

Appendix 1

An Introduction to the Electronic Water Quality Management System (eWQMS)

NOTE: The reader should not be constrained by the current configuration or functionality of the eWQMS. The current eWQMS framework could be easily modified and adapted to meet the requirements of the Adopt-A-River Programme. The eWQMS is therefore used as an example to highlight what can be achieved.

1. Background

WSAs have responsibilities including protection and management of water resources, operation and maintenance of infrastructure, monitoring and management of drinking water quality, reporting to DWAF with regards to the aforementioned, etc. In order to ensure an effective and sustainable water service, the above mentioned aspects must be addressed by WSAs. However, a number of recent surveys have indicated that many WSAs in the South Africa are not effectively monitoring and managing the quality of drinking water. Accordingly, DWAF and other water sector partners (e.g. IMESA, SALGA, WRC) have undertaken various initiatives to assist WSAs with operation and management of water services. In particular, DWAF, together with IMESA have rolled out the eWQMS to all 169 WSAs in South Africa. The eWQMS allows WSAs to interpret water quality data and highlights issues of concern requiring intervention. Data loaded by WSAs onto the eWQMS are transferred to the National Information System (NIS). Recent developments to the eWQMS have further enhanced functionality including the ability of WSAs to conduct self assessments of DWQM, infrastructure, etc.

2. IMESA Lead Iterative Enhancement Process

IMESA's specific roll is as an impartial honest broker ensuring that the eWQMS solution is appropriate and supportive of Municipal Engineering requirements. This is achieved by IMESA participating in both initial municipal interaction forums, and subsequently by IMESA led iterative feedback sessions with municipal users. At these sessions, recent new developments are presented to WSAs, ideas are brainstormed with WSAs, and WSAs are given the opportunity to provide feedback regarding:

- Useful features/functions of the eWQMS
- Features/functions that could be improved/amended
- Future desirable features/functions

WSAs are also asked to rank new and/or desirable features/functions from High to Low.

The above process helps to determine the actual on-the-ground needs at WSAs. Feedback obtained from these sessions is collated and desirable features/functions categorised and ranked. Subsequently, incremental improvements and enhancements are introduced to the tool.

3. Brief Overview of the eWQMS System

The eWQMS tool is a well proven comprehensive Water Quality Management tool, which has an established track record of being successfully used by WSA's, Regional and National DWAF offices, and the public. eWQMS has been set up to assist WSAs to meet the National Drinking Water Quality Management Framework requirements, and is a full management system. In particular, the eWQMS able to guide:

- Regulatory compliance by WSAs
- The timeous supportive intervention in water quality failures (chronic and acute)
- Infrastructure improvement
- Capacity development of municipal staff

The eWQMS is an internet accessible database system (accessible at www.wqms.co.za) utilising **open source** components (MySQL, XML, etc), and has been found following detailed assessment by DWAF's IT support team to be fully compatible with and compliant to DWAF Water Services National Information System and DWAF Regulatory System requirements.

Importantly, the eWQMS has been developed in a "bottom up" approach with WSAs, IMESA, DWAF and the Water Research Commission. Data can be loaded by WSAs onto eWQMS via the internet, spreadsheet or specific import scripts. Furthermore, the eWQMS can provide useful automated regulatory compliance reporting to all WSAs and sector partners. The eWQMS also provides easy access to useful water quality tools and information. Presently, the eWQMS consists of the following main components:

- Login/Logout
- Water Quality
- Infrastructure
- Risk Toolbox
- Administration
- Information

Considering the above, the following main features are described (**NOTE:** A full demonstration will be gladly provided on request):

▪ System Access

The system is usually accessible via the internet for full use (including via DBSA's LGNET), providing considerable costs and operational efficiency benefits over local application based systems. Nevertheless, the system can run as an independent local application if required. Information and reference material can be accessed without the need to login (This is especially useful to members of the public (e.g. teachers, students, etc) and saves municipal officials time).

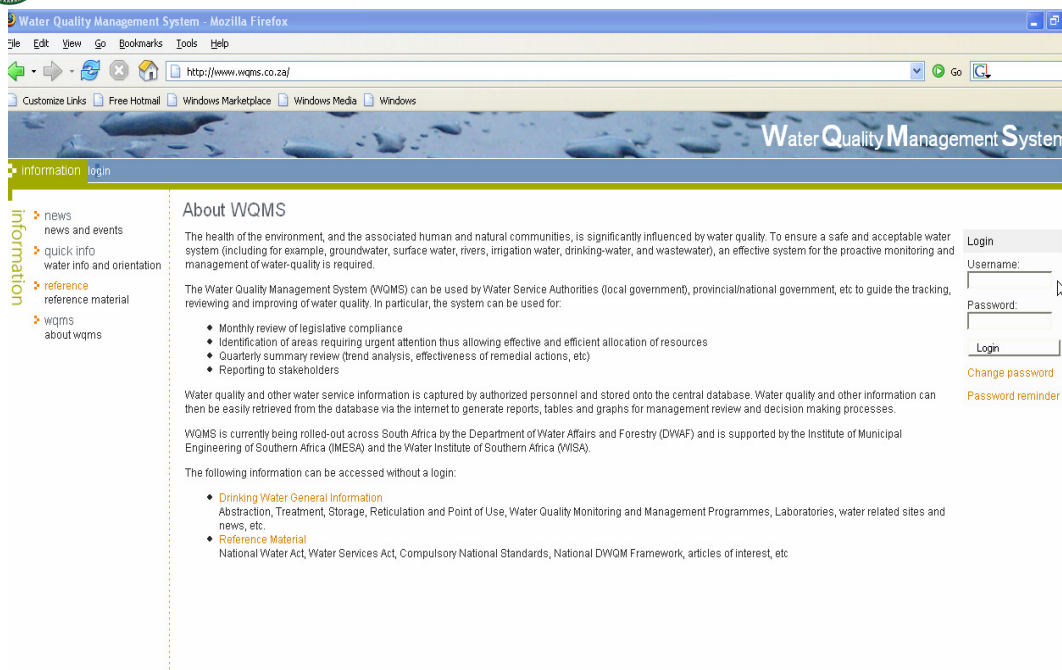


Figure A1: eWQMS access via the internet

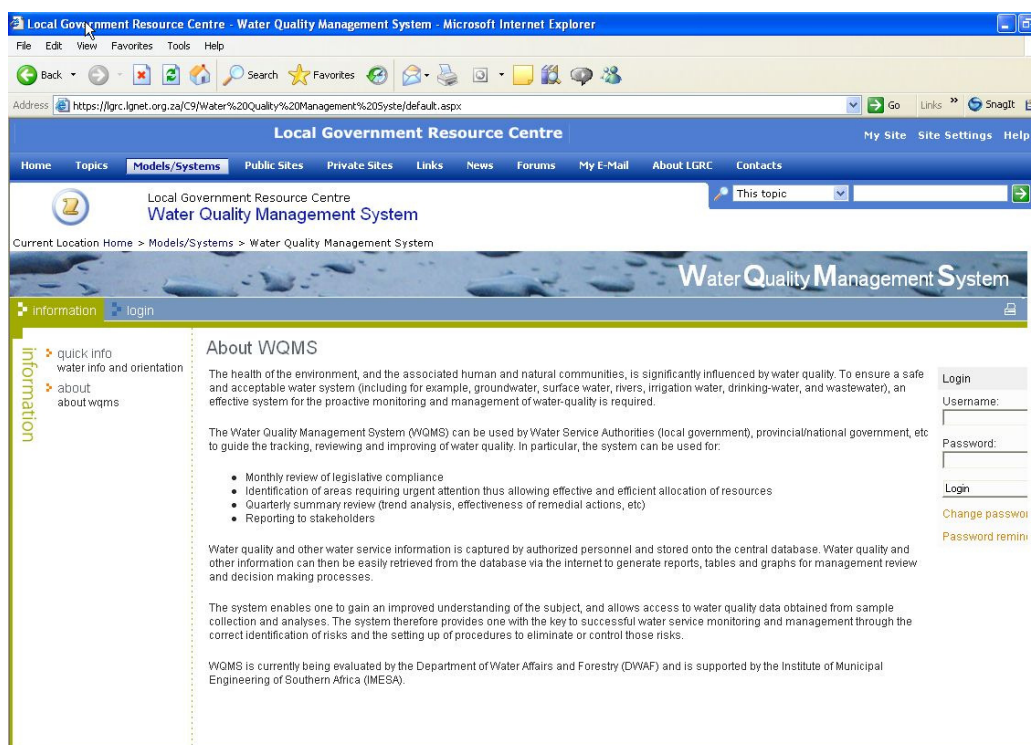


Figure A2: eWQMS access via DBSA's LGNET

■ System Compatibility

The system can be set up to run off existing water quality management systems, such as



LIMS systems. A number of “import scripts/patches” already exist, and where necessary additional will be written for data import. *E.g. of import scripts/patches includes Johannesburg Water and eThekweni*

■ Login/logout

A user is provided with username and password. A particular user will be provided with a WSA, District, Provincial or National view. Furthermore, limited detail “public” views of DWQ can be set up if required. *E.g. of Provincial view includes Free State; public view includes Stellenbosch.*

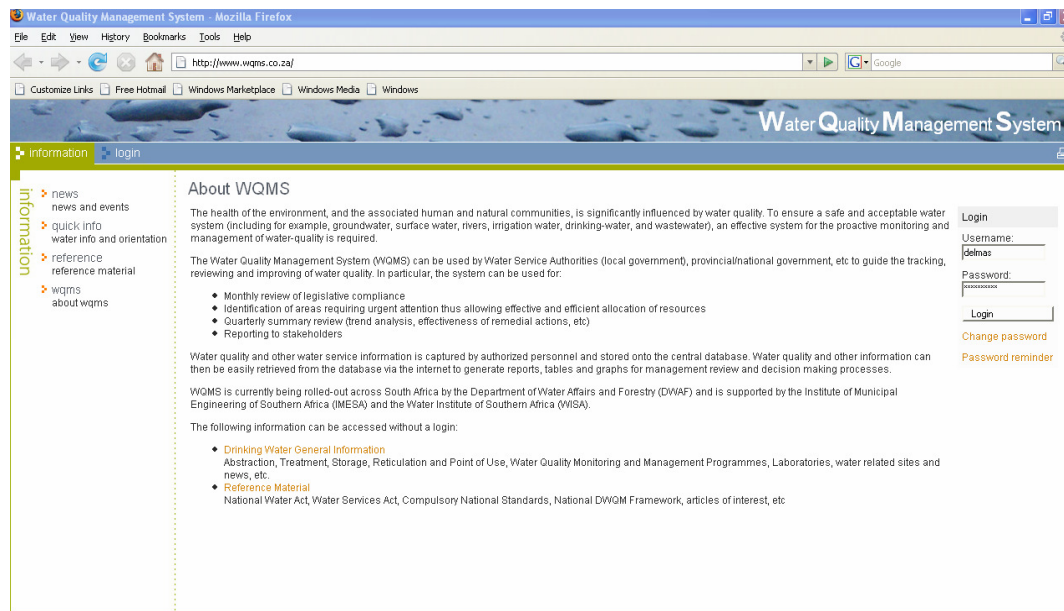


Figure A3: eWQMS login (Delmas Municipality, Mpumalanga)

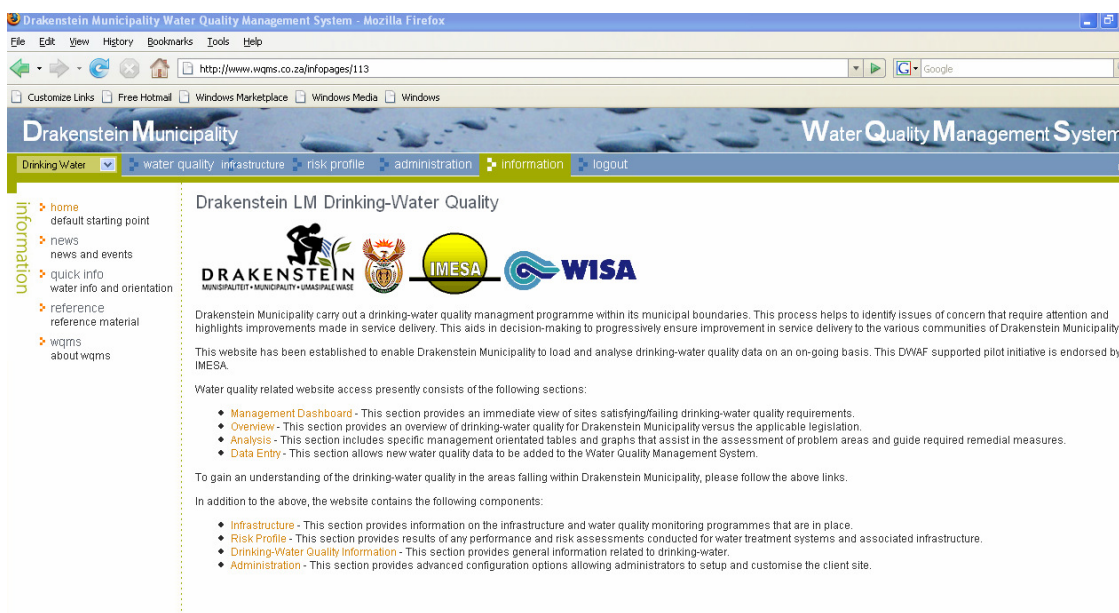


Figure A4: WSA homepage (Drakenstein Municipality, Western Cape)



Water Quality Management

A key functional requirement is easy water quality data loading and interpretation. The system can interpret data against a range of standards, but defaults to SANS 241. The system is capable of interpreting wastewater and river water quality data. Current functionality includes:

- o **Management Dashboard** [summarised monthly view of legislative compliance & identification of areas requiring urgent attention; easy colour coding to show compliance (green), failure of SANS 241 class 1 (yellow), and failure of SANS 241 Class 2 (red)].

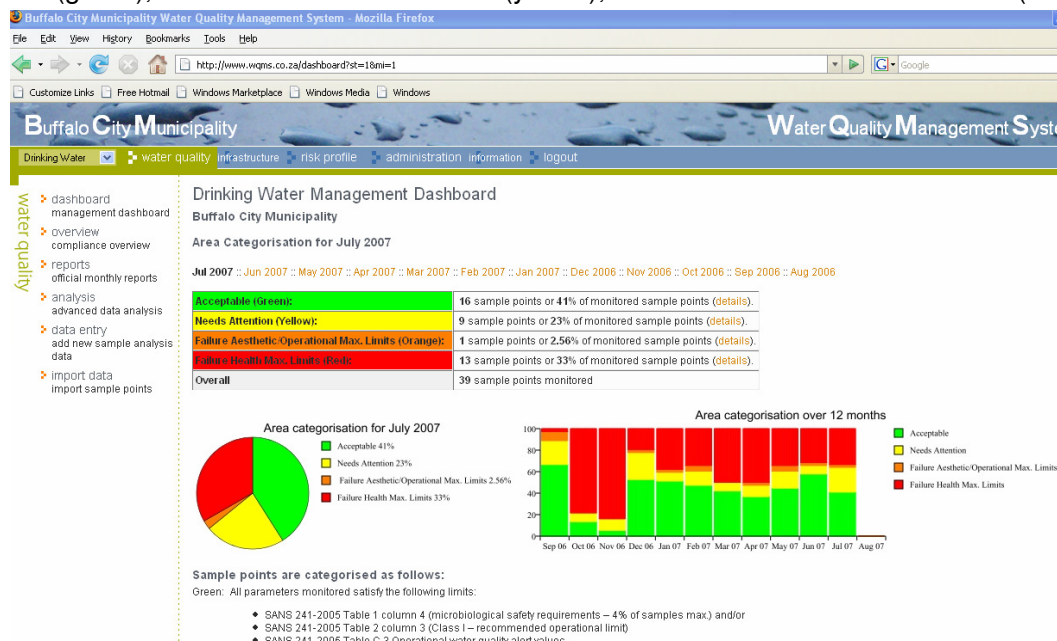


Figure A5: eWQMS Management Dashboard (Buffalo City, Eastern Cape)

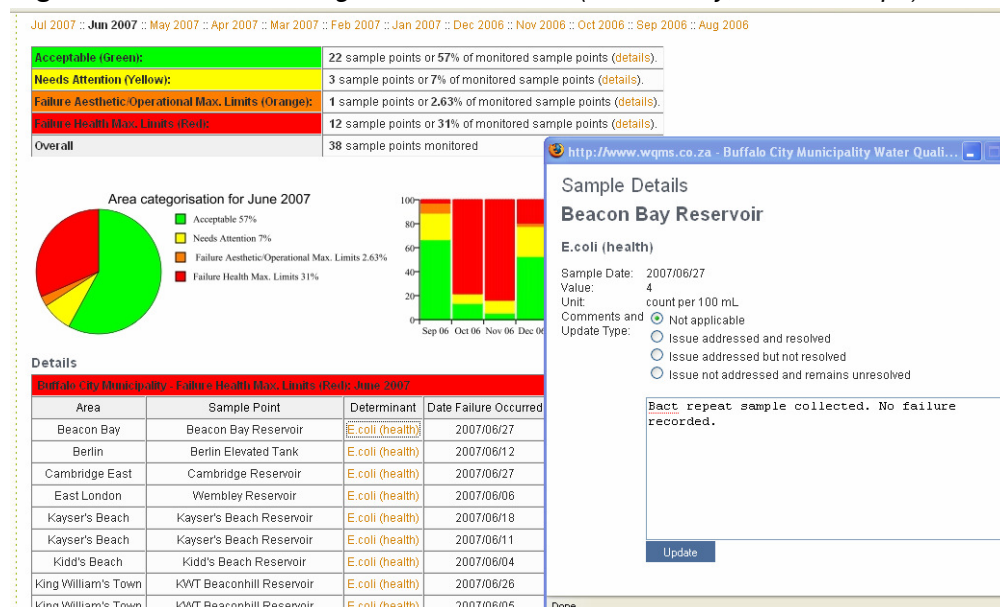


Figure A6: Detail of "Red" failure and actions taken to address issue of concern (Buffalo City, Eastern Cape)

- **Overview** (map-based interface with “period based” compliance summary of bacteriological, physical and chemical DWQ).

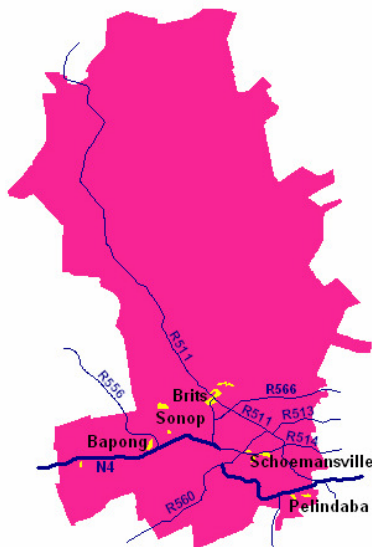
Drinking Water Overview

Madibeng Municipality

Water Quality Summary

Links to Useful Tables and Graphs

- ◆ Brits
- ◆ Cosmos East
- ◆ Damonsville
- ◆ Elandsrand
- ◆ Hartbeespoort
- ◆ Jericho
- ◆ Lethabale
- ◆ Madidi
- ◆ Meerhof
- ◆ Mmakau
- ◆ Mothotlung
- ◆ Sonop



Drinking Water Quality Summary

Microbiological Safety :: Microbiological Operational :: Physical :: Chemical

Configure Parameters	Faecal Coliforms (health)		E.coli (health)	
Area	SampleCount	Compliance %	SampleCount	Compliance %
South Africa	11920	98 (view)	24070	96 (view)
North West	1295	99 (view)	1139	99 (view)
Bojanala Platinum District Municipality	114	100 (view)	642	99 (view)
Madibeng Municipality			161	100 (view)
Brits			15	100 (view)
Cosmos East			15	100 (view)
Damonsville			19	100 (view)
Elandsrand			15	100 (view)
Hartbeespoort			17	100 (view)
Jericho			17	100 (view)
Lethabale			12	100 (view)
Madidi			11	100 (view)
Meerhof			13	100 (view)
Mmakau			14	100 (view)
Sonop			13	100 (view)
Data Period	2006/09/01 to 2007/08/30			

Quality of Water System	Microbiological requirement		Chemical requirement	
	Column 5 of Table 1	Class I	Class II	
Excellent	$\geq 99\%$	$\geq 95\%$	$\geq 97\%$	
Good	$\geq 98\%$	$\geq 90\%$	$\geq 95\%$	
Fair	$\geq 97\%$	$\geq 85\%$	$\geq 90\%$	
Poor	$< 97\%$	$< 85\%$	$< 90\%$	

Figure A7: eWQMS Overview (microbiological safety) (Local Municipality of Madibeng, North West)



Configure Parameters	Aluminium (health)			Iron (aesthetic/operational)		
Area	SampleCount	Compliance %	Median(mg/L as Al)	SampleCount	Compliance %	Median(mg/L as Fe)
South Africa	1917	87 (view)	0.07	5351	85 (view)	0.04
Western Cape	482	76 (view)	0.12	1142	68 (view)	0.11
Knysna Municipality	67	34 (view)	0.41	67	47 (view)	0.20
Buffalo Bay	15	0 (view)	1.14	15	93 (view)	0.06
Karatara	13	100 (view)	0.05	13	69 (view)	0.11
Knysna (Town)	12	50 (view)	0.29	12	41 (view)	0.30
Rheendal	12	8 (view)	1.30	12	0 (view)	0.40
Sedgefield	15	20 (view)	0.36	15	26 (view)	0.25
Data Period	2006/05/02 to 2007/04/30					

Notes:

- The median value displayed is the median of all samples collected in the particular area. The median value is compared to SANS 241 and color.
- The percentage compliance displayed is the percentage of all samples collected in the area falling within SANS: Physical, Organoleptic, Chemical: Class I
- Based on samples taken during the last 12 months.

Applicable Standards

SANS: Physical, Organoleptic, Chemical: Class I	
SANS: Physical, Organoleptic, Chemical: Class II	
Failure Phys-Organ-chem: Class II (Aesth/Operat)	
SANS: Failure Phys-Organ-chem: Class II (Health)	

SANS 241-2005 Table C.2: Compliance frequency targets in respect of microbiological and chemical requirements that have health implications

Quality of Water System	Microbiological requirement	Chemical requirement	
	Column 5 of Table 1	Class I	Class II
Excellent	>= 99%	>= 95%	>= 97%
Good	>= 98%	>= 90%	>= 95%
Fair	>= 97%	>= 85%	>= 90%
Poor	< 97%	< 85%	< 90%

Figure A8: eWQMS Overview (chemical) (Knysna Municipality, Western Cape)

- **Quick Analysis** (quick links to regularly used operational efficiency and legislative compliance tables/graphs and trend analysis)

Free Hotmail

Windows Marketplace

Windows Media

Windows

Sandton / Alex	732	0
Soweto	606	0
Data Period	2006/09/01 to 2007/08/30	

Notes:

- The median value displayed is the median of all samples collected in the particular area. The median value is compared to SANS 241 and color.
- The percentage compliance displayed is the percentage of all samples collected in the area falling within SANS: Microbiological Safety: Column 3
- Based on samples taken during the last 12 months.

Applicable Standards

SANS: Microbiological Safety: Column 3	
SANS: Microbiological Safety: Column 4	
SANS: Microbiological Safety: Column 5	
SANS: Failure Microbiological Safety: Column 5	

SANS 241-2005 Table C.2: Compliance frequency targets in respect of microbiological and chemical requirements that have health implications

Quality of Water System	Microbiological requirement	Chemical requirement	
	Column 5 of Table 1	Class I	Class II
Excellent	>= 99%	>= 95%	>= 97%
Good	>= 98%	>= 90%	>= 95%
Fair	>= 97%	>= 85%	>= 90%
Poor	< 97%	< 85%	< 90%

Configure Parameters for Summary

Useful Tables and Graphs

- E.coli - Percentage Failure
- Free Chlorine Residual - Median per Area
- pH - Median per Area
- Total Coliform - Percentage Failure
- Turbidity - Median per Area

Figure A9: Example of quick analysis links at the bottom of the Overview

- **Detailed Analysis** (dynamic Tables and Graphs with full flexibility)

Drinking Water Analysis

Report Selection

Point Analysis Table

[single determinant](#) | [determinant set](#)

The point analysis table provides a detailed water quality analysis for a selected sampling point vs. the applicable water quality standards.

Point Analysis Graph

[single determinant](#)

The point analysis graph provides a graphical water quality analysis for a selected sampling point vs. the applicable water quality standards.

Median Value Graph

[single determinant](#)

The median value graph shows the median value of a particular determinant in an area vs. the applicable water quality standards.

Compliance Table

[single determinant](#) | [multiple determinants](#)

The compliance table analyses the percentage compliance in an area vs. the applicable water quality standards.

Failure Table

[single determinant](#)

The failure table highlights failures in an area vs. the applicable water quality standards.

Failure Graph

[single determinant](#)

The failure graph shows the percentage failure of a particular determinant in an area vs. the applicable water quality standards.

Combined Compliance/Failure Graph

[single determinant](#)

The combined Compliance/Failure graphs show the percentages of particular determinant in an area vs. the applicable water quality standards.

Raw Analysis Data

[analysis values as csv](#)

Download analysis values in CSV format.

Raw Sample Point Data

Figure A10: eWQMS Analysis (tables and graphs)

Dynamic Drinking Water Reports

Water Quality Compliance Table

E.coli (health) (count per 100 mL) for Central

Area	June 2006		July 2006		August 2006	
	Samples Complied	% Compliance	Samples Complied	% Compliance	Samples Complied	% Compliance
Central	22 / 22	100%	22 / 22	100%	23 / 23	100%
Berea North	2 / 2	100%	2 / 2	100%	2 / 2	100%
Berea South	2 / 2	100%	2 / 2	100%	2 / 2	100%
Bluff	2 / 2	100%	2 / 2	100%	2 / 2	100%
Chatsworth	2 / 2	100%	2 / 2	100%	2 / 2	100%
Durban Centre	2 / 2	100%	2 / 2	100%	2 / 2	100%
Durban North	2 / 2	100%	1 / 1	100%	2 / 2	100%
Merebank	2 / 2	100%	1 / 1	100%	2 / 2	100%
New Germany	2 / 2	100%	2 / 2	100%	2 / 2	100%
Phoenix	1 / 1	100%	2 / 2	100%	2 / 2	100%
Pinetown	2 / 2	100%	2 / 2	100%	2 / 2	100%
Umbilo	2 / 2	100%	3 / 3	100%	2 / 2	100%
Umlhanga	1 / 1	100%	1 / 1	100%	1 / 1	100%



water & forestry
Department:
Water Affairs and Forestry
REPUBLIC OF SOUTH AFRICA



Notes

Figure A11: Compliance table example (Ethekewini Municipality, KwaZulu-Natal)

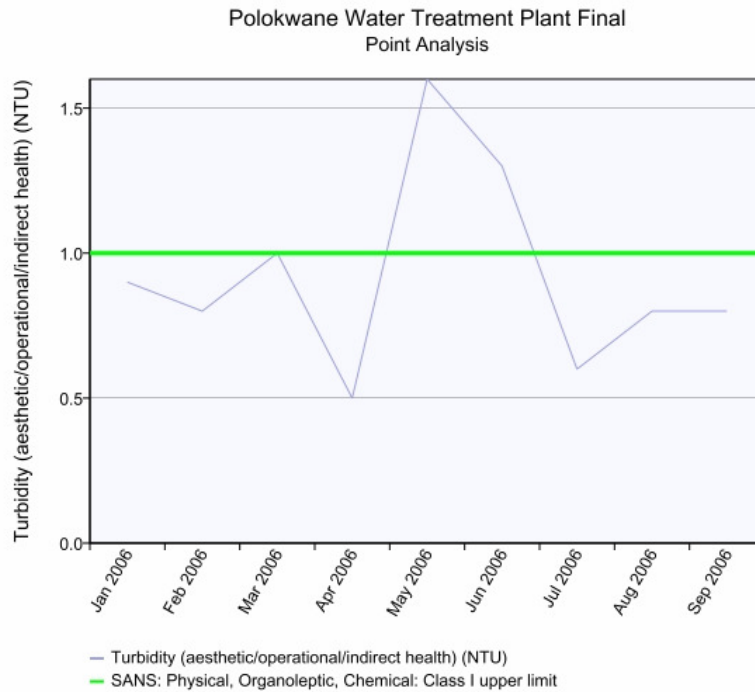


Figure A12: Point analysis graph example (Polokwane Municipality, Limpopo)

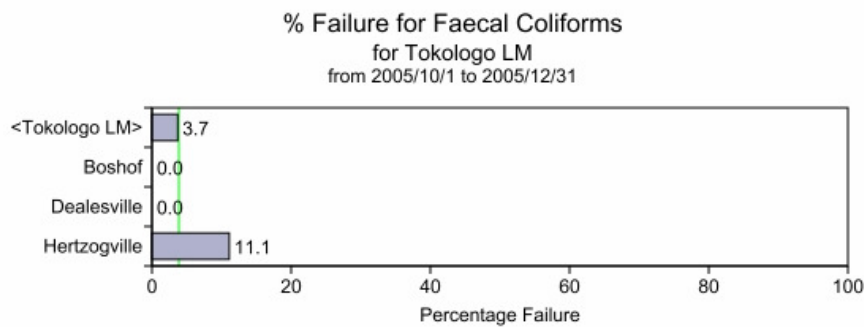
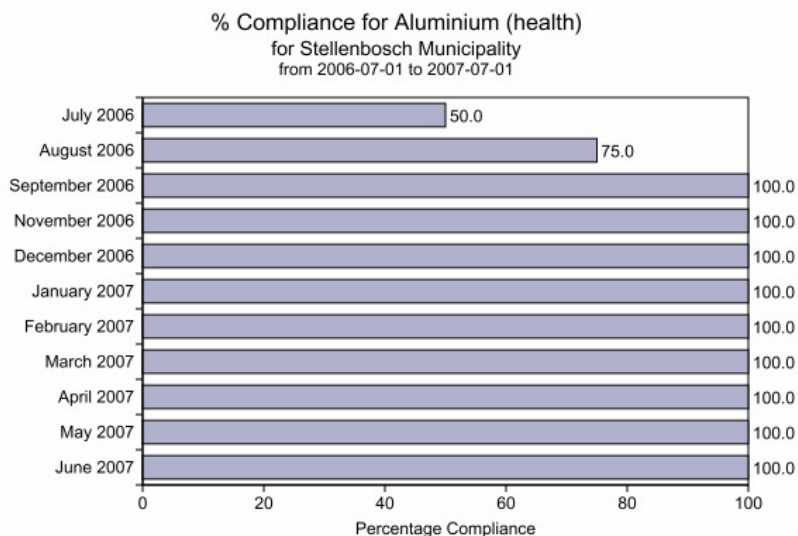


Figure A13: Percentage failure graph example (Tokologo Municipality, Free State)

Compliance Graph

Stellenbosch Municipality



Samples analysed by **CSIR**
SANAS accredited testing laboratory

Figure A14: Area monthly compliance graph (Stellenbosch Municipality, Western Cape)

- **Reports** (archive of water quality management reports in Adobe Acrobat format).

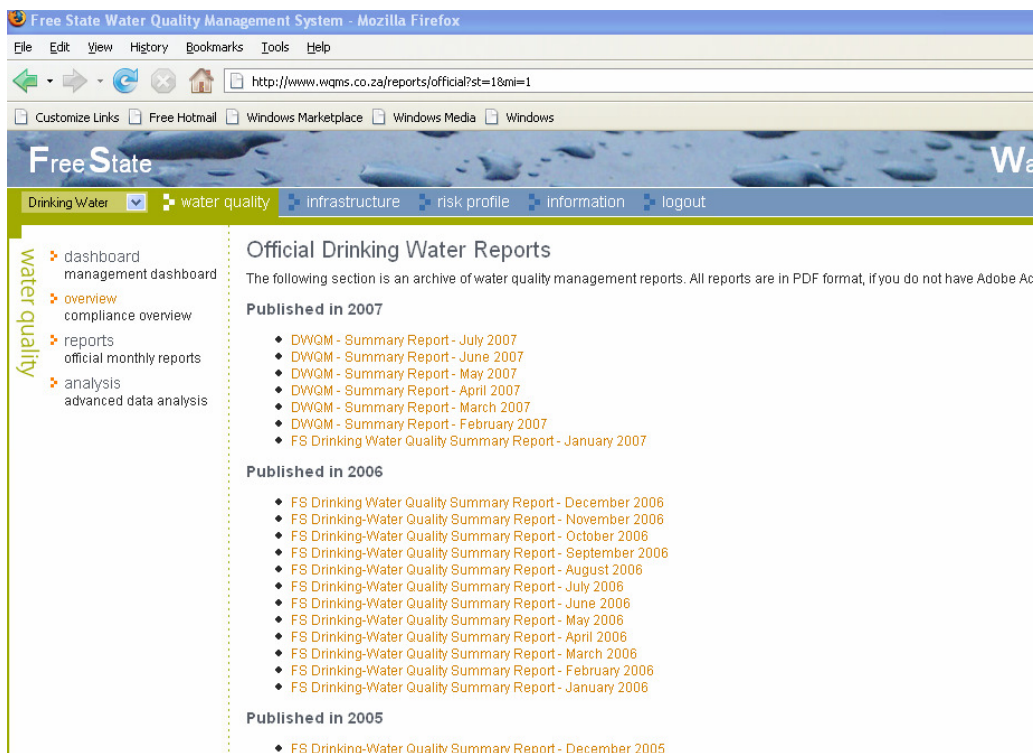


Figure A15: eWQMS reports (Free State)



- o **Data Entry** - mostly via internet and/or Excel, but patches exist and can be developed for to link to existing systems such as LIMS / UNIX / etc for specific clients)

Sol Plaatje Municipality Water Quality Management System - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://www.wqms.co.za/admin/

Customize Links Free Hotmail Windows Marketplace Windows Media Windows

import data
import sample points

Date Analysed (optional)

Lab Number (optional)

Type (optional) Not applicable

Comments (optional) Poor disinfection efficiency. Issue has been addressed. Re-sampling indicated that water is safe to drink. Issue has been resolved. Mr Manager (date)

Determinant	Value	Unit	Reason for no value
Aluminium (health)	0.15	mg/L as Al	None
E.coli (health)	10	count per 100 mL	None
Electrical Conductivity (aesthetic)		mS/m	Analysis not carried out
Fluoride (health)		mg/L as F-	Analysis not carried out
Free Chlorine Residual (operational)	0	mg/L	None
Iron (aesthetic/operational)	0.15	mg/L as Fe	None
Nitrates and Nitrites (health)	0	mg/L as N	None
pH (aesthetic/operational)	7.6	pH units	None
Total Coliforms (operational)	25	count per 100 mL	None
Turbidity (aesthetic/operational/indirect health)	4.5	NTU	None

Submit

Figure A16: eWQMS data entry via the internet (Sol Plaatje, Northern Cape)

Microsoft Excel - Umzinyathi LM July 2007 (1).xls

File Edit View Insert Format Tools Data Window Help

Counter New 10 B U % +.00 .00

Reply with Changes... End Review...

A	B	C	D	E	F
1 Sampling Organisation	Umzinyathi District Municipality		Testing Laboratory		
2 Address			Address		
3					
4					
5 Telephone			Telephone		
6 Fax			Fax		
7 E-mail			E-mail		
8 Contact Person			Contact Person		
9 Organisation	Umzinyathi District Municipality				
10 Sampler	Umzinyathi District Municipality				
11 Report Date	2007/07/02				
12 Date Samples Received	2007/07/02				
13 Date Analysis Completed	2007/07/02				
14					
15 Municipality	Endumeni Municipality				
16 Sample Point Description	Biggarsberg WTW Final	Biggarsberg Bulk Manifold	Vant's Drift WTW Final	Wasbank Reservoir	Meisinga Municipality
17 Sample ID	KZUMEN-001	KZUMEN-002	KZUMEN-003	KZUMEN-004	KZUMEN-001
18 Sample Date	2007/07/02	2007/07/02	2007/07/02	2007/07/02	2007/07/02
19 Alkalinity (mg/L as CaCO3)	b	93	135	b	71
20 Calcium (aesthetic/operational) (mg/L)	b	53	54	b	16
21 Calcium Carbonate Dissolution Potential	b	c	c	b	c
22 Electrical Conductivity (aesthetic)	b	55	57	b	22
23 Faecal Coliforms (health) (count per 100 mL)	b	0	0	b	0
24 Free Chlorine Residual (operational)	b	0.86	1.5	b	2
25 Iron (aesthetic/operational) (mg/L as Fe)	b	0.02	0.03	b	0.02
26 Fluoride (health) (mg/L as F-)	b	0.42	0.32	b	0.12
27 Calcium Hardness (mg/L as CaCO3)	b	130	135	b	40
28 Magnesium Hardness (mg/L as CaCO3)	b	34	71	b	30
29 Total Hardness (mg/L as CaCO3)	b	165	205	b	70
30 Heterotrophic Plate Count (operational)	b	1	0	b	0
31 Magnesium (aesthetic/health) (mg/L as Mg)	b	8.3	17	b	7.3
32 pH (aesthetic/operational)	b	8.1	7.9	b	7.6

Figure A17: eWQMS data entry via spreadsheet (submitted via e-mail) (Umzinyathi Municipality, KwaZulu-Natal)



Figure A18: eWQMS data loading via import script/patch (Ethekewini Municipality, KwaZulu-Natal)

- **Automation** (auto-notification by e-mail of failures, generation of auto-reports and summary reports for feedback to the full range of participating parties)

Figure A19: eWQMS e-mail with report as attachment ((Bitou Municipality, Western Cape)

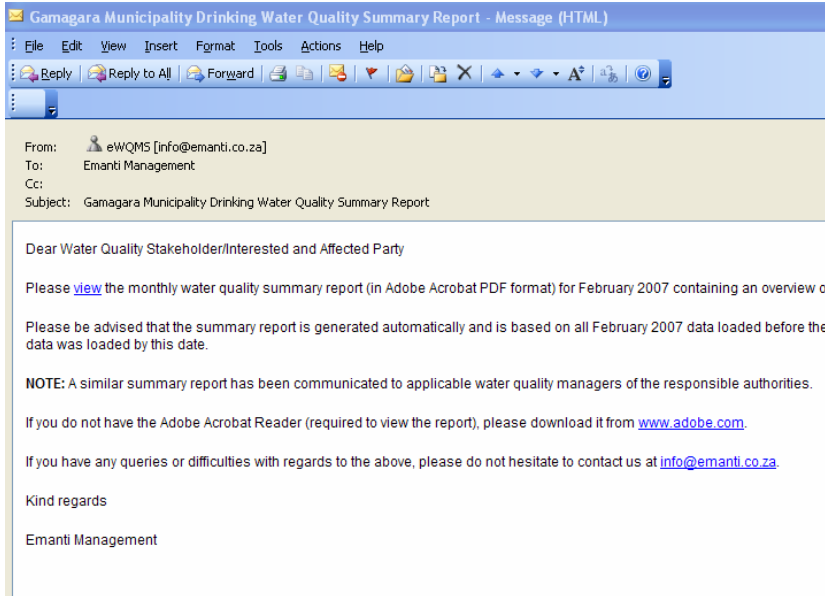


Figure A20: eWQMS e-mail with report accessible via internet link (Gamagara Municipality, Northern Cape)

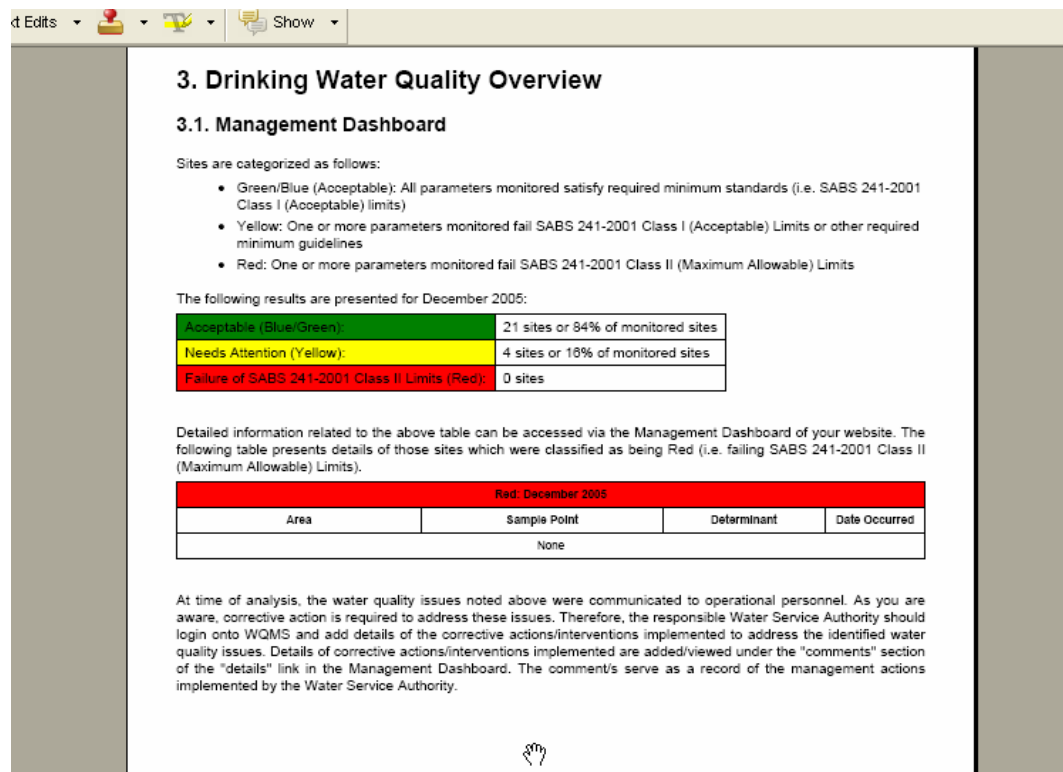


Figure A21: Extract from an automatic monthly summary report

■ Infrastructure

Captures WSA infrastructure details related to abstraction points, treatment systems, storage facilities (e.g. reservoirs), reticulation/point of use (e.g. sampling points), DWQM Programmes (frequency of monitoring, parameters, etc) and laboratories utilised.

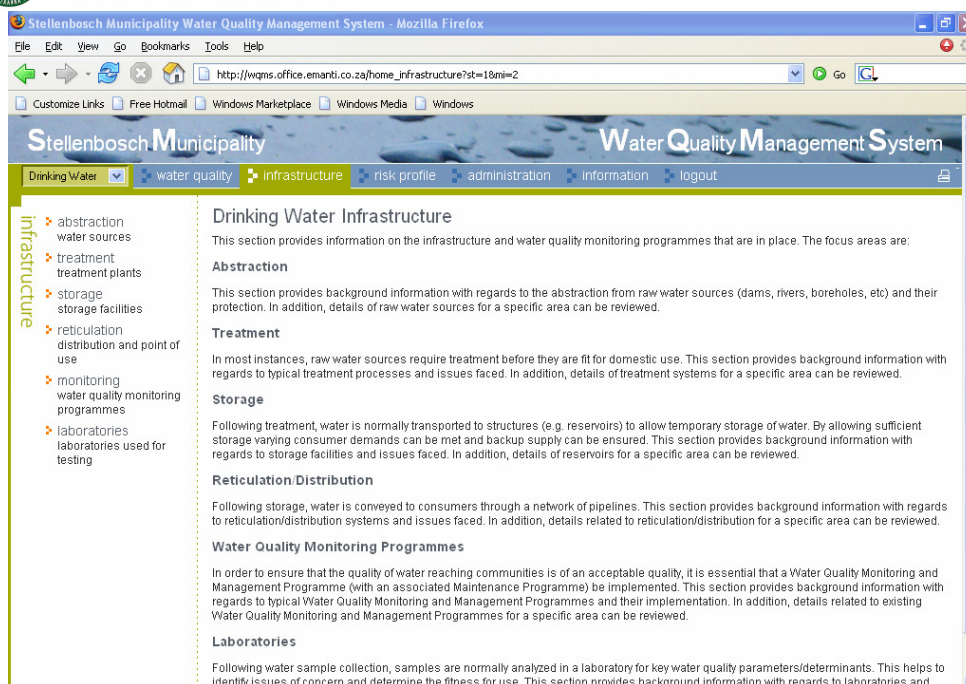


Figure A22: eWQMS Infrastructure component

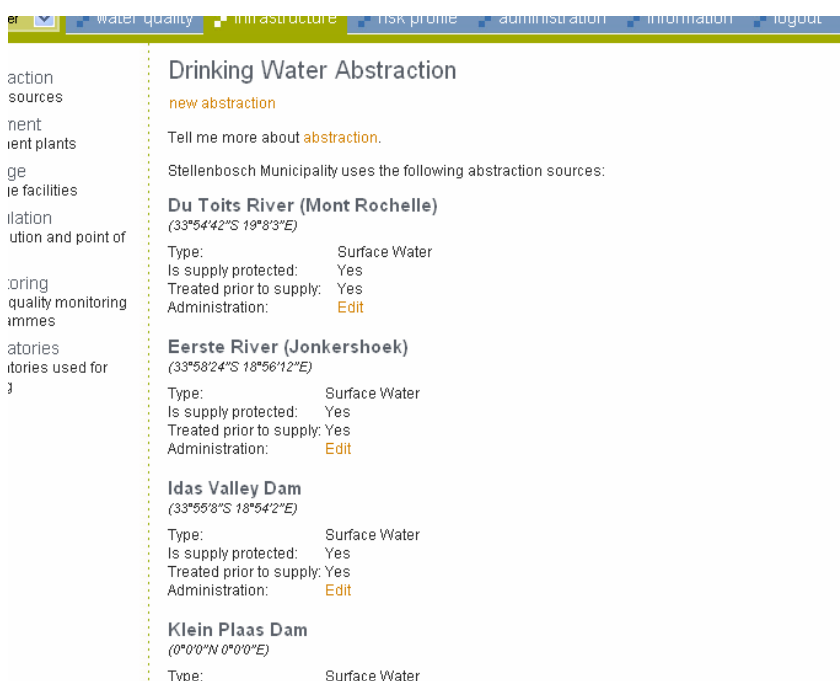


Figure A23: Example of raw water abstraction details on the eWQMS (Stellenbosch Municipality, Western Cape)

■ DWQM Risk Profiles

Assessment tools have been introduced which allow WSAs to perform a self-assessment of the status of their WSA. Examples include a strategic level WQM Sustainability Analysis (Gap Analysis) and a Water Research Commission “Drinking-Water Treatment Plant and Distribution Network Assessment and Risk Profile” system.

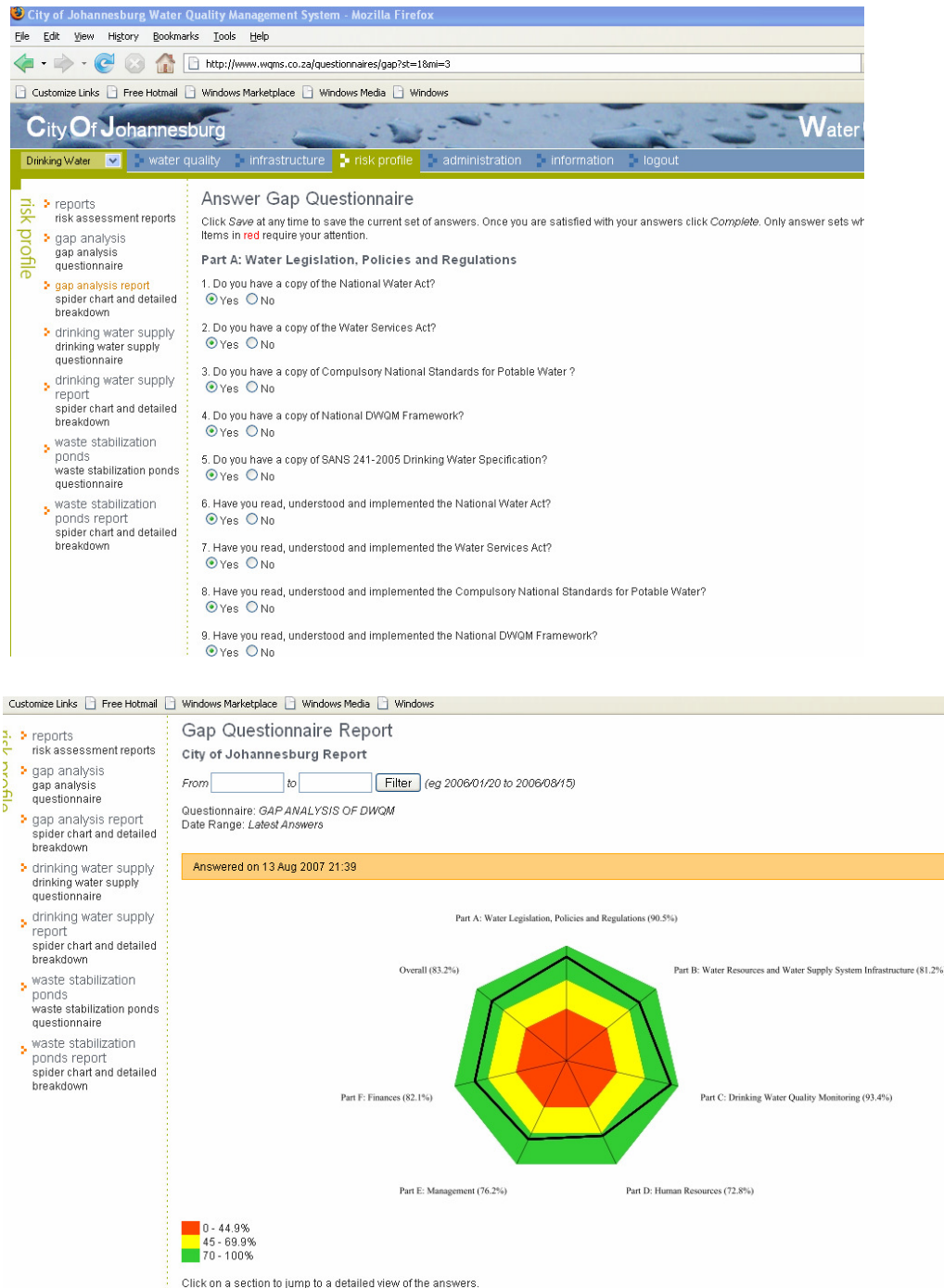


Figure A24: Gap analysis questionnaire and spider diagram output (City of Johannesburg, Gauteng)

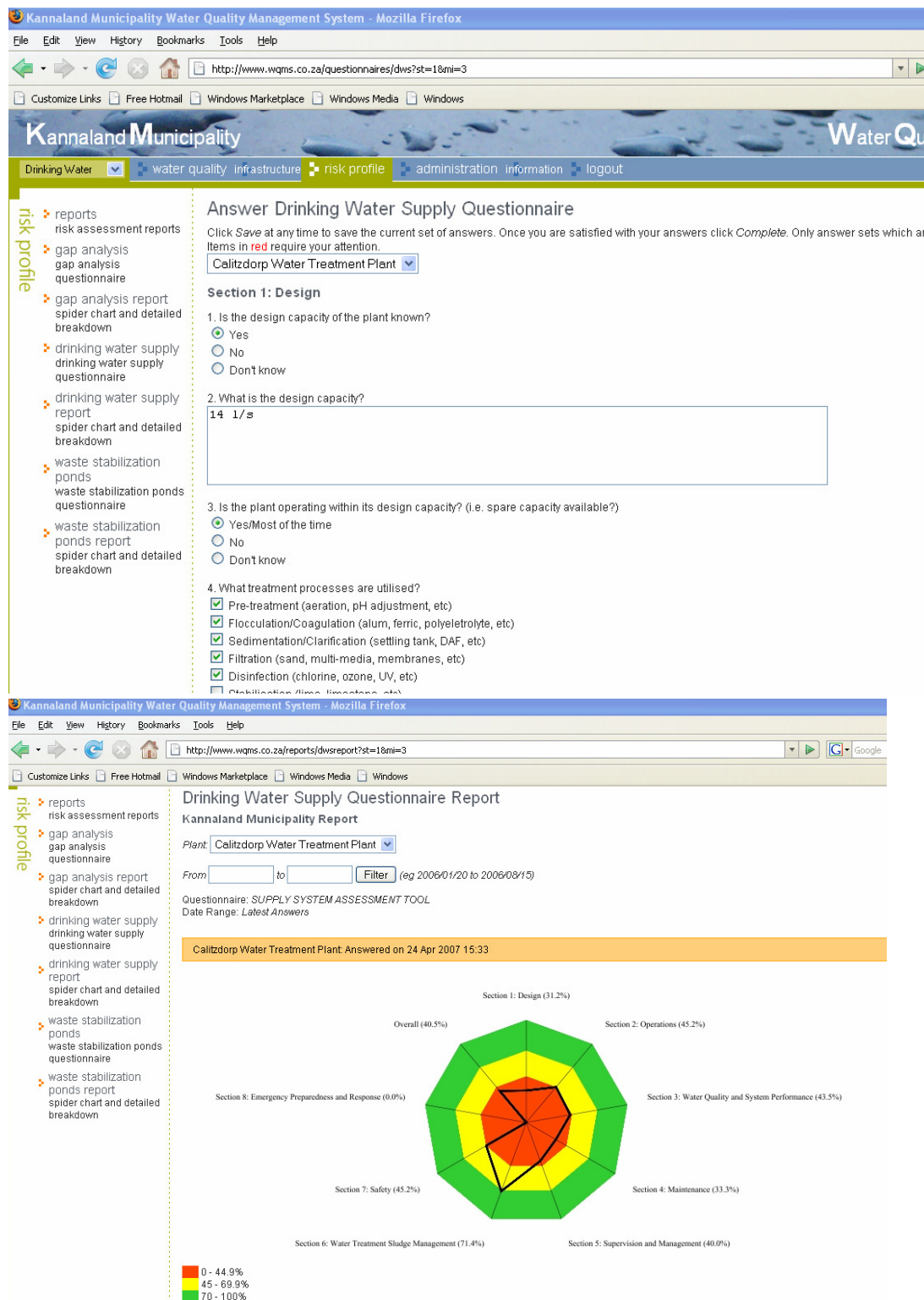
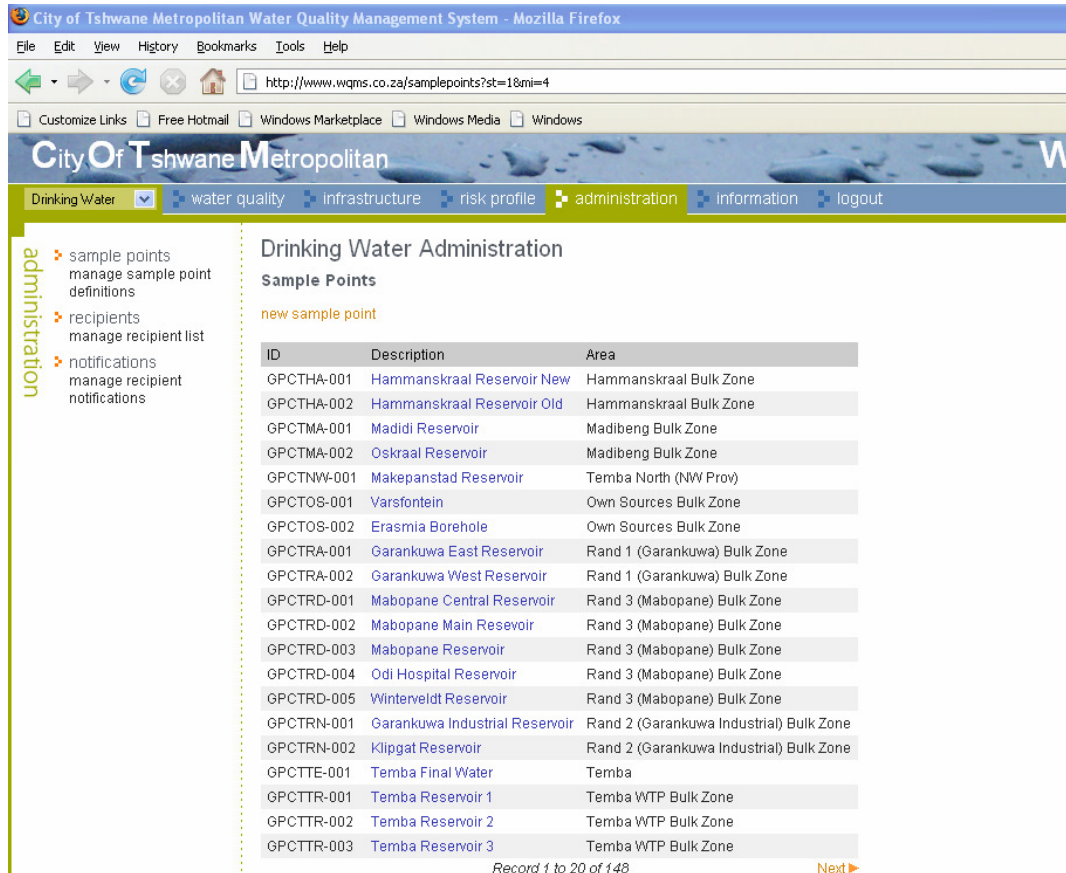


Figure A25: Water supply system questionnaire and spider diagram output (Kannaland Municipality, Western Cape)

■ Administration

Current WSA functionality includes the ability to manage sample points (add new/edit existing), manage recipients/distribution lists for automated communications, manage required automatic notifications (e-mail, summary report), data entry (water quality, infrastructure, etc) and ability to add comments related to drinking-water failures and actions taken to address issues of concern (i.e. comments serve as an action record taken to address issues of concern).



The screenshot shows the 'City of Tshwane Metropolitan Water Quality Management System' interface. The main navigation bar includes 'Drinking Water', 'water quality', 'infrastructure', 'risk profile', 'administration' (selected), 'information', and 'logout'. The left sidebar lists 'administration' tasks: 'sample points', 'manage sample point definitions', 'recipients', 'manage recipient list', 'notifications', 'manage recipient notifications', and 'notifications'. The main content area is titled 'Drinking Water Administration' and 'Sample Points'. It features a 'new sample point' link and a table of sample points.

ID	Description	Area
GPCTHA-001	Hammanskraal Reservoir New	Hammanskraal Bulk Zone
GPCTHA-002	Hammanskraal Reservoir Old	Hammanskraal Bulk Zone
GPCTMA-001	Madidi Reservoir	Madibeng Bulk Zone
GPCTMA-002	Oskraal Reservoir	Madibeng Bulk Zone
GPCTNW-001	Makepanstad Reservoir	Temba North (NW Prov)
GPCTOS-001	Varsfontein	Own Sources Bulk Zone
GPCTOS-002	Erasmia Borehole	Own Sources Bulk Zone
GPCTRA-001	Garankuwa East Reservoir	Rand 1 (Garankuwa) Bulk Zone
GPCTRA-002	Garankuwa West Reservoir	Rand 1 (Garankuwa) Bulk Zone
GPCTRD-001	Mabopane Central Reservoir	Rand 3 (Mabopane) Bulk Zone
GPCTRD-002	Mabopane Main Reservoir	Rand 3 (Mabopane) Bulk Zone
GPCTRD-003	Mabopane Reservoir	Rand 3 (Mabopane) Bulk Zone
GPCTRD-004	Odi Hospital Reservoir	Rand 3 (Mabopane) Bulk Zone
GPCTRD-005	Winterveldt Reservoir	Rand 3 (Mabopane) Bulk Zone
GPCTRN-001	Garankuwa Industrial Reservoir	Rand 2 (Garankuwa Industrial) Bulk Zone
GPCTRN-002	Klipgat Reservoir	Rand 2 (Garankuwa Industrial) Bulk Zone
GPCTTE-001	Temba Final Water	Temba
GPCTTR-001	Temba Reservoir 1	Temba WTP Bulk Zone
GPCTTR-002	Temba Reservoir 2	Temba WTP Bulk Zone
GPCTTR-003	Temba Reservoir 3	Temba WTP Bulk Zone

Record 1 to 20 of 148 [Next](#)

Figure A26: Sample point administration (City of Tshwane, Gauteng)

■ Guiding Information

Current functionality includes a convenient repository of drinking-water related information including: abstraction, treatment, storage, reticulation and point of use, Water Quality Monitoring and Management Programmes, water quality parameters, their effects and how to rectify issues, laboratories, water related sites and news and References including National Water Act, Water Services Act, Compulsory National Standards for DWQ, National DWQM Framework, etc.



- home
default starting point
- quick info
water info and orientation
- reference
reference material
- about
about wqms

Drinking-Water General Information

The following general information related to drinking-water is available:

- ◆ **Abstraction** - This section provides an overview of typical raw water sources and their protection.
- ◆ **Drinking-Water Treatment** - This section provides an overview of water treatment technologies, its maintenance and discusses the importance of disinfection.
- ◆ **Storage** - This section provides an overview of typical storage systems, highlights the need for n
- ◆ **Reticulation and Point of Use** - This section provides an overview of typical issues faced in distribution measures.
- ◆ **Drinking-Water Quality Monitoring and Management Programmes** - This section provides an overview to drinking-water and describes typical water quality management procedures.
- ◆ **Drinking-Water Quality Parameters** - This section describes typical water quality parameters and failures.
- ◆ **Drinking-Water Laboratories** - This section describes the types of laboratories and provides link

In addition to the above, some useful [drinking-water related sites and news](#) can be accessed.

quality infrastructure risk profile information logout

Microbiological Parameters

E.coli

Escherichia coli (*E.coli*) is used as an indicator of faecal pollution by warm blooded animals (often interpreted as human faecal pollution). The presence of faecal pollution by warm blooded animals may indicate the presence of pathogens responsible for infectious disease such as gastroenteritis, cholera, dysentery and typhoid fever after ingestion of contaminated water.

Effect and possible implications of failure

- ◆ Health

The risks of being infected correlates with the level of contamination of the water and the amount of contaminated water consumed. Higher concentrations of *E.coli* in water will indicate a higher risk of contracting waterborne disease, even if small amounts of water are consumed. Any bacteriological failure with regards to *E.coli* can therefore be considered a direct indication of risk to health.

SANS 241-2005 Standards

- ◆ SANS 241-2005 Table 1 (Microbiological safety requirements) column 3 Allowable Compliance Contribution (95% of samples min) Upper Limit: Not detected (count per 100 ml)
- ◆ SANS 241-2005 Table 1 (Microbiological safety requirements) column 4 Allowable Compliance Contribution (4% of samples max) Upper Limit: Not detected (count per 100 ml)
- ◆ **SANS 241-2005 Table 1 (Microbiological safety requirements) column 5 Allowable Compliance Contribution (1% of samples max) Upper Limit: 1 (count per 100 ml)**

Possible reasons for failure

- ◆ No disinfection (e.g. no chlorine dosing, no ozone dosing, no UV system)
- ◆ No residual chlorine or low level of residual chlorine (e.g. chlorine not added at plant, residual chlorine below 0.2 mg/L at point of consumption)
- ◆ Contamination (e.g. from pipe breaks and bursts, from repairs to network, infiltration or seepage from a contaminated source, sewage near groundwater sources, contamination from pit latrines/septic tanks, rubbish and faecal matter around standpipes)
- ◆ Lack of maintenance (e.g. reservoirs and pipes not cleaned/flushed)
- ◆ Poor design (e.g. long retention times in reservoir and distribution network, open reservoirs, large reticulation network with no additional chlorine dosing at reservoirs)
- ◆ Sabotage/vandalism

Faecal Coliforms

Faecal coliform bacteria are found in water wherever the water is contaminated with faecal waste of human or animal origin. Faecal coliforms are primarily used to indicate the presence of bacterial pathogens such as *Salmonella* spp., *Shigella* spp., *Vibrio cholerae*, *Campylobacter jejuni*, *Campylobacter coli*, *Yersinia enterocolitica* and pathogenic *E. coli*. These organisms can be transmitted via the faecal/oral route by contaminated or poorly treated water and may cause diseases such as gastroenteritis, salmonellosis, dysentery, cholera and typhoid fever.

Effect and possible implications of failure

Figure A27: Information examples

4. User Requested Enhancements to the eWQMS System

As noted in Section 2, through the national roll-out process and IMESA led workshops, a number of enhancements to eWQMS functionality have been requested by system users. This has led to the prioritisation of system user requirements and necessary incremental IT development of the eWQMS to meet the specified system user requirements. The development to the eWQMS includes enhancements to numerous components of the eWQMS including the Management Dashboard, Overview, Analysis (tables and graphs), Automatic Monthly Report and Communications. The methodology to be followed included development of the specified enhancement, testing and refinement of the specified enhancement and subsequent deployment

of the specified enhancement to eWQMS users. These enhanced components were made available to users in September 2007.

Furthermore, it must be noted that during the abovementioned enhancement phase, eWQMS users have noted the need for further developments and enhancements. Although some of these have already been implemented, other requests have only been noted and prioritised. The above highlights both the fact that WSAs find the eWQMS useful and contributes positively to improved water quality management, and the need to continuously develop the eWQMS to meet on-going user requirements for effective water quality management. In particular, eWQMS users have noted the need to further enhance wastewater components.