BLUE DROP HANDBOOK

Version I

water affairs

Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

blue drop
CERTIFICATION

drinking water quality
REGULATION

INTRODUCTION

Regulation of public utilities and in particular of water and wastewater services carries huge economic and social importance as they are essential to the development and cohesion of society. The importance of this function is emphasized when following the international trend whereby new and specialised agencies are created to provide for the regulation of their water utilities. In South Africa, this function is undertaken by the Department of Water Affairs (DWA), who has introduced a robust Water Services Regulation Strategy for the water sector. It clarifies the requirements and obligations placed on Water Services Institutions, thereby protecting consumers from a potentially unsustainable and unsafe service.

Regulation has the primary task to set and/or interpret rules, standards and, where relevant, grant approvals for the water sector. Regulation must monitor compliance, analyse and publish results promote transparency and confidence in the actions of the Regulator. It must make determinations, enforce decisions and intervene where necessary. In addition, the Regulator creates an environment that is conducive to sustainable investment and operations of this capital intensive sector.

In launching a Regulatory Strategy appropriate for the South African Water Sector, DWA has chosen a multi-facetted and programmatic approach, which enables the progressive implementation of regulation appropriate to the maturity of the sector while supporting achievement of the developmental local government objectives. This aspect will be discussed in more detail later in the handbook.

One of the approaches is that of Incentive-based Regulation, which was introduced to the water sector on 11 September 2008 at the National Municipal Indaba in Johannesburg by the Minister of Water Affairs. The concept was defined by two programmes: the Blue Drop Certification Programme for Drinking Water Quality Management Regulation; and the Green Drop Certification Programme for Wastewater Quality Management Regulation.

The Department of Water Affairs was cognisant of the need to develop a new regulatory approach upon the fundamentals of conventional regulation to ensure that credibility was not compromised. Incentive-based regulation is a form of enabling regulation and should not be perceived to be a weakened form of enforcement. The Blue Drop Certification and Green Drop Certification programmes are based upon the core fundamentals of regulatory responsibilities and are not regarded as a Municipal Support Programme.


BUILDING EXCELLENCE IN THE
MUNICIPAL WATER SERVICES SECTOR

The purpose of this handbook is to provide more clarity with regard to the Blue Drop Certification Programme, specifically in relation to how Blue Drop Assessments are undertaken and should be read in conjunction with the WORKplan as well as the Green Drop handbook.

Outline of the Blue Drop Handbook:

The Blue Drop Handbook has three components as shown in the following outline:

Introduction & Background

- Regulatory frame work and Incentive-based Regulation (Chapter 1)
  - The role of DWA as a Regulator
  - The history and objectives of the Blue Drop Certification programme
- The Future of Blue Drop Certification (Chapter 2)
- Drinking Water Quality Management Legislation (Chapter 3)

This section provides a understanding of the regulatory process in terms of focus areas and intention to accelerate and maximise sustainable water quality and build institutional excellence. It paves the path for the future of Blue Drop Certification Programme and provides an understanding of relevant Drinking Water Quality Management legislation and standards.

Blue Drop Certification & Assessment

- Risk Management (Chapter 4)
- Process Management & Control (Chapter 5)
- Drinking Water Quality Compliance (Chapter 6)
- Management, Accountability & Local Regulation (Chapter 7)
- Asset Management (Chapter 8)

It is followed with a detailed overview of each of the 5 Key Performance Areas which form the basis of the Blue Drop Assessment – the bulk of the manual.

Information Management & Appendices

- Drinking Water Quality Information Management (Chapter 9)
- Appendices

The final section contains an overview of the Blue Drop System and drinking water quality information management requirements and a number of Appendices which provide additional information.

CONTENTS OF HANDBOOK:

LIST OF ACRONYMS:

BDS	Blue Drop System
GDS	Green Drop System
DWA	Department of Water Affairs
DoH	Department of Health
DWi	Drinking Water Inspectorate (UK)
IWA	International Water Association
SANAS	South African National Accreditation System
SANS	South African National Standard
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
O&M	Operations and Maintenance
WHO	World Health Organization
WRC	Water Research Commission
WSA	Water Services Authority
WSI	Water Services Institution
WSP	Water Services Provider
WSPP	Water Safety Planning Process
IMP	Incident Management Protocol
W_2RAP	Wastewater Risk Abatement Plan
CCP	Critical Control Point
KPA	Key Performance Area
KPI	Key Performance Indicator
LIMS	Laboratory Information Management System
PTS	Proficiency Testing Schemes

1 REGULATORY FRAMEWORK AND INCENTIVE-BASED REGULATION

1.1 Introduction

The Constitution of South Africa assigns the responsibility for provision of water services to Local Government whilst oversight and performance monitoring duties are delegated to Provincial and National Government. The Department of Water Affairs (DWA) is responsible for the regulation of water services as dictated by Section 62 of the Water Services Act (No. 108 of 1997).

CONTENT OF THIS SECTION

1.2 Water Services Regulation Framework - ❶

The Department of Water Affairs was mandated by Cabinet in 2003 to act as Regulator of the water sector with the adoption of the *Strategic Framework for Water Services*. The *Strategic Framework for Water Services* also specifies that the Department of Water Affairs, as the sector leader and National Regulator of water services, will define (and revise from time to time) a set of compulsory norms and standards. The purpose of these standards is to protect the interests of consumers by ensuring that certain basic minimum standards are met. Technical norms and minimum standards are currently set out in regulations made in terms of Section 9 of the Water Services Act (No. 108 of 1997).

The overall objective of regulation is to protect consumer and public interests by ensuring:

- Compliance with minimum national norms and standards;
- Good performance and the efficient use of resources, and
- Good contracting practice.

Compulsory Participation in Blue Drop Assessments:

The Department of Water Affairs, as the Regulator of Water Services in South Africa, also has the duty to monitor Water Services Institutions as specified in Section 62 of the Water Services Act (No. 108 of 1997). Water Services Institutions are thus compelled to provide the necessary information required to undertake a proper analysis on the quality of water services and performance and it remains illegal for Water Services Authorities and Water Services Providers to refuse, withhold or provide false information as specified in Section 82 of the Water Services Act (No. 108 of 1997).

Participation in Blue and Green Drop Assessments is therefore mandatory.

Monitoring of water services institutions

62. *(1) The Minister and any relevant Province must monitor the performance of every water services institution in order to ensure-*

(a) compliance with all applicable national standards prescribed under this Act;
(b) compliance with all norms and standards for tariffs prescribed under this Act; and
(c) compliance with every applicable development plan, policy statement or business plan adopted in terms of this Act.

(2) Every water services institution must-

(a) furnish such information as may be required by the Minister after consultation with the Minister for Provincial Affairs and Constitutional Development; and
(b) allow the Minister access to its books, records and physical assets to the extent necessary for the Minister to carry out the monitoring functions contemplated in subsection (1).

Offences

82. *(1) No person may-*

(e) fail or refuse to give information, or give false or misleading information when required to give information in terms of this Act; and
(f) fail to provide access to any books, accounts, documents or assets when required to do so in terms of this Act.

(2) Any person who contravenes subsection (1) is guilty of an offence and liable, on conviction, to a fine or to imprisonment or to both such fine and imprisonment.

1.3 Regulatory Approaches - ❷

In the South African regulatory domain, four approaches to regulation are recognised. These include:

1. Compliances Monitoring (Norms & Standards)
2. Punitive Regulation (Enforcement)
3. Risk-based Targeted Regulation
4. Incentive-based Regulation (Blue and Green Drop Certification)

It is important to note that none of these regulatory approaches takes preference over others in terms of prominence or importance, but are rather utilised appropriately to facilitate improvement. The level of appropriateness is dictated by the reality of the domain being regulated.

Department of Water Affairs' Regulatory Responsibilities

The Department's drinking water quality regulatory responsibilities include:

- Monitoring and reporting on performance (from a national perspective), including audits;
- Investigation of non-compliance and drinking water quality failures;
- Definition and communication of regulatory requirements;
- Identification and specification of required regulatory actions or support;
- Undertaking regulatory actions where necessary to ensure that adequate steps are taken to comply and to reduce health risks to acceptable levels, and
- Reporting on regulatory actions undertaken and outcomes attained.

Incentive Based Regulation

The concept of Incentive-based Regulation was introduced to the water sector on 11 September 2008 at the National Municipal Indaba in Johannesburg by the Minister of Water Affairs. The concept was defined by two programmes: the Blue Drop Certification Programme for Drinking Water Quality Management Regulation; and the Green Drop Certification Programme for Wastewater Quality Management Regulation.

> ***Definition of Incentive-based regulation:***
>
> The conscious use of rewards as well as penalties to encourage performance excellence and continuous improvement, based upon an innovative performance rating system.

This incentive-based regulation programme was locally developed for uniquely South African challenges within drinking water quality management. It is a programme which allows for proactive management and regulation of drinking water quality management through the introduction of excellence requirements based upon legislated norms and standards, as well as international best practice. It is important to note that a municipality in its entirety cannot be awarded Blue or Green Drop status but rather a drinking water supply system or wastewater system according to the performance for that specific system.

It should be noted that the Blue Drop Certification Programme is not indifferent towards conventional regulation approaches, but seeks to augment the endeavour towards the improvement of municipal drinking water services through innovative means. Incentive-based regulation is thus an alternate form of regulation and should not be perceived to be a weakened form of enforcement, but is considered to be enabling regulation.

Incentive-based regulation, while a relatively new regulatory concept regarding water service compliance monitoring, promises to ensure significant improvements. The Blue Drop and Green Drop Certification Programmes are based upon the core fundamentals of regulatory responsibilities and can therefore not be regarded as a Municipal Support Programme. However, it certainly does not mean that this approach is based upon voluntary participation of the municipalities. Municipalities (as Water Services Authorities) are compelled to provide the necessary information required to do a proper analysis on the quality of water services and performance. The Enforcement Protocol will also be used to deal with cases where little to no cooperation is obtained from the municipality towards the improvement of identified shortcomings.

Additional benefits of incentive-based regulation include:

- The regulatory requirements may include both legislated norms and standards as well as best practice;
- The publication of results ensures enhanced levels of accountability at both departmental and municipal level;
- The public have access to credible information and do not fall prey to sensationalist reporting, and
- The assessments preceding reporting are conducted on a consultative audit basis to advise on required improvements.

1.4 History of Blue Drop Certification - ❸

Early Days of South African Drinking Water Quality Regulation

Initial efforts in drinking water quality management in South Africa focused on the monitoring of drinking water quality to manage drinking water quality and ensure a safe drinking water supply. With the introduction of formal regulation in South Africa (2004), a survey was conducted amongst municipalities to determine the extent of drinking water quality monitoring. It was a shocking fact to discover that more than 50% of the Water Services Authorities (municipalities authorised to govern the water service function) did not monitor the quality of tap water provided to their respective constituencies. In response, initial regulation objectives were to improve the monitoring records.

This was achieved mainly through the introduction of the Electronic Water Quality Management System (eWQMS) as a means to improve drinking water quality management but also to allow the Department access to information which improved regulation efficiency. This open-sourced system was availed to all Water Services Authorities with funding from the fiscus and together with new regulatory pressure applied, 100% of municipalities were undertaking drinking water quality monitoring by 2007.

While this was a tremendously successful feat, the Department was not comfortable with the renewed prominence of monitoring alone and thus went in search for regulatory innovation which would allow for a more proactive stance towards ensuring the supply of safe tap water. There was also increasing recognition that monitoring of drinking water for compliance was not sufficient to guarantee the quality and safety of our water supplies. A significant limitation of the monitoring alone approach was that it promotes reactive management, rather than proactive preventative management, as corrective actions are initiated only after drinking water quality monitoring indicates that limits have been exceeded. By the time that water quality monitoring indicates that there are health-related contaminants present, a water treatment process failure has occurred and many people may already have been exposed. The 2005 and 2007 drinking water quality failures in Delmas also emphasised the shortcomings of the traditional drinking water quality management and regulatory approaches.

Internationally, the water quality fraternity also focussed on output-based regulation which relied exclusively on monitoring results to inform decision-making. The drinking water quality failure of Walkerton (Ontario; Canada) in 2000 when thousands of people were hospitalised and five people lost their lives due to a massive drinking water quality failure, necessitated a rethink on the reactive manner in which the quality of drinking water was being managed and regulated. The subsequent hearing resulted in a watershed judgement from Judge O'Connor which formed the foundation for the water safety plan concept. The World Health Organization (WHO) documented a more proactive and holistic approach to drinking water quality management in their 2004 Guidelines and was advocated globally by both the WHO and International Water Association (IWA). From this the "*catchment-to-consumer*" drinking water quality management concept was developed.

In recognition of the limitations of the monitoring only approach and international best practice thinking, a *Drinking Water Quality Framework for South Africa* was prepared in 2005, based on a preventative risk management approach, which is comprehensive from catchment-to-consumer. This approach promoted an understanding of the entire water supply system, the events that could compromise drinking water quality and the operational control necessary for optimising drinking water quality and protecting public health.

Figure 1: The catchment-to-consumer approach to drinking water quality management

The *Drinking Water Quality Framework for South Africa* was updated in 2008, and the concept of Incentive-based Regulation was introduced on 11 September 2008 to the water sector at the National Municipal Indaba in Johannesburg by the Minister of Water Affairs. The concept was defined by two programmes: the Blue Drop Certification Programme for Drinking Water Quality Management Regulation; and the Green Drop Certification Programme for Wastewater Quality Management Regulation. This incentive-based regulation programme was locally developed for uniquely South African challenges within drinking water quality management. It is a programme which allows for proactive management and regulation of drinking water quality through the introduction of excellence requirements based upon legislated norms and standards, as well as international best practice.

The Blue Drop Certification Programme has had a significant positive on the drinking water quality sector of South Africa existence and promises to be the catalyst for sustainable improvement in drinking water quality management:

- Two Blue Drop Assessment cycles have been completed since the inception of the programme and an increase in the number of water supply systems certified with the prestigious Blue Drop was noted. The number of certified systems improved from 23 (2009) to 39 (2010) in spite of 12 systems losing certification;
- There was a significant improvement recoded in the national average Blue Drop score. Average scores increased from 53% in 2009 to 70.7% in 2010;
- Overall drinking water quality compliance improved from (2009 to 2010) as measured over a rolling 12-month period. Microbiological compliance improved from 93.3% to 97.5%, while chemical compliance improved from 98.9 % to 99.5%;

- The Programme gives prominence to water safety planning, as the basis for proactive, risk-based drinking water quality management. In 2009, only 9 systems had Water Safety Plans in place, while in 2010, 154 systems were incorporated in a Water Safety Planning Process;
- There has been a significant enhancement in the credibility of monitoring programmes and the influence of the Water Safety Planning Process now ensures that monitoring is based upon the risk assessments that inform drinking water quality issues management;
- Decision-makers now have a greater focus on drinking water quality management and this has resulted into positive budget revisions at municipal level. National Treasury now requires municipalities to incorporate Blue Drop and Green Drop planning into their Business Plans;
- Improved public engagement with drinking water quality management has also enhanced accountability of responsible authorities. The Blue Drop System (BDS) allows municipalities to promote their drinking water quality to a wider audience via the *My Water* search-engine based application (http://www.dwa.gov.za/mywater). This 360° regulation, where the public is empowered with a source of information, allows the public to apply pressure for improved drinking water quality management. Improved media access to information has also resulted in improved reporting of drinking water quality and has minimised sensationalist reporting;
- The 2010 FIFA World Cup was successfully hosted without any drinking water quality incidents. The Readiness report was accepted by the Local Organising Committee prior to the tournament, and
- The DWA Drinking Water Quality Regulation unit has also established good relationships with the DWI (Drinking Water Inspectorate; UK), enhancing the credibility of the local regulation programme.
- The Department of Water Affairs serves as a member on the Regulator's Network of the World Health Organization where the international trends in regulation are defined and discussed.

Even though significant progress has been made, there remain considerable challenges in the field of drinking water quality which will require a focussed regulatory approach as well as intensified municipal management commitment to ensure improvement. These challenges generally occur in the domain of the management of and operation of treatment technology, due to the lack of adequate process controlling skills in some areas.

1.5 Objectives of Blue Drop Certification - ❹

The Department of Water Affairs is implementing incentive-based Blue Drop Certification Programme to acknowledge excellence in drinking water quality management in South Africa. The Certification programme is designed with the specific intent to encourage and facilitate a turnaround in non-compliant municipalities, to acknowledge those who are achieving and maintaining standards of best practice and excellence, and to bring credible and current information to the South African public.

The objectives of Blue Drop Certification are to:

- Introduce incentive-based regulation of drinking water quality management;
- Promote transparency and subsequent accountability;
- Provide reliable and consistent information to the public;
- Facilitate closer relationships between Water Services Authorities and Water Services Providers (where applicable), and
- Introduce an element of excellence to conventional regulation.

Figure 2: The ultimate objective of the Blue Drop Certification programme is to ensure that Water Services Institutions provide safe drinking water and protect public health

Continuous improvement:

The sequencing of the Blue Drop and Green Drop assessments facilitates incremental and continuous improvement where lessons learnt from the one assessment cycle feeds into the next. The Blue Drop and Green Drop Assessment sequencing thus becomes a continuous cycle of:

GD/BD assess -> results/report - > trigger regulation-> intervention -> results/report -> etc

This allows the Water Services Institution to start identifying trends regarding performance and problems. Trends monitoring becomes very important and this process enables business intelligence to follow trends and intervene appropriately to effect turnaround and continuous improvement.

2 THE FUTURE OF BLUE DROP CERTIFICATION

2.1 Introduction

The future of the Blue Drop Certification Programme will be outlined in the Municipal Water Quality Management and Regulation Workplan which depicts the Department of Water Affair's regulatory path for the next three years taking into account the targets set by the Presidency for drinking water quality and wastewater services management.

For future Blue Drop Assessments, the nine requirements will be replaced by five Key Performance Areas. The relative of contributions of these Key Performance Areas and Indicators varies year by year and is indicated in Table 1 for the next three years in the Blue Drop Assessment cycle (Years 4-6). A variety of bonus and penalty scores can either increase or reduce a Blue Drop score.

CONTENT OF THIS SECTION

2.2 Blue Drop Key Performance Areas -

Table 1: Key Performance Areas and Indicators and their relative contributions towards the Blue Drop score for Years 4 to 6

Key Performance Area		KPA Percentages			Key Performance Indicator		KPI Percentages		
		Year 4	Year 5	Year 6			Year 4	Year 5	Year 6
1	**Water Safety Planning**	30	35	35	1.1	Water Safety Planning Process	10	10	5
					1.2	Risk Assessment and Review of Control Measures	30	30	35
					1.3	Risk-Based Monitoring Programmes	25	25	25
					1.4	Credibility and Submission of Drinking Water Quality Data	20	15	15
					1.5	Incident Management	15	20	20
2	**Drinking Water Quality Process Management & Control**	15	10	10	2.1	Compliance with Regulation - Works Classification	15	10	10
					2.2	Compliance with Regulation - Process Controller Registration	50	50	40
					2.3	Availability of signed WTP logbook	35	40	50
3	**Drinking Water Quality Compliance**	30	30	25	3.1	Compliance per Determinand (according to Monitoring Programme)	60	60	60
					3.2	Risk Assessment Defined Health Index	20	20	20
					3.3	Operational Efficiency Index	20	20	20
4	**Management, Accountability & Local Regulation**	10	10	15	4.1	Management Commitment	40	40	40
					4.2	Publication of Performance	30	30	30
					4.3	Service Level Agreements / Performance Agreements	30	30	30
5	**Asset Management**	15	15	15	5.1	Annual Process Audit	20	20	20
					5.2	Asset Register	15	15	15
					5.3	Availability & Competence of Maintenance Team	15	15	15
					5.4	Operations and Maintenance Manual	15	15	15
					5.5	Maintenance and Operations Budget and Expenditure	20	20	20
					5.6	Design Capacity versus Operational Capacity	15	15	15

2.3 Blue Drop Assessment Bonuses and Penalties - ❷

It is important to note that there are potential bonuses and penalties which can either improve a drinking water system's Blue Drop score or reduce it. These bonuses will vary between years dependent on the percentage allocated to the relevant KPA in the year of assessment (see Table 1).

Bonuses

- 5% (of 30% for Year 4 for KPA 1):
    - Ownership bonus where evidence exists that the risk assessment and Water Safety Planning Process is undertaken and implemented inhouse;
    - Evidence of the use of Advanced Risk Assessment methodologies during the Water Safety Planning Process;
    - Evidence of measures taken to ensure the credibility of the sampling process.
- 15% (of 15% for Year 4 for KPA 2): Proof of significant non-commercial Blue Drop/Drinking Water Quality Management capacity building within in the sector;
- 15% (of 10% for Year 4 for KPA 4): Evidence of publication of drinking water quality performance published in three or more different forms or media , and
- 20% (of 15% for Year 4 for KPA 5): Best practice will be incentivised through a 20 % bonus.

Penalties

- 15% (of 15% for Year 4 of KPA 2): Misconduct/failure to report (communicate) incidents or falsifications of data recordings;
- 25% (of 30% for Year 4 of KPA 3):
    - Less than 11 months of data to assess compliance, and
    - Evidence of a significant difference between actual laboratory data and data submitted to the Blue Drop System (evidence of withholding of selected compliance data or evidence of partial submission of data);
- 10% (of 15% for Year 4 for KPA 5): Negligence and non-adherence to crucial elements may attract 10% penalty.

2.4 Blue Drop Site Verification Inspection - ❸

In addition to evaluation of compliance to the requirements of the five Key Performance Areas, a site verification inspection may also be undertaken as part of a Blue Drop Assessment. The objective of the site verification inspection is to confirm that claims made during the assessment stage can be confirmed on the actual water treatment site such, for example, the availability of the O&M manual and presence of the claimed compliment of Process Controllers. The inspection focuses on a number of issues ranging from administrative matters to detailed engineering and scientific considerations.

Figure 3: A Blue Drop Site Verification Inspection may form part of the Assessment

During the site inspection a number of checks will be made to confirm effective operation of the water treatment plant. Some focus areas and key questions for the site inspection are:

- Does the Water Services Institution's water treatment plant reflect the implementation of the required level of maintenance, both preventative and reactive in nature?
- Do Process Controllers keep a reliable logbook of events and data for the site including daily shift recordings of water quality (raw, interim and final), quantity of water produced, water loss at the plant, chemical dosing rates, chemical use and chemical stock levels; incidents and equipment failures and repairs?
- Is there an adequate and complete Operations and Maintenance Manual present at the treatment plant? Are the Process Controllers familiar with the Manual and do they use it?
- Does the Water Services Institution maintain safety standards?
- Is the selection of process related chemicals based on sound principles, and are they dosed with sufficient care and assurance against systems failure?
- Is the dosing of process related chemicals maintained at optimal levels to ensure that safe water is produced cost effectively?
- Are the phase separation units maintained and operated properly through regular washing and desludging?
- Does the works manage its sludge systems and also any return flows to the environment responsibly?

Many of these questions will be directed at Process Controllers to assess their level of knowledge and understanding.

A Site Inspection sheet has been designed to capture the above aspects and provision has also been made for providing photographic evidence to substantiate these findings. From the inspection sheets, a score will be calculated which will feed into the score obtained during the theoretical assessment in order to obtain a final Blue Drop score. The Site Inspection sheet is presented in Appendix A.

3 DRINKING WATER QUALITY MANAGEMENT LEGISLATION

3.1 Introduction

The Department of Water Affairs regulates drinking water quality through the implementation of the Water Services Act (No. 108 of 1997) and related Regulations promulgated under Section 9 of the Act: Norms and Standards for Quality Water Services. The *Compulsory National Standards for the Quality of Potable Water* refers Water Services Institutions and Water Services Intermediaries to the *South African National Standard (SANS) 241: Drinking Water*. The *Classification of Water Services Works and Registration of Process Controllers* requires Water Services Institutions to classify and/or register all water services works and process controller on those water services works.

The overarching objective of these regulations and standard is the production of safe drinking water and the protection of public health.

CONTENT OF THIS SECTION

3.2 Compulsory National Standards for the Quality of Potable Water - ❶

The Minister of Water Affairs has under Section 9(1) of the Water Services Act (No. 108 of 1997) made the regulations for the *Compulsory National Standards for the Quality of Potable Water.* This updated regulation (currently draft, to be gazetted) specifies the following requirements for drinking water quality management:

(1) A Water Services Authority must ensure that comprehensive, preventative drinking water quality management is practiced according to a Water Safety Plan for the drinking water supply system. The Water Safety Plan must be in accordance with requirements specified in SANS 241 Drinking Water.

(2) A Water Services Authority must ensure that a suitable monitoring programme, in accordance with the requirements of SANS 241 Drinking Water, is implemented to sample the quality of potable water supplied to citizens in their supply zone –
   (a) This monitoring programme, and any amendments, must be registered with the Department of Water Affairs using the Blue Drop System;

(b) The monitoring programme must consider risks identified during the Water Safety Planning Process and assess the effectiveness of control measures in mitigating these risks;
(c) Samples collected by this monitoring are required to be analysed in a laboratory which is either ISO/IEC 17025: 2005 accredited or DWA-approved per method of analysis;
(d) All results from this monitoring programme must be submitted to the Department of Water Affairs at a monthly frequency, or on request from the Department of Water Affairs;

Figure 4: WSAs are required to implement water quality monitoring

(e) Records of all original laboratory results are required to be maintained and be available on request;
(f) The Water Services Authority must ensure that drinking water quality performance against SANS 241 is reported and published at an annual frequency in suitable media accessible to relevant stakeholders.

(3) The results of the water quality monitoring programme implemented by the Water Services Institution must comply with the requirements of SANS 241: Drinking Water. Should the results not comply with the requirements of SANS 241: Drinking Water, and indicate that the water supplied poses a health risk, the Water Services Institution must inform the Water Services Authority, the Director-General of the Department of Water Affairs and the head of the relevant Provincial Department of Health within 24 hours of result confirmation.

(4) The Water Services Institution must ensure that the following Public Water Quality Notices are issued when so required (according to conditions described above) within 12 hours of confirmation of drinking water quality failure:

a) A Drinking Water Quality Advisory must be issued when analyses results indicates a health risk associated with the domestic use of the sampled water. The drinking water quality advisory must specify the nature of the risk presented; indicate rectification measures taken by the Water Services Institution, and indicate risk minimization measures to be taken by the public.
b) A Boil Water Notice should be issued when the quality of drinking water poses a risk which can be adequately addressed by boiling the water in accordance with the notice, prior to human consumption.
c) A Do Not Use Water Notice should be issued when there is a risk which cannot be adequately mitigated by means of domestic treatment.

(5) A Water Services Institution must ensure that water treatment processes are managed to ensure the production of safe drinking water for the protection of public health, including –
(a) a process audit of the water treatment plant every year;
(b) an asset management inspection of the drinking water supply system by an Approved Professional Person every 5 years;
(c) use of drinking water treatment chemicals registered with the Department of Health.

Every Water Services Institution must comply with the requirements of this regulation. Failure to comply with a regulation is an offence and any person found guilty of the offence is liable to a fine or to imprisonment for a period.

3.3 Classification of Water Services Works and Registration of Process Controllers - ②

Adequate numbers of appropriately skilled and experienced staff are required to operate and supervise a water treatment plant. This includes the class of Process Controller and Supervisor required, and depends on a number of factors, including the population served, the design capacity of the water treatment plant, the complexity of the water treatment process and the variability of the raw water. Since water treatment is considered to be an essential service, workers are not allowed to strike, and backup staff are always required to be available.

The Minister of Water Affairs has under Section 9(1) (e) & (f) of the Water Services Act (No. 108 of 1997) made the regulations for the *Classification of Water Services Works and Registration of Process Controllers* (currently draft, to be gazetted). These regulations require Water Services Institutions to classify and/or register all water services works and every process controller on those water services works.

DWA, as the Regulator, shall then:

- classify every water services works in accordance with Schedule I (Appendix B);
- register each process controller employed for the operation of the water treatment plant in accordance with Schedule III (Appendix B), and
- issue a certificate of classification and/or registration in respect of such water services works and/or process controller.

The Water Services Institution is required to display the classification certificate of the water services works and the registration certificates of the process controllers in prominent places.

The Water Services Institution must employ for the operation and control of a water services works:

- a supervisory process controller;
- process controllers, and
- operations and maintenance support services

as set out in Schedule IV (Appendix B).

Within two years of promulgation of this Regulation, no person shall operate a drinking water supply system or water treatment plant unless the person holds a valid Process Controller Registration Certificate issued in accordance with this Regulation. The Process Controller Registration Certificate must be equal to or greater than the class specified in Schedule IV, which is appropriate to the water services works class. To qualify for a Process Controller's Registration Certificate, a person must meet requirements related to:

- Qualification and Training, and
- Experience.

The Process Controller Registration Certificate expires five years after it is issued, but an individual must apply to the responsible authority within 90 days of such date to have the registration renewed.

This draft regulation for the *Classification of Water Services Works and Registration of Process Controllers* also establishes mandatory refresher training requirements for Process Controllers to ensure that competency levels are maintained. Process Controller registration renewal is thus conditional on meeting specified training requirements. The Water Services Institution or owner operating the water treatment plant must ensure that every Process Controller employed must complete the required hours of training every year, over the five years between registration renewals. The following training is required per Process Controller/Supervisor per year:

Table 2: Annual Process Controller & Supervisor Training Requirements

Class of Process Controller	Unit Standard Credits	
In Training	30	Continued Education
Class I	30	
Class II	30	
Class III	30	
Class IV	30	
Class V	10*	Continued Education/ Refresher Training
Class VI	10*	

* Professional Credits: From Class V, Process Controllers must register for Professional Process Controller Registration.

Process Controller Registration Certificate renewal is also conditional on having at least 6 months operating or related experience within the past five years.

A Process Controller-in-training certificate will be considered for Process Controllers not yet meeting all requirements of the regulation and at the beginning of a career as a Process Controller, every person must obtain a Process Controller-in-Training certificate. Such certificate will allow new Process Controllers to gain the experience needed to become Class I Process Controllers. Process Controller-in-Training certificates shall expire at the end of a three-year period calculated from the date of original issue. To remain certified the Process Controller-in-Training must secure a Class I certificate.

A grand-parenting provision has been included this regulation as a transition from the currently under-regulated to a more regulated industry. This grand-parenting provision will allow a currently employed Process Controller who satisfies the experience requirements, but not the education requirements, to receive a registration certificate for a period of five years thereby enabling them to keep their jobs. Every grand-parented Process Controller must successfully demonstrate their competence to receive a registration certificate and in order to renew their registration. Grand-parenting shall be permitted only to existing Process Controllers in existing systems. Registration for the Grand-parented Process Controllers must be site-specific and non-transferable to other Process Controllers. At a water services

works where a grand-parented Process Controller is supervising the works, the Water Services Institution must apply for an exemption from this regulation.

A water services works Process Controller's registration is recommended to be revoked if he or she does not comply with the requirements specified in the regulation, and if his actions include:

- fraudulently obtaining his or her registration;
- falsification of operational records, or
- gross negligence and incompetence relating to the performance of official duties.

3.4 SANS 241 Drinking Water - ❸

The South African National Standard (SANS) 241 Drinking Water is the definitive reference on acceptable limits for drinking water quality parameters in South Africa and provides limits for a range of water quality characteristics. SANS 241: 2011 Drinking Water effectively summarises the suitability of water for drinking water purposes by specifying a single class of water which is acceptable for lifetime consumption. SANS 241: 2011 has been prepared in two parts, both of which are normative and are thus considered mandatory:

- SANS 241 – 1: 2011 Microbiological, physical, aesthetic and chemical determinands
- SANS 241 – 2: 2011 Application of SANS 241–1

Part 1 of this standard specifies the quality of acceptable drinking water, defined in terms of microbiological, physical, aesthetic and chemical determinands, at the point of delivery. Water meeting this standard is deemed to present an acceptable health risk for a lifetime of consumption. Water Services Institutions are required to monitor and maintain monitoring programmes informed by a risk assessment. Water provided by Water Services Institutions and Intermediaries is required to comply with the numerical limits specified in SANS 241-1, as specified by the *Compulsory National Standards for the Quality of Drinking Water* (currently draft, to be gazetted). The World Health Organization (WHO) guidelines for drinking water quality were used as a guide in deriving the numerical limits in SANS 241-1: 2011.

Part 2 of the standard addresses how to achieve the numerical limits specified in SANS 241-1 and is applicable to all Water Services Institutions and Intermediaries. Assessment of the fitness for use of drinking water against the determinands and numerical limits specified in SANS 241-1 provides the assurance that the water is deemed to present an acceptable health risk for lifetime use (an average consumption of 2 litres of water per day for 70 years by a person that weighs 60 kg). Part 2 of this standard also includes the evaluation of water quality risks, risk-informed monitoring and verification of water quality to enable the management of the identified water quality risks. Part 2 documents the primary requirements for implementing management actions to achieve the numerical limits specified in SANS 241-1, including

- Water Quality Risk Assessment
- Routine and Response Monitoring
- Verification of Water Quality
- Water Safety Plan

(SANS 241: 2011)

The provision of water deemed to have an acceptable health risk as defined by SANS 241-1 remains the ultimate responsibility of the Water Services Institution. However, SANS 241: 2011 acknowledges that site specific conditions may necessitate adaptations to the minimum requirements specified in SANS 241-1 and 2. Water Services Institutions are thus required to use a risk management approach to make adaptations to these minimum requirements, and to ensure that safe drinking water is produced at all times and public health is protected.

4 DRINKING WATER QUALITY RISK MANAGEMENT

4.1 Introduction

This section introduces a process to consistently ensure the safety of drinking water systems, using a preventative, risk management approach, which is comprehensive from catchment-to-consumer. This sustainable risk-based approach promotes an understanding of the entire water supply system, the events that can compromise drinking water quality and the operational control necessary for optimising drinking water quality and protecting public health.

CONTENT OF THIS SECTION

4.2 Water Safety Planning Process - ⓘ

The purpose of the Water Safety Planning Process is to introduce a holistic approach to drinking water quality management and provide a systematic, transparent approach to the consistent provision of safe water with a clear focus on public health. The emphasis of the Water Safety Planning Process is on water supply management and covers the entire water supply system with participation of all stakeholders.

The Water Safety Planning Process is seen as the future for drinking water quality management globally and represents a proactive approach to water quality assurance. The Water Safety Planning Process is not a new concept and builds on existing good practice and includes effective management of all risks as well a response plan to incidents. The process is adapted to each community situation and size of the system and is underpinned by health-based targets.

Both the World Health Organization (Chapter 4 of the Third Edition of the WHO Guidelines for Drinking-water Quality (2004) first captured the philosophy of the Water Safety Plan approach) and the Department of Water Affairs strongly endorse the development of Water Safety Plans for the management of drinking water systems. Furthermore, DWA have also included the requirement for a Water Safety Plan into the update to the regulation *Compulsory National Standards for the Quality of Potable Water* (to be gazetted).

The objectives of the Water Safety Planning Process are to consistently ensure the safety and acceptability of the drinking water system by:

- Identifying hazards and prioritizing risks in the drinking water system from catchment-to-consumer;
- Assessing the effectiveness of existing control measures for these risks, and
- Implementing improvement plans for high priority uncontrolled risks.

Open, transparent and proper implementation of a Water Safety Planning Process can have the following benefits:

- Improved drinking water compliance, safety of water supplies and protection of public of public health;
- Increased the confidence of consumers and other stakeholders in the safety of water supply, and
- Cost savings.

The Water Safety Plan report is required to be signed by key stakeholders from the catchment, treatment works and distribution system and may include senior representatives from the Catchment Management Agency/DWA Regional Office, Water Services Provider and Water Services Authority. This management commitment and signature of the report indicates approval of the risk ratings as well as commitment to the allocation of resources and budget for improvement plans for high priority risks at a minimum.

While DWA do not prescribe the format of the report or the methodology to be followed, the Water Safety Plan report is required to include the following minimum requirements:

Minimum Requirements for the Water Safety Planning Process:

- Detailed flow diagrams and system descriptions;
- Rigorous method to identify hazards and hazardous events, and assess and prioritise risks;
- Development of an improvement plan for each HIGH priority risk;
- Operational monitoring of control measures;
- Compliance monitoring and auditing of operational activities to verify the effectiveness of the Water Safety Plan;
- Management procedures for normal and incident/emergency conditions;
- Identification of the support programmes that are required to develop people's skills and knowledge, commitment to the Water Safety Plan approach, and capacity to manage systems to deliver safe water, and
- A planned review schedule for the Water Safety Planning Process to ensure that it is up to date and continues to be appropriate to the needs of the drinking water system and stakeholders. The Water Safety Planning Process follows a never ending circular form and therefore continually leads to refinement and redevelopment of itself. The WSPP cannot therefore be a once-off exercise and the plan must be reviewed and updated at least annually;
- Report signed by key catchment, treatment and distribution stakeholders indicating approval of the risk ratings as well as commitment to the allocation of resources and budget.

It is acknowledged that while generic risks may exist within institutions, it is important that the Water Safety Planning Process also identifies and manages system- and site-specific risks. A generic Water

Safety Plan document that does not also include the management of system- and site-specific risks is not deemed acceptable.

A useful guide to the process can be found in the *Water Safety Plan Manual: Step-by-Step Risk Management for Drinking-Water Suppliers*, World Health Organization, Geneva, 2009.

The Water Safety Planning Process is NOT:

- A document only (it is a more complete drinking water quality management approach / culture on risk-based management principles);
- A new concept (it is a more structured approach amalgamating best practices from various scientific and technical origin), and
- A desktop assessment of the drinking water quality business (it includes a survey of activities that may have a detrimental effect on the quality of the water resource and the drinking water system).

Most important of all is that the process promotes and stimulates overall excellence and efficiency in the manner in which drinking water quality is being managed. For this reason, the Blue Drop Assessment will focus on implementation of the Water Safety Planning Process rather than the Water Safety Plan document.

The World Health Organization and International Water Association (IWA) have developed a Water Safety Plan Quality Assurance Tool that is available for Water Services Institutions to undertake a self assessment of the adequacy and completeness of their Water Safety Plan. The Quality Assurance Tool systematically highlights the areas where progress is being made and where there are opportunities for improvement. The Quality Assurance Tool can be downloaded from the World Health Organization website at http://www.who.int/water_sanitation_health/publications/wsp_qa_tool/en/index.html .

4.3 Water Quality Management Risk Assessment - ❷

Water Quality Management Risk Assessment

A fundamental component of the Water Safety Planning Process is the Water Quality Management Risk Assessment. This Risk Assessment is based on the concepts of hazard and risk and likelihood and consequence. The definitions for these concepts are as follows:

- A hazard is a biological, chemical, physical and/or radiological agent that has the potential to cause harm;
- A hazardous event/activity is an incident or situation that can lead to presence of a hazard;
- Risk is the likelihood of identified hazards causing harm in exposed populations in a specified time frame. The concept incorporates the magnitude of the harm or consequence;
- Likelihood is determined by “how often’ or “how likely” a hazard or a hazardous event occurs. It should take into account hazards that have occurred in the past and their likelihood of re-

occurrence and should also predict the likelihood of hazards and events that have not occurred to date;

- Consequence looks at the severity of the results of the hazard/hazardous event and the seriousness or intensity of the impact of the hazard. When dealing with impact, we are primarily concerned with public health, and.
- Critical Control Point (CCP) is a point, step or procedure at which controls can be applied and a hazard can be prevented, eliminated or reduced to acceptable levels.

The risk rating for each identified hazard can be calculated by multiplying the derived likelihood ratings with derived consequence ratings as follows:

Risk rating = likelihood x consequence

The calculation of a risk rating is best described in a risk matrix as illustrated below. The risk rating will determine the management action required to reduce that particular risk

Table 3: Risk Rating Scores based on Likelihood and Consequence of Occurrence

Risk Rating Scores		Consequence of occurrence				
		Insignificant	**Minor**	**Moderate**	**Major**	**Catastrophic**
Likelihood of occurrence	**Almost certain**	5	10	20	40	80
	Likely	4	8	16	32	64
	Moderately likely	3	6	12	24	48
	Unlikely	2	4	8	16	32
	Rare	1	2	4	8	16

Table 4: Key to Risk Rating Scores

Risk Rating	Range	Management actions required
LOW	0 - 9	No immediate action required. Keep under review and introduce any simple and inexpensive control.
MEDIUM	10 – 19	Evaluate underlying factors, set timescale for putting extra control measures in place.
HIGH	> 20	Immediate substantive action is required to bring the situation under control, and then introduce extra control measures (barrier).

Note: *This is an example. There are various ways to calculate risk ratings in terms of the figures and ranges used but the concept remains similar.*

Advanced Risk Assessment:

Advanced Risk Assessment methodology includes an assessment of the effectiveness of existing controls which may be in place to mitigate an inherent or original risk. Based on their control effectiveness, the inherent risk may be mitigated and result in a reduced residual risk. The residual risk is then prioritised for further action and the development of improvement plans.

EXAMPLE:

Risk Description: Critical Process Unit operating above 90% Capacity

Likelihood	Consequence	Inherent Risk	Existing Controls	Control Reference	Control Effectiveness (%)	Residual Risk	Residual Risk Priority
Likely	Major	32 High	Frequent Operational Monitoring (every 2 hours)	Quality Control Sheet	50%	16	Medium

Water Quality Compliance Risk Assessment (SANS 241: 2011)

Part of the Water Quality Management Risk Assessment for the Water Safety Planning Process is the Water Quality Compliance Risk Assessment required by SANS 241: 2011. For the purposes of Water Quality Compliance Risk Assessment, it is accepted that if a Water Services Institution is able to comply with the drinking water quality numerical limits specified in SANS 241-1 on a sustained basis, it will provide water that is deemed acceptable for lifetime consumption (SANS 241: 2011).

Determinands

Risks are quantified by comparing the value of each determinand over the period of review against the numerical limit specified in SANS 241-1. It should be noted that during this risk assessment it is necessary to analyse for all the water quality determinands specified in SANS 241-1 as well as any additional determinands anticipated to be in the water that are not listed SANS 241-1. Consideration should thus be given to catchment land uses and activities which may result in hazards not specified in SANS 241-1. Analysis on raw waters should exclude those determinands formed only after treatment.

Sites

A Water Quality Compliance Risk Assessment is required to provide information on water quality at a number of sites, namely the raw and final water and representative points of delivery from bulk Water Services Providers and to consumers (as a minimum).

Frequency

The Water Quality Compliance Risk Assessment should be conducted:

- At least at an annual frequency, but at a frequency that ensures that all spatial and temporal risks are apparent. The timing of the Drinking Water Quality Compliance Risk Assessment shall consider periods when the most unacceptable raw water quality is anticipated, and
- In the event of any change in the catchment-to-consumer drinking water system.

Timing of the Drinking Water Quality Compliance Risk Assessment:

A full set of analysis as required by SANS 241 should be undertaken during the worst anticipated water quality. This may correspond to a period:

- After the 'first flush', the first significant rainfall after the season when pollutants may be washed from the catchment into the resource and abstracted for treatment;
- High demand, when the water treatment plant may be operating above its design capacity;
- Impoundment turnover or destratification when anoxic water from the dam bottom is mixed through the water column and abstracted for treatment, or
- Any other period when raw or final water quality is anticipated to be compromised.

When undertaking a risk assessment, it is important to "move away from the mindset of monitoring to verify the quality of water with the assumption that the water is safe, toward one of monitoring to detect contamination most effectively with the knowledge that contamination potential is always present. This requires information that will increase the understanding of the entire water supply chain and provide improved insight on hazards, risks, treatment performance and overall vulnerability of the water supply chain" Rizak and Hrudy (2007).

Minimum requirements for Risk Assessment:

Drinking Water Quality Management Risk Assessment

- Identification of the hazards and hazardous events that could affect the catchment, treatment, distribution and consumers, and an assessment of risks;
- Identification of existing controls and validation of the effectiveness of the controls;
- Identification and prioritization of insufficiently controlled risks, and
- Development of an improvement plan for each HIGH priority risk.

Drinking Water Quality Compliance Risk Assessment

- A full list of determinands analysed as required by SANS 241 on raw, final and distribution water during the period of worst anticipated water quality, and
- A full list of determinands analysed as required by SANS 241 when there are any changes to the catchment-to-consumer drinking water system.

4.4 Risk Informed Monitoring Programmes - ❸

In Section 9(1) of the Water Services Act (No. 108 of 1997) – *The Compulsory National Standards for the Quality of Potable Water* – it is stated that a Water Services Authority must ensure that a suitable monitoring programme, in accordance with the requirements of SANS 241 Drinking Water, is implemented to sample the quality of potable water supplied to citizens in their supply zone.

The design of this monitoring programme must consider risks identified during the Water Safety Planning Process and assess the effectiveness of control measures in mitigating these risks. The samples must be taken and analysed according to this monitoring programme, and this information must inform and result in the required process changes. This monitoring programme, and any amendments, must be registered with the Department of Water Affairs.

Figure 5: Water quality monitoring is essential to verify that the public is receiving safe water

This section indicates the water quality monitoring requirements according to SANS 241: 2011. The routine water quality programme shall include the following monitoring activities:

Monitoring Activity 1 – Routine monitoring of Process Indicators

Operational monitoring of process indicators shall comply with Table 5, the minimum requirement specified in SANS 241: 2011 for characterising raw water quality, ongoing levels of operational efficiency in a water treatment system and acceptable final water quality to the point of delivery.

These requirements may be relaxed to a monthly frequency for groundwaters (due to the reduced variability of groundwater quality), provided that no health-related determinands are detected at levels exceeding the numerical limits in SANS 241-1 during the risk assessment.

Table 5 – Minimum monitoring for process indicators

Determinand	Minimum Monitoring Frequency		
	Intake water	Outlet water	Distribution system
conductivity or total dissolved solids	Daily	Daily	Not applicable
pH value	Daily	Once per shift [a]	Fortnightly
Turbidity	Daily	Once per shift	Fortnightly
disinfectant residuals [b]	Not applicable	Once per shift	Fortnightly
E. coli (or faecal coliforms) [c]	Not applicable	Weekly	Fortnightly [but dependent on population served, refer table 6]
heterotrophic plate count [c]	Not applicable	Weekly	Fortnightly
treatment chemicals	Not applicable	Weekly	Fortnightly

[a] Once per shift in this standard is defined as an eight hour work period.

[b] Disinfection shall be sustained at a value defined by the Water Services Institution and Water Services Intermediary throughout the distribution system such that the Water Services Institution and Water Services Intermediary ensure that all bacteriological indicators listed in SANS 241-1 are achieved on a continuous basis.

[c] If non-compliant with the numerical limits specified in SANS 241-1, implement corrective action and instigate immediate follow-up sampling at an increased sampling frequency.

(SANS 241: 2011)

The minimum microbiological monitoring frequency (for *E. coli* or faecal coliforms) within the distribution system shall comply with the requirements set out in Table 6 (from SANS 241: 2011), provided that the Water Services Institution is able to provide appropriate assurance that the water complies with the numerical limits specified in SANS 241-1. The frequency of sampling in distribution networks should, however, also be dictated by the size and nature of the distribution network, variability of determinand results, as well as by the incidence pattern of consumer complaints (SANS 241: 2011).

Table 6 – Minimum sample numbers for *E. coli* (or faecal coliforms) in distribution systems

Population served	Total number of samples per month [a] Minimum
< 5 000	2
≥ 5 000 – 100 000	1 per 5 000 head of population
≥ 100 000 – 500 000	1 per 10 000 head of population
≥ 500 000	1 per 20 000 head of population

[a] During the rainy season, sampling should be carried out more frequently to ensure that all spatial and temporal risks are apparent.

(SANS 241: 2011)

Monitoring Activity 2 – Follow-up on the Water Quality Compliance Risk Assessment

The purpose of a Water Quality Compliance Risk Assessment is to obtain an overview of the ability of Water Services Institutions to meet the numerical limits specified in SANS 241-1 on a sustained basis. Pending the nature of any hazards/risks identified, adequate monitoring of the identified hazards/risks needs to be maintained while the Water Services Institutions also puts in place the necessary corrective and verification measures. This is not a once-off process since the nature of risks could vary as social, economic and environmental activities are subject to constant change. It is therefore required under the Blue Drop Certification programme that a Water Quality Compliance Risk Assessment is done on an annual basis; requiring that Monitoring Programmes would require amendment as informed by the Water Safety Planning Process.

The Water Quality Compliance Risk Assessment plan should therefore include at least one full SANS 241 analysis per year, and if any changes in the environment or process or delivery (or all) occur, at least monthly drinking water quality monitoring from source, through treatment and distribution, to the end user. The outcome of the risk assessment and the objectives of the monitoring programmes should further influence the design and implementation of the monitoring programmes.

SANS 241: 2011 specifies that Monitoring Activity 2 requires additional monitoring of all determinands identified in the risk assessment that do not comply with the numerical limits specified in SANS 241-1. To ensure optimised functioning of infrastructure, determinands detected in the raw and final water that exceed the numerical limits specified in SANS 241-1, shall be monitored at the frequencies indicated in Table 7.

Table 7 – Frequency of analyses for determinands identified during the risk assessment exceeding the numerical limits in SANS 241-1

Risk	Frequency	Infrastructure optimisation	Infrastructure change
Acute health - 1	Weekly	Ensure optimised functioning of infrastructure	If problem is not resolved, obtain necessary infrastructure
Acute health - 2	Monthly		
Chronic health	Monthly		
Aesthetic	Monthly		
Operational	Weekly		

(SANS 241: 2011)

Risk-based monitoring for all determinands included under Monitoring Activity 2 is required to continue until the Water Services Institution can provide evidence that the risk posed by the identified determinand has reduced to an acceptable level.

The Drinking Water Quality Compliance Risk Assessment may be interpreted as follows (and shall result in the adaptation of monitoring programmes accordingly):

- If the determinand exceeds the numerical limit specified in SANS 241-1 in both the raw and final water: existing treatment infrastructure is not capable of removing the determinand.
- If the determinand exceeding the numerical limit in the raw water is removed to the extent that it complies with SANS 241-1 in the final water: installed infrastructure is adequate to address the problem.
- If both raw and final water comply with the numerical limits specified in SANS 241-1: risks are deemed negligible.

- If the raw water complies with the numerical limits specified in SANS 241-1, and the final water does not: a determinand has been added to the water during the treatment process.

(SANS 241: 2011)

Minimum Requirements for Risk-Informed Monitoring Programmes:

Operational Monitoring:

- Intake, after filtration (per process unit), Water Treatment Plant Final and Distribution – Determinands and frequencies according to SANS 241 Process Indicator requirements;
- Evidence of additional operational monitoring at critical control points (CCP) specific to each water treatment plant;
- Proof of equipment used and calibration records for all operational monitoring equipment.

Compliance Monitoring:

- Evidence of adaptation of monitoring programmes according to risks identified during the Water Safety Planning Process;
- Sites: Water Treatment Plant Final and Distribution;
- Determinands: Full SANS 241 list annually on Water Treatment Plant Final, disinfectant residual, *E. coli*/faecal coliforms, heterotrophic plate counts, turbidity and treatment chemicals on Distribution. Determinands monitored adapted according to the Risk Assessment analysis results;
- Frequency: Compliance with SANS 241 required minimum frequencies for the Water Treatment Plant Final and Distribution (according to population served in the reticulation) and frequencies adapted according to the Water Quality Compliance Risk Assessment analysis results;
- All Compliance Monitoring Programmes, and any amendments, are required to be registered on the Blue Drop System;
- Actual monitoring must occur according to registered Blue Drop System monitoring programme;
- Monitoring Population Coverage compliance figure on the Blue Drop System of at least 80% over at least 11 months;
- Sampling ratios of 1 sample: 10 000 population (relaxation to 1 sample: 20 000 population for metropolitan areas), and
- A map illustrating the location of routine sample points, covering at least 80% of the spatial extent of the Water Services Authority mandated area.

4.5 Credibility, Traceability and Submission of Drinking Water Quality Data - ❹

Credibility and Traceability of Laboratory Results

Management and regulation of water services requires the availability of reliable data and information on municipal water quality. This data and information is obtained by means of effective monitoring programmes and accurate analysis of samples which produce credible data. In South Africa, formal recognition that laboratories are competent to carry out specific tasks/tests, is given by the South African National Accreditation System (SANAS). Although achievable by all laboratories complying with the set criteria, SANAS accreditation has historically been believed to be a status awarded to only large laboratories. This perception continues and is indicated by the scarcity of facilities accredited for water

tests throughout the country. The limited SANAS accredited water testing facilities are furthermore centred on the major metropolitan areas of South Africa.

In response to this dilemma, the Department of Water Affairs, in collaboration with sector partners, has developed a strategy to ensure that Water Services Institutions use laboratories which are deemed competent and produce credible and traceable results to manage and report on their drinking and wastewater quality and to ensure that the Regulator (DWA) has defensible data with which to regulate. In this way, ensuring credible and traceable data from competent laboratories contributes to the ultimate objective of ensuring safe drinking water and effective wastewater management services in South Africa.

Submission of Drinking Water Quality Data

All compliance data and information related water services are required to be submitted to the DWA as per Section 62 of the Water Services Act (Act 108 of 1997). The act requires all Water Services Institutions (WSIs) to furnish all such information as required by the Minister. This information is essential to allow the Minister to monitor (regulate) the performance of Water Service Institutions. It is a known fact that information is the most important element for effective regulation.

In the case of the Blue Drop, the Minister requires a monthly submission of data onto the Blue Drop System (BDS). False submissions, refusal to make submission and a failure to submit information are addressed under Section 82e of the act which lists these actions as an offence and holds individuals as well as Water Services Institution's responsible for the submission of information requested in terms of the act. All Municipal Managers and Line function directors/managers are also required to have access to BDS to confirm drinking water quality submission and performance as portrayed on BDS.

Minimum Requirements for Credibility, Traceability and Submission of Results:

All drinking water quality analyses are required to be undertaken in a laboratory which is classified as a:

- Reference Laboratory OR
- Laboratory with ISO/IEC 17025: 2005 accreditation per method OR
- Laboratory with DWA approval per method.

and fulfils all the requirements for this classification status as specified in the *DWA Municipal Water Quality Laboratory Strategy*.

The required laboratory information, including each method's accreditations status, Proficiency Testing Schemes Z-scores or DWA approval, is required to be uploaded onto the Blue Drop System to provide evidence of the credibility of the drinking water quality analyses.

The minimum requirement to ensure the traceability of drinking water quality data on the Blue Drop System is that all data is linked with a unique ID to a:

- Laboratory
- Analytical method
- Instrument
- Sampler
- Laboratory Technician

(as per data requirements for the Blue Drop System - Blue Drop Certified Data).

Drinking water quality compliance data is required to be submitted at a MONTHLY frequency as a minimum, but also on request from the Department of Water Affairs.

4.6 Incident Management - ❺

An Incident Management Protocol (IMP) must exist to guide the Water Services Institution's response to resolution and communication of drinking water quality failures (as defined according to the latest version of SANS 241: Drinking Water). The objective of an IMP is to ensure that the failures are dealt with and are managed in an efficient and effective manner, using a consultative and transparent approach. The Water Services Act (No. 108 of 1997) states that in emergency situations, Water Services Institutions must take reasonable steps to address incidents to minimise the health risks.

The three Alert levels of acute drinking water quality failure are commonly recognised in Incident Management Protocols:

- Alert Level I (Drinking Water Incident – no significant risk to health), routine problems including minor disruptions to the water system and single non-compliance samples.
- Alert Level II (Drinking water failure – potential minor risk to health), minor emergency requiring additional sampling, process optimization and reporting/communication of the problem
- Alert Level III (Drinking water emergency – potential major risk to health), major emergencies requiring significant interventions to minimize public health risk.

Each of these alert levels will require a different response and response urgency. The Incident Management Protocol must recognise this. The key issues that are required to be addressed by the Incident Management Protocol include:

- Specific alert levels indicating water quality failures must be identified;
- Specific actions to be taken after failures/incident has been detected or after the emergency has been reported;
- Responsible staff to act on incident triggers and the required response times;
- Plans for emergency water supply to the affected areas;
- Mechanisms for the increasing of drinking water quality monitoring during the event must also be addressed, and
- The activation of communication vehicles and strategies including internal, external, regulatory bodies, media and public have to be informed by the IMP.

Key stakeholders to be informed include:

- Provincial District Management unit
- Water Services Manager
- Water Treatment Plant Operations
- Consumer services unit
- Affected communities
- Department of Water Affairs
- Provincial Department of Health
- Provincial Department of Corporate and Traditional Affairs
- District Municipality Environmental Health Practitioners
- Community leaders

The Incident Management Protocol must be aligned to the communication requirements stipulated in the *Compulsory National Standards for the Quality of Potable Water* under section 9 of the Water Services Act (No. 108 of 1997) (currently draft, to be gazetted). The *Compulsory National Standards for the Quality of Potable Water* states that a Water Services Institution must ensure that a Drinking Water Quality Advisory is issued within 12 hours of confirmation of drinking water quality failure:

- A ***Drinking Water Quality Advisory*** must be issued when analysis results indicates a health risk associated with the domestic use of the sampled water. The Drinking Water Quality Advisory must specify the nature of the risk presented; indicate rectification measures taken by the Water Services Institution, and indicate risk minimization measures to be taken by the public.
- A ***Boil Water Notice*** should be issued when the quality of drinking water poses a risk which can be adequately addressed by boiling the water in accordance with the notice, prior to human consumption.
- A ***Do Not Use Water Notice*** should be issued when there is a risk which cannot be adequately mitigated by means of domestic treatment.

The Drinking Water Quality Advisory or Notice may be rescinded when:

- The treatment, distribution or operational failure has been corrected and the contaminated water has been flushed from the distribution system;
- The microbiological quality and disinfectant residual of the treated water in at least three consecutive sets of samples has returned to an acceptable level.

Risk Informed versus Response Monitoring:

The difference between risk informed and response monitoring can be defined as:

- Risk informed monitoring is undertaken when a hazard has been identified in the water quality compliance or management risk assessment and results in routine monitoring at an increased frequency until the monitoring of the effectiveness of the implemented control measures indicate that the risk has reduced to an acceptable level;

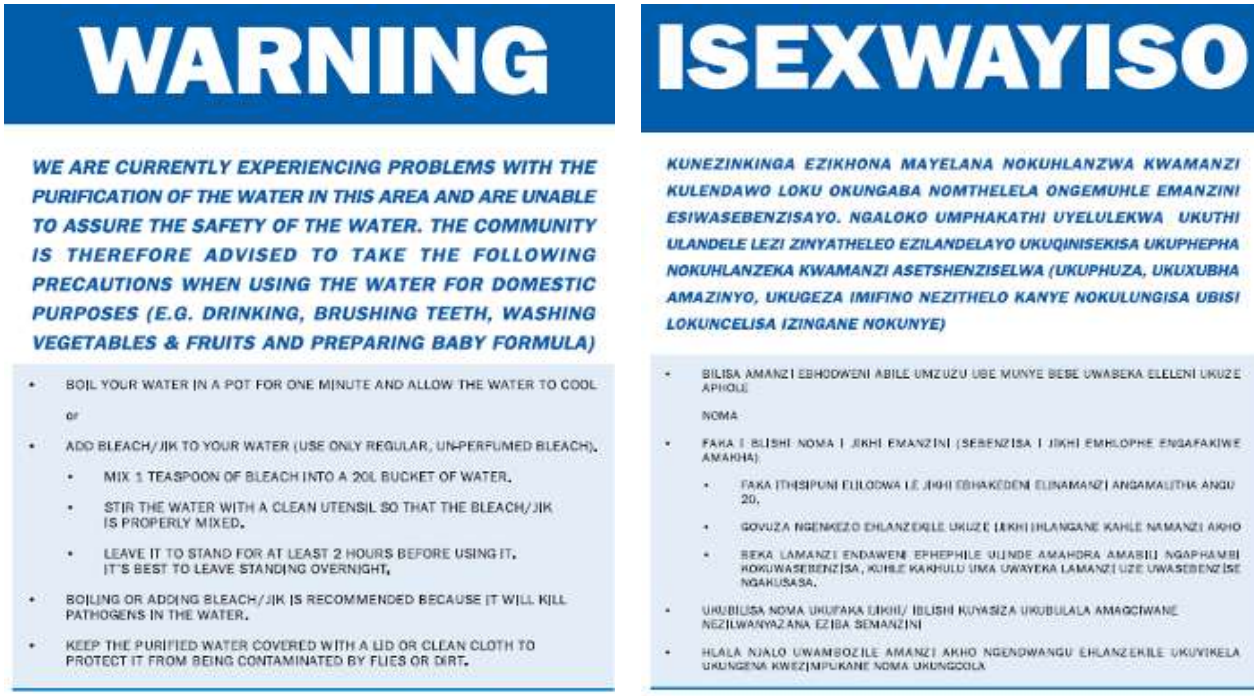
- Response monitoring occurs when a trigger occurs or an alert level in the Incident Management Protocol has been breeched, resulting in drinking water quality failure. Failure response management requires implementation of corrective action and additional monitoring at an increased frequency until the results indicate that the failure has been rectified. Three consecutive compliant samples are necessary before the additional response monitoring ceases.

The Drinking Water Quality Advisory needs to be communicated in a language and form that is accessible to the affected audience:

- Where relevant, the English version of the Advisory is required to be translated into other official South African languages;
- In rural areas where there may be high levels of illiteracy, a pictorial version of the Advisory is required.

Other media forms such as radio can also be considered for communicating Water Quality Advisories.

EXAMPLE:



WARNING

WE ARE CURRENTLY EXPERIENCING PROBLEMS WITH THE PURIFICATION OF THE WATER IN THIS AREA AND ARE UNABLE TO ASSURE THE SAFETY OF THE WATER. THE COMMUNITY IS THEREFORE ADVISED TO TAKE THE FOLLOWING PRECAUTIONS WHEN USING THE WATER FOR DOMESTIC PURPOSES (E.G. DRINKING, BRUSHING TEETH, WASHING VEGETABLES & FRUITS AND PREPARING BABY FORMULA)

- BOIL YOUR WATER IN A POT FOR ONE MINUTE AND ALLOW THE WATER TO COOL

  or
- ADD BLEACH/JIK TO YOUR WATER (USE ONLY REGULAR, UNPERFUMED BLEACH).
  - MIX 1 TEASPOON OF BLEACH INTO A 20L BUCKET OF WATER.
  - STIR THE WATER WITH A CLEAN UTENSIL SO THAT THE BLEACH/JIK IS PROPERLY MIXED.
  - LEAVE IT TO STAND FOR AT LEAST 2 HOURS BEFORE USING IT. IT'S BEST TO LEAVE STANDING OVERNIGHT.
- BOILING OR ADDING BLEACH/JIK IS RECOMMENDED BECAUSE IT WILL KILL PATHOGENS IN THE WATER.
- KEEP THE PURIFIED WATER COVERED WITH A LID OR CLEAN CLOTH TO PROTECT IT FROM BEING CONTAMINATED BY FLIES OR DIRT.

ISEXWAYISO

KUNEZINKINGA EZIKHONA MAYELANA NOKUHLANZWA KWAMANZI KULENDAWO LOKU OKUNGABA NOMTHELELA ONGEMUHLE EMANZINI ESIWASEBENZISAYO. NGALOKO UMPHAKATHI UYELULEKWA UKUTHI ULANDELE LEZI ZINYATHELEO EZILANDELAYO UKUQINISEKISA UKUPHEPHA NOKUHLANZEKA KWAMANZI ASETSHENZISELWA (UKUPHUZA, UKUXUBHA AMAZINYO, UKUGEZA IMIFINO NEZITHELO KANYE NOKULUNGISA UBISI LOKUNCELISA IZINGANE NOKUNYE)

- BILISA AMANZI EBHODWENI ABILE UMZUZU UBE MUNYE BESE UWABEKA ELELENI UKUZE APHOLE

  NOMA
- FAKA I BLISHI NOMA I JIKHI EMANZINI (SEBENZISA I JIKHI EMHLOPHE ENGAFAKIWE AMAKHA):
  - FAKA ITHISPUNI ELILODWA LE JIKHI EBHAKEDENI ELINAMANZI ANGAMALITHA ANGU 20.
  - GOVUZA NGENKEZO EHLANZEKILE UKUZE IJIKHI IHLANGANE KAHLE NAMANZI AKHO
  - BEKA LAMANZI ENDAWENI EPHEPHILE ULINDE AMAHORA AMABILI NGAPHAMBI KOKUWASEBENZISA, KUHLE KAKHULU UMA UWAYEKA LAMANZI UZE UWASEBENZISE NGAKUSASA.
- UKUBILISA NOMA UKUFAKA IJIKHI/ IBLISHI KUYASIZA UKUBULALA AMAGCIWANE NEZILWANYANA EZIBA SEMANZINI
- HLALA NJALO UWAMBOZILE AMANZI AKHO NGENDWANGU EHLANZEKILE UKUVIKELA UKUNGENA KWEZIMPUKANE NOMA UKUNGCOLA

EXAMPLE:

DRINKING WATER QUALITY INCIDENT REGISTER

Trigger	Sample point	Nature of Incident	Risk Rating	Corrective action	Communication of failure	Reference documents
Laboratory reported *E. coli* failure	High Level Reservoir	9 *E. coli* per 100 mL recorded on 24 May 2010	Alert level 2 – Moderate Risk	Laboratory informed Operations, Water Quality Advisory issued, additional chlorine dosed, resampled on 26, 28 and 30-Jun-2010. All resample results 0 *E. coli* per 100mL.	Failure, corrective action and resample results communicated to WSA Manager, DWA and DoH.	Water Quality Advisory and evidence of communication stored on network drive.

Minimum Requirements for Incident Management:

- DWA will not prescribe the format of the Protocol, but it must specify triggers (including from public reports), alert levels, response times, required actions, roles & responsibilities and communication vehicles;
- The Protocol is required to include responses on possible risks identified in the Risk Assessment of the Water Safety Planning Process;
- The Protocol must comply with the requirements for Public Water Quality Notices specified in the *Compulsory National Standards for the Quality of Potable Water* (currently draft, to be gazetted), and
- Evidence of adherence to the requirements of this protocol must be provided, preferably in the form of an Incident Register.

During the Blue Drop Assessment, evidence of Advisories issued is required. Cross-checking of issuing of Advisories with data submitted to the Blue Drop system will be undertaken by the Assessors.

BONUS: An additional 5% (of the percentage allocated to KPA 1) can be achieved if Water Services Institutions can provide evidence of the following:

- Ownership bonus where evidence exists that the risk assessment and Water Safety Planning Process is undertaken and implemented inhouse;
- Evidence of the use of Advanced Risk Assessment methodologies during the Water Safety Planning Process;
- Evidence of measures taken to ensure the credibility of the sampling process or that Samplers have been subjected to relevant sampling training