p>	<p><i>Vandalism to disinfection plant. No disinfection occurring</i></p>

4.2 Dawid Kruiper Local Municipality

Water Service Institution	Dawid Kruiper Local Municipality	
Water Service Provider	Dawid Kruiper Local Municipality	
Municipal Green Drop Score	VROOM Impression (Towards restoring functionality):	
2021 Green Drop Score	64%↑	
2013 Green Drop Score	60% (KHELM)	1% (MLM)
2011 Green Drop Score	36% (KHELM)	5% (MLM)
2009 Green Drop Score	22% (KHELM)	13% (MLM)
	VROOM Estimate: - R10,973,380 <i>The plant has recently commenced with an upgrading project to address most of the issues above.</i>	

NOTE: KHELM = Khara Hais Local Municipality; MLM = Mier Local Municipality. These two LMs have joined to form the Dawid Kruiper Local Municipality

Key Performance Area	Weight	Kameelmond	Louisvaleweg	Askham	Rietfontein
A. Capacity Management	15%	80.0%	65.0%	70.0%	57.5%
B. Environmental Management	15%	41.0%	38.8%	30.0%	30.0%
C. Financial Management	20%	75.0%	62.5%	62.5%	62.5%
D. Technical Management	20%	61.0%	27.6%	27.6%	27.6%
E. Effluent & Sludge Compliance	30%	41.0%	43.8%	1.9%	1.9%
F. Bonus		70.0%	55.0%	40.0%	55.0%
G. Penalties		0.0%	0.0%	0.0%	-25.0%
H. Disqualifiers		Directive	None	None	None
Green Drop Score (2021)		66%	55%	40%	36%
2013 Green Drop Score		61%	47%	4%	NA
2011 Green Drop Score		36%	38%	5%	NA
2009 Green Drop Score		35%	8%	13%	NA
System Design Capacity	MI/d	16	1.242	0.135	0.322
Design Capacity Utilisation (%)		86%	30%	11%	16%
Resource Discharged into		Orange River	NI	Evaporation	Evaporation
Microbiological Compliance	%	0%	100%	Insufficient data set	Insufficient data set
Chemical Compliance	%	31%	46%	Insufficient data set	Insufficient data set
Physical Compliance	%	28%	65%	Insufficient data set	Insufficient data set
Wastewater Risk Rating (CRR% of CRR_{max})		Kameelmond	Louisvaleweg	Askham	Rietfontein
CRR (2011)	%	50.0%	47.1%	NA	100.0%
CRR (2013)	%	45.5%	70.6%	100.0%	71.0%
CRR (2021)	%	68.2%	58.8%	76.5%	76.5%

Regulator's Comment:

The Dawid Kruiper LM team was well-structured and well-prepared for the Green Drop Audit. The Green Drop champion of the WSA invited all the Supervisors and Process Controllers not only to attend the audit, but to transfer knowledge on their wastewater treatment systems. This was the first Green Drop Audit for the Dawid Kruiper LM; previously the audit for Upington was done for the Khara Hais LM, and the outlying towns of Askham and Rietfontein was then part of the Mier LM – later amalgamated to form the current Dawid Kruiper LM. The 2021 GD audit score is 64%, which is a lauded improvement from previous scores. The Regulator congratulates the municipality, and the Green Drop champion for this progressive performance. The scores of 40% and 36% respectively for Askham and Rietfontein WWTWs show the positive effect of the amalgamation of the two earlier municipalities.

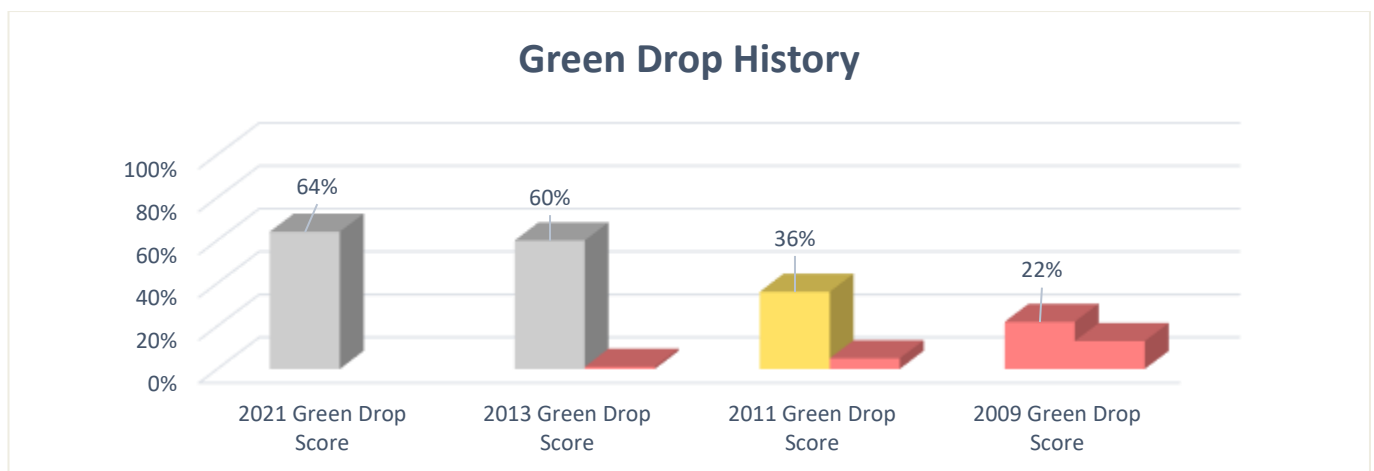
The evidence and documentation for the Green Drop audit was well organised and indexed in files and contained supporting documentation as well, e.g. consulting engineers' reports, master plans, etc. The municipality can improve their score by drawing up formal operational and compliance monitoring programmes for the different WWTWs, and by updating their W₂RAPs (the 2012 versions were outdated in many respects). There were no W₂RAPs for Askham and Rietfontein, and the WSA was urged to get this in place for the 2023 GD audit, pointing out the benefits that it has for management of the WWTWs.

Compliance of the final effluent with the licence and authorisation requirements were unfortunately poor, especially in the case of the Kameelmond WWTW (Upington). The Department places emphasis on effluent and sludge quality, and scores have been detracted in this KPA. The plant has experienced a number of challenges over the years and was in serious need of upgrading and renewal. This was evident when the plant was visited for the Technical Site Assessment (55%). However, the plant is currently in the early stages of being upgraded, which should address most of the issues currently experienced. The plant discharges to the Orange River and impacts on downstream farming activities and the towns of Keimoes and Kakamas.

Dawid Kruijer LM is encouraged to carry on with the positive attitude and professional manner in which the audit was executed, and to improve on those aspects that were pointed out in the main audit and confirmation audit. Municipal leadership can take pride in the current assessment and support the technical staff to aim for Green Drop scores exceeding 80% in 2023.

Green Drop findings:

1. Partial compliance was in place for technical (PCs, Supervisors) and scientific capacity. Engineering and maintenance capacity were however not satisfactory and could ensure considerably improved scores for the next audit cycle in 2023
2. Kameelmond WWTW is experiencing several infrastructure capacity and condition issues, but these should be eradicated in the near future with the current upgrading project that has recently commenced
3. The W₂RAPs for Kameelmond and Louisvaleweg are outdated and should be renewed. This will allow more effective planning for operational management and maintenance of the plants. No W₂RAPs are in place for Askham and Rietfontein
4. Zero of the systems had updated process audits or condition assessments in place. The WSA is encouraged to undertake this as a priority, not only for compliance reasons, but also for the value of these reports in improving the operation of the WWTWs and understanding the design intention of the technologies in use
5. Final effluent quality compliance was poor. The process audits will point out the root causes for this on process unit basis, so that it can be rectified and the final effluent quality improved
6. No operational or compliance monitoring programs in place, which is a critical gap and legal risk to be addressed
7. On-site laboratory capabilities should be provided to improve the score for analytical services
8. Two of the four plants are in high-risk positions
9. Capital fundings has been secure to address some of the gaps identified:
 - o R65,000,000: Kameelmond WWTW upgrade completion targeted for December 2022 – RBIG funds
 - o Unknown amounts: Louisevale and Rietfontein works.



Technical Site Assessment

Kameelmond WWTW 55%

The **Kameelmond WWTW** was inspected to verify the Green Drop audit findings:

- The pump station that was visited (main pump station) was in a good condition, with a secure building and two pumps in operation and alternating automatically
- The MCC was also in good condition and all elements in operation
- Upgrading work on the WWTW has recently commenced and the plant was largely rendered a construction site
- The plant infrastructure, especially the civil works, was mostly old and in need of renewal. The current upgrading project will be addressing most of the high-risk aspects
- The plant buildings and amenities were neat and tidy and well maintained
- There were no operational water quality measurement equipment on the plant. It was mentioned that this will be addressed as part of the upgrading of the plant
- A flow diagram and incident and operational information logbooks were filled in on a daily basis
- Degritters out of operation for more than two months. The screening equipment was in a satisfactory condition
- Only three of the four PSTs were in operation, resulting in overloading of the three operational PSTs
- The distribution arms of the biofilters were not in operation, and there were ponding on the top of the filters
- Three of the four aerators in the bioreactors were operational, with the fourth one being out of operation for eight months already. This is a matter of concern
- The MLSS was determined occasionally, but there was no indication that it is used to control the plant operation or inform sludge wasting
- One of the SSTs were not in operation for some time already, due to structural problems. This has led to the operational SSTs being overloaded with reported sludge carry-over taking place to the maturation ponds
- Due to the sludge carry-over, there was considerable quantities of sludge in the chlorine contact channels as well, which presumably contribute to the poor microbiological quality compliance of the final effluent
- The PPE and signage at the chlorination facilities were inadequate and not complying with the requirements.

		
<p><i>Three of 4 aerators functional, operational control lacking</i></p>	<p><i>Overloading of primary and secondary clarifiers due to some structure not in operation</i></p>	<p><i>Considerable quantities of sludge in the chlorine contact channels leading to poor microbiological quality</i></p>

4.3 Emthanjeni Local Municipality

Water Service Institution	Emthanjeni Local Municipality		
Water Service Provider	Emthanjeni Local Municipality		
Municipal Green Drop Score	VROOM Impression (Towards restoring functionality):		
2021 Green Drop Score	13%↓	1. Calibrate flowmeters	
2013 Green Drop Score	66%	2. Consideration should be given to automating the screening process	
2011 Green Drop Score	21%	3. Grit removal not effective	
2009 Green Drop Score	10%	4. AS plant to urgently be reinstated to prevent untreated wastewater spillages	
		5. Chlorine disinfection need to be reinstated	
		VROOM Estimate:	
		- R896,000	

Key Performance Area	Weight	De Aar	Britstown	Hanover
A. Capacity Management	15%	52.0%	52.5%	65.0%
B. Environmental Management	15%	0.0%	0.0%	0.0%
C. Financial Management	20%	36.5%	33.1%	33.1%
D. Technical Management	20%	18.2%	10.3%	15.0%
E. Effluent & Sludge Compliance	30%	0.0%	0.0%	0.0%
F. Bonus		34.5%	34.5%	4.5%
G. Penalties		-75.0%	0.0%	0.0%
H. Disqualifiers		None	None	None
Green Drop Score (2021)		11%	20%	18%
2013 Green Drop Score		62%	74%	74%
2011 Green Drop Score		21%	19%	22%
2009 Green Drop Score		31%	0%	0%
Design Capacity	ML/d	4	0.6	1
Design Capacity Utilisation (%)		NI	NI	NI
Resource Discharged into		Orange River	No discharge	No discharge
Microbiological Compliance	%	No monitoring	No monitoring	No monitoring
Chemical Compliance	%	No monitoring	No monitoring	No monitoring
Physical Compliance	%	No monitoring	No monitoring	No monitoring
Wastewater Risk Rating (CRR% of CRR_{max})		De Aar	Britstown	Hanover
CRR (2011)		88.0%	29.0%	29.0%
CRR (2013)		41.2%	47.1%	58.8%
CRR (2021)		88.2%	94.1%	94.1%

Regulator's Comment:

The Emthanjeni Local Municipality has shown a disappointing Green Drop performance with a significant regress from a promising performance in 2013 (66%) to the current municipal Green Drop score of 13%. The lack of organised, indexed documentation to provide as Portfolio of Evidence, under the lead of a municipal champion, contributed largely to the poor score. Notable, KPA B (Environmental Management) and KPA E (Effluent and Sludge Compliance) received 0% scores. The Regulator is alarmed by this status and urge municipal leadership to put an urgent intervention plan in place to turnaround wastewater management in Emthanjeni.

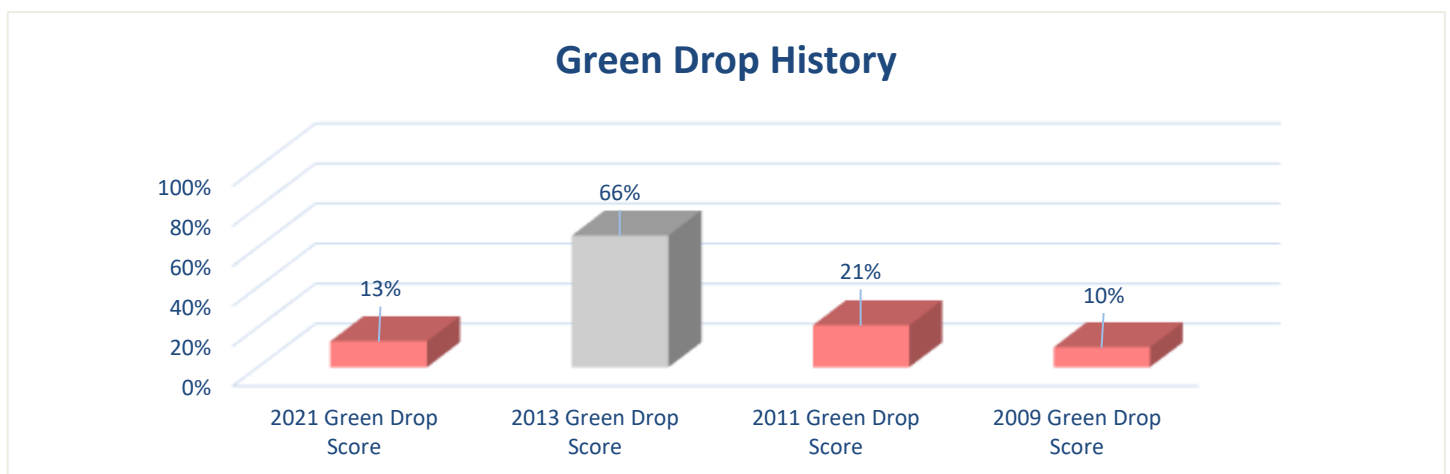
A number of improvements can be affected in the short term and in preparation for the 2023 audit cycle. None of the works have a Water Use Authorisation and no compliance monitoring is taking place which are the biggest detractors to a higher score. In addition, the lack of operational monitoring and operational skills to operate, control and maintain the unit processes remains of great concern. No flow data is available to be used as a baseline in planning for future extensions are not possible. Although Bylaws exists, no proof of implementation could be provided.

It is advised that the municipality place serious concerted efforts toward turning the situation around by updating the W₂RAP ensuring that critical risks are prioritised and addressed. All plants are in critical and high-risk space, and thereby trigger the regulatory enforcement process.

Green Drop findings:

1. The Supervisor and majority of Process Controllers are unregistered and do not comply with Reg. 2834 or Draft Reg. 813
2. No operational monitoring and no compliance monitoring is conducted
3. Financial information was available which included budget and expenditure. However, there is a shortfall in treated volume
4. Flow meters are in place, flow is not converted to m³/day and no trend analysis is done for operation optimisation
5. The W₂RAP and GDIP are not in place. It is important that an Incident Management Protocol be put in place and that Alert Levels be included to deal with potential emergency situations
6. No plant audits were conducted on capacity and condition of sewer network and pump stations
7. Sludge should be classified, and a sludge monitoring plan should be developed and implemented. Currently no sludge management practices in place
8. Asset register is available
9. Bylaws are not in place nor implemented
10. None of the plants have a Water Use License and limited process and compliance monitoring is taking place
11. Site specific training for Process controllers is urgently required.
12. A capital project is in place supported by business plans:
 - R28,842,358: De Aar - WSIG application for Phase II upgrade of the De Aar WWTW, dated January 2021 (BVI consulting) - uploaded to IRIS
 - R33,988,497: Britstown - RBIG application for new Britstown WWTW, dated 2017- BVI Consulting. Project has since been constructed and in operation
 - R0.00: Hanover.

The Regulator is concerned about the overall poor state of wastewater services at De Aar, Britstown and Hanover and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

De Aar WWTW **16%**

The **De Aar WWTW** was inspected to verify the Green Drop audit findings:

- The network and pump station were in good condition, with operations and maintenance attended to
- PFD and incident management protocols were not displayed, and operational and maintenance logbooks were lacking
- The facility is fenced, however accessible to general pedestrians and animals through vandalised sections - and open gate
- No access control was implemented to prevent the public from entering the premises
- Carcass of drowned goat/sheep in anaerobic pond
- The terrain is not signposted
- The area is arid and not much vegetation. Very little housekeeping was done on site

- No safety and remediate protocols were adhered to when raw sewage spills occur. Spills were not cleaned, and vegetation is allowed to grow in spillage areas.
- Anaerobic and oxidation ponds had overgrown banks which render inspection difficult
- The site office area had been vandalised and lockers, eating area, and ablution not available
- Flow meters were in place, but not calibrated or used to inform process optimisation and no raw sewage quality or extraneous flows are monitored
- No operational monitoring nor compliance monitoring was done and organic load for unit processes were unknown
- SSTs were not operational
- Reactor unit was not operational due to damage to the raw water sewage pumps' cables
- No chlorine facility was in place, no disinfection performed
- No sludge treatment was being conducted. Sludge is still discharged to old, decommissioned ponds.



Damaged fence allows for pedestrians and livestock to access the works



Grit channels not cleaned regularly



The biological reactor has been non-operational for 4 years

4.4 Ga-Segonyana Local Municipality

Water Service Institution	Ga-Segonyana Local Municipality		
Water Service Provider	Sedibeng Water		
Municipal Green Drop Score	VROOM Impression (Towards restoration of functionality):		
2021 Green Drop Score	9%↓	1. Sand replacement	
2013 Green Drop Score	64%	2. Vandalism of infrastructure, especially pump stations	
2011 Green Drop Score	66%	3. Aged civil infrastructure including buildings	
2009 Green Drop Score	0%	4. Submersible pump at degritting unit	
		5. RBC motor faulty	
		6. Office building burnt, no documentation, no data storage	
		VROOM Estimate:	
		- R18,176,000	
		- Kuruman WWTW under refurbishment	

Key Performance Area	Weight	Kuruman	Mothibistad
A. Capacity Management	15%	25.0%	37.5%
B. Environmental Management	15%	12.0%	15.0%
C. Financial Management	20%	0.0%	0.0%
D. Technical Management	20%	13.0%	5.3%
E. Effluent & Sludge Compliance	30%	6.0%	7.5%
F. Bonus		30.0%	0.0%
G. Penalties		-25.0%	-25.0%
H. Disqualifiers		None	None
Green Drop Score (2021)		11%	7%
2013 Green Drop Score		66%	45%
2011 Green Drop Score		69%	44%
2009 Green Drop Score		0%	0%
System Design Capacity	MI/d	4	2.4
Design Capacity Utilisation (%)		NI	NI
Resource Discharged into		Wetland	Orange River
Microbiological Compliance	%	Insufficient data set	Insufficient data set
Chemical Compliance	%	Insufficient data set	Insufficient data set
Physical Compliance	%	Insufficient data set	Insufficient data set
Wastewater Risk Rating (CRR% of CRR_{max})		Kuruman	Mothibistad
CRR (2011)	%	76.5%	76.5%
CRR (2013)	%	29.4%	52.9%
CRR (2021)	%	94.1%	94.1%

Regulator's Comment:

Ga-Segonyana Municipality extended a graceful welcome to the DWS audit team and cooperated throughout the process to the best of their ability. Unfortunately, the team was unprepared to respond to the audit enquiries, and no information was forthcoming during the second audit event. The resultant Green Drop score of 2021 was 9%, which is a severe regress from the good 64% achieved during the GD 2013 cycle. Both WWTWs are in critical risk positions. These plants previously held positions in low and medium risk space.

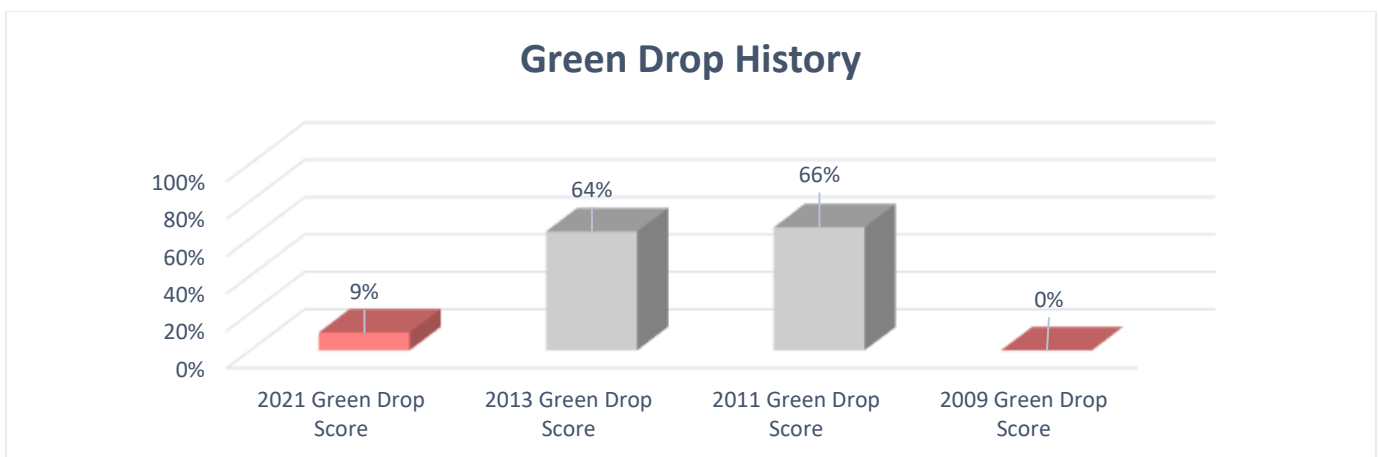
The Regulator is concerned about the lack of documentation as part of the administrative process and upload on IRIS. The positive attitudes of the team coupled with current upgrades to infrastructure, and the good state of the sewer network pumpstations, bodes well for the 2023 audit. However, the team will need to focus on getting the very basics of wastewater management in place, i.e. registration of Process Controllers and Supervisor, provide engineering, technical and scientific capabilities, flow metering, operational and compliance monitoring on a monthly basis, embedded and governed by the General Authorisation standards. Training on process control aspects are crucial to enhance the capability to operate the newly refurbished processes.

Financial information was lacking, with the exception of the Kuruman WWTW upgrade. The municipality is encouraged to develop and implement a W2RAP with immediate effect, as risk-based planning forms the foundation from which to plan, prioritise and motivate resources towards improved services. The poor state of the wastewater systems places Ga-Segonyana on the priority list for enforcement intervention.

Green Drop findings:

1. Registration of Process Controllers and Supervisors are not in place, with none of the WWTWs complying with the Green Drop standards, i.e. Reg. 2834 or draft Reg. 813
2. No qualified engineering, technical or scientific persons are in place. A laboratory is contracted but no management information is provided. Incorporation of qualified staff in the planning, operation and management function of the wastewater systems is critical, especially in light of the significant capital investment in infrastructure that is taking place
3. Risk management is a fundamental regulatory requirement and a useful monitoring instrument for municipal management, but is absent in all respects
4. Operational monitoring is absent and presents a primary risk to the compliance of the works, again noting a R10.3 million investment in technology that need to be operated to their design standard
5. Compliance monitoring is partially implemented across the wastewater systems, a serious regulatory indictment
6. The municipal finance team were not present during the audit, and no financial or asset information was forthcoming, which contributed to a 0% under this audit criteria
7. Design information and flow monitoring were not presented for both plants, however, flow records were viewed during the site inspection – better preparation would result in improved audit scores
8. Poor effluent quality compliance was noted from both WWTWs – a risk to the health of downstream users and contamination of scarce waterways
9. A capital project is in place to address some of the defects noted during the audit:
 - o R10,350,000: Kuruman WWTW currently including sewage pump stations
 - o R0.00: Mothibistad WWTWs currently being upgraded but no capital amount or business plan provided.

The Regulator is concerned about the overall poor state of wastewater services at all systems and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Kuruman WWTW **62%**

The **Kuruman WWTW** was inspected to verify the Green Drop audit findings:

- The sewer network and pumpstations were in very good condition, underscored by professionalism and good workmanship
- One major hazard is the degree of vandalism, hence the 24-hour armed response at all pump stations
- A functional Genset support interruptions in power supply. A demonstration of the switch-over was conducted
- Four (4) pumps and grinder equipment are installed at the inspected pumpstation, with 2 pumps on duty
- Civil infrastructure is mostly aged, this is an "old" treatment facility in need of refurbishment and replacement – hence, the current upgrade projects taking place

- The submersible pump on the degritter unit has been faulty for 2 years, and is being repaired as part of the refurbishment contract
- The abattoir is discharging a hazardous effluent, with a high blood and fatty solids content. This discharge impact on the process efficiency of the plant and prosecution is pursued to address this risk
- Rotating Biological Contactors are part of the aeration basins, i.e. 6 RBCs each aeration basin 1&2 - 1 is faulty and was being attended to during audit.

		
<p><i>Genset and grinder in place at sewer network pump station – very good overall condition and functionality observed</i></p>	<p><i>Manual and mechanical screen available, not efficient, screenings not monitored before discharge/ Grit removal are efficient and regularly cleaned</i></p>	<p><i>Settled sewage overflow clear and void of floc, some algae present on SST walls. Performance of process units are not confirmed, as no operational monitoring in place</i></p>

4.5 Gamagara Local Municipality

Water Service Institution	Gamagara Local Municipality		
Water Service Provider	Gamagara Local Municipality		
Municipal Green Drop Score	VROOM Impression (Towards restoring functionality):		
2021 Green Drop Score	26%↓	1. Vandalism and theft	
2013 Green Drop Score	42%	2. Sewage overflow during loadshedding events	
2011 Green Drop Score	11%	3. Dysfunctional electrical control panel at Head of Works	
2009 Green Drop Score	45%	4. Degritting unit not functional	
		5. Chlorine requires civil and mechanical investigation	
		6. General maintenance and spares stock	
		7. Manhole covers	
		VROOM Estimation:	
		- R29,741,400	

Key Performance Area	Weight	Kathu	Dibeng	Olifantshoek
A. Capacity Management	15%	68.0%	77.5%	65.0%
B. Environmental Management	15%	20.0%	18.8%	2.5%
C. Financial Management	20%	10.0%	0.0%	0.0%
D. Technical Management	20%	24.8%	5.6%	4.1%
E. Effluent & Sludge Compliance	30%	21.0%	7.5%	18.8%
F. Bonus		10.0%	10.0%	10.0%
G. Penalties		0.0%	0.0%	-25.0%
H. Disqualifiers		None	None	None
Green Drop Score (2021)		28%	19%	14%
2013 Green Drop Score		52%	12%	9%
2011 Green Drop Score		19%	13%	9%
2009 Green Drop Score		23%	66%	66%
System Design Capacity	ML/d	10	1.1	0.99
Design Capacity Utilisation (%)		56%	73%	NI
Resource Discharged into		Outflow onto pond	Gamagara River	Farmer receives final effluent
Micro Compliance	%	Insufficient data set	Insufficient data set	No monitoring
Chemical Compliance	%	Insufficient data set	Insufficient data set	No monitoring
Physical Compliance	%	Insufficient data set	Insufficient data set	No monitoring
Wastewater Risk Rating (CRR% of CRR_{max})		Kathu	Dibeng	Olifantshoek
CRR (2011)	%	94.1%	41.2%	41.2%
CRR (2013)	%	50.0%	82.4%	94.1%
CRR (2021)	%	72.7%	76.5%	94.1%

Regulator's Comment:

Gamagara Local Municipality displayed a fair level of readiness to engage with the audit requirements and provided all available information. Unfortunately, the documentation is not on par with regulatory requirements, resulting in an overall Green Drop score of 26%, which is a significant regress from the 42% baseline of 2013. The CRR risk scores places all three WWTWs in high and critical risk space, which deserves a firm intervention from municipal management.

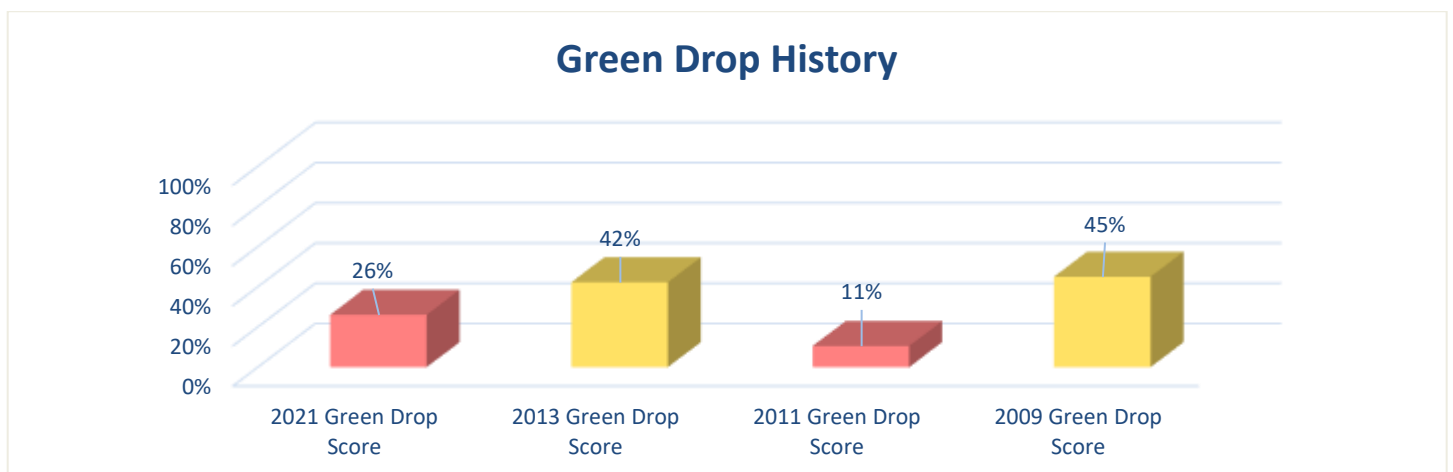
Areas that should receive immediate priority, in preparation for the 2023 audit cycle, would be the consistent monitoring of inflow and outflow, verification of flow meters, operational- and compliance analysis via a credible laboratory, and registration (and training) of Process Controllers and Supervisors. It's disappointing that, despite the presence of a qualified engineering and technical team, that asset registers, asset condition assessments, risk plans, maintenance rosters, budgets and production costs were not evident. Evidence uploaded on IRIS was scarce and needs to be corrected.

The municipality is encouraged to develop and implement a W₂RAP with immediate effect, as risk-based planning forms a foundation from which to plan, prioritise and motivate resources towards improved services. The poor state of the wastewater systems places Gamagara municipality on the priority list for enforcement intervention.

Green Drop findings:

1. All Wastewater Treatment Works are registered with DWS, with the exception of Olifantshoek
2. Process Controllers and Supervisor classification at the Dibeng and Olifantshoek systems are incomplete and attracted a reduced score
3. The maintenance team demonstrated a professional and competent team, however, the qualifications of the team were not provided for
4. No W₂RAPs or Process Audits were presented, or implementation demonstrated for any of the systems
5. Operational monitoring was presented and uploaded for Kathu & Dibeng only
6. Laboratory credibility information was absent for all systems
7. All systems lacked financial and asset data – this is a core aspect of accountable wastewater management. The municipal finance team participation in future audits will potentially maximise this score
8. Design and operational flow data was partial presented for Kathu only, the other two systems found lacking, with Olifantsfontein attracting a penalty for lack of inflow monitoring
9. Document control and data security may present a risk and needs to be addressed in the W₂RAP process
10. Effluent quality compliance is poor, and require urgent remedial interventions, particular attention on the Dibeng and Olifantshoek systems.
11. No capital projects appears to be in place to address the shortcomings for any of the 3 systems.

The Regulator is concerned about the overall poor state of wastewater services at all systems and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Kathu WWTW: 55%

The **Kathu WWTW** was inspected to verify the Green Drop audit findings:

- Documentation of sewer incidents was found to be well managed
- Manhole cover replacement and finalisation of a Maintenance Plan linked to the asset register is being prioritised
- Security personnel is present on-site from 17h00 till the morning, to counter the increasing incidents of vandalism and theft
- No backup power is available in the event of loadshedding or electrical shutdown, in which case, pumpstations overflows and causes pollution to the receiving environment
- Flow volume of sewage were not recorded. Overflow at the inlet into the sump was evident, particularly at times of high flow volumes from the nearby mall
- High fat content was observed, but Bylaws (e.g., enforcement of fat traps) are not efficient to address such risks
- General aspects at the WWTW office displayed good workmanship and professionalism and positive attitude
- Good groundskeeping was observed – well done, this is a satisfactory work environment with good team work evident
- PCs have formed a WhatsApp group for more effective and efficient communication, particularly in case of emergencies

- Safety signage and gate security control was mostly absent, as were other OHS contraventions
- One of 2 degritting structures were not operational and has a negative downstream impact on process and equipment wear and tear
- Sludge management protocol was absent
- Overloading of some process units were observed and need to be investigated and addressed
- Process monitoring sensors were dysfunctional, aerators were out of commission, and operational monitoring was largely not adequate
- Chlorine handling training to be urgently implemented, and complemented by operational upskilling
- The disinfection contact tank seemed ineffective and chlorination procedures and dosage control are required.

		
<p><i>Sewer network manhole coverage and maintenance need attention. Vandalism is a critical risk</i></p>	<p><i>Basic laboratory equipment is in place, used, and recorded. An O&M manual is present at the site, PFD displayed</i></p>	<p><i>One of the degrit structures are not operational. Grit is safely binned and disposed</i></p>
		
<p><i>Sludge drying beds in good condition, with adequate sand replacement monitoring in place</i></p>	<p><i>4 of 5 aerators and all mixers functional – scum formation noted operational sensors to be fixed. Recycle pumps operational and well managed</i></p>	<p><i>Flow meter in place, functional and recorded – plant is receiving inflow in excess of its design capacity. Flow meters are not calibrated or verified</i></p>

4.6 Hantam Local Municipality

Water Service Institution	Hantam Local Municipality		
Water Service Provider	Hantam Local Municipality		
Municipal Green Drop Score	VROOM Impression (Towards restoring functionality): 1. Collapsed wall of reed bed 2. Eroded wall 3. Fence defects VROOM Estimate: - R5,128,200		
2021 Green Drop Score			36%↓
2013 Green Drop Score			52%
2011 Green Drop Score			15%
2009 Green Drop Score			0%

Key Performance Area	Weight	Calvinia	Nieuwoudtville	Brandvlei	Loeriesfontein
A. Capacity Management	15%	82.5%	77.5%	64.0%	90.0%
B. Environmental Management	15%	67.5%	67.5%	54.0%	67.5%
C. Financial Management	20%	33.8%	31.3%	25.0%	31.3%
D. Technical Management	20%	21.2%	14.1%	9.5%	14.1%
E. Effluent & Sludge Compliance	30%	18.8%	43.8%	15.0%	18.8%
F. Bonus		12.0%	12.0%	12.0%	12.0%
G. Penalties		-25.0%	-25.0%	-25.0%	-40.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		37%	42%	27%	34%
2013 Green Drop Score		39%	62%	61%	40%
2011 Green Drop Score		19%	25%	18%	23%
2009 Green Drop Score		0%	0%	0%	0%
System Design Capacity	MI/d	1.085	0.325	0.31	0.5
Design Capacity Utilisation (%)		35%	88%	60%	57%
Resource Discharged into		Oorlogskloof River	Oorlogskloof River	Sak River	Kamdanie River
Microbiological Compliance	%	83%	92%	83%	67%
Chemical Compliance	%	3%	21%	0%	29%
Physical Compliance	%	42%	33%	33%	19%
Wastewater Risk Rating (CRR% of CRR_{max})		Calvinia	Nieuwoudtville	Brandvlei	Loeriesfontein
CRR (2011)	%	89.0%	67.0%	89.0%	67.0%
CRR (2013)	%	71.0%	76.0%	94.0%	82.0%
CRR (2021)	%	64.7%	64.7%	76.5%	82.4%

Regulator's Comment:

The DWS Inspectors received a good welcome at the Hantam Municipality and the audit process was conducted in a positive spirit with the objective of improving wastewater functions in the four towns. The Technician: Water and Sanitation was well prepared with all the required documentation organised and indexed in folders and files according to the Green Drop Requirements. Hantam Municipality obtained a 2021 Green Drop score of 36%, which is lower than the 52% that was achieved in 2013. The wastewater team is commended for effective manner in which the wastewater management appears to be done, but there are a number of challenges (some more serious than others) that need to be addressed urgently. The municipality is urged to give the necessary attention to those aspects pointed out by the DWS GD team during the audits. The Calvinia WWTW, where the TSA was conducted, was in a good condition and achieved a TSA score of 71%.

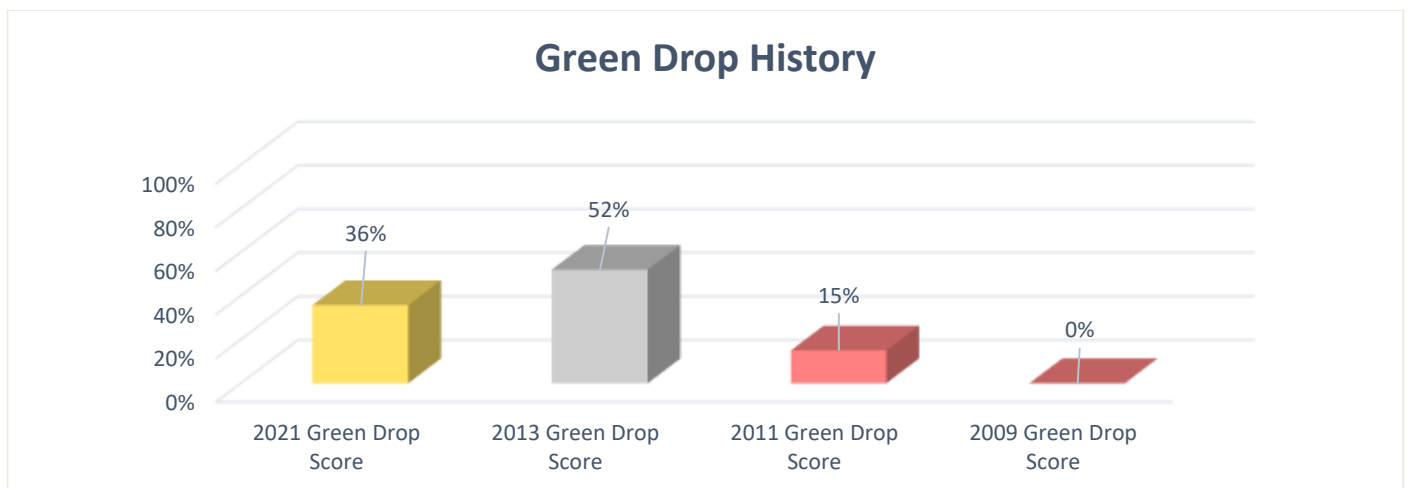
Aspects that require attention include the training of technical personnel at the various towns on both the operation and management of the WWTW, so that WSA can rely less on the roaming supervisor from Calvinia, and their consulting engineers.

The consulting engineers are doing a great job in the whole northern region of the Northern Cape with providing technical support to the municipalities, so much so that their engineering technologist is to a large extent fulfilling the role of a superintendent for the municipality. These external resources must be used to develop operational capacity and know how within the municipality.

Although the four systems are basic systems (three oxidation ponds systems and one reed bed system), operational monitoring should be implemented in order to receive early warnings should any operational or maintenance inputs be required at the treatment systems. Hantam also needs to record inflow and outflow readings and keep track of organic and hydraulic loadings to the WWTWs. Compliance of the final effluent quality is a critical limitation, as is the authorisation status of the WWTWs and regular sewer and pumps station inspections as part of the operational procedures. Wastewater treatment budgets, expenditure and budget control remains a gap, and hence reduced the GD score. The Regulator is impressed with the No Drop initiatives taken to reduce water losses and will follow this development with interest during the next audit in 2023.

Green Drop findings:

1. Flow estimates by the consulting engineers of the 4 systems estimate that systems are not being overloaded; however, because there are now flow meter figures available, a penalty for the loading sub-KPA was incurred by the municipality
2. The Supervisor from Calvinia is the roaming Supervisor at the other three systems in Nieuwoudtville, Brandvlei and Loeriesfontein. Insufficient Process Controllers are registered to comply with Regulations 813/2834
3. Consulting engineers provide the municipality with technical support regarding their water and wastewater treatment functions. Critical shortcoming is found in the operational monitoring program of all systems, pertaining to both the liquid and sludge processing units
4. No ringfenced budget and expenditure figures are readily available for the technical personnel on the operational level
5. Production costs and energy efficiency require attention
6. W₂RAPs are in place dated 2018, and must be updated and drive the planning process – emerging risks such as climate change (droughts and floods), vandalism and sludge management should be included
7. No inspections are performed of the sewer systems or the pump stations
8. The quality of the final effluent did not comply with the Green Drop expectations for any of the WWTWs. Chemical compliance seems to be particularly challenging, noting the low % compliance
9. DWS must be engaged on the limitations of ponds systems and relaxation of the requirements when the last pond is not overflowing – this need to be capture in authorisations before time of the next Green Drop audit
10. The last process audits were carried out in 2015; however, no evidence of this was provided
11. Two of the four plants are in high-risk positions
12. No proof of capital projects was provided, just mention of the irrigation project that is contemplated.



Technical Site Assessment

Calvinia WWTW 71%

The **Calvinia WWTW** was inspected to verify the Green Drop audit findings:

- The pump station building was in a satisfactory condition with sufficient ventilation. Signage was insufficient
- The security fencing was also in a satisfactory condition (although it can be firmed up) and the gate was locked
- There are two pumps, but the motor of one of the pumps was removed for repairs and out of operation for a month
- At the treatment works, the certificate was displayed on the notice board in the office of the WWTW - date of issue: 15 Sept 2021
- There were instruments available in the office, but they were not being used
- No maintenance and repairs logbook was available during the inspection
- The terrain was neat and well kept, and the inspector commended on this good practice. It is suggested that a small water wise garden be established to raise the standard even higher
- A big negative is, however, that solid waste is blown by the wind from the adjacent landfill site onto the plant area, which reduces the effect of the neat plant surroundings
- The fence was in a good condition and there were no animals observed on the site. There are a few places where the fence should be repaired
- The reeds in the vertical reed beds have mostly 'died' and consequently not producing full treatment capability. The reed beds need to be maintained
- The operation and maintenance of the reed bed systems were well explained in the O&M Manual. However, it appears that the reed beds are not being operated optimally
- The final effluent was not being discharged; it is the intention that the final effluent be irrigated in future. Irrigation pumps are already in place.



The terrain is well maintained and display a proud workplace



Stuctures are in good condition



Reedbeds need to be maintained to polish the effluent from the ponds

4.7 Joe Morolong Local Municipality

Water Service Institution	Joe Morolong Local Municipality	
Water Service Provider	Joe Morolong Local Municipality	
Municipal Green Drop Score		VROOM Impression (Towards restoring functionality):
2021 Green Drop Score	3%↓	1. Hand rake screens bars to be refurbished
2013 Green Drop Score	39%	2. Flow meter to be replaced
2011 Green Drop Score	49%	3. Magnetic flow meter to be installed at Dwars Street pump station
2009 Green Drop Score	0%	4. Refurbish, repair and/or service all four aeration compressors
		7. Repair all SBR decanting valves
		8. Recommission chlorination
		VROOM Estimate:
		- R2,391,360

Key Performance Area	Weight	Hotazel	Van Zylsrus
A. Capacity Management	15%	26.0%	21.3%
B. Environmental Management	15%	17.5%	0.0%
C. Financial Management	20%	8.0%	0.0%
D. Technical Management	20%	3.0%	0.0%
E. Effluent & Sludge Compliance	30%	35.0%	0.0%
F. Bonus		0.0%	0.0%
G. Penalties		-25.0%	-50.0%
H. Disqualifiers		None	Notice
Green Drop Score (2021)		3%	0%
2013 Green Drop Score		20%	44%
2011 Green Drop Score		65%	36%
2009 Green Drop Score		0%	0%
Design Capacity	MI/d	0.35	0.03
Design Capacity Utilisation (%)		NI	NI
Resource Discharged into		Irrigation	No Discharge
Microbiological Compliance	%	Insufficient data set	No monitoring
Chemical Compliance	%	Insufficient data set	No monitoring
Physical Compliance	%	Insufficient data set	No monitoring
Wastewater Risk Rating (CRR% of CRR_{max})		Hotazel	Van Zylsrus
CRR (2011)	%	50.0%	83.3%
CRR (2013)	%	52.9%	94.1%
CRR (2021)	%	94.1%	94.1%

Regulator's Comment:

The Joe Morolong Local Municipality has not implemented any meaningful initiatives to improve its wastewater management or services since the last Green Drop audit in 2013. This is apparent since all wastewater systems within the Municipality completely failed against all the GD Key Performance Areas, thereby placing all wastewater systems in critical positions.

The Regulator is disappointed by the Municipality's poor performance, evident by a 3% Green Drop Score, which translate to poor compliance and lacking good practice. Green Drop requirements are not achieved for most of the criteria and the poor performance can be attributed to various aspects, e.g. lack of technical skills; no authorisation; no operational and limited compliance monitoring for 6 months; no incident response management; no bylaws; no flow monitoring, no technical plans, etc. The largest contributing factor to the poor performance, however, is the complete absence of good management practices and lack of administration and management support. The budget was reported to be 5% of the municipal budget, but no further information is available – this does not suffice as a financial management tool. This critical state would warrant an urgent intervention by municipal leadership.

The WSI did manage to develop a generic W₂RAP, but it was not implemented. The revision and implementation of this document may be a starting point in the turn-around strategy for the WSI. It would be important to assign competent technical persons, if the municipality is to strive to step up their performance before the next Green Drop audit.

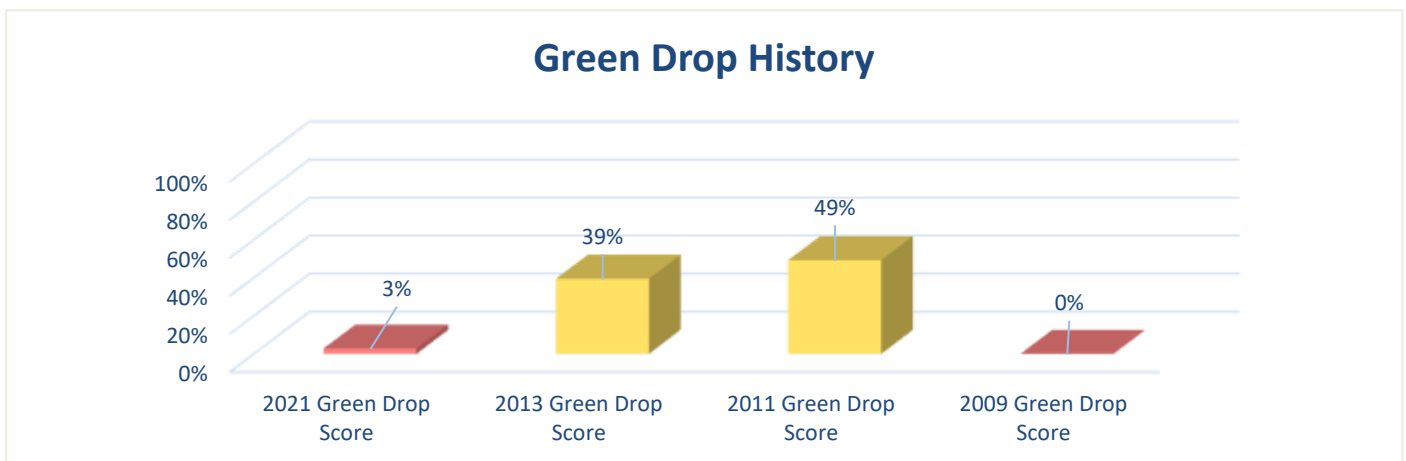
The relationship between South32Mine and the Municipality is critical, but the responsibilities between these two parties are not clearly defined. The Municipality and South32Mine need to draft a formal agreement with a clear definition of responsibilities, where Joe Morolong Local Municipality is prevented from abdicating their legal position.

Other wastewater treatment systems owned by South32Mine will be included in the next Green Drop assessment. The critical state of wastewater services in Joe Morolong trigger the regulatory enforcement protocol.

Green Drop findings:

1. Lack of commitment from the municipal management to rectify poor performance - improvement is urgently required
2. No evidence of financial planning, maintenance, nor asset management
3. Process Controllers are not registered on IRIS
4. Neither of the wastewater treatment works has records of inflow, process unit performance, and infrastructure capacity or status
5. No Water Use Authorisations are in place for either of the systems
6. No proof of implementation of the Bylaws
7. The W₂RAP is not implemented and should be used to prioritise critical risks – monitoring of the W₂RAP is imperative in order to have impact
8. No capacity and condition assessment/audit on sewer reticulation network and pump stations was conducted
9. Limited effluent compliance monitoring conducted only at Hotazel for a period of six months
10. A formal agreement with clear definitions of responsibilities is required between the Municipality and South32Mine, where the Municipality is prevented to abdicate its legal position.
11. The 2 plants are in critical risk positions
12. No capital projects are in place for any of the systems.

The Regulator is concerned about the overall poor state of wastewater services at all systems and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Hotazel WWTW 40%

The **Hotazel WWTW** was inspected to verify the Green Drop audit findings:

- All five (5) pump stations were operational
- General housekeeping and upkeep of site was maintained
- A single hut serves as the office, laboratory, kitchen, and storeroom. A better facility is required to differentiate between workspaces.
- Plant classification certificate was not displayed, and the Supervisor and Process Controller certificates were not available

- Incident management procedures and contact list was not available
- Improvement of grit removal and disposal is necessary
- Two (2) aerated Sequence Batch Reactors (SBR) were operational on site. Aeration distribution was even, and no dead zones observed. MLSS concentration and settling was good
- No Standard Operating Procedures were available for the operation, maintenance, and monitoring of SBR and process efficacy
- No disinfection of final effluent.

Van Zylsrus WWTW 12%

The **Van Zylsrus WWTW** was inspected to verify the Green Drop audit findings:

- The pump station was not maintained. No stand-by pump available at the pump station
- No signage was available at the site entrance of WWTW
- Illegal dumpsite at entrance of site caused litter to blow into the maturation ponds
- No effluent reaches the last maturation pond, due to leakages in the first two (2). Maturation ponds urgently need to be refurbished
- Screenings volume was not measured nor was it disposed of correctly and safely
- Process for grit removal and disposal was not effective
- No process nor compliance monitoring was conducted – a serious regulatory indictment
- No Process Controllers at the treatment works – the plant seemed to be abandoned.

<p>Contact channel not clean, high suspended solids in the overflow</p>	<p>Scum accumulation in SBR due to lack of surface water draw-off</p>	<p>Three (3) operational blowers and one (1) decommissioned</p>
<p>Pump station not maintained and no stand-by pump available</p>	<p>Litter in maturation ponds</p>	<p>Maturation pond three (3) not in use and overgrown with vegetation</p>

4.8 Kamiesberg Local Municipality

Water Service Institution	Kamiesberg Local Municipality		
Water Service Provider	Kamiesberg Local Municipality		
Municipal Green Drop Score	VROOM Impression (Towards restoring functionality):		
2021 Green Drop Score	0%→	1. Ponds lined and embankments in satisfactory condition	
2013 Green Drop Score	0%	2. Office/guardhouse facility lacking	
2011 Green Drop Score	5%	3. New pump house is new, no work needed - outstanding issues under retention	
2009 Green Drop Score	87%	VROOM Estimate: - R157,480	

Key Performance Area	Weight	Garies	Kamieskroon
A. Capacity Management	15%	30.0%	30.0%
B. Environmental Management	15%	0.0%	0.0%
C. Financial Management	20%	5.0%	5.0%
D. Technical Management	20%	8.8%	8.8%
E. Effluent & Sludge Compliance	30%	0.0%	0.0%
F. Bonus		0.0%	3.0%
G. Penalties		-37.5%	-25.0%
H. Disqualifiers		2 Directives	None
Green Drop Score (2021)		0%	2%
2013 Green Drop Score		0%	0%
2011 Green Drop Score		7%	3%
2009 Green Drop Score		87%	87%
System Design Capacity	MI/d	0.5	0.008
Design Capacity Utilisation (%)		NI	NI
Resource Discharged into		Evaporation	Evaporation
Microbiological Compliance	%	No monitoring	No monitoring
Chemical Compliance	%	No monitoring	No monitoring
Physical Compliance	%	No monitoring	No monitoring
Wastewater Risk Rating (CRR% of CRR_{max})		Garies	Kamieskroon
CRR (2011)	%	100.0%	88.2%
CRR (2013)	%	100.0%	100.0%
CRR (2021)	%	100.0%	100.0%

Regulator's Comment:

Kamiesberg Local Municipality continues to disappoint. The technical management team seems to be disinterested and non-responsive to the compulsory 2021 Green Drop Audit. The senior manager was the only person attending the audit, and the audit team questions if internal issues may have resulted in the previous Green Drop champion and other technical personnel not attending the audit session. The Manager also did not honour the confirmation audit, even after a rescheduling was allowed.

Kamiesberg had little to no documentary evidence in place, as is evident from a Green Drop score of 0%, in continuing the disappointing trend from 2011 and 2013. The resultant score of 2% for Garies and 4% for Kamieskroon was further penalised by the poor state of the Garies Technical Assessment Score (27%). Municipal management is urged to investigate the severe digress in wastewater services delivery to its people and environment and reinstate the processes that earned Kamiesberg a Green Drop score of 87% in 2009.

A foreman and some general workers are responsible for operation and minor maintenance of wastewater facilities in the two towns, but no certificates, qualifications, workplans, or other evidence was offered. No evidence of registration of the WWTWs were provided either, which is a regulatory indictment.

Positive contributions were made by the senior manager being a qualified engineering technician, combined with two qualified electricians. Qualified wastewater operational personnel is completely lacking. The audit score were further burdened by the lack of risk registers, W₂RAPs, operational- and compliance monitoring, asset condition assessments, sewer inspections, financial information, and IRIS uploads. In essence, no good practice or regulatory compliance is in place. The municipality indicated that there is an asset register in place containing most of the required data fields. A new pump station was recently built and was in a good condition, to be added to the asset register.

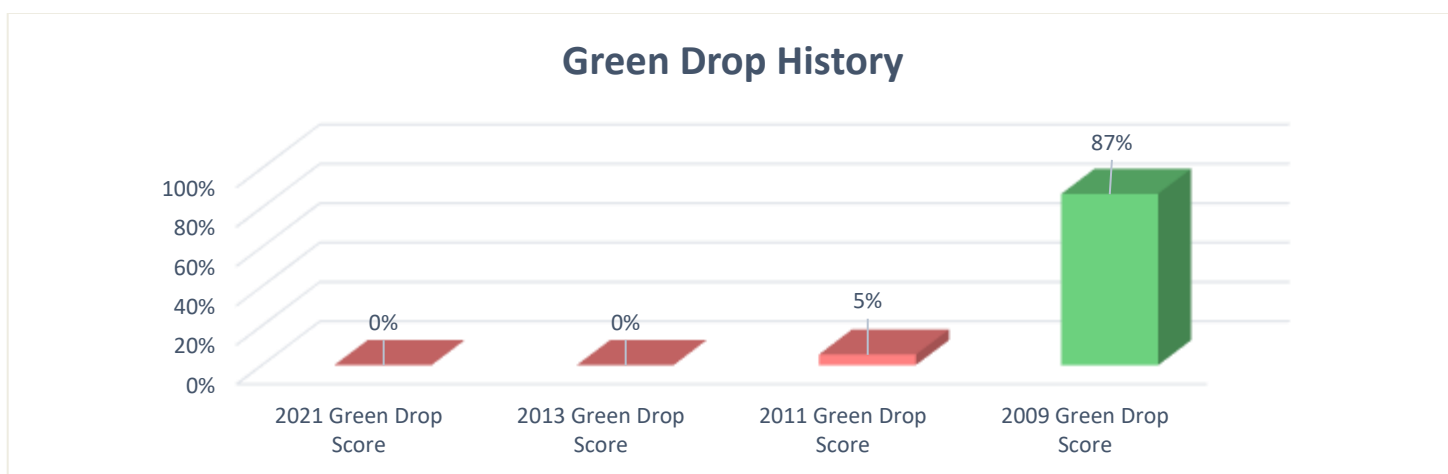
The Garies WWTW that was visited for the TSA (see comments below) was in a fair condition, although with signs of neglect and dereliction. Unfortunately, the condition was judged from a distance as the senior manager could not obtain a key during the audit to unlock the gate of the WWTW. The level of unpreparedness and disregard to the Regulator deserves further investigation by municipal management. The Municipal Manager is reminded that it is an offence to prevent the Regulator access to- or inspection of public wastewater infrastructure. The combination of events does not reflect well on the professionalism and conduct by Kamiesberg.

The municipality is to formulate a turnaround plan to reinstate their former high-quality care for the wastewater treatment function in the two towns. Management is compelled to prepare the necessary administration and field work required to comply with the law and basic good practice. The low Green Drop score places Kamiesberg on the priority list of interventions by the Regulator.

Green Drop findings:

1. No evidence or documentation was provided to the Green Drop audit team
2. No evidence was uploaded on IRIS
3. No compliance monitoring is in place. Samples are taken by the environmental health officials (EPH) of the Namaqua District Municipality, but are not uploaded on IRIS
4. No financial figures of budget or expenditure was provided to the GD team
5. No risk assessments, infrastructure condition assessments or process audits are in place
6. No records of inflow to or outflow from the two WWTWs are available because there are no flow meters
7. Because there is no compliance monitoring, a default of 0% compliance for final effluent discharge is assigned
8. A Non-Compliance Directive was issued by DWS in May 2019 for long term overflowing of pump stations in Garies, which lead to the construction of a new pump station in 2021
9. Both plants are still in the critical risk position
10. No capital funding is in place to address the poor state of wastewater services, apart from the recent upgrade of the pumpstations.

The Regulator is concerned about the overall poor state of wastewater services at all systems and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Garies WWTW 27%

The **Garies WWTW** was inspected to verify the Green Drop audit findings:

- The new pump station was visited and was found to be in a good condition, with good secure fencing
- No signage was installed at the new pump station, and no manual or drawings offered, no logbook to record pump hours or operational inspections - the consulting engineers are still responsible for retention completion of the pump station and to ascertain that all the requirements have been met for monitoring, safety, security, and training associated with the pumpstation
- The plant could not be accessed because the manager was unable to obtain a key to unlock the gate – this lack of preparation reflects poorly on municipal management and could have triggered an offence in terms of the relevant regulation
- Poor grounds keeping was evident - the grounds of the WWTW was overgrown with weeds
- No building facility on site for an official to record measurements or observations, ablution facilities or first aid equipment
- The site was well fenced and the fence in a good condition
- There was no signage on the gate or on the fence
- The plant would potentially have obtained a higher score if the oxidation ponds system could be visited.

		
<i>Good fencing in place</i>	<i>Ponds are lined and structurally in good condition</i>	<i>Poor grounds keeping evident.</i>

4.9 Kareeberg Local Municipality

Water Service Institution	Kareeberg Local Municipality			
Water Service Provider	Kareeberg Local Municipality			
Municipal Green Drop Score	VROOM Impression (Towards restoring functionality): 1. No disinfection is in place 2. Additional treatment capacity is required VROOM Estimate: - R567,000			
2021 Green Drop Score				44% ↑
2013 Green Drop Score				21%
2011 Green Drop Score				28%
2009 Green Drop Score				0%

Key Performance Area	Weight	Carnarvon	Van Wyksvlei	Vosburg
A. Capacity Management	15%	67.5%	0.0%	17.5%
B. Environmental Management	15%	78.1%	0.0%	56.3%
C. Financial Management	20%	71.3%	0.0%	71.3%
D. Technical Management	20%	22.4%	0.0%	20.6%
E. Effluent & Sludge Compliance	30%	16.3%	0.0%	0.0%
F. Bonus		1.5%	0.0%	1.5%
G. Penalties		0.0%	0.0%	0.0%
H. Disqualifiers		None	None	None
Green Drop Score (2021)		45%	0%	29%
2013 Green Drop Score		18%	31%	26%
2011 Green Drop Score		45%	19%	17%
2009 Green Drop Score		0%	0%	0%
Design Capacity	MI/d	1.3	NI	0.05
Design Capacity Utilisation (%)		NI	NI	NI
Resource Discharged into		Land Discharge	No Discharge	No Discharge
Microbiological Compliance	%	83%	No monitoring	Insufficient data set
Chemical Compliance	%	64%	No monitoring	Insufficient data set
Physical Compliance	%	42%	No monitoring	Insufficient data set
Wastewater Risk Rating (CRR% of CRR_{max})		Carnarvon	Van Wyksvlei	Vosburg
CRR (2011)		76.5%	52.9%	52.9%
CRR (2013)		76.5%	58.8%	76.5%
CRR (2021)		70.6%	100.0%	94.1%

Regulator's Comment:

The Kareeberg Local Municipality impressed with a positive approach towards Green Drop conformance by improving from the 2013 baseline Green Drop score of 21% to 44% in 2021. Well done.

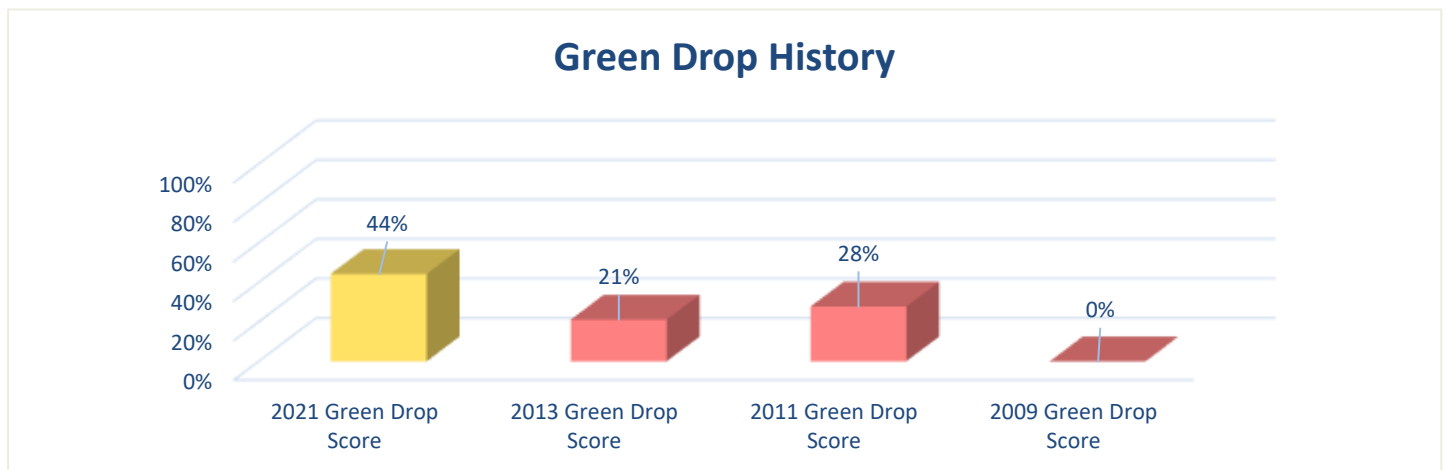
Unfortunately, the score obtained in this round is still indicative of wastewater services which are not managed according to the expectations of the regulation programme. The three wastewater systems are pond systems, with no complex technologies in place. However, the lack of active monitoring and operation of pond systems holds a risk to public health and the water quality of the impacted water resource. Compliance monitoring, flow monitoring and basic treatment capacity confirmations are quick interventions and will assist in future planning for these systems. These actions will also assist to improve on the CRR risk status of the 3 systems, 2 of which are in critical state, and 1 in high risk position. The 0% of the Van Wyksvlei system deducted substantially from a higher Green Drop score. On the positive side, decent scores on the Environmental and Financial Management KPAs were noted. The largest score deduction was for poor final effluent quality or insufficient monitoring/data.

The Kareeberg team is encouraged to further complete the already developed W₂RAP process and implement it as an effective mechanism to reduce the CRR. Active identification, prioritisation and correction of higher risks will be a good and sustainable turnaround strategy. Two of the wastewater systems are prioritised in terms of regulatory enforcement, based on their critically low Green Drop scores.

Green Drop findings:

1. The Supervisor and majority of Process Controllers are unregistered and do not comply with Reg. 2834 or draft Reg. 813
2. The W₂RAP is not fully implemented and should be used to prioritise critical risks
3. No operational monitoring. Limited compliance monitoring was presented
4. No capacity and condition assessment/audit on sewer reticulation network and pump stations was conducted
5. Sludge should be classified, and a sludge monitoring plan should be developed and implemented
6. Financial information, including budgets and expenditure were presented
7. Flow meters are in place, flows displayed and recorded but no trend analysis is done
8. No implementation of the Bylaws is taking place
9. None of the plants have a Water Use Authorisation
10. All plants are in the critical and high-risk positions
11. No capital projects or business plans were offered in evidence to address identified deficiencies:
 - R0.00: Carnarvon - MIG plans currently in progress for new financial year
 - R0.00: Vosburg - MIG plans currently in progress for new financial year.

The Regulator is concerned about the overall poor state of wastewater services at Van Wyksvlei and Vosburg and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Carnarvon WWTW 42%

The **Carnarvon WWTW** was inspected to verify the Green Drop audit findings:

- The only network system is in the new developed formal housing area and was found to be in good condition. The pump station was in good condition, with maintenance attended to
- PFD and incident management protocols were not displayed, and operational and maintenance logbooks were lacking
- The WWTW terrain was not signposted
- General housekeeping and upkeep of the site was adhered to
- Flow meters were in place, however not calibrated or used to inform process optimisation. Extraneous flows were not being monitored. Flow balances were not in place to determine if all flow reaches the WWTWs
- Compliance of raw sewage and final effluent quality was monitored
- No operational monitoring was being done
- Desludging of anaerobic ponds not occurring due to blocked pipes
- Syphon used to discharge from evaporation pond during high flow season
- Sludge drying beds are available, however had not been utilised - structures were in good condition.



Grit channels installed on site



Flow through grit channels controlled by standing way flume. Flume not effectively constructed, rendering it ineffective to control flow



No desludging of anaerobic ponds

4.10 Karoo Hoogland Local Municipality

<i>Water Service Institution</i>	Karoo Hoogland LM		
<i>Water Service Provider</i>	Karoo Hoogland LM		
Municipal Green Drop Score		VROOM Impression (Towards restoring functionality):	
2021 Green Drop Score	11%↑	1. Office and ablution	
2013 Green Drop Score	5%	2. Vandalism	
2011 Green Drop Score	12%	3. Flow metering	
2009 Green Drop Score	0%	4. Signage at plant	
		VROOM Estimate:	
		- R722,400	

Key Performance Area	Weight	Fraserburg	Williston	Sutherland
A. Capacity Management	15%	22.5%	18.0%	18.0%
B. Environmental Management	15%	31.3%	25.0%	25.0%
C. Financial Management	20%	3.8%	3.0%	3.0%
D. Technical Management	20%	8.8%	7.5%	7.5%
E. Effluent & Sludge Compliance	30%	0.0%	0.0%	0.0%
F. Bonus		6.0%	6.0%	6.0%
G. Penalties		0.0%	0.0%	0.0%
H. Disqualifiers		None	None	None
Green Drop Score (2021)		11%	9%	9%
2013 Green Drop Score		6%	6%	2%
2011 Green Drop Score		12%	14%	10%
2009 Green Drop Score		0%	0%	0%
System Design Capacity	MI/d	0.447	0.447	0.447
Design Capacity Utilisation (%)		NI	NI	NI
Resource Discharged into		Sout River	Sak River	Dorps River
Microbiological Compliance	%	Insufficient data set	Insufficient data set	Insufficient data set
Chemical Compliance	%	Insufficient data set	Insufficient data set	Insufficient data set
Physical Compliance	%	Insufficient data set	Insufficient data set	Insufficient data set
Wastewater Risk Rating (CRR% of CRR_{max})		Fraserburg	Williston	Sutherland
CRR (2011)	%	41.2%	41.2%	41.2%
CRR (2013)	%	100.0%	100.0%	100.0%
CRR (2021)	%	100.0%	100.0%	100.0%

Regulator's Comment:

The Director of Infrastructure was the sole representative at the audit sessions and was well prepared for the main audit, with Green Drop files ready and indexed according to Green Drop KPAs. The audit was conducted in a positive spirit, and it was clear that the Director is dedicated to improving wastewater management, noting that some challenges and restrictions were hampering this objective. The WSA also relies to a large extent on support provided by the Namaqua District Municipality and by their consulting engineers.

Unfortunately, the municipality fell short with most of the required documentary evidence, which could not be provided by time of the main- or confirmation audit. As a result, the WSA obtained a low score of 11%, following on the 12% and 6% received in 2011 and 2012. The lack of technical capacity present a weak link in the institution and underlies many of the failures against compliance and good practice standards. There are no Process Controllers at the ponds systems of the three towns, and no evidence of maintenance teams, although it was mentioned that this function is carried out by local service providers.

No qualified engineers, technologists, or technicians are in place. W₂RAPs are wholly absent, but the Regulator notes the commitment that the Karoo Hoogland LM will be assisted in drawing up a W₂RAP inhouse before the next Green Drop audit in 2023. This commitment is noted but needs to be followed through in terms of implementation, which will require technical competent persons. Condition assessments or process audits will aid significantly in the development of good W₂RAPs.

WWTWs do not perform any operational monitoring, and a partially compliant compliance monitoring is in place, with support of 2 external laboratories. The monitoring program should be extended. Namaqua District Municipality has worked with the team to develop monitoring programmes which are aligned with the Authorisation and DWS will follow this progress with interest.

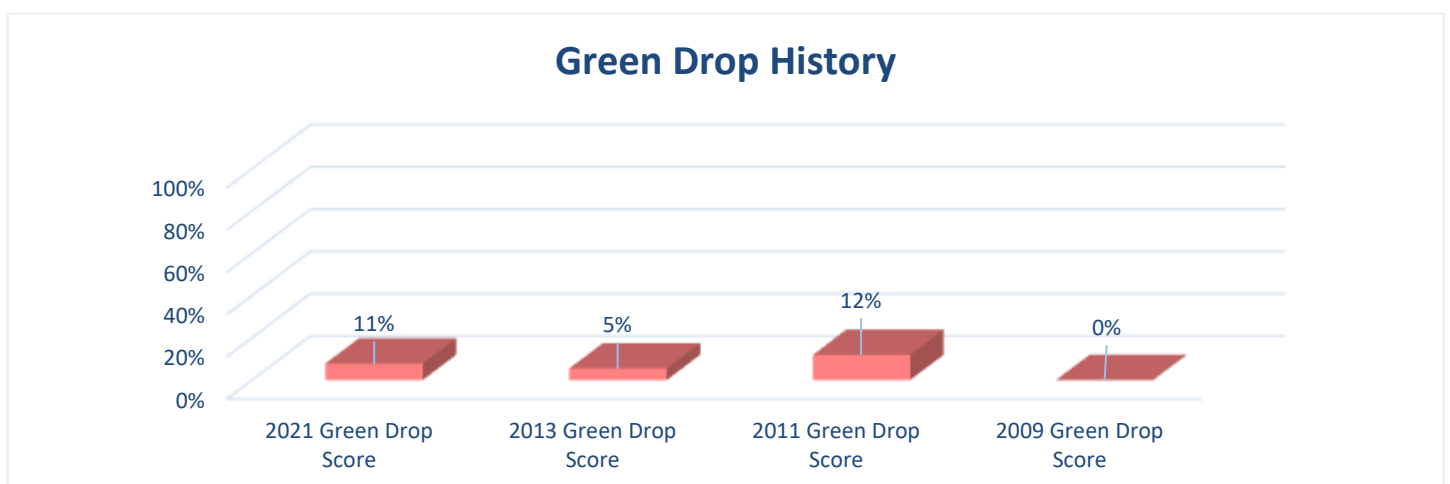
The sanitation systems for all three towns have been converted to urine separation systems in order to reduce the water consumption for conventional sanitation. Taking such appropriate, innovative technology into the sanitation strategy is commendable. However, it appears that the municipality may revert back to the conventional sanitation due to the UD systems not being sustainable for Karoo Hoogland LM. The Fraserburg WWTW was visited for the TSA and was found to be reasonably well operated and maintained with a TSA score of 57%.

The critical state of all three wastewater systems in Karoo Hoogland triggers the regulatory enforcement protocol.

Green Drop findings:

1. All systems lacked documentary evidence for certificates, programs, registers, and financial figures
2. Very little information was uploaded on IRIS. The Director indicated that they were experiencing problems to view uploaded documents. The DWS IRIS helpdesk will work with the municipality to train/resolve any problems
3. There are no W₂RAPs, conditions assessment reports or process audit reports in place. The municipality appreciates any assistance in drawing up and implementing guidelines on how to do these reports inhouse
4. There are asset registers in place for all three of the wastewater functions in the three towns
5. There appears to be ample capacity in the ponds for the short term future, based on the number of tank truck discharges on estimates from bulk water supply figures
6. The WWTWs were not authorised
7. The WWTWs received some bonuses for a Water Demand Management Plan and for a sewer line upgrading project
8. No penalties were applied as the Inspectorate accepted the recorded and calculated figures from tanker discharge
9. All plants are in the critical risk positions
10. A capital plan is in place for sewer line upgrading for all three towns to commence in March 2022 over a period of three years to a value of R30,000,000.

The Regulator is concerned about the overall poor state of wastewater services at all systems and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Fraserburg WWTW 57%

The **Fraserburg WWTW** was inspected to verify the Green Drop audit findings:

- The pump station was secure and well enclosed with fencing and a locked gate, however no signage on the gate
- The pumps are not enclosed in a building, and therefore well ventilated. There were two pumps in the pump station, which operate alternately (automatically). Both pumps were in a good working condition
- The WWTW consists of a series of oxidation ponds. The three towns are employing urine diversion systems. The sewage is discharged at the WWTW by tank trucks and buckets, which give rise to obnoxious conditions, which are not favoured by the plant personnel (general workers)
- The grounds of the ponds system were tidy and well kept
- The ponds were lined and no evidence of wind erosion
- There is no site office, therefore classification certificates were not displayed
- The municipality applied for registration of WWTWs at the DWS Kimberley office, and this process is underway
- An old office container onsite could possibly be renovated, together with all the other amenities, to serve of process office
- The roaming Supervisor is reportedly overwhelmed with work and requested support from the HR department
- The facility is fenced and there were no animals within the pond's enclosure
- There was a flow meter in place, but it had been vandalised. The Director of Infrastructure indicated that it was very difficult to protect the equipment on the plant against vandalism.



Tanker discharge gives rise to unpleasant odours



Very good grounds keeping create a satisfactory and overall pleasant work environment



Ponds are adequately lined and structurally sound

4.11 Kgatelopele Local Municipality

Water Service Institution	Kgatelopele Local Municipality	
Water Service Provider	Kgatelopele Local Municipality	
Municipal Green Drop Score	VROOM Impression (towards restoring functionality):	
2021 Green Drop Score	15%↓	1. Screening
2013 Green Drop Score	78%	2. Fences and security
2011 Green Drop Score	42%	3. Vandalism
2009 Green Drop Score	3%	4. Staff facilities
		5. Inlet works
		6. Flowmeters absent
		VROOM Estimate:
		- R1,814,000
		- The plant is currently being upgraded

Key Performance Area	Weight	Danielskuil
A. Capacity Management	15%	47.5%
B. Environmental Management	15%	7.5%
C. Financial Management	20%	0.0%
D. Technical Management	20%	12.6%
E. Effluent & Sludge Compliance	30%	18.8%
F. Bonus		30.0%
G. Penalties		-25.0%
H. Disqualifiers		None
Green Drop Score (2021)		15%
2013 Green Drop Score		78%
2011 Green Drop Score		42%
2009 Green Drop Score		3%
System Design Capacity	ML/d	0.72
Design Capacity Utilisation (%)		NI
Resource Discharged into		Wetland - eventually into Bouplaas Pan
Microbiological Compliance	%	Insufficient data set
Chemical Compliance	%	Insufficient data set
Physical Compliance	%	Insufficient data set
Wastewater Risk Rating (CRR% of CRR_{max})		Danielskuil
CRR (2011)	%	70.6%
CRR (2013)	%	47.1%
CRR (2021)	%	94.1%

Regulator's Comment:

The Kgatelopele wastewater team cooperated in full and engaged positively with the audit process. Unfortunately, the lack of information proved to be the downfall for this committed team and a Green Drop score of 15% was reached. This is a disappointing regression from the impressive 78% in 2013 and warrants an intervention of the highest order from the municipal leadership. Despite the undertakings of the team, IRIS upload remained unattended to, and the Municipality did not maximise its opportunity during the 2nd audit event.

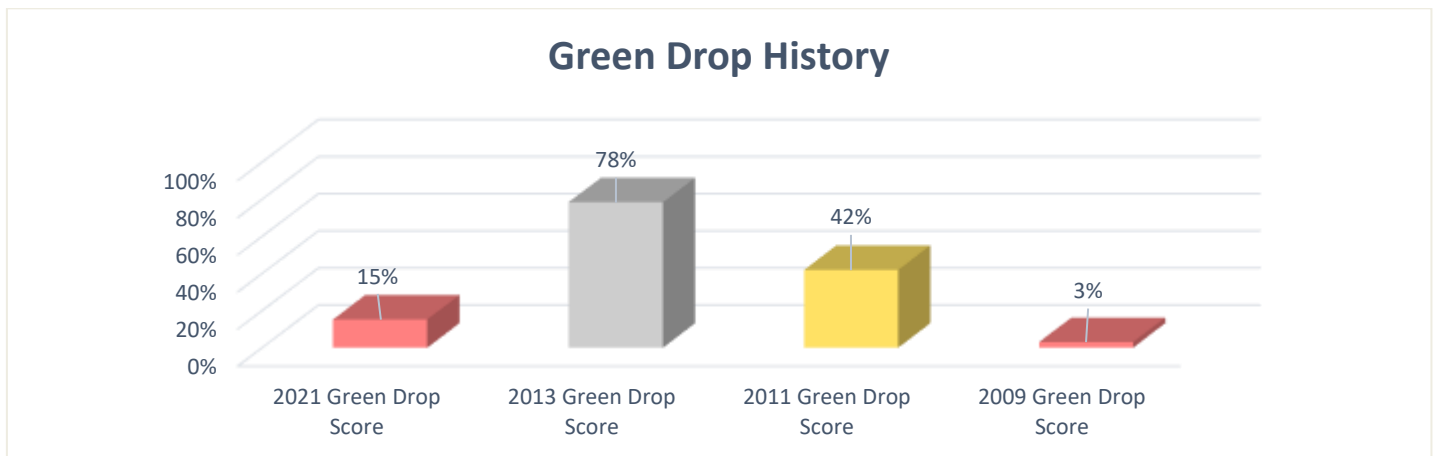
The Regulator is concerned about the lack of effort to meet legal compliance and good practice standards and urges the team to rectify the key issues as outlined in the Green Drop scorecard. Note is taken of the upgrade project that is underway, but refurbished assets will surely deteriorate if the appropriate resources for operations and maintenance are not in place. The most immediate focus would be to get address the very basics of wastewater management, i.e. registration of Process Controllers and Supervisor, incorporate the necessary engineering, technical and scientific capabilities, flow monitoring, operational and compliance monitoring, and embedding the General Authorisation standards.

Financial information was lacking and attracted a zero score. The municipality is encouraged to develop and implement a W₂RAP for the sewer network and pumpstations with immediate effect, as risk-based planning forms a foundation from which to plan, prioritise and motivate resources towards improved services. This would include the magnitude of vandalism that is upsetting services to the customers. The poor state of the wastewater systems places Kgatelopele on the priority list for enforcement intervention.

Green Drop findings:

1. Registration of Process Controllers and Supervisors are incomplete, and does not meet the Green Drop standard of either Reg. 2834 or draft Reg. 813
2. The current maintenance structure, services and competency could not be viewed – qualifications of the team could not be verified
3. No W₂RAP or updated Condition Assessment was in place; however, noting that a capital project is currently undertaking to address some shortcomings
4. Operational monitoring is absent and compliance monitoring is erratic - a serious regulatory indictment
5. No financial records, budgets, or asset registers could be viewed, the financial team was not present to present a cohesive municipal team
6. No design information or flow records could be presented, noting that this will be reinstalled upon the commissioning of the upgraded plant
7. Effluent quality compliance is poor and needs to be addressed as a priority at time of the commissioning of the upgraded plant end February 2022
8. A capital project is in place to address the identified defects:
 - o R40,282,080: Danielskuil WWTW upgrade, including septic tanks (conservancy tasks)
 - Phase 1 of project undertaken.

The Regulator is concerned about the overall poor state of wastewater services at all systems and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Danielskuil WWTW **31%**

The **Danielskuil WWTW** was inspected to verify the Green Drop audit findings:

- Sewer network inspections were not regularly undertaken or documented
- Operational logbooks were not kept to inform on activities at the sewer networks and pump stations
- The treatment facility was untidy, poor groundskeeping, no cutting of grass nor general upkeep of surrounds
- The Classification Certificate was not displayed, the buildings and infrastructure at the WWTW are continually being vandalised
- No Process Controllers could be found on site to attend to their daily duty
- Operational and compliance monitoring was lacking – even for a pond system, some basic aspects of control need to be in place
- An Incident Management Protocol (IMP) was absent, and anti-vandalism strategies were not in place
- Flow & flow balancing record keeping has not been done for an extended period.

 <p>04 Nov 2021 14:52:51 R31 Danielskui Benede Oranje Northern Cape</p>	 <p>04 Nov 2021 14:34:25 R31 Danielskui Benede Oranje Northern Cape</p>	 <p>04 Nov 2021 14:49:44 R31 Danielskui Benede Oranje Northern Cape</p>
<p><i>Poor groundskeeping, terrain is vandalised and untidy, no staff is working on the site</i></p>	<p><i>Terrain maintenance lacking. No staff found on site during inspection</i></p>	<p><i>7 ponds in series, concrete and lined – 2 anaerobic, 1 facultative, 4 maturation - structurally in sound condition but final effluent high turbidity</i></p>

4.12 Khai Ma Local Municipality

<i>Water Service Institution</i>	Khai Ma Local Municipality	
<i>Water Service Provider</i>	Khai Ma Local Municipality	
Municipal Green Drop Score		VROOM Impression (Towards restoring functionality):
2021 Green Drop Score	1%↓	1. Pond capacity unknown (no flow meters)
2013 Green Drop Score	28%	2. Ponds are unlined
2011 Green Drop Score	14%	3. No fencing
2009 Green Drop Score	0%	4. No inlet works
		5. No building amenities
		6. Pump dysfunctional
		VROOM Estimate:
		- R2,940,600

Key Performance Area	Weight	Pofadder	Aggenys	Pella	Onseepkans
A. Capacity Management	15%	22.5%	22.5%	22.5%	22.5%
B. Environmental Management	15%	0.0%	0.0%	0.0%	0.0%
C. Financial Management	20%	0.0%	0.0%	0.0%	0.0%
D. Technical Management	20%	5.3%	5.3%	5.3%	5.3%
E. Effluent & Sludge Compliance	30%	0.0%	0.0%	0.0%	0.0%
F. Bonus		0.0%	0.0%	30.0%	0.0%
G. Penalties		-25.0%	-25.0%	-25.0%	-25.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		0%	0%	3%	0%
2013 Green Drop Score		28%	NA	NA	NA
2011 Green Drop Score		14%	NA	NA	NA
2009 Green Drop Score		0%	NA	NA	NA
System Design Capacity	MI/d	0.38	NI	NI	NI
Design Capacity Utilisation (%)		53%	NI	NI	NI
Resource Discharged into		Evaporation	NI	Orange River	Orange River
Microbiological Compliance	%	No monitoring	No monitoring	No monitoring	No monitoring
Chemical Compliance	%	No monitoring	No monitoring	No monitoring	No monitoring
Physical Compliance	%	No monitoring	No monitoring	No monitoring	No monitoring
Wastewater Risk Rating (CRR% of CRR_{max})		Pofadder	Aggenys	Pella	Onseepkans
CRR (2011)	%	35.3%	NA	NA	NA
CRR (2013)	%	88.2%	NA	NA	NA
CRR (2021)	%	88.2%	100.0%	100.0%	100.0%

Regulator's Comment:

The Khai Ma LM Green Drop team consists of the senior manager for technical services as sole attendee of the main audit and subsequent confirmation audit. From the outset of the audit, the manager indicated that the municipality has insufficient documentation and would not be able to satisfy the Green Drop requirements. The reason being that the municipality has focussed exclusively on the drinking water supply in its towns and lacks capacity to attend to wastewater management. Limited funds are compounding this challenge.

Four systems were audited to the three towns of Aggenys, Pella and Onseepkans, over and above Pofadder. All systems are registered on IRIS and consisting of oxidation pond systems. A municipal Green Drop score of 1% confirmed that no systems, processes, or staff are meeting the Green Drop standards, which places wastewater services in critical care in Khai Ma. The oxidation ponds at Pofadder deliver very poor effluent quality and has major shortcomings, as was evidenced in the score of 0% that was achieved for this system. It can be assumed that the ponds systems of the other three systems are likely to exhibit the same shortcomings.

Little documentary evidence was presented or uploaded on IRIS. In essence, no capacity is in place, a lack of Process Controllers, technical, scientific or maintenance qualified staff. Management relies on the tank truck drivers to report any incidents at the oxidation ponds. There were no risk registers or W₂RAPs, and also no evidence of condition assessments or process audits. The municipality does not have operational and compliance monitoring programmes in place. The design capacity of the ponds systems are unknown, and no flow measurement or calculations taking place to establish the loads on the plant. The only documentary evidence shown during the audit was an asset register. The only bonus is for the capital upgrades of the Pella WWTWs. A penalty was incurred for lack of evidence that the plant is not currently hydraulically overloaded.

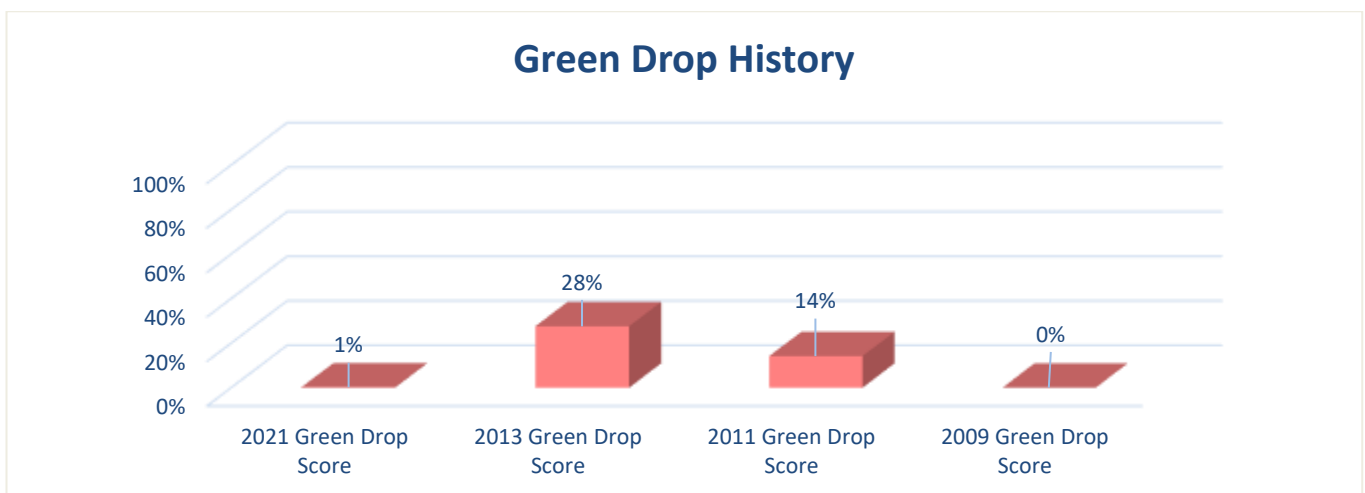
The Regulator is encouraged by the senior manager commitment to make a concerted effort to meet the requirements of the Green Drop program in 2023. The WSA is further encouraged to investigate and engage the DWS on the monitoring requirements, as these ponds are potentially evaporation ponds and may qualify to be reduced/exempted from discharge monitoring. This exemption must be documented in the water use authorisation.

The critical Green Drop scores for all four wastewater systems, triggers the regulator's enforcement protocol.

Green Drop findings:

1. No documentary evidence was shown during either of the main audit or confirmation audit, nor was anything forwarded by email or uploaded on IRIS. The only exception was an asset register for the municipality
2. No compliance monitoring is taking place and no results are therefore uploaded on IRIS
3. The senior manager (i.e., Green Drop representative) is aware of all the shortcomings and has undertaken to rectify this as a high priority in the short to medium term
4. All plants are in critical and high-risk positions
5. A capital project is in place of R10,000,000 to install lining of the 1 existing pond and extend the WWTW with 2 additional ponds at the Pella WWTW. The Regulator commends the use of suitable and appropriate technology by the municipality.

The Regulator is concerned about the overall poor state of wastewater services at all systems and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Pofadder WWTW 15%

The **Pofadder WWTW** was inspected to verify the Green Drop audit findings:

- The building of the pump station was secure and well fenced, but no signage in place
- The general housekeeping at the pump station was not on standard and should be improved
- One of the two pumps was not operational, and has been out of operation for over a month – the only reason being a fan belt replacement, which is a minor correction
- The general appearance and condition of the oxidation ponds were very poor
- There is no building or guardhouse on the premises, and consequently no documents such as an incident logbook, records of tank truck discharges, water quality meters or ablution facilities

- The oxidation ponds site is not fenced
- The ponds are located next to the landfill site and receives windblown waste, plastic bags and other material onto the ponds terrain – this must be taken up with the Solid Waste Department
- There was a short circuit between two of the ponds, effectively reducing the retention time in the ponds system
- Cows were found drinking water from one of the ponds
- The ponds are unlined and at risk of polluting the groundwater – groundwater monitoring needs to be established
- The ponds have not been desludged and the sludge levels in the ponds are likely to be high
- The final effluent was not discharged, as it evaporates and does not overflow.

<p><i>Poor groundkeeping with waste material from neighbouring landfill site polluting the site (especially plastics)</i></p>	<p><i>Cattle grazing the site and drinking water from the ponds</i></p>	<p><i>Ponds are not fenced, unlined and never been desludged</i></p>

4.13 Kai Garib Local Municipality

Water Service Institution	Kai Garib Local Municipality	
Water Service Provider	Kai Garib Local Municipality	
Municipal Green Drop Score	VROOM Impression (Towards restoring functionality):	
2021 Green Drop Score	13%↓	1. Pond lining
2013 Green Drop Score	34%	2. Site office
2011 Green Drop Score	22%	3. Pond embankments
2009 Green Drop Score	0%	4. Roads
		5. Fencing.
		VROOM Estimate:
		- R642,000

Key Performance Area	Weight	Kakamas	Keimoes	Kenhardt	Vredesvallei
A. Capacity Management	15%	65.0%	65.0%	52.5%	42.0%
B. Environmental Management	15%	36.3%	32.5%	36.3%	16.0%
C. Financial Management	20%	0.0%	0.0%	0.0%	0.0%
D. Technical Management	20%	7.6%	10.6%	7.6%	4.5%
E. Effluent & Sludge Compliance	30%	7.5%	7.5%	0.0%	0.0%
F. Bonus		34.5%	4.5%	4.5%	0.0%
G. Penalties		-25.0%	-25.0%	-25.0%	-25.0%
H. Disqualifiers		None	None	Directive	None
Green Drop Score (2021)		18%	14%	10%	4%
2013 Green Drop Score		33%	28%	50%	NA
2011 Green Drop Score		11%	8%	8%	NA
2009 Green Drop Score		0%	0%	0%	NA
System Design Capacity	MI/d	0.43	1.9	0.7	0.18
Design Capacity Utilisation (%)		NI	NI	NI	NI
Resource Discharged into		Orange River	Orange River	Hartbees River	Orange River
Microbiological Compliance	%	40%	0% (NI)	0% (NI)	0% (NI)
Chemical Compliance	%	0% (NI)	6%	0% (NI)	0% (NI)
Physical Compliance	%	0% (NI)	59%	67%	0% (NI)
Wastewater Risk Rating (CRR% of CRR_{max})		Kakamas	Keimoes	Kenhardt	Vredesvallei
CRR (2011)	%	94.1%	94.1%	47.1%	NA
CRR (2013)	%	76.5%	82.4%	88.2%	NA
CRR (2021)	%	88.2%	94.1%	94.1%	94.1%

Regulator's Comment:

The Kai Garib team is commended for the positive attitude to the Green Drop audits. The GD champion was very cooperative and attempted to provide the required information and evidence during the main audit. Unfortunately, the municipality is experiencing major challenges in wastewater management, which is reflected by many systems not operational and poor final effluent quality compliance. The technical department should secure the support from other departments to ensure that opportunities such as the asset and financials are not forfeited, these scores were sacrificed at the detriment of the overall municipal Green Drop score. The evidence gaps resulted in a low Green Drop score of 13%, which is a significant regress from the 34% baseline obtained in 2013. In addition, all WWTWs are in high and critical risk space, as is evident from the CRR ratings.

The Kakamas WWTW, which were also the subject of the Technical Site Assessment, was in a poor condition and scored a disappointing 18% GD score and 27% TSA score. Key areas that impacted on Green Drop scores included the absence of operational monitoring programs, no financial figures, no proof of cost effectiveness in operation and maintenance of the pump stations, sewage networks, tankers services and treatment systems. The above scorecard can be consulted to identify the full list of shortcomings.

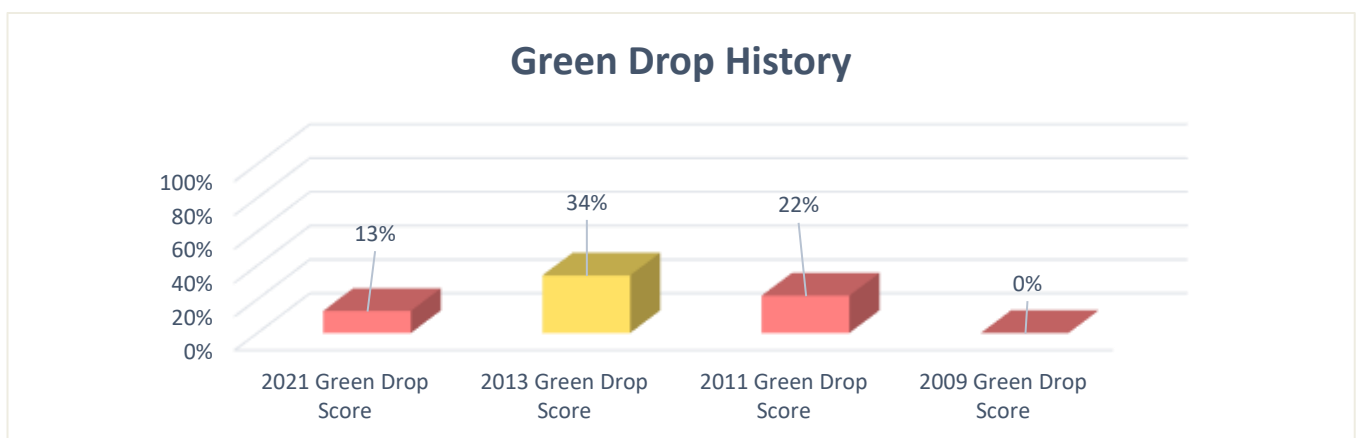
Condition assessments or process audits will be a meaningful start in preparing for the 2023 audit as it is instrumental to confirm capacity, describe the systems, and identify infrastructure and processing gaps, which again would inform the W₂RAP. Flow measurement is absent at all plants, which compromises the efforts of the supervisors and engineers to optimise process performance, and to conduct medium term planning for capacity upgrades. The lack of flow measurement activated a penalty as the Regulator regards this as a risk that the ponds and advanced systems are potentially overloaded. The largest contributor to the low scores were the non-compliance of the final effluent with the General Limit, noting that General Authorisations were not presented as evidence. In some of the towns, only microbiological results were submitted, thereby faulting the mandatory requirement for chemical and physical compliance monitoring.

The Regulator is dissatisfied with the low Green Drop score and places Kai Garib on the priority list of interventions. The Vredesvallei WWTW has been out of operation for more than 3 years and needs to be resolved urgently. The municipal leadership is urged to use the Green Drop audit criteria to start a systematic plan of turnaround before the next audit.

Green Drop findings:

1. All WWTWs of the four towns are registered, and registration certificates uploaded on IRIS – well done
2. The uploaded process controller registrations are still under review and need to be fast tracked with the IRIS office. Only the Supervisor at Kakamas complied with Regulations 2834/813, with the none of the Process Controllers complying
3. No risk registers are in place, and the last W₂RAP was done in 2012. W₂RAPs need to be revised or new plans to be developed – these plans will be a foundation for compliance and improved Green Drop scores going forward
4. No operational monitoring (sampling, observations, flow measurement) at any of the WWTWs
5. No flow measurement at any of the plants, and the WSA is thus unaware whether the plants are still within the design limits or being overloaded. This hampers the short term planning process for the ponds systems
6. Wastewater budget and expenditure figures were not made available during either of the two audits – the lack of financial officials presenting evidence impacted negative on the audit score
7. A condition assessment report was done by consulting engineers, but no evidence was provided. No process audits have been done as alternative
8. An asset register was presented during the main audit, but lacked some of the required fields and failed to inform the maintenance plan
9. The quality of the effluent overflowing from the final pond does not comply with the General Authorisation, presumably largely as the result of the poor condition of the ponds systems. No desludging plans are in place
10. The Vredesvallei WWTW is a package plant system and has been dysfunctional for the largest part of the past 3 years - raw sewage running right through the plant without treatment. This situation requires urgent attention
11. Capital projects have been identified and funding secured to address some of the defects identified:
 - o R60,300,000: Construction of a new WWTW at Kakamas, feasibility study completed – RBIG funding.
 - o No funding for remaining 3 systems.

The Regulator is concerned about the overall poor state of wastewater services at all systems and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Kakamas WWTW 27%

The **Kakamas WWTW** was inspected to verify the Green Drop audit findings:

- The pump station is not in a building but is well fenced and maintained. No signage in place
- The general housekeeping at the pumpstation was poor and should be improved
- A maintenance team is responsible for the pump station; however, no maintenance plan was in place which implied that the municipality follows a reactive maintenance strategy
- The ponds system was in a poor condition, with very little maintenance or cleaning of the site being done
- The plant is located adjacent to the landfill site, and all the plastic bags and other material is blown by the wind into the series of oxidation ponds – this must be taken up with the Solid Waste Department
- A building should be provided on site for office, guard house with security, ablution and record keeping purposes (tank trucks)
- The wastewater treatment facility is unfenced and has overgrown vegetation, which is not conducive to a pleasant working environment
- The ponds are unlined, implying ground water pollution – no impact monitoring was done
- A large portion of the wastewater discharged into the ponds is via tank trucks, but no evidence of quality and quantity checks were offered
- Erosion of some of the embankments was noticed
- The final effluent was not discharged, and the final pond is in a poor condition.

		
<p><i>Littering of the site from the nearby solid waste facility</i></p>	<p><i>Ponds are in a poor condition with solids, weed growth, and waste matter prominent at all ponds</i></p>	<p><i>Civil infrastructure is in poor condition. Overall housekeeping of the plant is mostly defective</i></p>

4.14 !Kheis Local Municipality

Water Service Institution	!Kheis Local Municipality	
Water Service Provider	!Kheis Local Municipality	
Municipal Green Drop Score	VROOM Impression (Towards restoring functionality):	
2021 Green Drop Score	2%↓	1. Vandalism
2013 Green Drop Score	25%	2. Wegdraai WWTW not operational
2011 Green Drop Score	8%	3. No flow to plant, all process units dry
2009 Green Drop Score	0%	VROOM Estimate:
		- R1,281,600

Key Performance Area	Weight	Groblershoop	Brandboom	Wegdraai*	Topline*	Grootdrink*
A. Capacity Management	15%	25.0%	25.0%	0.0%	0.0%	0.0%
B. Environmental Management	15%	0.0%	0.0%	0.0%	0.0%	0.0%
C. Financial Management	20%	0.0%	0.0%	0.0%	0.0%	0.0%
D. Technical Management	20%	2.4%	2.4%	0.0%	0.0%	0.0%
E. Effluent & Sludge Compliance	30%	0.0%	0.0%	0.0%	0.0%	0.0%
F. Bonus		0.0%	0.0%	0.0%	0.0%	0.0%
G. Penalties		0.0%	0.0%	-25.0%	-25.0%	-25.0%
H. Disqualifiers		None	None	None	Notice	None
Green Drop Score (2021)		2%	2%	0%	0%	0%
2013 Green Drop Score		4%	29.6%	27%	27%	27%
2011 Green Drop Score		8%	NA	NA	NA	NA
2009 Green Drop Score		0%	0%	0%	0%	0%
System Design Capacity	ML/d	0.6	0.12	NI	NI	NI
Design Capacity Utilisation (%)		90%	50%	NI	NI	NI
Resource Discharged into		NI	NI	NI	NI	NI
Microbiological Compliance	%	Insufficient data set	No monitoring	No monitoring	No monitoring	No monitoring
Chemical Compliance	%	Insufficient data set	No monitoring	No monitoring	No monitoring	No monitoring
Physical Compliance	%	Insufficient data set	No monitoring	No monitoring	No monitoring	No monitoring
Wastewater Risk Rating (CRR% of CRR_{max})		Groblershoop	Brandboom	Wegdraai	Topline	Grootdrink
CRR (2011)	%	52.9%	NA	NA	NA	NA
CRR (2013)	%	94.1%	94.1%	94.1%	94.1%	94.1%
CRR (2021)	%	88.2%	82.4%	100.0%	100.0%	100.0%

* WWTWs not registered on IRIS

Regulator's Comment:

The !Kheis Local Municipality did not honour the Regulator's notice to attend the main Green Drop audit, however the subsequent Confirmation Audit session was attended. The Green Drop score of 2% is as result of the overall absence of documentation, legislative compliance, and devoid of any good practice.

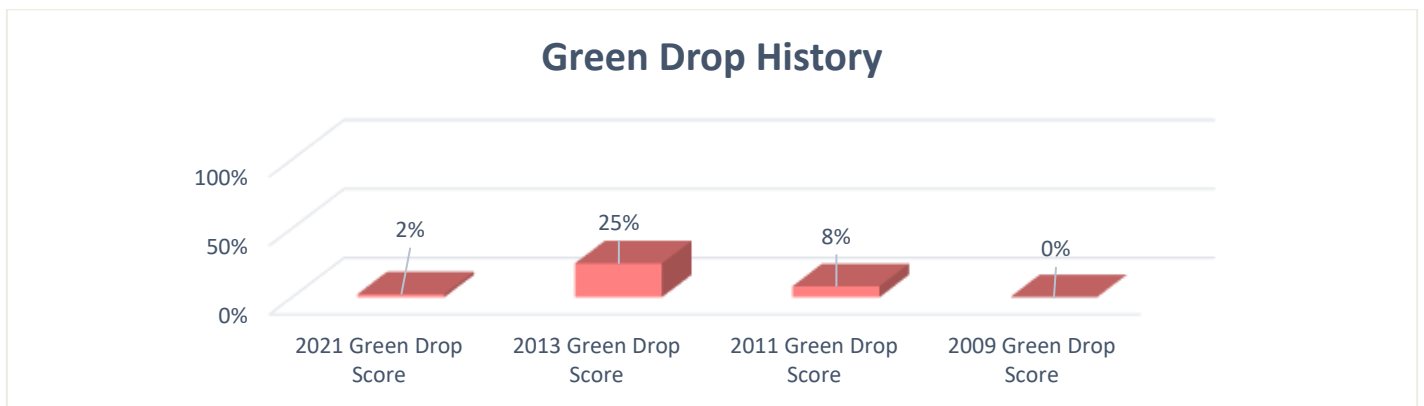
The opportunity to converse with !Kheis, albeit brief and belated, did put the prevailing environment into perspective. The Regulator encourages the municipality and DWS regional office to build a productive relationship to understand and address the challenges in the municipality. Unfortunately, at time of the audit, there was very little regulatory, maintenance, operational, capacity, financial or planning information in place. !Kheis is urged to use the five (5) Green Drop KPA as basis and guideline to plan and execute each sub-criteria, as these focus areas represent compliance and good practice. The team will then be ready to have a constructive audit in 2023. The Regulator looks forward to this progress.

In the meantime, the municipality is placed on the priority list for regulatory intervention, noting that all systems are in critical GD space and in high and critical CRR risk positions for all WWTWs. Three (3) systems are not registered on IRIS and need to be uploaded: Wegdraai, Topline and Grootdrink. The municipality is urged to engage with the Helpdesk toward resolving this status.

Green Drop findings:

1. Brandboom and Groblershoop systems are registered, and Classification Certificates uploaded on IRIS – well done. The other systems do not have certificates in place
2. Very limited to no information is uploaded on the IRIS system and also not available in indexed hard-copy format
3. Information in support of sub-KPA D1 and sub-KPA E3 from the Groblershoop system partially uploaded
4. Flow data and design capacity is unknown for any of the systems – which triggered a penalty
5. No risk plans, condition assessments or any technical reports were available
6. No financial information was available, noting the absence of financial officers during audit
7. No management commitment or care to duty was impressed by !Kheis – turnaround would require leadership involvement and setting an enabling environment to work and progress.

The Regulator is concerned about the overall poor state of wastewater services at all systems and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Wegdraai WWTW 0%

The **Wegdraai WWTW** was inspected to verify the Green Drop audit findings:

- The 0% score reflects the dismal performance and lack of functional, maintained, or operational equipment and processes
- The entire plant is in an advanced state of disrepair and dilapidation
- All processes and equipment are rundown via a lack of infrastructure maintenance and basic operations
- Vandalism is a high-risk factor, and no anti-vandalism strategies seem to be in place to safeguard public infrastructure or provide a safe, satisfactory work environment to the staff.



4.15 Magareng Local Municipality

Water Service Institution	Magareng Local Municipality	
Water Service Provider	Magareng Local Municipality	
Municipal Green Drop Score	VROOM Impression (Towards restoring functionality):	
2021 Green Drop Score	5%↓	1. Screening not effective
2013 Green Drop Score	33%	2. Grit removal not effective
2011 Green Drop Score	20%	3. Chlorine disinfection to be reinstated
2009 Green Drop Score	0%	4. Screening bypass channel needs to be considered
		5. Dysfunctional aerator equipment to be addressed
		VROOM Estimate:
		- R360,000

Key Performance Area	Weight	Warrenton
A. Capacity Management	15%	32.0%
B. Environmental Management	15%	9.0%
C. Financial Management	20%	47.5%
D. Technical Management	20%	0.0%
E. Effluent & Sludge Compliance	30%	0.0%
F. Bonus		15.0%
G. Penalties		-75.0%
H. Disqualifiers		Directive
Green Drop Score (2021)		5%
2013 Green Drop Score		34%
2011 Green Drop Score		30%
2009 Green Drop Score		0%
Design Capacity	MI/d	2
Design Capacity Utilisation (%)		70%
Resource Discharged into		Vaal River
Microbiological Compliance	%	Insufficient data set
Chemical Compliance	%	Insufficient data set
Physical Compliance	%	Insufficient data set
Wastewater Risk Rating (CRR% of CRR_{max})		Warrenton
CRR (2011)		88.2%
CRR (2013)		88.2%
CRR (2021)		88.2%

Regulator's Comment:

The Magareng Local Municipality was ill prepared for the initial audit. No evidence of key aspects such as final effluent compliance was uploaded to IRIS. Oversight by senior management seems to be lacking. The Regulator notes with disappointment the sharp decline from the 2013 baseline Green Drop score of 33% to 5% which places the Warrenton wastewater network and treatment system in critical state.

Green Drop requirements are not met for most of the criteria, notably with the largest gaps in KPAs A, D and E. Although various aspects could be singled out as reason for the poor performance, the lack of evidence pertaining to compliance monitoring, condition assessment, W₂RAP, asset register, O&M manual, financials, operational monitoring and sludge management, were most prominent and can be used to formulate a turnaround plan. A significant and an unfortunate development is the vandalism of infrastructure. Aging infrastructure failure also needs to be addressed. Inhouse O&M and external specialist contractors are used on ad-hoc basis as needed. Contracts need to be designed and monitored, specifically related to supervisory, operational and maintenance requirements.

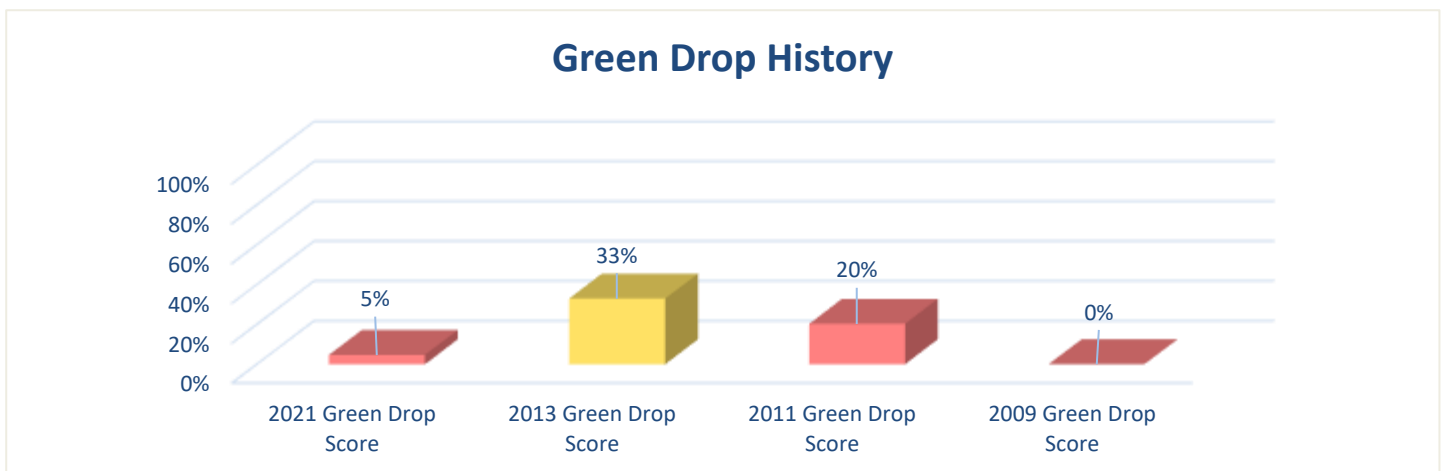
Most importantly, no performance measures are in place to safeguard final effluent or sludge quality. Credible data from the laboratory and the non-use of field instrumentation is an eminent risk and needs to be addressed via the W₂RAP process. The Magareng Local Municipality is urged to further develop the W₂RAP as an effective mechanism to for a sustainable turnaround strategy.

The Regulator is placing Magareng on its list of priority interventions in terms of the Enforcement Protocol, due to the critical state of wastewater management in the municipality.

Green Drop findings:

1. The Supervisor and majority of Process Controllers are not registered
2. No Water Use License in-place and no water quality monitoring programmes or maintenance planning in place
3. The treatment works does not comply with effluent quality standards, thereby impacting negatively on the receiving environment and public health.
4. The WWTW has no information pertaining to its inflow, process unit performance, and infrastructure capacity or status
5. No Bylaws are available nor implemented
6. The W₂RAP is not fully implemented and should be used to prioritise critical risks
7. No capacity and condition assessment/audit on sewer reticulation network and pump stations was conducted
8. Sludge should be classified, and sludge monitoring plan should be developed and implemented
9. There is lack of commitment from the municipality management to rectify the current dreadful performance. Improvement is urgently required
10. A pro-active plan to combat vandalism must be developed and enforced
11. No business plans or capital budgets have been provided to address infrastructure or capacity defects.

The Regulator is concerned about the overall poor state of wastewater services at the Warrenton systems and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Warrenton WWTW **18%**

The **Warrenton WWTW** was inspected to verify the Green Drop audit findings:

- Main outfall sewer collection pipeline regularly blocks and floods adjacent dwellings. This is a serious health risk to the community. Pumps were not operational
- PFD and incident management protocols were not displayed
- No operational monitoring was done. Operational design limits of the process units were calculated by the Audit Team. Operational and maintenance logbooks were not available
- The treatment site is signposted; however, not fenced and very little to no housekeeping is performed on site
- Screenings were not measured and not disposed of safely
- Flow meters were in place, however no calibration certificates could be provided

- No raw sewage quality or extraneous flows were not recorded and monitored
- Operational and compliance monitoring was not conducted
- The clarifier was not operational due to mechanical failure and vandalism
- The reactor unit was not functional due to mechanical failure and vandalism
- The final effluent did not comply, which reiterated the inefficacy of upstream treatment processes
- Sodium hypo-chloride disinfection system was installed, but not used. Dosing area is not bunded and poses an OHS risk
- Sludge treatment is available, however, not performed. Structures are in good condition
- No sludge management procedures were in place and sand must be replenished in sludge drying beds.



Drying beds available but not used



Mechanical equipment not operational due to lack of maintenance and servicing



Mechanical equipment not operational due to lack of maintenance and servicing

4.16 Nama Khoi Local Municipality

Water Service Institution	Nama Khoi Local Municipality	
Water Service Provider	Nama Khoi Local Municipality	
Municipal Green Drop Score	VROOM Impression (Towards restoring functionality):	
2021 Green Drop Score	27%↓	1. Lining of ponds
2013 Green Drop Score	34%	2. Office and ablution facilities
2011 Green Drop Score	37%	3. Inlet works
2009 Green Drop Score	58%	4. Screening
		5. Flow meter dysfunctional
		6. Screenings disposal and health hazards.
		VROOM Estimate:
		- R10,570,000

Key Performance Area	Weight	Springbok	Bergsig	Carolusberg	Concordia
A. Capacity Management	15%	62.5%	62.5%	62.5%	62.5%
B. Environmental Management	15%	66.9%	66.9%	57.5%	57.5%
C. Financial Management	20%	56.9%	56.9%	56.9%	56.9%
D. Technical Management	20%	8.8%	8.8%	8.8%	8.8%
E. Effluent & Sludge Compliance	30%	7.5%	26.3%	7.5%	7.5%
F. Bonus		0.0%	0.0%	0.0%	0.0%
G. Penalties		-25.0%	-25.0%	-25.0%	-25.0%
H. Disqualifiers		None	None	Notice	None
Green Drop Score (2021)		29%	35%	28%	28%
2013 Green Drop Score		38%	40%	32%	45%
2011 Green Drop Score		32%	58%	54%	39%
2009 Green Drop Score		62%	62%	19%	19%
System Design Capacity	MI/d	1	1	0.5	0.5
Design Capacity Utilisation (%)		NI	NI	NI	NI
Resource Discharged into		Orange River	Orange River	Orange River	Orange River
Microbiological Compliance	%	20%	Insufficient data set	0%	Insufficient data set
Chemical Compliance	%	0%	Insufficient data set	4%	Insufficient data set
Physical Compliance	%	48%	Insufficient data set	52%	Insufficient data set
Wastewater Risk Rating (CRR% of CRR_{max})		Springbok	Bergsig	Carolusberg	Concordia
CRR (2011)	%	64.7%	82.4%	64.7%	70.6%
CRR (2013)	%	94.1%	82.4%	94.1%	82.4%
CRR (2021)	%	88.2%	94.1%	88.2%	94.1%

Key Performance Area	Weight	Komaggas	Nababeep	Okiep	Steinkopf
A. Capacity Management	15%	62.5%	50.0%	62.5%	62.5%
B. Environmental Management	15%	57.5%	46.0%	57.5%	57.5%
C. Financial Management	20%	56.9%	45.5%	56.9%	56.9%
D. Technical Management	20%	8.8%	15.0%	8.8%	8.8%
E. Effluent & Sludge Compliance	30%	7.5%	6.0%	11.3%	32.5%
F. Bonus		0.0%	0.0%	0.0%	0.0%
G. Penalties		-25.0%	-50.0%	-25.0%	-25.0%
H. Disqualifiers		None	Notice	None	None
Green Drop Score (2021)		28%	19%	29%	35%
2013 Green Drop Score		51%	22%	34%	37%

Key Performance Area	Weight	Komaggas	Nababeep	Okiep	Steinkopf
2011 Green Drop Score		44%	18%	21%	29%
2009 Green Drop Score		62%	62%	62%	62%
System Design Capacity	MI/d	0.5	2	1	0.5
Design Capacity Utilisation (%)		NI	NI	NI	NI
Resource Discharged into		Orange River	Orange River	Orange River	Orange River
Microbiological Compliance	%	Insufficient data set	Insufficient data set	18%	91%
Chemical Compliance	%	Insufficient data set	Insufficient data set	4%	39%
Physical Compliance	%	Insufficient data set	Insufficient data set	39%	37%
Wastewater Risk Rating (CRR% of CRR _{max})		Komaggas	Nababeep	Okiep	Steinkopf
CRR (2011)	%	82.4%	82.4%	82.4%	82.4%
CRR (2013)	%	82.4%	82.4%	88.2%	88.2%
CRR (2021)	%	94.1%	94.1%	88.2%	82.4%

Regulator's Comment:

The Nama Khoi team was well prepared for the Green Drop audit, with the senior manager, Green Drop champion and supervisors in attendance. Rather than taking the normal route of showing hard copy documents in files, the team displayed all evidence, material, and photos on a wall-mounted TV screen. This method allowed for easy navigation through the evidence. Despite the professional set up, the eight systems did not have sufficient documentation to satisfy a number of audit requirements. The primary gaps being the lack of Process Controller and Supervisor registration, and IRIS not showing the uploaded information. The GD champion is advised to contact the IRIS helpdesk to resolve any problems with the system.

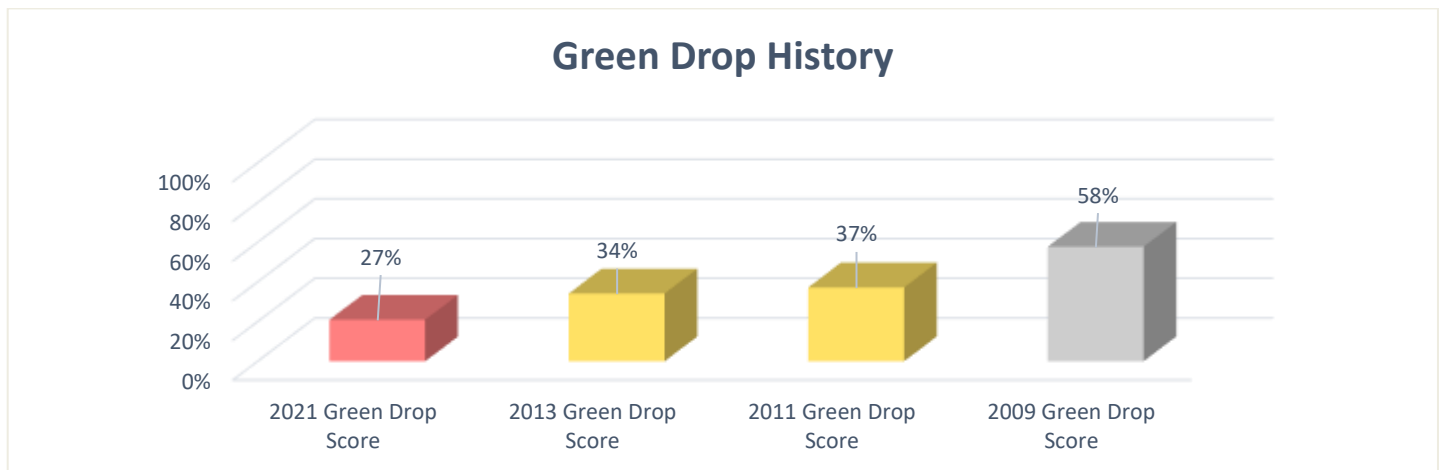
Immediate areas for improvement can be implemented by ensuring flow measurement, and compliance and operational monitoring at all WWTWs. The Regulator urges the municipality to rectify these in order to comply with both the authorisation and Green Drop standards. These shortcomings attracted low scores and penalties. Poor compliance of the final effluent water quality with the mandatory requirements was noted, thus resulting in Nama Khoi LM only scoring 27% for the 2021 GD audit. The score for the TSA of the Springbok ponds system (20%) was also disappointing, but can be readily improved by addressing systems information, plans, and minor infrastructure improvements. The non-payment of the contracted laboratories and lack of ringfenced budgets must be addressed with the financial department.

The positive attitude of the GD team was welcoming, and the Regulator was impressed with the further uploads on IRIS after the main audit. Correcting the key gaps above will result in a significant increase in the audit score during the upcoming 2023 audit. Unfortunately, the critical state of six wastewater systems places Nama Khoi under regulatory enforcement.

Green Drop findings:

1. No inflow measurement or raw wastewater analysis is done at any of the pond systems; hence, no information is available regarding the loading to the WWTWs. This seriously affects both the compliance and operational control of the final treated water, and hampers any attempts to improve the performance of the ponds systems
2. The quality of the final effluents during the audit year did not comply with the requirements at any of the 8 WWTWs, compounded by the lack in operational monitoring.
3. The municipality is aware of all the risks and shortcomings of the wastewater treatment function, as they have a risk register in place and also compiled (internally) W₂RAPs in 2017. This risk plan should be updated, and resources secured to implement mitigation of high and critical risks. Such evidence must be kept for the 2023 audit
4. No proof was shown of actively managing the asset register and using it in the planning of maintenance programs or budgeting
5. Authorisations of the WWTWs are lacking
6. Loading of compliance monitoring results on IRIS is irregular and incomplete data sets
7. No condition assessments or process audits are in place. Management does not have a good understanding of what the condition (and improvement needs) of the WWTWs are and cannot make informed decisions or longer-term plans
8. Sampling and arrangements with laboratories appear to satisfactorily managed, however turnaround issues need to be resolved
9. Training is largely absent more opportunities should be made to upskill Process Controllers and Supervisors
10. All the plants are in critical and high-risk positions
11. The Green Drop trend analysis (below) shows a steep and consistent decline with each audit year, starting in 2009
12. No capital funds are in place to address the shortcomings.

The Regulator is concerned about the overall poor state of wastewater services at all systems and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Springbok WWTW 20%

The **Springbok WWTW** was inspected to verify the Green Drop audit findings:

- The pump station was in a poor condition, with no fencing, no access control, and no signage in place
- The building is not secured, and the site was overgrown and unsecured
- A small building was found on site with no content - no classification certificates were displayed
- There is no signage at the entrance of the WWTW; however, the building just inside the gate was signposted
- The treatment facility's surrounding area was poor and untidy, with litter due to a landfill that is located close by
- The screenings were not measured and poorly disposed of on-site for more than six (6) months. These rows of screenings are located next to the WWTW building and creates a health hazard
- The inlet works (screen) was not effective and the discharge facilities for the tank trucks needs attention
- A flow meter was in place, but was not operational
- Weeds were present in and around the ponds and evident of poor grounds keeping. The ponds were all unprotected, but no serious erosion was observed
- Odours were present around the ponds
- No discharge of final effluent took place, due to high evaporation rates
- Effluent is irrigated on the adjacent golf course.



4.17 Phokwane Local Municipality

Water Service Institution	Phokwane Local Municipality		
Water Service Provider	Phokwane Local Municipality		
Municipal Green Drop Score		VROOM Impression (Towards restoring functionality): 1. Newly constructed reactor basin, including return flows, and SST to be to be commissioned 2. Chlorine disinfection to be reinstated VROOM Estimate: - R1,501,000	
2021 Green Drop Score	0%↓		
2013 Green Drop Score	34%		
2011 Green Drop Score	30%		
2009 Green Drop Score	0%		

Key Performance Area	Weight	Hartswater	Jan Kempisdorp	Pampierstad
A. Capacity Management	15%	20.0%	0.0%	0.0%
B. Environmental Management	15%	0.0%	0.0%	0.0%
C. Financial Management	20%	0.0%	0.0%	0.0%
D. Technical Management	20%	0.0%	0.0%	0.0%
E. Effluent & Sludge Compliance	30%	0.0%	0.0%	0.0%
F. Bonus		0.0%	0.0%	0.0%
G. Penalties		0.0%	0.0%	0.0%
H. Disqualifiers		Directive	Directive	None
Green Drop Score (2021)		1%	0%	0%
2013 Green Drop Score		40%	40%	66%
2011 Green Drop Score		21%	0%	0%
2009 Green Drop Score		7%	7%	0%
Design Capacity	MI/d	1.2	2.7	4
Design Capacity Utilisation (%)		NI	NI	NI
Resource Discharged into		Vaal River	Vaal River	Harts River
Microbiological Compliance	%	No monitoring	No monitoring	No monitoring
Chemical Compliance	%	No monitoring	No monitoring	No monitoring
Physical Compliance	%	No monitoring	No monitoring	No monitoring
Wastewater Risk Rating (CRR% of CRR_{max})		Hartswater	Jan Kempisdorp	Pampierstad
CRR (2011)	%	41.1%	64.7%	76.5%
CRR (2013)	%	70.6%	64.7%	41.2%
CRR (2021)	%	100.0%	100.0%	100.0%

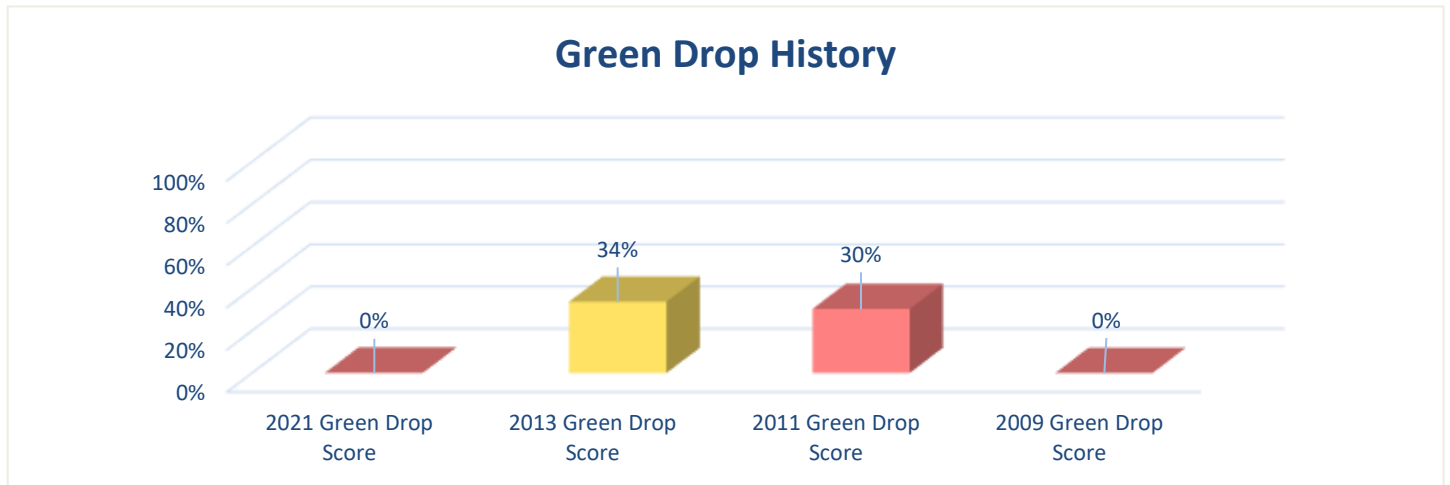
Regulator's Comment:

The Phokwane Local Municipality continues to disappoint and seems devoid of leadership and technical integrity. The WSA's dismissive attitude towards a national flagship programme is reflected in a municipal Green Drop score of 0% and TSA score of 19%. Clearly, wastewater services is not a priority as is seen by the lack of commitment by municipal leadership and disregard for an important learning opportunity. The deterioration of assets, poorly operated processes, and continuous pollution is impacting on the residents of Phokwane and contaminating the area's previous water resources. Over and above the Directives issued, the Regulator will accelerate the Enforcement Protocol to hold the municipality accountable for the critical state of wastewater services.

Green Drop findings:

1. Lack of participation during the 2021 Green Drop audit process
2. No information is available on IRIS
3. Historic information had been sourced by the audit team, and a site inspection conducted to verify observations
4. No business plans or capital budgets have been provided to address infrastructure or capacity defects
5. All plants are in the critical risk positions

The Regulator is concerned about the overall poor state of wastewater services at Hartswater, Jan Kempdorp and Pampierstad systems and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Hartswater WWTW 19%

The **Hartswater WWTW** was inspected to verify the Green Drop audit findings:

- The network and pumpstations was reported to be functional and operational
- PFD and incident management protocols were not displayed, and operational and maintenance logbooks were lacking
- The facility was fenced and not accessible to general public and livestock
- The facility was not signposted but tidy
- The office area, lockers, eating, and ablution were not in an acceptable state
- Flow meters were installed, but no records kept, and no raw sewage quality or extraneous flows monitored
- No operational monitoring was done, and operational design limits of the process units were not known to the staff
- Desludging of clarifiers was not done. Upstream unit processes are being used as conduits and no physical treatment of influent received
- A reactor unit is being refurbished
- Chlorination was not operational
- Health and safety aspects were being neglected
- Sludge treatment facility were available and functional, and structures were found to be in acceptable condition. However, operational procedures and monitoring were not done.



Screening and de-gritting installed at head of works



Commissioning of the new unit processes will enhance treatment capability and improved final effluent quality



Existing disinfection facility being extended to sodium hypo chloride, will be commissioned under the current upgrade contract

4.18 Renosterberg Local Municipality

Water Service Institution	Renosterberg Local Municipality		
Water Service Provider	Renosterberg Local Municipality		
Municipal Green Drop Score	VROOM Impression (Towards restoring functionality): 1. Tanker dumping facility and inlet works to be constructed 2. Oxidation ponds to be relined 3. Fencing around the WWTW requires upgrading VROOM Estimate: - R120,000		
2021 Green Drop Score			0%↓
2013 Green Drop Score			1%
2011 Green Drop Score			28%
2009 Green Drop Score			1%

Key Performance Area	Weight	Petrusville	Phillips Town	Vanderkloof
A. Capacity Management	15%	0.0%	0.0%	0.0%
B. Environmental Management	15%	0.0%	0.0%	0.0%
C. Financial Management	20%	0.0%	0.0%	0.0%
D. Technical Management	20%	0.0%	0.0%	0.0%
E. Effluent & Sludge Compliance	30%	0.0%	0.0%	0.0%
F. Bonus		0.0%	0.0%	0.0%
G. Penalties		0.0%	0.0%	0.0%
H. Disqualifiers		None	None	None
Green Drop Score (2021)		0%	0%	0%
2013 Green Drop Score		69%	0%	0%
2011 Green Drop Score		32%	31%	22%
2009 Green Drop Score		1%	1%	1%
Design Capacity	MI/d	0.7	0.3	0.2
Design Capacity Utilisation (%)		NI	NI	NI
Resource Discharged into		Orange River	Vanderkloof Dam	Vanderkloof Dam
Microbiological Compliance	%	No monitoring	No monitoring	No monitoring
Chemical Compliance	%	No monitoring	No monitoring	No monitoring
Physical Compliance	%	No monitoring	No monitoring	No monitoring
Wastewater Risk Rating (CRR% of CRR_{max})		Petrusville	Phillips Town	Vanderkloof
CRR (2011)		94.1%	47.1%	94.1%
CRR (2013)		88.2%	88.2%	94.1%
CRR (2021)		100.0%	100.0%	100.0%

Regulator's Comment:

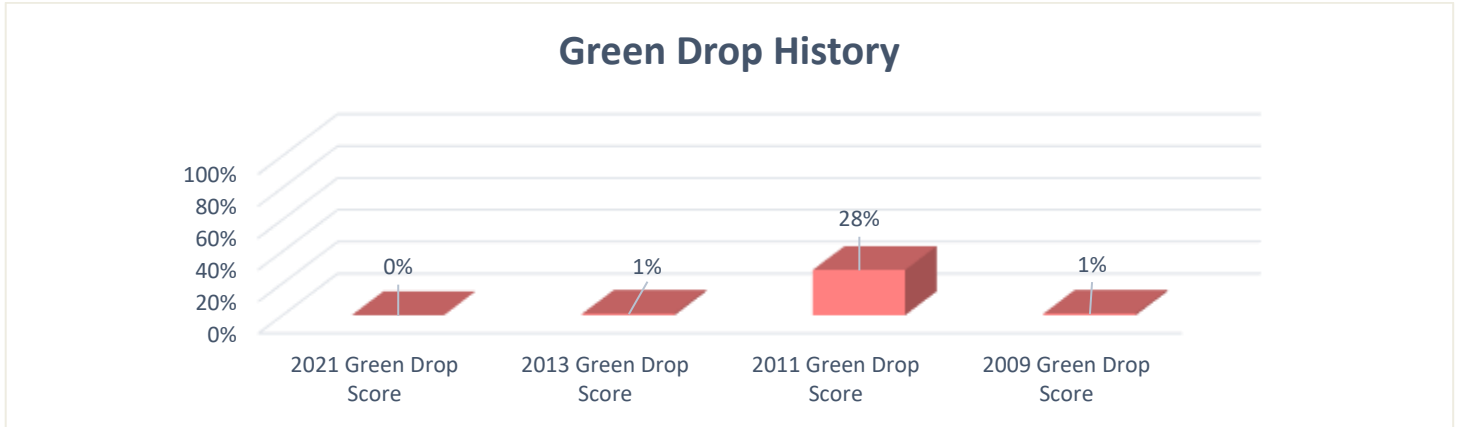
Renosterberg Local Municipality continues to disappoint and stands unaccountable for wastewater services to their community and environment. The municipality failed to attend the audit, despite numerous communications and notices, thereby forfeiting an opportunity to turnaround their performance. Noting the continued critically low Green Drop scores since 2009, it is clear that turnaround will not be possible without stern leadership and higher intervention.

IRIS is poorly populated with lack of evidence on key aspects of the Green Drop requirements. Compliance and good practice is not a priority, and no plans are in place to address such. The Municipality did not attend either the main audit or 2nd confirmation audit. The WSA's dismissive attitude and its lack of response to a performance evaluation of national scale is disturbing. The Green Drop score of 0% and TSA score of 10% indicate that neither administration and field work is being done according to standards and compliance. The Regulator will accelerate the Enforcement Protocol to hold the municipality accountable for the unacceptable state of wastewater services.

Green Drop findings:

1. The lack of participation during the 2021 Green Drop audit process poses a major risk to the community and water quality in Renosterberg
2. All the WWTWs are in high-level critical risk states. Rapid and urgent intervention is required
3. No business plans or capital budgets have been provided to address infrastructure or capacity defects.

The Regulator is concerned about the overall poor state of wastewater services at all systems and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Petrusville WWTW 10%

The **Petrusville WWTW** was inspected to verify the Green Drop audit findings:

- The network and pump stations could not be inspected due to the lack of staff at the municipality or on site
- At the treatment works, facilities were vandalised and in a shocking condition
- PFD and incident management protocols were not displayed, and operational and maintenance logbooks were lacking
- The facility is fenced, but no controlled accesses at the main gate
- The facility is not signposted, and little housekeeping was being conducted
- Ablutions were present but dirty, unhygienic and not usable. Administration building is not fit to perform work duties
- No constructed inlet works/area for tankers to dump into the pond system
- Screenings and grit was not removed nor appropriately disposed of
- No raw sewage quality or extraneous flows were monitored
- No evidence of operational or compliance monitoring
- The site appeared abandoned and neglected, with no control or compliance measures in place.

<p><i>Pond system overgrown and not maintained</i></p>	<p><i>New anaerobic ponds not yet commissioned. Treatment process train is not complete</i></p>	<p><i>Ablutions are not clean or usable</i></p>

4.19 Richtersveld Local Municipality

Water Service Institution	Richtersveld Local Municipality	
Water Service Provider	Richtersveld Local Municipality	
Municipal Green Drop Score	VROOM Impression (Towards restoring functionality):	
2021 Green Drop Score	2%↓	1. Vandalism
2013 Green Drop Score	9%	2. Ponds lining
2011 Green Drop Score	28%	3. Flow metering
2009 Green Drop Score	0%	VROOM Estimate:
		- R628,320

Key Performance Area	Weight	Port Nolloth
A. Capacity Management	15%	30.0%
B. Environmental Management	15%	0.0%
C. Financial Management	20%	0.0%
D. Technical Management	20%	7.6%
E. Effluent & Sludge Compliance	30%	0.0%
F. Bonus		0.0%
G. Penalties		-12.5%
H. Disqualifiers		None
Green Drop Score (2021)		2%
2013 Green Drop Score		9%
2011 Green Drop Score		28%
2009 Green Drop Score		0%
System Design Capacity	MI/d	3
System Capacity Utilisation (%)		33%
Resource Discharged into		Irrigation
Microbiological Compliance	%	0%
Chemical Compliance	%	67%
Physical Compliance	%	50%
Wastewater Risk Rating (CRR% of CRR_{max})		Port Nolloth
CRR (2011)	%	47.1%
CRR (2013)	%	94.1%
CRR (2021)	%	82.4%

Regulator's Comment:

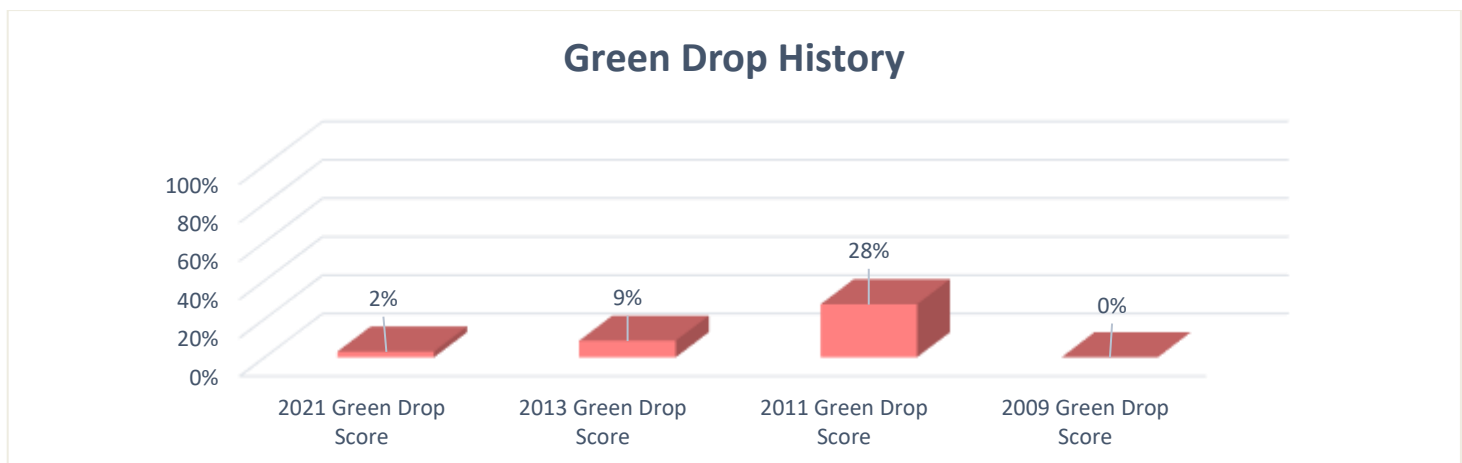
The senior manager and data capturer represented Richtersveld Local Municipality. The District Municipality was not present. The municipality has limited systems in place for operation and management of its wastewater function. As a consequence, a 2% Green Drop score was assigned. The senior manager indicated that he was largely aware of the shortcoming in the wastewater system and would appreciate any assistance that may be provided to get the required systems and programs in place.

The Port Nolloth oxidation ponds system is currently in the process of being extended, and the municipality is urged to put all the required monitoring programs, plant condition assessments, risk management, operational personnel, and financial control systems (budget and expenditure) in place during the upgrading process, and certainly before the next Green Drop Audit in 2023. The Regulator is disappointed in the poor response to the mandatory requirements on compliance and good practice and thereby places Richtersveld on its list of priority interventions.

Green Drop findings:

1. No evidence was provided on registration of the WWTW or the process controllers working in the wastewater section
2. Local contractors are used to perform the maintenance on the mechanical equipment, mostly the raw sewage pumps. No examples of contracts or any other evidence could be provided
3. No risk registers or W₂RAPs are available. The municipal team was not familiar with W₂RAPs and need assistance to get this plan in place for the municipality
4. No operational or compliance monitoring programs are in place and relies on the Namaqua DM and Pathcare to do the sampling and analysis of water and wastewater samples
5. There is no flow measurement at either the WWTW or the pump station, and the municipality therefore does not have an indication of the day-to-day hydraulic loading on the plant
6. The municipality relies to a large extent on their consulting engineers to do the planning for upgrading of and extensions to the WWTW, including condition assessments. The municipality should capacitate themselves to do the operational and compliance monitoring themselves
7. Compliance results were only uploaded for February 2021, hence the % compliance was reworked from 1 month to 12 months – showing low % compliance
8. The fact that there was no measurement of the inflow to the plant incurred a 50% penalty, but this was reduced to 25% because bulk water flow figures indicated that the oxidation ponds system is not overloaded
9. No capital project evidence was presented but indications are that tenders are underway to line the older pond systems.

The Regulator is concerned about the overall poor state of wastewater services at all systems and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Port Nolloth WWTW 29%

The **Port Nolloth WWTW** was inspected to verify the Green Drop audit findings:

- The pump station was in a good condition and secure, well fenced, and the building had sufficient ventilation
- Two pumps were present, one duty and one standby, and both in good working condition
- The MCC was accessible and in good condition
- The fence around the oxidation ponds were vandalised and the gate was stolen, no signage visible
- No screens at the ponds system, but some of the pump stations have screens
- The ponds system is currently being upgraded and extended
- There are nine (9) ponds in total, of which three (3) are new
- The three (3) new ponds were lined. Of the five (5) old ponds, two (2) were lined. Tender documents being prepared for the other old ponds to be lined
- The ponds are lined; however, the sections of plastic lining material above the high-water level mark has largely been stolen, allegedly by illegal diamond prospectors in the area
- There was no discharge of the final effluent, due to evaporation from the ponds
- Long term plans are to irrigate the effluent to the Sportsfield.



Ponds are currently being upgraded and lined



Nine ponds of which 3 are newly constructed. Sections of lining removed by illegal persons



Fence is vandalised, gate stolen, and overall groundskeeping not good

4.20 Siyancuma Local Municipality

<i>Water Service Institution</i>	Siyancuma Local Municipality		
<i>Water Service Providers</i>	Siyancuma Local Municipality		
Municipal Green Drop Score	VROOM Impression (Towards restoring functionality):		
2021 Green Drop Score	26%↑	1. Screens	
2013 Green Drop Score	17%	2. Flow meters	
2011 Green Drop Score	4%	3. Trickling filter pumps	
2009 Green Drop Score	0%	4. Humus tank pump	
		VROOM Estimation:	
		- R2,948,000	
		- Upgrade of sewer network currently undertaken	

Key Performance Area	Weight	Douglas	Griekwastad	Schmidtsdrift
A. Capacity Management	15%	80.0%	80.0%	80.0%
B. Environmental Management	15%	48.8%	48.8%	28.8%
C. Financial Management	20%	0.0%	0.0%	0.0%
D. Technical Management	20%	6.5%	6.5%	0.0%
E. Effluent & Sludge Compliance	30%	37.5%	4.7%	0.0%
F. Bonus		4.0%	0.0%	0.0%
G. Penalties		0.0%	0.0%	-25.0%
H. Disqualifiers		Notice	None	None
Green Drop Score (2021)		32%	22%	13%
2013 Green Drop Score		9%	26%	24%
2011 Green Drop Score		4%	4%	0%
2013 Green Drop Score		9%	26%	24%
System Design Capacity	ML/d	2.7	0.7	1
Design Capacity Utilisation (%)		59%	97%	NI
Resource Discharged into		Vaal	Vaal	Vaal
Microbiological Compliance	%	71%	67%	No Monitoring
Chemical Compliance	%	No Monitoring	No Monitoring	No Monitoring
Physical Compliance	%	No Monitoring	No Monitoring	No Monitoring
Wastewater Risk Rating (CRR% of CRR_{max})		Douglas	Griekwastad	Schmidtsdrift
CRR (2011)	%	100.0%	52.9%	52.9%
CRR (2013)	%	100.0%	100.0%	100.0%
CRR (2021)	%	82.4%	82.4%	94.1%

Regulator's Comment:

The Siyancuma Local Municipality rendered a valiant and committed effort to engage with the Green Drop audit process and succeeded to improve from 17% in 2013 to a Green Drop score of 26%. Noting the Green Drop History graph below, it is clear that the municipality is slowly but consistently building an increased compliance portfolio, and this is acknowledged by the Department. Unfortunately, the low Green Drop score indicates that the bulk of the regulatory standards and good practice are not being achieved. All WWTWs are in high or critical risk space as is evident from the CRR scores. The Regulator takes note of the destruction of critical documentation and reports during civil unrest and burning of municipal buildings. However, these incidents emphasise the need for a risk-based approach, noting that no W₂RAPs have been in place to guide decision making and resource allocation in 2020/21. Coupled with increased trends in vandalism, a risk-averse management approach should be considered.

The most immediate areas for improvement should be aligned with basics wastewater practice, i.e. registration of Process Controllers and Supervisors, address the scientific and engineering gaps, training and skills enhancement, flow monitoring, operational and compliance monitoring, and resolving authorisations with DWS.

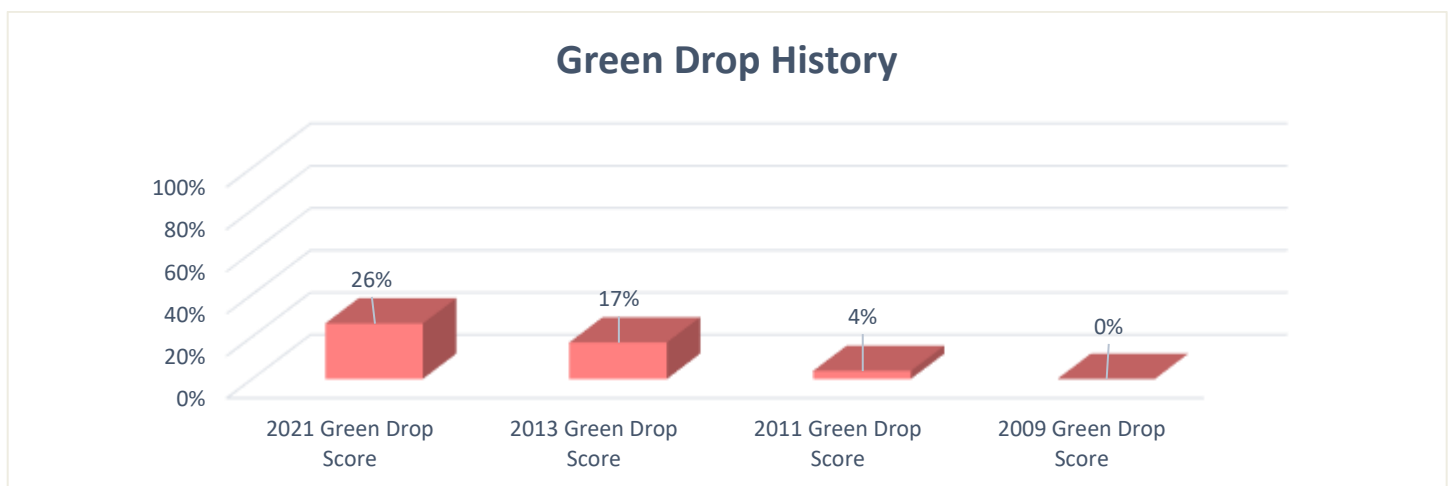
Financial information was lacking and drew a zero score. Technical management and design information also presented a weakness in the wastewater business, despite the technical skill that resides in the municipality.

The municipality is encouraged to develop and implement a W₂RAP for the sewer network and pumpstations with immediate effect, as risk-based planning forms a foundation from which to plan, prioritise and motivate resources towards improved. The poor state of the wastewater systems places Siyancuma on the priority list for enforcement intervention.

Green Drop findings:

1. Process Controllers and Supervisors are existing; however, no credit could be given as their registration status is incomplete on IRIS, and no soft copies could be provided of these qualifications
2. Despite the high functionality of the inspected sewers and treatment plant, the maintenance practice on paper could not attract a full score as results of partially completed maintenance schedules and logged activities
3. No W₂RAP or updated Condition Assessment was in place for any of the three (3) systems
4. Operational monitoring is mostly absent and compliance monitoring is done for microbiological compliance only – the absence of physical and chemical compliance monitoring is a serious regulatory indictment
5. No financial records, budgets, or asset registers could be viewed, the financial team was not present to present a cohesive municipal team
6. No design information or flow records could be presented, although limited information could be presented on the number of pumpstations and sewer lines
7. Effluent quality compliance is poor and need to be addressed as a priority – these aspects along with boost the GD score at the upcoming 2023 audit event
8. No capital projects have been reported to address the defects observed for any of the three wastewater systems. However, note is taken of the wastewater network pipeline that will be upgraded to accommodate larger volumes. No capital budget has been provided to this effect.

The Regulator is concerned about the overall poor state of wastewater services of Griekwastad and Schmidtsdrift and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Douglas WWTW 60%

The **Douglas WWTW** was inspected to verify the Green Drop audit findings:

- A total of 3 pump stations conveys sewage to the treatment facility – the pipelines are being upgraded to 315mm under construction since October 2020
- One standby pump on the inspected pumpstation has been out of commission for 5 months
- The treatment terrain was well maintained, neat, fenced, and workers facilities were in fair condition
- Inflow monitoring and analysis of raw sewage was absent and need to be initiated and results uploaded on IRIS
- Screening and grit removal units were functional, but volumes and frequencies not recorded, discharged, and burnt on-site

- Desludging of the ponds requires urgent investigation to ensure that the processes remains capable to reach final effluent quality
- Biofilters were structurally in good condition, no short-circuiting, centre column and arm distribution even
- Settled sewage from humus tank was of poor quality, desludging regimes and other operational aspects need priority attention
- Sludge withdrawal was not optimised, and humus pumps were dysfunctional or run down
- Maintenance protocols and schedules need to be attended to and informed by asset age and condition
- Chemical disinfectant was out of stock, resulting in poor compliance of final effluent and negative impact to the receiving water courses – no contact tank provided, discharge to a pond system and reedbeds
- Lack of safety signage and PPE presents an OHS hazard.



Terrain is fenced, neat and good groundskeeping evident



Screening is not optimal and screenings/grit disposed and burnt on-site



Pond systems are visually overloaded and no sludge removal scheduled

4.21 Siyathemba Local Municipality

Water Service Institution	Siyathemba Local Municipality		
Water Service Provider	Siyathemba Local Municipality		
Municipal Green Drop Score	VROOM Impression (Towards restoring functionality):		
2021 Green Drop Score	49.6%↑	1. No security presence at the Marydale WWTW	
2013 Green Drop Score	38%	2. Vandalism is prevalent	
2011 Green Drop Score	18%	3. No serious defects	
2009 Green Drop Score	67%	VROOM Estimate:	
		- R371,640,000	

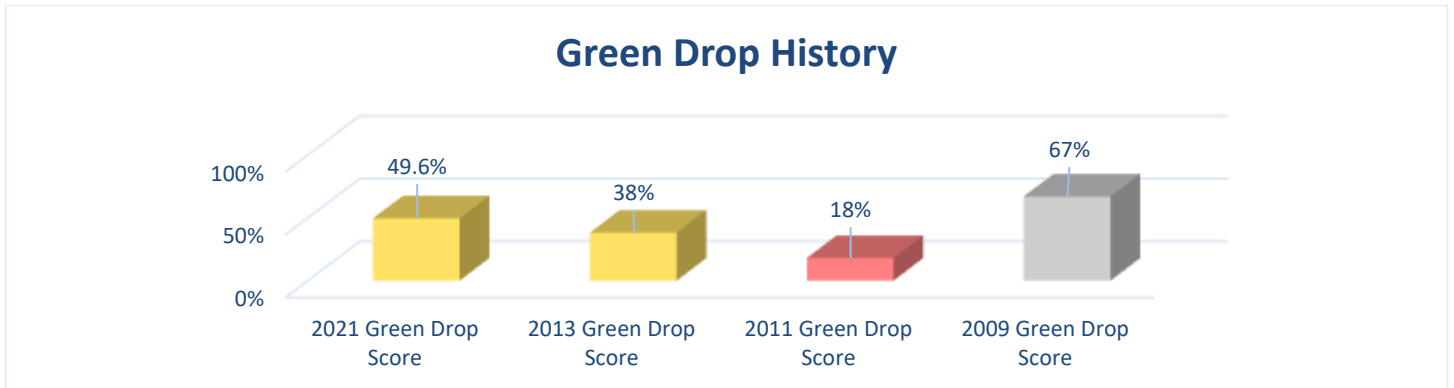
Key Performance Area	Weight	Prieska	Marydale	Niekerkshoop
A. Capacity Management	15%	77.5%	87.5%	52.5%
B. Environmental Management	15%	95.0%	95.0%	95.0%
C. Financial Management	20%	0.0%	0.0%	0.0%
D. Technical Management	20%	43.2%	32.4%	11.2%
E. Effluent & Sludge Compliance	30%	37.5%	37.5%	37.5%
F. Bonus		0.0%	0.0%	0.0%
G. Penalties		-5.0%	0.0%	-25.0%
H. Disqualifiers		None	None	None
Green Drop Score (2021)		50%	50%	37%
2013 Green Drop Score		23%	48%	48%
2011 Green Drop Score		22%	15%	17%
2013 Green Drop Score		71%	65%	65%
System Design Capacity	MI/d	2.2	0.94	0.12
Design Capacity Utilisation (%)		100%	40%	35%
Resource Discharged into		Vaal	Vaal	Vaal
Microbiological Compliance	%	27%	9%	0%
Chemical Compliance	%	52%	18%	34%
Physical Compliance	%	85%	39%	39%
Wastewater Risk Rating (CRR% as of CRR_{max})		Prieska	Marydale	Niekerkshoop
CRR (2011)	%	82.4%	52.9%	52.9%
CRR (2013)	%	76.5%	82.4%	88.2%
CRR (2021)	%	70.6%	64.7%	70.6%

Regulator's Comment:

Siyathemba Municipality presented a committed team, especially during the Confirmation Audit event when additional evidence was presented. The Green Drop score of 49.6% shows a commendable progress from the 38% baseline of 2013. The collaboration and exchange of information during the Marydale site assessment demonstrated the professionalism and depth of knowledge of the staff, supported by able use of IRIS, which resulted in a TSA score of 82%. Well done. The CRR scores for the wastewater systems are unfortunately not in the low-risk space that it should target, with Prieska and Niekerkshoop being in high-risk position and Marydale in medium risk position. This can be corrected by meeting 90% effluent quality compliance and by registering and adhering to Green Drop standards for Superintendents and Process Controllers. The Siyathemba team can improve their Green Drop score for 2023 by attending to the regulatory compliance and operational staff at the WWTWs, ensuring financial information is packaged and presented correctly (this was severely lacking), and by address process assessments and risk analysis and implementation. One risk that was highlighted was the electric supply that was disconnected to the Marydale WWTW as result of outstanding bill payment. Over or under use of hydraulic capacity carried penalties, and no bonuses were motivated for by the team. Training, skills development, water loss management and capital budgets are potential areas to improve on the Green Drop status going forward. The Regulator urges the Municipality to maximise these opportunities, with the assistance of the financial colleagues and support of municipal leaders.

Green Drop findings:

1. All WWTWs are classed and registered on IRIS
2. Process Controllers and Supervisor classification and registration is incomplete for all WWTWs
3. The maintenance capacity was well motivated and demonstrated a professional and able team; however, the competency of the team need evidence in terms of their qualifications
4. The focus area for Environment Management was well presented
5. All WWTWs had flow data and compliance monitoring
6. Financial data and asset values were absent and resulted in a lower audit score. The WSA is urged to engage with the municipal finance team toward ensuring common understanding of the financial information required by the wastewater division toward regulatory compliance
7. None of the three (3) systems had process assessments or condition assessments in place
8. Further work is required on network and pumpstation inspection and description of the assets
9. The WSA is advised to monitor the implementation of technical projects recently established and ensure that the outcomes are monitored and documented for future audit information
10. Poor effluent quality compliance is evident at all WWTWs and require urgent remedial interventions.



Technical Site Assessment

Marydale WWTW **82%**

The **Marydale WWTW** was inspected to verify the Green Drop audit findings:

- The WWTW consist of 2 anaerobic ponds, 1 primary, 1 secondary, 3 tertiary ponds in series, and was in a good state with functional infrastructure and processes
- Electricity supply was not connected during the assessment, due to outstanding bill payment
- Honeysuckers discharging septic tank effluent in the designated place at the inlet. The staff collect wastewater from the village septic tanks and empty these at the works – a schedule is kept at municipal office
- No permanent PCs or individuals are working at the plant, only to attend to honeysucker offload
- No inflow meter is in place - inflow is calculated from the honeysucker loads
- No capital works or budgets are in place or planned.



Vacuum tankers discharge wastewater to the head of works



Infrastructure is in place and well maintained



Prieska was recently upgraded and presents a picture of a well maintained functional and apt pond system

4.22 Sol Plaatje Local Municipality

Water Service Institution	Sol Plaatje Local Municipality		
Water Service Provider	Sol Plaatje Local Municipality		
Municipal Green Drop Score	VROOM Impression (Towards restoring functionality):		
2021 Green Drop Score	34%↓	1. The main outfall sewer towards Beaconsfield has collapsed	
2013 Green Drop Score	56%	2. Standby screen to be installed	
2011 Green Drop Score	76%	3. PST drive units to be refurbished	
2009 Green Drop Score	0%	4. SST desludge pipework to be refurbished	
		5. Chlorine disinfection system is dysfunctional	
		VROOM Estimate:	
		- R31,270,000	

Key Performance Area	Weight	Homevale	Beaconsfield	Ritchie
A. Capacity Management	15%	84.0%	84.0%	84.0%
B. Environmental Management	15%	16.0%	16.0%	16.0%
C. Financial Management	20%	26.5%	26.5%	26.5%
D. Technical Management	20%	37.0%	43.5%	37.0%
E. Effluent & Sludge Compliance	30%	15.0%	0.0%	7.5%
F. Bonus		52.5%	22.5%	15.0%
G. Penalties		-25.0%	0.0%	-25.0%
H. Disqualifiers		None	None	None
Green Drop Score (2021)		36%	32%	28%
2013 Green Drop Score		53%	53%	55%
2011 Green Drop Score		80%	62%	43%
2009 Green Drop Score		0%	0%	0%
Design Capacity	MI/d	48	9	2
Design Capacity Utilisation (%)		NI	104%	NI
Resource Discharged into		Kamfers Dam	De Beers Mine & du Toits Pan	Modder River
Microbiological Compliance	%	Insufficient data set	Insufficient data set	No monitoring
Chemical Compliance	%	Insufficient data set	Insufficient data set	No monitoring
Physical Compliance	%	Insufficient data set	Insufficient data set	No monitoring
Wastewater Risk Rating (CRR% of CRR_{max})		Homevale	Beaconsfield	Ritchie
CRR (2011)		59.3%	63.6%	76.5%
CRR (2013)		59.6%	68.2%	58.8%
CRR (2021)		96.3%	81.8%	94.1%

Regulator's Comment:

The Sol Plaatje Local Municipality achieved a Green Drop score of 34% which is a decline from 56% and 76% in former audits. However, the Municipality has shown commitment towards improving their wastewater management and engaged actively during the consultative audit process.

The use of the W₂RAP as a working document is highly commendable and the Municipality has done well in implementing its wastewater risk abatement plan. The W₂RAP must now be revised to update and include new identified risks. A significant and an unfortunate risk is the vandalism of infrastructure. In addition, aging infrastructure failure needs to be addressed. None of the WWTWs have Water Use Authorisations and no compliance monitoring is taking place. This single defect detracted significantly from a higher score that could have been achieved. In addition, the lack of operational monitoring and operational skills to operate, control and maintain the unit processes remains of great concern. No flow data is available to determine the extent in which the plant is being operated over/under capacity and planning for future extensions are not possible. No process audit has been conducted for a few years. Bylaws are in place and are being enforced.

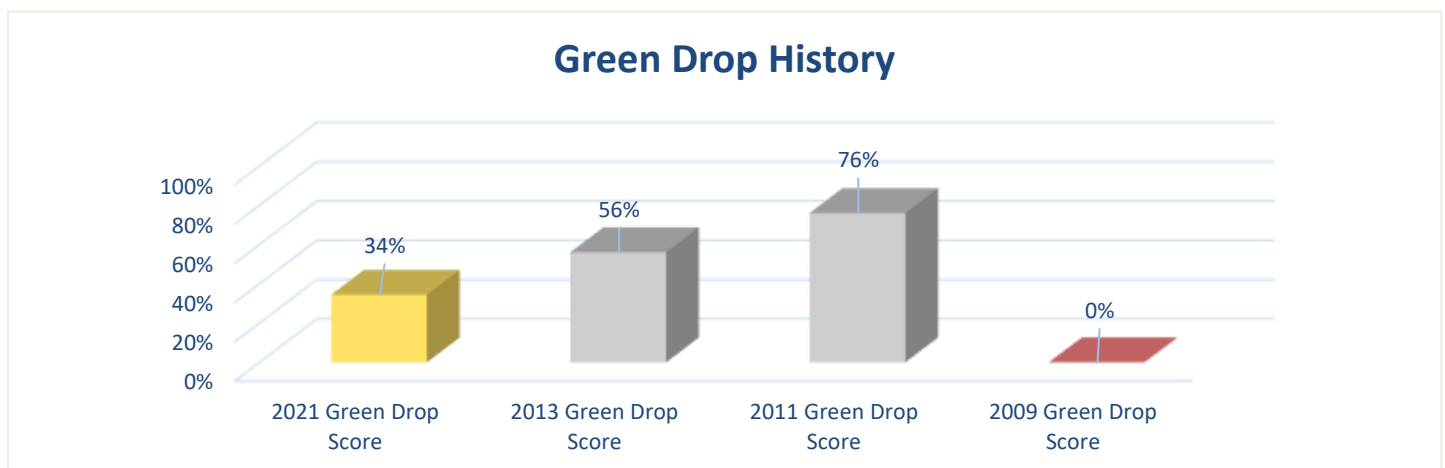
Considering the above, several improvement opportunities can be identified as a basis for a sustainable turnaround strategy. Skills development in the operations and management of wastewater processes and infrastructure is key, and continued development and training is required. Commitment and oversight by senior management needs to be intensified. The Green Drop Standards can be used to develop a GD Improvement Plan, however the implementation would require a skilled and qualified technical team.

The audit team noted with disappointment the continued long-term bypassing of infrastructure and discharge of raw sewage at Homevale WWTW that was vandalised in 2018 and none of the process units are operational. The poor Green Drop score of 36% for this system does not reflect the actual state affairs, as the impact of this situation can be regarded as critical, as is indeed reflected by the CRR value that places the plant in critical risk space.

The Regulator is concerned about the overall poor state of wastewater services at the Ritchie system and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.

Green Drop findings:

1. No flow measurement was recorded due to vandalism. Flowmeters to be calibrated as matter of urgency. Flow data to be recorded and interpreted to inform process optimisation
2. No capacity and condition assessment/audit on sewer reticulation network and pump stations was conducted
3. Sludge should be classified, and sludge monitoring plan should be developed and implemented
4. No basic process monitoring equipment is available and no operational nor compliance monitoring is done. Operational design limits of the process units are not known
5. Re-application for WUL for Beaconsfield WWTW is required
6. Financial information was available; however, not all cost drivers were addressed
7. Asset register should be developed and used to inform maintenance schedules and budgeting
8. No anti-vandalism strategy seems to be in place
9. The treatment plant does not comply with effluent quality standards, thereby impacting negatively on the receiving environment and public health
10. All plants are in critical and high-risk positions
11. No business plans or capital budgets have been provided to address infrastructure or capacity defects.



Technical Site Assessment

Beaconsfield WWTW **53%**

The **Beaconsfield WWTW** was inspected to verify the Green Drop audit findings:

- The main outfall sewer towards Beaconsfield has collapsed. Pump stations were in an acceptable condition, with in-house operations and maintenance attended to
- Large influent volumes were bypassing the WWTW and were being discharged to the environment
- PFD and incident management protocols were not displayed, and operational and maintenance logbooks records were lacking
- The terrain is not signposted, but the site is fenced. The terrain was clean and staff facilities in an acceptable condition
- Sludge was improperly disposed of on-site and poses an OHS risk

- Flow meters were in place, but no calibration certificates were available and not used to inform process optimisation. No raw sewage quality or extraneous flows were monitored or recorded
- No operational monitoring was done, and operational design limits of the process units were only reported within masterplans
- Desludging of settling tanks and clarifiers was inadequate and contributed to high solids carry-over to final effluent channels and high chlorine demand for disinfection
- Biofilters were functional and deliver a visually clear effluent, some structural defects noted in the biofilter walls and walkways
- Final effluent channels were clean but contained high solids, the chlorine equipment did not function effectively
- General OHS standards are practiced, but limited signage available and no certificates for chlorine handling was displayed
- Sludge treatment structures were in good condition, however, sludge wasting, and management was not effectively and safely conducted.

		
<p>Screening is operational</p>	<p><i>Effluent from the bio-filter acceptable</i></p>	<p><i>Unsafe on-site sludge disposal</i></p>

4.23 Thembelihle Local Municipality

Water Service Institution	Thembelihle Local Municipality		
Water Service Provider	Thembelihle Local Municipality		
Municipal Green Drop Score	VROOM Impression (Towards restoring functionality): 1. Screening channels to be constructed 2. Flowmeter to be calibrated 3. No disinfection in place, LM stated zero discharge VROOM Estimate: - R1,197,000		
2021 Green Drop Score			40%↓
2013 Green Drop Score			56%
2011 Green Drop Score			56%
2009 Green Drop Score			52%

Key Performance Area	Weight	Hopetown	Strydenburg
A. Capacity Management	15%	90.0%	77.5%
B. Environmental Management	15%	88.8%	58.8%
C. Financial Management	20%	30.6%	30.6%
D. Technical Management	20%	20.0%	30.9%
E. Effluent & Sludge Compliance	30%	9.4%	0.0%
F. Bonus		45.0%	15.0%
G. Penalties		-25.0%	0.0%
H. Disqualifiers		None	Notice
Green Drop Score (2021)		43%	35%
2013 Green Drop Score		54% (Old) and 62% (New)	33% (Old) and 55% (New)
2011 Green Drop Score		62.4%	26%
2009 Green Drop Score		25%	79%
Design Capacity	MI/d	1.3	0.8
Design Capacity Utilisation (%)		NI	NI
Resource Discharged into		Orange River	Orange River
Microbiological Compliance	%	Insufficient data set	No monitoring
Chemical Compliance	%	Insufficient data set	No monitoring
Physical Compliance	%	Insufficient data set	No monitoring
Wastewater Risk Rating (CR% of CRR_{max})		Hopetown	Strydenburg
CRR (2011)		100.0%	70.6%
CRR (2013)		64.7%	64.7%
CRR (2021)		82.4%	82.4%

Regulator's Comment:

The Thembelihle Local Municipality has shown a disappointing Green Drop performance from a promising score in the 2013 assessment cycle (56%) to the current municipal Green Drop score of 40%. Nevertheless, the Municipality impressed with a positive approach towards Green Drop conformance and management support.

Key gaps can be identified from the Green Drop scorecard, which identifies KPA E as the major detractor to a higher performance score. WWTWs did not have Water Use Authorisations in place, final effluent compliance monitoring were incomplete or absent, and no flow data was available as a baseline in planning for future extensions. Although a budget was presented, it did not include all cost drivers.

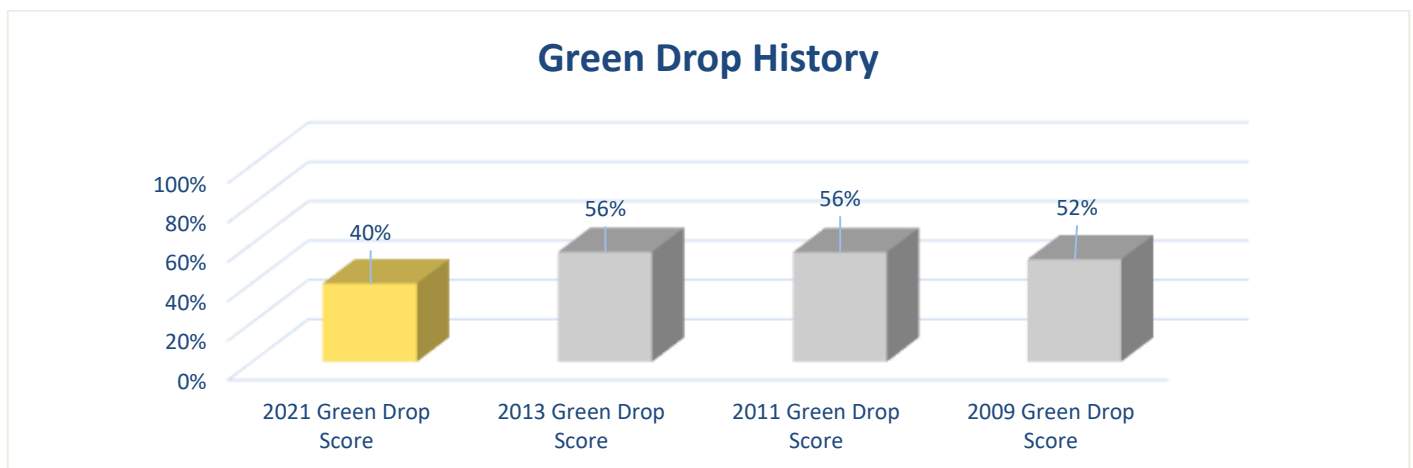
The Municipality is commended for good practices in terms of process monitoring and a strong operation and maintenance team. It is also encouraging to note that compliance monitoring is conducted for Hopetown WWTW and that sufficient numbers of qualified process controllers are employed.

Unfortunately, the lack of 12 months compliance data rendered Hopefield non-compliant on final effluent compliance. It is evident that the Municipality is embracing the Wastewater Risk Abatement process by showing a strong concerted commitment to its updated format and implementation thereof. Further points of strength include the Water Conservation and Water Demand Management Plan that was developed. The Regulator further notes that planning is underway to upgrade the Hopetown WWTW.

A good foundation has been prepared by the Municipality and it is encouraged to implement corrections against all Green Drop findings. Thembelihle has the will and potential to break the 60% Green Drop mark within the next audit cycle.

Green Drop findings:

1. Majority of Process Controllers comply with requirements, but are not formally registered, and classification not uploaded on IRIS
2. The WWTW do not monitor flow or have functional flow meters to inform forward planning or daily operations. None of the plants have information pertaining process unit performance, and infrastructure capacity or status
3. Although an extensive W₂RAP is available, it still requires management approval
4. No plants audits and capacity and condition assessment/audit on sewer reticulation network and pump stations was conducted
5. The WSI should extend their budget to include cost drivers such as Energy Consumption, Chemical and Maintenance costs
6. Sludge should be classified, and sludge monitoring plan should be developed and implemented
7. Strydenburg WWTW has no WUL in-place
8. Both treatment plants do not have the required effluent quality monitoring in place; and hence, do not comply with effluent quality standards, thereby impacting negatively on the receiving environment and public health. The Municipality should investigate the root cause of the non-compliance, develop a corrective action plan and implement the plan
9. Both plants are in high-risk positions
10. A capital project is in place for:
 - o R39,000,000: Hopetown - No information or business plans provided.



Technical Site Assessment

Hopetown WWTW **57%**

The **Hopetown WWTW** was inspected to verify the Green Drop audit findings:

- The network and pump station were in good condition, with operations and maintenance attended to
- PFD and incident management protocols were not displayed, and operational and maintenance logbooks are lacking
- The terrain is not signposted. The grass was cut and access to the pond system was controlled by a gate. The gate was locked during site inspection
- Pond embankments were overgrown
- No ablutions facility was located on site
- No Process Controllers present on site
- Flow meters were in place however not used to optimise processes
- No raw sewage quality or extraneous flows were monitored.



Screening conducted on a shift rotation



Vegetation (trees and bushes) around ponds may cause damage to dam linings. Must be removed



Pollution of the surrounding environment

4.24 Tsantsabane Local Municipality

Water Service Institution	Tsantsabane Local Municipality	
Water Service Providers	Spangenberg Laboratory Services	
	C-PaC Pumps & Valves	
Municipal Green Drop Score		VROOM Impression (towards restoring functionality): 1. Vandalism 2. Mechanical screen 3. Pumps and aerators faulty VROOM Estimate: - R4,118,000 <i>Postmasburg WWTW under construction</i>
2021 Green Drop Score	38%↓	
2013 Green Drop Score	83%	
2011 Green Drop Score	24%	
2009 Green Drop Score	13%	

Key Performance Area	Weight	Postmasburg	Jenn-Haven
A. Capacity Management	15%	68.0%	60.0%
B. Environmental Management	15%	44.0%	55.0%
C. Financial Management	20%	20.0%	0.0%
D. Technical Management	20%	52.5%	51.8%
E. Effluent & Sludge Compliance	30%	30.5%	15.0%
F. Bonus		0,0%	0,0%
G. Penalties		0,0%	-25,0%
H. Disqualifiers		None	None
Green Drop Score (2021)		40%	28%
2013 Green Drop Score		94%	34%
2011 Green Drop Score		15%	38%
2009 Green Drop Score		21%	0%
System Design Capacity	MI/d	4.8	1
Design Capacity Utilisation (%)		83%	NI
Resource Discharged into		Groenwaterspruit & mining	Groenwaterspruit & mining
Microbiological Compliance	%	Insufficient data set	Insufficient data set
Chemical Compliance	%	Insufficient data set	Insufficient data set
Physical Compliance	%	Insufficient data set	Insufficient data set
Wastewater Risk Rating (CRR% of CRR_{max})		Postmasburg	Jenn-Haven
CRR (2011)	%	76.5%	41.2%
CRR (2013)	%	23.5%	100.0%
CRR (2021)	%	82.4%	94.1%

Regulator's Comment:

Tsantsabane Local Municipality cooperated and engaged optimally during the audit process. Unfortunately, the documentation and evidence trail failed and limited uploads on IRIS was present to maximise the performance score. The Green Drop score for 2021 is 38%, which is a marked regression compared to the 2013 baseline. The Regulator is disappointed that Tsantsabane has not been able to return its performance to the 83% of 2013 audit year. Both WWTWs reside in critical and high-risk space. The root causes for these risk positions need to be assessed and interventions made by municipal leadership to remedy such. Despite the disappointing overall audit score, a few highlights were noted, i.e. the maintenance competency, risk registers and implementation, the MISA infrastructure condition assessment of 2020, and the 2021 corrective maintenance at sewer pumpstations. An asset register is in place, but the team could not engage with the tool to derived asset values.

In preparing for the 2023 audit cycle, the most immediate focus would be to secure the services of qualified Process Controllers and Supervisors, or register and upskill the existing staff, as the current competency does not meet Green Drop standards. Also, to enhance engineering, technical, and scientific capabilities in the wastewater department (noting such exist in PMU), flow monitoring, as well as operational and compliance monitoring.

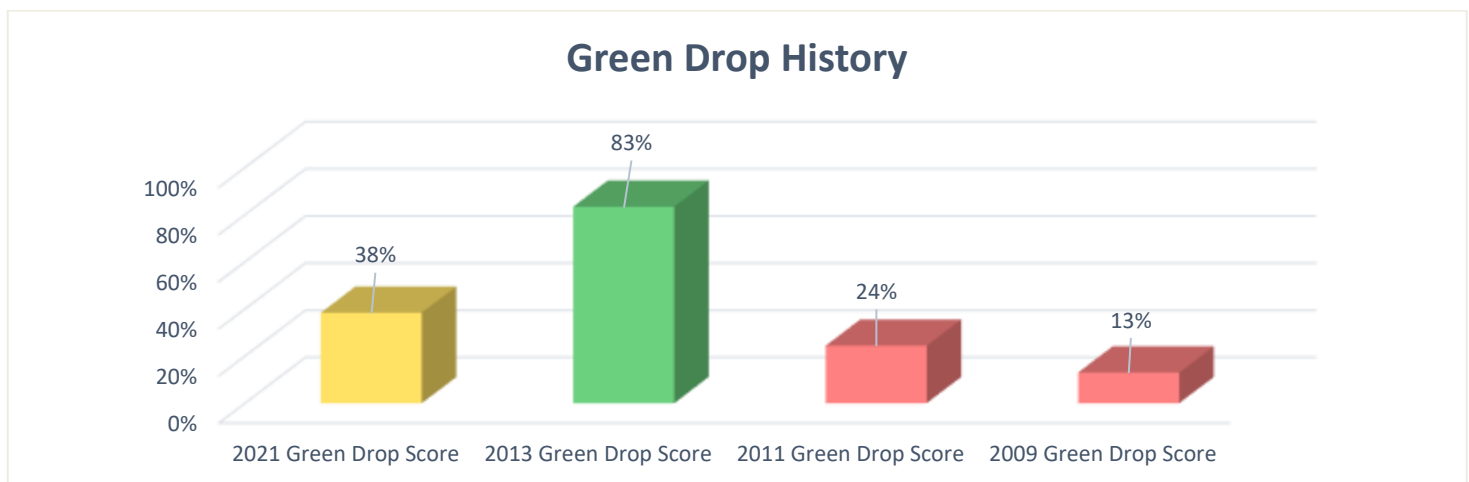
There appears to be a disconnect between the wastewater administration evidence and field data, as could be seen from the TSA findings for Postmasburg WWTW (see below). It might be beneficial to include the Plant Supervisor/Process Controller in the audit and have evidence consolidation before the audit event.

Financial information was largely lacking and drew a zero score. The cooperation and participation of the financial officials would aid to address this gap. The municipality is encouraged to redevelop the Risk Register into a W₂RAP for the sewer network and pumpstations, as risk-based planning forms a foundation from which to plan, prioritise and motivate resources towards improved services. The poor state of the Jenn-Haven wastewater system places Tsantsabane on the priority list for enforcement intervention.

Green Drop findings:

1. One of the two (2) WWTWs is classified
2. None of the Supervisors or Process Controllers achieved the Green Drop standard in terms of either Reg. 2834 or draft Reg. 813 – no training has been done to enhance operational skills
3. Operational monitoring is lacking at both WWTW, and contributes to the poor effluent quality discharged to the Groenwaterspruit and for mining repurposing
4. Compliance monitoring is only partially undertaken - a serious regulatory indictment. Microbiological monitoring is completely absent from the analytical services
5. The contracted laboratory could not be verified due to lack of evidence (PTS and Z-scores)
6. No documentation were presented in terms of financial data (budget, expenditure, production cost) – which attracted a zero score
7. Design information and flow monitoring is lacking and disable the municipality to monitor performance or to plan for the future needs and demands of the towns. This lack of evidence does not match the flow monitoring observed in the field, which indicated flows are recorded, converted, and used
8. Improved preparation should be done to maximise scoring in future as the administration and field work does not seem to coincide. Notably, low GD scores were achieved although a very good TSA score was found when inspecting the site (see results hereunder)
9. No capital projects were reported to address the defects, although the site visit revealed that construction is taking place.

The Regulator is concerned about the overall poor state of wastewater services at the Jenn-Haven and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Postmasburg WWTW 78%

The **Postmasburg WWTW** was inspected to verify the Green Drop audit findings:

- Vandalism is rife and negatively affects the sewer network functionality. Manhole covers and pragmatic maintenance plans, informed by asset condition and age, should be prioritised
- There were no standby pumps at the pump station
- Sewer network inspections were not regularly undertaken and documented. Due to low staff capacity, the turnaround time for blockages is 24 hours

- Logsheets on maintenance activities for the sewer network systems were not consistently updated or detailed
- The plant site was neat and well maintained, and no serious OHS contraventions observed
- On the activated sludge plant, 3 of the 4 aerators were functional, noting a 3-month turnaround time. Repairs were coordinated with those of the RAS screw pumps
- Contrary to the desktop audit findings, operational monitoring appears to be present at the site and was well recorded, including MLSS on the ASP basins
- Contrary to the desktop evidence, flow monitoring including PWWF, were conducted on site
- The mechanical screen has been non-operational for 2 months, grit removal is efficient – screenings disposal could be improved
- The overflow from the secondary settlers were clear and visually of good quality, disinfection is functional – microbiological quality has not been reported during the desktop audit
- Sludge drying beds were in very good condition and well maintained and operated – well done.



The plant office is highly functional and operational monitoring is conducted. The plant is neat and present a satisfactory work environment



Mechanical screen and RAS archimedes screw pumps are repaired – 2 months lead time



Mechanical screen and RAS archimedes screw pumps are repaired – 2 months lead time



3 of 4 aerators functional at activated sludge plant – operational monitoring done by internal lab



Jo jo tanks used to dose chlorine tablets manually



Sludge drying beds in good condition and well operated

4.25 Ubuntu Local Municipality

Water Service Institution	Ubuntu Local Municipality		
Water Service Provider	Ubuntu Local Municipality		
Municipal Green Drop Score	VROOM Impression (Towards restoring functionality):		
2021 Green Drop Score	23%↓	1. Tanker dumping site and inlet works to be reconstructed	
2013 Green Drop Score	24%	2. Ponds are not lined	
2011 Green Drop Score	24%	3. Flow meters to be installed	
2009 Green Drop Score	0%	4. Fencing to be upgraded	
		VROOM Estimate:	
		- R740,000	

Key Performance Area	Weight	Victoria West	Richmond	Loxton
A. Capacity Management	15%	60.0%	60.0%	60.0%
B. Environmental Management	15%	25.0%	25.0%	25.0%
C. Financial Management	20%	59.4%	59.4%	59.4%
D. Technical Management	20%	8.8%	8.8%	8.8%
E. Effluent & Sludge Compliance	30%	0.0%	0.0%	0.0%
F. Bonus		0.0%	0.0%	0.0%
G. Penalties		-25.0%	0.0%	0.0%
H. Disqualifiers		None	None	None
Green Drop Score (2021)		21%	24%	24%
2013 Green Drop Score		30%	6%	36%
2011 Green Drop Score		24%	25%	24%
2009 Green Drop Score		0%	0%	0%
Design Capacity	MI/d	2.5	2.5	2.4
Design Capacity Utilisation (%)		NI	NI	NI
Resource Discharged into		No Discharge	NI	No Discharge
Microbiological Compliance	%	No monitoring	No monitoring	No monitoring
Chemical Compliance	%	No monitoring	No monitoring	No monitoring
Physical Compliance	%	No monitoring	No monitoring	No monitoring
Wastewater Risk Rating (CRR% of CRR_{max})		Victoria West	Richmond	Loxton
CRR (2011)		47.1%	47.1%	52.9%
CRR (2013)		76.5%	94.1%	94.1%
CRR (2021)		94.1%	100.0%	100.0%

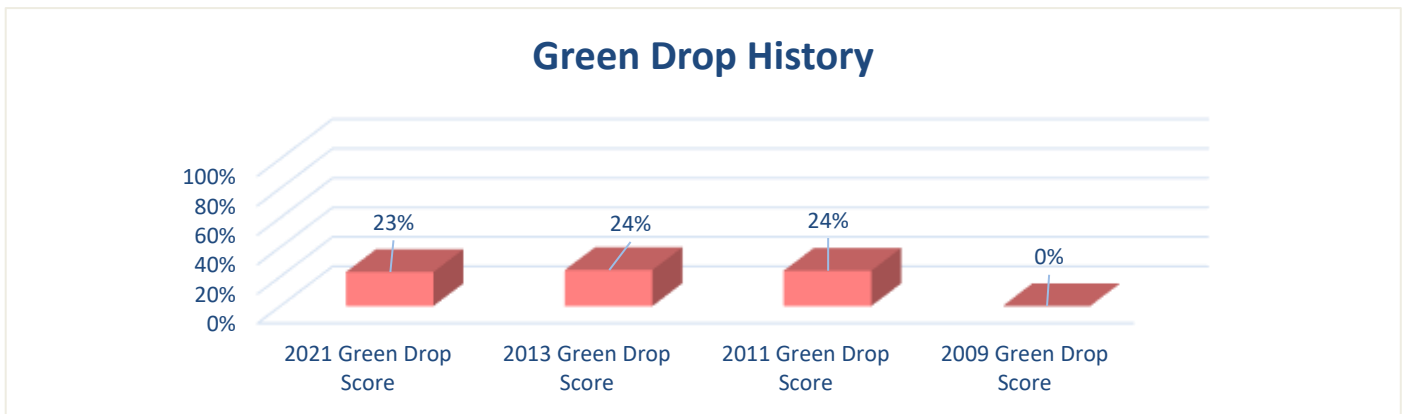
Regulator's Comment:

Ubuntu Local Municipality has maintained their overall performance, noting the 2013 baseline Green Drop score of 24% and 23% in 2021. The Ubuntu team showed commitment and appreciation for the consultative audit process and engaged actively in the audit. The presence of managers is an indication of a positive outlook to raise performance towards the GD 2023 audit. Regrettably, Green Drop requirements are not met for most of the Key Performance Areas, with KPAs D and E failing against all standards. Various aspects could be singled out as reason for the poor performance. i.e. no authorisation, lack of technical skills, no operational and limited compliance monitoring, lack of flow monitoring, no W₂RAP, no incident response management, and no bylaws implementation. The municipality must acknowledge that although the three (3) wastewater systems are pond systems, with no complex technologies in place, the lack of maintenance and operation of pond systems can still have detrimental impacts on public health and the environment. Implementation of basic aspects such as flow monitoring and basic treatment capacity confirmations will assist in future planning for these systems. Performance measures need to be implemented to safeguard final effluent and sludge quality. The Ubuntu LM is encouraged to develop and implement a W₂RAP process as an effective mechanism to ensure that critical risks are prioritised and addressed. Since all three wastewater systems and WWTWs reside in critical Green Drop positions and CRR risk space, the Regulator places Ubuntu on the pathway for regulatory enforcement.

Green Drop findings:

1. The supervisor is not complying, but PC complies with Reg. 2834 for Class E plant
2. No operational or compliance monitoring could be presented during the audit period
3. Financial information was available which included budget and expenditure. However, there is a shortfall in treated m³
4. No flow meter is installed therefore no records kept during audit period
5. No discharge from pond system
6. Only one (1) pond are available for operation, due to water shortages
7. All plants are in critical risk positions
8. No business plans or capital budgets have been provided to address infrastructure or capacity defects.

The Regulator is concerned about the overall poor state of wastewater services at all systems and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Victoria West WWTW 10%

The **Victoria West WWTW** was inspected to verify the Green Drop audit findings:

- The network and pumpstation was in good condition, with operations and maintenance attended to
- PFD and incident management protocols were not displayed, and operational and maintenance logbooks were lacking
- The terrain is not signposted, untidy and the ponds surrounds were infested with weeds, rendering inspection problematic
- Site is not fenced which poses a huge risk allowing access of livestock and general public
- No flow meters were in place and extraneous flows were not being monitored
- Raw sewage as well as final effluent quality was not monitored an no operational monitoring was being conducted
- No desludging of any of the ponds was taking place and no desludging plan is in-place.

<p>No flow recording, screening or grit removal at the tanker dumping zone and inlet works</p>	<p>Litter covers the entire site</p>	<p>Ponds are not lined, and no groundwater monitoring is conducted to determine or prevent groundwater contamination and pollution of surrounding environment</p>

4.26 Umsobomvu Local Municipality

<i>Water Service Institution</i>	Umsobomvu Local Municipality			
<i>Water Service Provider</i>	Umsobomvu Local Municipality			
Municipal Green Drop Score	VROOM Impression (Towards restoring functionality): <ol style="list-style-type: none"> 1. Install screen in emergency by-pass channel and installation of automatic screen should be considered 2. Grit removal is not effective 3. Chlorine disinfection needs to be reinstated VROOM Estimate: <ul style="list-style-type: none"> - R1,305,600 			
2021 Green Drop Score				18%↑
2013 Green Drop Score				13%
2011 Green Drop Score				7%
2009 Green Drop Score				0%

Key Performance Area	Weight	Colesberg	Noupoort	Norvalspont
A. Capacity Management	15%	62.0%	42.5%	42.5%
B. Environmental Management	15%	39.0%	48.8%	48.8%
C. Financial Management	20%	0.0%	0.0%	0.0%
D. Technical Management	20%	0.0%	0.0%	0.0%
E. Effluent & Sludge Compliance	30%	6.0%	7.5%	7.5%
F. Bonus		15.0%	15.0%	15.0%
G. Penalties		0.0%	0.0%	0.0%
H. Disqualifiers		None	Directive	None
Green Drop Score (2021)		18%	17%	17%
2013 Green Drop Score		12%	35%	4%
2011 Green Drop Score		6%	10%	4%
2009 Green Drop Score		0%	0%	0%
Design Capacity	MI/d	2.4	0.18	0.14
Design Capacity Utilisation (%)		NI	NI	NI
Resource Discharged into		Orange River	Zeekoei River	NI
Microbiological Compliance	%	Insufficient data set	Insufficient data set	Insufficient data set
Chemical Compliance	%	Insufficient data set	Insufficient data set	Insufficient data set
Physical Compliance	%	Insufficient data set	Insufficient data set	Insufficient data set
Wastewater Risk Rating (CRR % of CRR_{max})		Colesberg	Noupoort	Norvalspont
CRR (2011)		82.4%	100.0%	100.0%
CRR (2013)		47.1%	100.0%	100.0%
CRR (2021)		88.2%	94.1%	94.1%

Regulator's Comment:

The Umsobomvu Local Municipality continues to disappoint in consideration of the critical Green Drop scores from 2009 to 2021. The 2021 Green Drop score of 18% indicates that the municipality has not implemented any meaningful initiatives to improve its wastewater services. The findings of this Green Drop audit echo the findings of the previous Green Drop assessments which all point to a wastewater service that is failing the regulatory requirements and good practice standards.

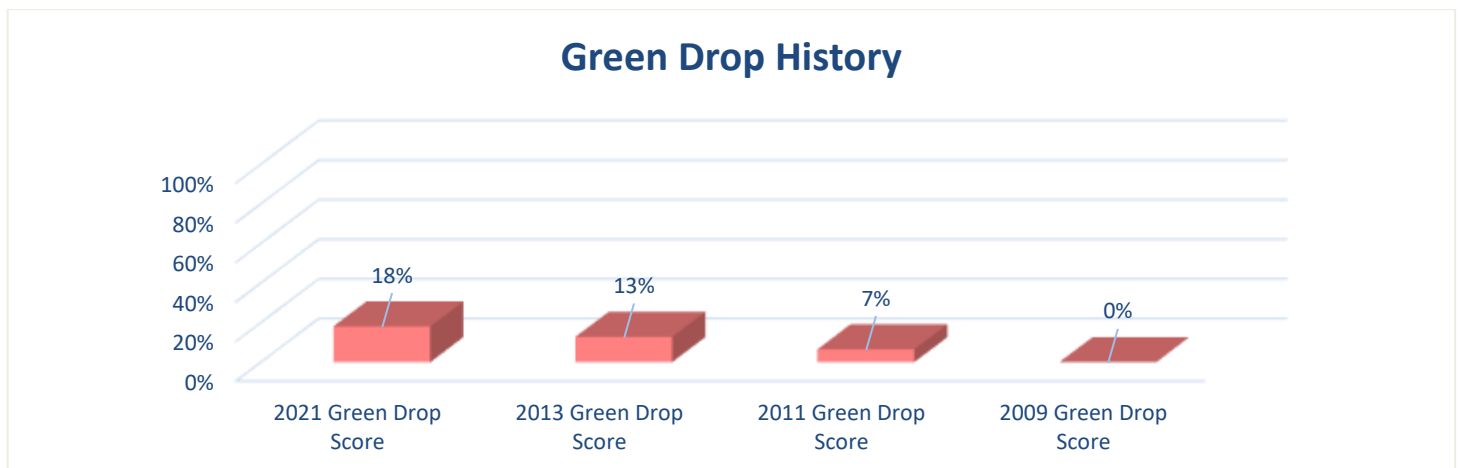
Green Drop requirements are not achieved for most of the criteria. Various aspects could be singled out as reason for the poor performance, i.e. no flow monitoring, no authorisation, lack of technical skills, no operational and limited compliance monitoring, and no W₂RAP, and no financial evidence. However, the single most important denominator would be that municipal management prioritise and resource the provision of wastewater services in Umsobomvu. With all 3 wastewater systems having <31% Green Drop scores and all in critical CRR risk space, firm and apt leadership intervention seems to be vital at this stage. Staff morale is affected by the reported lack in management support and interest, and the 2023 Green Drop audit could be a meaningful opportunity to unite the minds and focus of the entire wastewater team.

It is advised that the municipality place serious and concerted efforts toward turning the situation around through the further development and implementation of site-specific wastewater risk abatement plans ensuring that critical risks are prioritised and addressed. Such intervention would require qualified and skilled technical staff. For this audit season, the municipality is placed on the regulatory intervention list for Enforcement Protocol.

The Regulator is concerned about the overall poor state of wastewater services at Colesberg, Noupoort and Norvalspont systems and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.

Green Drop findings:

1. The Supervisor is not registered; however, Process Controllers are registered and comply with Reg. 2834 or Draft Reg. 813
2. No risk management or abatement planning is conducted
3. No operational monitoring and limited compliance monitoring could be presented
4. Financial information was largely absent, including budgets, expenditure and production cost
5. Flow meters are in place; however, no records are kept. Flow is not converted to m³/day and no trend analysis is done
6. No implementation of the bylaws is taking place
7. No plant audits and capacity and condition assessment/audit on sewer reticulation network and pump stations was conducted
8. Sludge are not classified, and a sludge monitoring plan has not been developed or implemented
9. The treatment plant does not comply with effluent quality standards, thereby impacting negatively on the receiving environment and public health
10. No business plans or capital budgets have been provided to address infrastructure or capacity defects.



Technical Site Assessment

Colesberg WWTW 48%

The **Colesberg WWTW** was inspected to verify the Green Drop audit findings:

- The treatment facility is fenced and inaccessible to livestock, but an area of the fence had been damaged due to theft and vandalism at the works
- PFD and incident management protocols were not displayed, and operational and maintenance logbooks were lacking
- The area between ponds was kept relatively clean, but some evidence of embankment erosion is present
- Staff were outspoken with regards to the absence of management and their dissatisfaction in their workplace
- Flow meters were in place and records were kept but could not be presented during the audit process. Calibration information was available. No raw sewage quality or extraneous flows were monitored
- No operational monitoring was being done and only microbiological effluent compliance monitored
- Desludging of anaerobic ponds was done daily to sludge lagoons and WAS is wasted to the sludge lagoons
- Reactor basin was functional. The mixed liquor suspended solids floc was acceptable and brown in colour
- Final effluent channels were clean, the chlorine (HTH) equipment was available; however, not in operation. No disinfection of final effluent occurred
- Personnel adhere to very basic (and not all) OHS standards and practices, this includes wearing of PPE, BA kit, signage, and certificates of chlorine handling
- Sludge treatment was effective, but sludge classification and disposal was lacking.

		
<p><i>Aerator units are operational and used on a time-based sequence</i></p>	<p><i>Secondary treatment in place and effective</i></p>	<p><i>Chlorine facility vandalised</i></p>

“It always seems impossible until it’s done.”
Nelson Mandela

5. CONCLUSION

The National Green Drop Report 2022 provides recommendations and guidance for the way forward and can be access via the DWS homepage.

In summary, the way forward would entail sustainable improvement of the South African wastewater sector via:

The Department of Water and Sanitation as Regulator of the water sector will use this Green Drop Report as the performance baseline for the municipal wastewater fraternity, to inform appropriate regulatory intervention with the objective to facilitate improvement. This will include the development of a Water Services Improvement Programme, which will include the 10-point plan towards informing sustainable intervention with the objective of ensuring a turnaround in the Municipal Water Services sector.

The results of this report demands that wastewater services be a primary focus area of the said programme in targeted areas. Green Drop Performance trends will be used to determine repetitive poor performance (which have led to significant environmental damage over a period of time), to inform a more drastic approach towards ensure turn around. This could include facilitating long term intervention by either a capacitated water board or any other suitable mode of sanitation services support.

National Government will ensure that grant funding allocated to the water sector will be allocated with the objective of restoring functionality of existing wastewater infrastructure according to the findings of this report. The determination of the very rough order of estimates (VROOM) was done to give an estimation of the capital requirement for the functionality restoration drive. This will be effected with the support from National Treasury.

The Regulator will improve the implementation of Section 19 of the National Water Act (Act 36 of 1998) to ensure that directives are issued with timeframes for implementation. Failure to respond will trigger remedial action be taken at cost of the non-complying entity or municipality. The Department will take steps to improve its capacity to more effective in this duty. There are engagements with the Department of Cooperative Governance as well as National Treasury to explore ways of utilising conditional grants for the purpose of remedial intervention.

The Department welcomes the participation of Eskom, Sasol and other private sector partners in the Green Drop Process and will take guide from this to ensure that a more inclusive regulatory process be explored for the next audit season. The Green Drop Certification programme will thus become mandatory for all wastewater treatment systems, including the private sector.

Water Services Institutions are hereby encouraged to commence immediately with the preparation for the next Green Drop audit process.

For 2022, Green Drop awards and acknowledgement are attributed to the Northern Cape as follows:

RECOGNITION OF TEAMS & INSTITUTIONS

Awards	Criteria	Winner	2 nd runner up	3 rd runner up
Best Provincial Risk Managers	Northern Cape	Siyathemba LM	Dawid Kruiper LM	Hantam LM

RECOGNITION OF INDIVIDUALS and GREEN DROP CHAMPIONS

Recognition	Name and Designation	Award
Dawid Kruiper LM: All Systems	Leoné Sago - Control Technician: Water Production, Sewerage Treatment & Sanitation	A motivated, enthusiastic wastewater professional with excellent technical know-how
Hantam LM: All Systems	Cheslyn Barnes-September - Technician: Water & Sanitation	A motivated, enthusiastic wastewater professional with excellent technical know-how
Thembehle LM: All Systems	Stephen Marufu - Technical Manager	A Green Drop Champion and Gentlemen - excellence in mentoring, knowledge and respect for his peers and the profession
Sol Plaatje LM: All Systems	Sabelo Mkhize - Senior Manager, Water Services Authority and Compliance	A Green Drop expert in own right - striving to keep systems running under challenging circumstances
Emthanjeni LM: All Systems	Jason Barth – Technician	A Green Drop expert in own right - stiving to keep systems running under challenging circumstances
Kareeberg LM: All Systems	Albertus van Schalkwyk – Operational Manager	A hard-working, innovative professional who strives for excellent in his everyday work ethic and positive approach to duty and his team
Dikgatlong LM: All Systems	Desmond Makaleni - Technical Manager	A newcomer to Green Drop with technical knowhow and morale builder



Kai Garib team making the most of the audit. Now that they are aware of the Green Drop audit criteria, they hope to raise the level of performance in the next Green Drop audit in 2023.



Green Drop Inspectors assessing the standard practice for discharge in the urine diversion system at Fraserburg, Karoo Hoogland Local Municipality.

ANNEXURE A: CALCULATIONS TABLE

PARAMETER	DESCRIPTION	CALCULATION	REFERENCE
Green Drop Scores	A GD % is awarded to an individual WWTW based on audit results considered against 5 KPAs. The individual audit scores aggregate as a single (weighted) GD audit score for the WSI. The score is weighted against the design capacities of the individual WWTWs.	<p>1) System GD score (%) = Sum (Audit scores x KPA sub weights) for each of the 5 KPAs Example: KPA sub weight = 15% of 100% for all 5 KPAs; KPA A sub-weights are 20% each for sub-KPAs A1 to A5 as per GD Requirements in the scorecard $KPA A = (100\% \times 0.2) + (100\% \times 0.2) + (90\% \times 0.2) + (100\% \times 0.2) + (100\% \times 0.2) = 98\%$ Contribution of KPA A to the overall GD score = $(98\% \times 0.15) = 14.7\%$ (out of 15%)</p> <p>2) WSI GD score (%) = Sum ((System design capacity / Total design capacity) x System GD score) Example (WSA - 2 Systems): $WSA GD score = ((200 \text{ MI/d} / 255 \text{ MI/d}) \times 66.4\%) + ((55 \text{ MI/d} / 255 \text{ MI/d}) \times 86.6\%) = 70.7\%$</p>	Introductory Provincial and National Chapters
Cumulative Risk Rating	CRR and %CRR/CRRmax The CRR value is based on 4 (weighted) risk indicators, i.e. the design capacity, ADWF, # final effluent failures and technical skills status at each WWTW. The risk weights are summarised in the section following this table. The %CRR/CRRmax provides the variance of a CRR value against the maximum CRR value that could potentially be reached if all 4 risk indicators are in critical state	<p>1) $CRR = (A \times B) + C + D$ where A = Design capacity rating, B = Capacity exceedance rating, C = Final effluent failures rating, D = Technical skills rating Example: $CRR = (2 \times 3) + 6 + 2 = 14$; $CRR \text{ max} = (2 \times 5) + 8 + 4 = 22$; $\%CRR/CRRmax = (14/22) \times 100 = 63.6\%$</p> <p>2) $WSA \%CRR/CRRmax = \text{Mean (arithmetical average)}$ $\%CRR/CRRmax$ calculated for each WSA Example (3 systems): $WSA \%CRR/CRRmax = \text{Mean}(64.9\% + 40.6\% + 59.1\%) / 3 = 54.9\%$</p>	Introductory Provincial and National Chapters
Technical Site Assessments	The TSA % reflects the physical condition of the sewer collector network, pumping stations, treatment plant and point of discharge. The intention of the TSA is to verify the evidence and findings presented during the GD audit through the physical inspections of randomly selected sites	Multiple TSA scores per WSA: Combined TSA score = System design capacity divided by total TSA design capacity and multiplied by TSA score Example (2 TSA scores) = $(200 \text{ MI/d} / 350 \text{ MI/d}) \times 71\% + (150 \text{ MI/d} / 350 \text{ MI/d}) \times 59\% = 66\%$	GD scorecards
	TSA and GD score comparison	$\% \text{ Deviation (TSA \& GD score)} = \% \text{ score difference}$ Example: $TSA \text{ score} = 44\%$ and $GD \text{ score} = 38\% = 6\%$ deviation or difference	Diagnostic 6
Green Drop KPA Analysis	Mean GD score (&) for KPA A to E	Mean (arithmetical average) = Mean (Range of values) Example: $\text{Mean} (32\% + 68\% + 94\%) / 3 = 65\%$	Diagnostic 1
Technical Competence	Ratios to do a comparative analysis "Qualified Technical Staff" - staff appointed in positions to support wastewater services, and who has the required qualifications. "Technical shortfall" means the number of staff who are in technical support positions. "Qualified Scientists" - professional registered scientists (SACNASP) appointed in positions to support wastewater services. "Scientist's shortfall" means the number of scientists in scientific positions that are professional registered and qualified in technical support positions but not qualified. "Shortfall" is calculated based on a minimum requirement of at least 2 Engineers/Technologists/Technicians and at least one 1 Scientist per WSI.	Ratio - A : B (2 elements) or A : B : C (3 elements) etc Example 1: WWTW staff - No. Supervisors : No PC = 1 : 3 (based on 2 shifts) Example 2: If WSI has no qualified technical staff, the shortfall would be 2 qualified technical staff; Similarly, If WSI has 1 qualified technical staff, the shortfall would be 1 qualified technical staff Example 3: If WSI has no qualified scientific staff, the shortfall would be 1 qualified scientist; Similarly, If WSI has 1 qualified scientist, the shortfall would be zero	Diagnostic 2

PARAMETER	DESCRIPTION	CALCULATION	REFERENCE
Treatment Capacity	Future average wastewater flows (minimum and maximum options) based on future population growths using 2021 Statistical figure of 2.5%	Red Book: Water consumption (q) = 400 l/c/day; wastewater flow (qw) = 60-80% of water consumption. Anticipated flow Qw = P*q*qw (P-population) Example: 219.4 MI/d spare capacity. 40-60% goes to plant: 0.4*219.4-160l/c/d to 240 l/c/d; Available capacity can service: 219.4 x 1,000,000/160 = 1,371,250 persons (for 40% flow) and 219.4 x 1,000,000/240 = 914,166 persons (for 60% flow)	Diagnostic 3
Wastewater Monitoring and Compliance	%Mean of each of the 3 no. final effluent categories (Microbiological, Chemical and Physical)	1) Mean (arithmetical average) = Mean (Range of values) Example: Mean (24% + 71% + 91%) / 3 = 62% 2) % Compliance = #Compliant samples / Total #Samples tested *100 Example: %Compliance = 42 samples comply with 75mg/l COD / 50 samples tested = 84% compliance for COD	Diagnostic 4
Energy Efficiency	Median used for Actual SPC and Energy Cost (R/m ³) due to asymmetrical/ skewed data sets and because of outliers that do not represent credible figures or values	Median = +Median (Range of values) Example (Actual SPC in kW/m ³): Median = (1.02 + 1418 + 0.51 + 0.36) = 0.77	Diagnostic 5
	Typical industry benchmark figures (range as per the wastewater technology types (effluent) per WSI) and Energy Unit Cost/Tariff (R/kWh) (From: WRC 2021 Energy Report)	Range = Range (A to B) or Range (A to C), etc Example (Industry benchmarks for type of WW technology in kWh/m ³) where WSI has Activated Sludge & BNR and Biofilters: Range (BF & AS BNR) = 0.177-0.412	
Operation & Maintenance & Refurbishment of Assets	O&M Cost Benchmarking using: - WRC WATCOST model: calculated breakdown of assets into civil, buildings, pipelines, mechanical, electrical, instrumentation. - SALGA model: calculate annual maintenance cost per asset type based on benchmark of 15.75% of asset value -Production cost by a specific WWTW to treat inflow expressed in R/m ³ -Shortfall is the gap between the budgeted production cost budgeted and actual cost expressed in R/m ³	1) Current asset value (100% = Civil structures (46%) + Buildings (3%) + Pipelines (6%) + Mechanical equipment (35%) + Electrical equipment (8%) + Instrumentation (2%) 2) Modified SALGA maintenance guideline: 15.5% = Civil structures (0.5%) + Buildings (1.5%) + Pipelines (0.75%) + Mechanical equipment (4%) + Electrical equipment (4%) + Instrumentation (5%) Example (Civil structures) = (0.46 x R20,000,000) X 0.005 = R46,000 3) System O&M cost = System Expenditure (R) / Operational Flow (MI/d) * 1000 Example: R13,1m / 9.6 MI/d *1000 = R1.36/m ³ 4) Shortfall = Budget Cost – Actual Cost Example: R3,90/m ³ - R1.36/m ³ = R2.54	Diagnostic 7
	Median used for O&M Budget (R/m ³), O&M Actual (R/m ³) and Shortfall (R/m ³) <i>Note: asymmetrical/skewed data sets, outliers, data credible issues</i>	Median = +Median (Range of values) Example: (O&M Budget (R/m ³)): Median = (2.03 + 13,476.00 + 6.98 + 7.77 + 3.67) = 6.98	
VROOM	Estimation of cost required to restore existing infrastructure to its original design capacity and operational functionality by addressing civil, mechanical, and electrical failures or defects. The cost is derived from an algorithm that uses the GD Inspector's impression of the condition of the hardware, coupled with the system-specific design capacity and GD score to derive an aggregated score for all systems within the WSI. The aggregated score is based on an algorithm that uses the refurbishment cost estimate of 1-2 systems and extrapolates it according to the other systems size and GD scores to arrive at a VROOM estimation cost	With reference to the earlier 'Technical Site Assessments' parameter: The following is extracted from the TSA scorecard and inserted into the WSA Summary Dashboard of the GD scorecard: (1) VROOM cost ratio in R million per MI/d (2) % cost estimates for Civil and Mechanical Estimated refurbishment requirement = VROOM cost ratio (R million per MI/d) x total WSA systems design capacity x 10 ⁶ Example: VROOM Cost = R1.87 (from TSA scorecard) x 1058 MI/d (Total design capacity from WSI Information Sheet) x 10 ⁶ = R1,978,460,000	GD scorecards Diagnostic 7

CRR Risk Weighting: Risk is defined and calculated by the following formulae:

Cumulative Risk Rating (CRR) = (A x B) + C + D

Where:

A = Hydraulic design capacity of the treatment plant in Ml/day

B = Operational flow as % of the installed design capacity

C = Number of non-compliant effluent quality parameters at point of discharge to receiving water body

D = Number of technical skills gaps (supervision, operation, maintenance) in terms of Reg. 2834 & Draft Reg. 813.

Each risk element carries a different weight in proportion to the severity of the risk element (refer to Annexure A):

A: Design Capacity (Ml/d)		WF
Design Capacity Rating	> 400	7
	201 to 400	6
	101 to 200	5
	51 to 100	4
	21 to 50	3
	20 to 5	2
	<5	1

B: Design Capacity Exceedance (%)		WF
Capacity Exceedance Rating	> 151 %	5
	101 - 150 %	4
	51 - 100 %	3
	1 - 50 %	2
	0 - 10 %	1
	< 0 %	0

C: Technical Skills Compliance		WF
Technical Skills Rating	Superintendent + Process Controllers + Maintenance Team	1
	Superintendent + Maintenance Team but no Process Controllers	2
	Process Controllers + Maintenance Team but no Superintendent	
	Process Controllers + Superintendent but no Maintenance Team	
	Superintendent but no Maintenance Team & no Process Controllers	3
	Process Controllers but no Maintenance Team & no Superintendent	
	Maintenance Team but no Superintendent & no Process Controllers	
	No Superintendent + No Process Controllers + No Maintenance Team	4

D: No of Non-Compliant Parameters	WF
Effluent Failure Rating	8
	7
	6
	5
	4
	3
	2
	1
	0

↓

Risk indicator D for effluent quality (8x):

- Microbiological: Faecal coliform or *Escherichia coli*
- Physical: pH, EC, SS
- Chemical: COD, NH₃-N, NO₃-N, O-PO₄

ANNEXURE B: GUIDE TO READING THE REPORT CARD

The following is an example of a typical report card that appears in the Green Drop Report 2022. Results are provided in colour coded format – each colour has a specific meaning and performance reference.

Water Service Institution	Name
Water Service Provider/s	Name

WSI Green Drop Score	
2021 Green Drop Score	82%↑
2013 Green Drop Score	64%
2011 Green Drop Score	45%
2009 Green Drop Score	26%

The WSI Green Drop score is a **Performance Indicator** of the overall wastewater business of the organisation. See colour legends below. Arrows: Depict the current Green Drop status of the plant. A ↑ arrow shows improvement, ↓ shows digress, → shows unchanged situation

VROOM Impression: List of dysfunctional hardware VROOM Estimation: Extrapolated Rand value to restore functionality	Breakdown of VROOM		
	Civil	0%	RO
	Mechanical	71%	R4,270,280
	Electrical	29%	R1,769,720

Estimated refurbishment cost and key hardware defects are listed. The VROOM breakdown is summarised in the Provincial Summary under the 'Cost Diagnostic'.

Key Performance Area	Weight	System X
A. Capacity Management	15%	100%
B. Environmental Management	15%	86%
C. Financial Management	30%	72%
D. Technical Management	20%	76%
E. Effluent & Sludge Compliance	30%	70%
F. Bonus		78%
G. Penalties		0%
H. Disqualifiers		None
Green Drop Score (2021)		82%
2013 Green Drop Score		64%
2011 Green Drop Score		45%
2009 Green Drop Score		26%
System Design Capacity	MI/d	28
Design Capacity Utilisation (%)		77%
Resource Discharged into		Mhlongo River
Microbiological Compliance	%	91%
Chemical Compliance	%	96%
Physical Compliance	%	100%
Wastewater Risk Rating (CRR% of CRR_{max})		System X
CRR (2011)	%	76%
CRR (2013)	%	63%
CRR (2021)	%	45%

Colour codes	Appropriate action by institution
90-100%	Excellent situation, need to maintain via continued improvement
80-<90%	Good status, improve where gaps identified to shift to 'excellent'
50-<80%	Average performance, ample room for improvement
31-<50%	Very poor performance, need targeted turnaround interventions
0-<31%	Critical state, need urgent intervention for all aspects of the wastewater services business

A system is disqualified from GD Certification if it defaulted to respond to a Notice/Directive

The final Green Drop score - same colour legends as above

Operational flow as calculated as % of the design capacity (ADWF)*

Effluent quality compliance compared to mandatory limits as audited under KPA E. A system is disqualified from Green Drop Certification if microbiological and/or chemical compliance <90%

CRR% indicates the risk of each treatment plant. A higher value reflects a high-risk state (undesirable). A lower value reflects a lower risk state.

Note: Design capacity refers to Average Dry Weather Flow (ADWF)

CRR% Deviation	Risk Level	Colour
90 – 100%	Critical risk WWTP	Red
70 - <90%	High Risk WWTP	Yellow
50-<70%	Medium risk WWTP	Grey
<50%	Low Risk WWTP	Green

ANNEXURE C: ACRONYMS

ACRONYM	DESCRIPTION	ACRONYM	DESCRIPTION
AD	Anaerobic Digester	MM	Municipal Manager
ADWF	Average Dry Weather Flow	NA	Not Assessed or Not Applied
AS	Activated Sludge	NH ₃	Ammonia
AS(P)	Activated Sludge (Plant)	NI	No information
AS(R)	Activated Sludge (Reactor)	NO ₂ /NO ₃	Nitrites/Nitrates
BF	Biofilter	NMR	No Monitoring Required
BNR	Biological Nutrient Reactor	NQF	National Qualifications Framework
CCT	Chlorine Contact Tank	O&M	Operation and Maintenance
CFO / CEO	Chief Financial / Executive Officer	OHS	Occupational Health and Safety
CHP	Combined Heat and Power	PA	Process Audit
C:N:P	Carbon Nitrogen Phosphorus ratio	PC	Process Controller
CO ₂ eq	Carbon Dioxide equivalent	PFD	Process Flow Diagram
COD	Chemical Oxygen Demand	PMU	Project Management Unit
COGTA	Cooperative Governance and Traditional Affairs	PO ₄	Orthophosphate
CRR	Cumulative Risk Rating	PPE	Personal Protective Equipment
DAF	Diffused Air Flotation	PS	Pump Station
DBSA	Development Bank of South Africa	PST	Primary Settling Tank
DFFE	Department of Forestry, Fisheries and Environment	PTS	Participatory Testing Scheme
DM	District Municipality	QFS	Quality Filtration Systems
DMRE	Department of Mineral Resources & Energy	RAS	Return Activated Sludge
DO	Dissolved Oxygen	RBC	Rotating Biological Contactor
DPW	Department of Public Works	RBIG	Regional Bulk Infrastructure Grant
DWS	Department of Water and Sanitation	RR	Risk Register
EA	Extended Aeration	SABS	South African Bureau of Standards
EC	Electrical Conductivity	SACNASP	South African Council for Natural Scientific Professions
EPWP	Expanded Public Works Programme	SALGA	South African Local Government Association
GA	General Authorisation	SAP	Systems, Applications and Products
GD	Green Drop	SAPS	South African Police Service
GDC	Green Drop Certification	SBR	Sequence Batch Reactor
GDIP	Green Drop Implementation Plan	SCADA	Supervisory Control and Data Acquisition
GWSA	Green Water Services Audit	SLA	Service Level Agreement
HOD	Head of Department	SMP	Sludge Management Plan
IMP	Incident Management Protocol	SPC	Specific Power Consumption
IMQS	Infrastructure Management Quality System	SS	Suspended Solids
IRIS	Integrated Regulatory Information System	SSC/SST	Secondary Sludge Clarifier / Settler
IT	Information Technology	SVI	Sludge Volume Index
KPA / I	Key Performance Area / Indicator	TSA	Technical Site Assessment
kl	kilo litre	USDG	Urban Settlements Development Grant
km	kilo metre	VROOM	Very Rough Order of Measurement
kWh	kilo Watt hour	W ₂ RAP	Wastewater Risk Abatement Plan
LM	Local Municipality	WAS	Waste Activated Sludge
MA	Mechanical Aeration	WCDM	Water Conservation Demand Management
MBR	Membrane Biological Reactor	WF	Weighting Factor
MCC	Motor Control Centre	WQ	Water Quality
MEC	Member of the Executive Council	WRC	Water Research Commission
MIG	Municipal Infrastructure Grant	WSA	Water Services Authority
MISA	Municipal Infrastructure Support Agent	WSP	Water Services Provider
MI	Mega litre	WSI	Water Services Institution
MI/d	Mega litres per day	WSIG	Water Services Infrastructure Grant
MLSS	Mixed Liquor Suspended Solids	WUL	Water Use Licence
		WWTP/W	Wastewater Treatment Plant/Works
PROVINCES/REGIONS			
NC	Northern Cape		

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