Government Gazette
Staatskoerant

REPUBLIC OF SOUTH AFRICA
REPUBLIEK VAN SUID AFRIKA

Vol. 663 | 25 September / September 2020 | No. 43734

PART 1 OF 3

ISSN 1682-5843

43734

9 771682 584003

IMPORTANT NOTICE OF OFFICE RELOCATION

government printing
Department:
Government Printing Works
REPUBLIC OF SOUTH AFRICA

Private Bag X85, PRETORIA, 0001 149 Bosman Street, PRETORIA
Tel: 012 748 6197, Website: www.gpwonline.co.za

URGENT NOTICE TO OUR VALUED CUSTOMERS: PUBLICATIONS OFFICE'S RELOCATION HAS BEEN TEMPORARILY SUSPENDED.

Please be advised that the GPW Publications office will no longer move to 88 Visagie Street as indicated in the previous notices.

The move has been suspended due to the fact that the new building in 88 Visagie Street is not ready for occupation yet.

We will later on issue another notice informing you of the new date of relocation.

We are doing everything possible to ensure that our service to you is not disrupted.

As things stand, we will continue providing you with our normal service from the current location at 196 Paul Kruger Street, Masada building.

Customers who seek further information and or have any questions or concerns are free to contact us through telephone 012 748 6066 or email Ms Maureen Toka at Maureen.Toka@gpw.gov.za or cell phone at 082 859 4910.

Please note that you will still be able to download gazettes free of charge from our website www.gpwonline.co.za.

We apologies for any inconvenience this might have caused.

Issued by GPW Communications

For purposes of reference, all Proclamations, Government Notices, General Notices and Board Notices published are included in the following table of contents which thus forms a weekly index. Let yourself be guided by the gazette numbers in the righthand column:

Weekly Index

Alle Proklamasies, Goewermentskennisgewings, Algemene Kennisgewings en Raadskennisgewings gepubliseer, word vir verwysingsdoeleindes in die volgende Inhoudopgawe ingesluit wat dus weeklikse indeks voorstel. Laat uself deur die Koerantnommers in die regterhandse kolom lei:

Weeklikse Indeks

GENERAL NOTICE

BOARD NOTICE

ALGEMENE KENNISGEWINGS

RAADSKENNISGEWINGS

Contents

government
printing

Department:
Government Printing Works
REPUBLIC OF SOUTH AFRICA

HIGH ALERT: SCAM WARNING!!!

TO ALL SUPPLIERS AND SERVICE PROVIDERS OF THE GOVERNMENT PRINTING WORKS

It has come to the attention of the *GOVERNMENT PRINTING WORKS* that there are certain unscrupulous companies and individuals who are defrauding unsuspecting businesses disguised as representatives of the *Government Printing Works* (*GPW*).

The scam involves the fraudsters using the letterhead of *GPW* to send out fake tender bids to companies and requests to supply equipment and goods.

Although the contact person's name on the letter may be of an existing official, the contact details on the letter are not the same as the *Government Printing Works*'. When searching on the Internet for the address of the company that has sent the fake tender document, the address does not exist.

The banking details are in a private name and not company name. Government will never ask you to deposit any funds for any business transaction. *GPW* has alerted the relevant law enforcement authorities to investigate this scam to protect legitimate businesses as well as the name of the organisation.

Example of e-mails these fraudsters are using:

PROCUREMENT@GPW-GOV.ORG

Should you suspect that you are a victim of a scam, you must urgently contact the police and inform the *GPW*.

GPW has an official email with the domain as **@gpw.gov.za**

Government e-mails DO NOT have org in their e-mail addresses. All of these fraudsters also use the same or very similar telephone numbers. Although such number with an area code 012 looks like a landline, it is not fixed to any property.

GPW will never send you an e-mail asking you to supply equipment and goods without a purchase/order number. *GPW* does not procure goods for another level of Government. The organisation will not be liable for actions that result in companies or individuals being resultant victims of such a scam.

Government Printing Works gives businesses the opportunity to supply goods and services through RFQ / Tendering process. In order to be eligible to bid to provide goods and services, suppliers must be registered on the National Treasury's Central Supplier Database (CSD). To be registered, they must meet all current legislative requirements (e.g. have a valid tax clearance certificate and be in good standing with the South African Revenue Services - SARS).

The tender process is managed through the Supply Chain Management (SCM) system of the department. SCM is highly regulated to minimise the risk of fraud, and to meet objectives which include value for money, open and effective competition, equitability, accountability, fair dealing, transparency and an ethical approach. Relevant legislation, regulations, policies, guidelines and instructions can be found on the tender's website.

Fake Tenders

National Treasury's CSD has launched the Government Order Scam campaign to combat fraudulent requests for quotes (RFQs). Such fraudulent requests have resulted in innocent companies losing money. We work hard at preventing and fighting fraud, but criminal activity is always a risk.

How tender scams work

There are many types of tender scams. Here are some of the more frequent scenarios:

Fraudsters use what appears to be government department stationery with fictitious logos and contact details to send a fake RFQ to a company to invite it to urgently supply goods. Shortly after the company has submitted its quote, it receives notification that it has won the tender. The company delivers the goods to someone who poses as an official or at a fake site. The Department has no idea of this transaction made in its name. The company is then never paid and suffers a loss.

OR

Fraudsters use what appears to be government department stationery with fictitious logos and contact details to send a fake RFQ to Company A to invite it to urgently supply goods. Typically, the tender specification is so unique that only Company B (a fictitious company created by the fraudster) can supply the goods in question.

Shortly after Company A has submitted its quote it receives notification that it has won the tender. Company A orders the goods and pays a deposit to the fictitious Company B. Once Company B receives the money, it disappears. Company A's money is stolen in the process.

Protect yourself from being scammed

- If you are registered on the supplier databases and you receive a request to tender or quote that seems to be from a government department, contact the department to confirm that the request is legitimate. Do not use the contact details on the tender document as these might be fraudulent.

- Compare tender details with those that appear in the Tender Bulletin, available online at **www.gpwonline.co.za**

- Make sure you familiarise yourself with how government procures goods and services. Visit the tender website for more information on how to tender.

- If you are uncomfortable about the request received, consider visiting the government department and/or the place of delivery and/or the service provider from whom you will be sourcing the goods.

- In the unlikely event that you are asked for a deposit to make a bid, contact the SCM unit of the department in question to ask whether this is in fact correct.

Any incidents of corruption, fraud, theft and misuse of government property in the *Government Printing Works* can be reported to:

Supply Chain Management: Ms. Anna Marie Du Toit, Tel. (012) 748 6292.
Email: **Annamarie.DuToit@gpw.gov.za**

Marketing and Stakeholder Relations: Ms Bonakele Mbhele, at Tel. (012) 748 6193.
Email: **Bonakele.Mbhele@gpw.gov.za**

Security Services: Mr Daniel Legoabe, at tel. (012) 748 6176.
Email: **Daniel.Legoabe@gpw.gov.za**

Closing times for **ORDINARY WEEKLY** GOVERNMENT GAZETTE 2020

*The closing time is **15:00** sharp on the following days:*

- **24 December 2019,** Tuesday for the issue of Friday **03 January 2020**
- **03 January,** Friday for the issue of Friday **10 January 2020**
- **10 January,** Friday for the issue of Friday **17 January 2020**
- **17 January,** Friday for the issue of Friday **24 January 2020**
- **24 January,** Friday for the issue of Friday **31 January 2020**
- **31 February,** Friday for the issue of Friday **07 February 2020**
- **07 February,** Friday for the issue of Friday **14 February 2020**
- **14 February,** Friday for the issue of Friday **21 February 2020**
- **21 February,** Friday for the issue of Friday **28 February 2020**
- **28 February,** Friday for the issue of Friday **06 March 2020**
- **06 March,** Friday for the issue of Friday **13 March 2020**
- **13 March,** Thursday for the issue of Friday **20 March 2020**
- **20 March,** Friday for the issue of Friday **27 March 2020**
- **27 March,** Friday for the issue of Friday **03 April 2020**
- **02 April,** Thursday for the issue of Thursday **09 April 2020**
- **08 April,** Wednesday for the issue of Friday **17 April 2020**
- **17 April,** Friday for the issue of Friday **24 April 2020**
- **22 April,** Wednesday for the issue of Thursday **30 April 2020**
- **30 April,** Thursday for the issue of Friday **08 May 2020**
- **08 May,** Friday for the issue of Friday **15 May 2020**
- **15 May,** Friday for the issue of Friday **22 May 2020**
- **22 May,** Friday for the issue of Friday **29 May 2020**
- **29 May,** Friday for the issue of Friday **05 June 2020**
- **05 June,** Friday for the issue of Friday **12 June 2020**
- **11 June,** Thursday for the issue of Friday **19 June 2020**
- **19 June,** Friday for the issue of Friday **26 June 2020**
- **26 June,** Friday for the issue of Friday **03 July 2020**
- **03 July,** Friday for the issue of Friday **10 July 2020**
- **10 July,** Friday for the issue of Friday **17 July 2020**
- **17 July,** Friday for the issue of Friday **24 July 2020**
- **24 July,** Friday for the issue of Friday **31 July 2020**
- **31 July,** Thursday for the issue of Friday **07 August 2020**
- **06 August,** Thursday for the issue of Friday **14 August 2020**
- **14 August,** Friday for the issue of Friday **21 August 2020**
- **21 August,** Friday for the issue of Friday **28 August 2020**
- **28 August,** Friday for the issue of Friday **04 September 2020**
- **04 September,** Friday for the issue of Friday **11 September 2020**
- **11 September,** Friday for the issue of Friday **18 September 2020**
- **17 September,** Thursday for the issue of Friday **25 September 2020**
- **25 September,** Friday for the issue of Friday **02 October 2020**
- **02 October,** Friday for the issue of Friday **09 October 2020**
- **09 October,** Friday for the issue of Friday **16 October 2020**
- **16 October,** Friday for the issue of Friday **23 October 2020**
- **23 October,** Friday for the issue of Friday **30 October 2020**
- **30 October,** Friday for the issue of Friday **06 November 2020**
- **06 November,** Friday for the issue of Friday **13 November 2020**
- **13 November,** Friday for the issue of Friday **20 November 2020**
- **20 November,** Friday for the issue of Friday **27 November 2020**
- **27 November,** Friday for the issue of Friday **04 December 2020**
- **04 December,** Friday for the issue of Friday **11 December 2020**
- **10 December,** Thursday for the issue of Friday **18 December 2020**
- **17 December,** Thursday for the issue of Friday **24 December 2020**
- **23 December,** Wednesday for the issue of Friday **31 December 2020**

LIST OF TARIFF RATES

FOR PUBLICATION OF NOTICES

COMMENCEMENT: 1 APRIL 2018

NATIONAL AND PROVINCIAL

Notice sizes for National, Provincial & Tender gazettes 1/4, 2/4, 3/4, 4/4 per page. Notices submitted will be charged at R1008.80 per full page, pro-rated based on the above categories.

Pricing for National, Provincial - Variable Priced Notices		
Notice Type	**Page Space**	**New Price (R)**
Ordinary National, Provincial	1/4 - Quarter Page	252.20
Ordinary National, Provincial	2/4 - Half Page	504.40
Ordinary National, Provincial	3/4 - Three Quarter Page	756.60
Ordinary National, Provincial	4/4 - Full Page	1008.80

EXTRA-ORDINARY

All Extra-ordinary National and Provincial gazette notices are non-standard notices and attract a variable price based on the number of pages submitted.

The pricing structure for National and Provincial notices which are submitted as **Extra ordinary submissions** will be charged at R**3026.32** per page.

GOVERNMENT PRINTING WORKS - BUSINESS RULES

The **Government Printing Works** (**GPW**) has established rules for submitting notices in line with its electronic notice processing system, which requires the use of electronic *Adobe* Forms. Please ensure that you adhere to these guidelines when completing and submitting your notice submission.

Closing Times for Acceptance of Notices

1. The *Government Gazette* and *Government Tender Bulletin* are weekly publications that are published on Fridays and the closing time for the acceptance of notices is strictly applied according to the scheduled time for each gazette.

2. Please refer to the Submission Notice Deadline schedule in the table below. This schedule is also published online on the Government Printing works website www.gpwonline.co.za

   All re-submissions will be subject to the standard cut-off times.
   All notices received after the closing time will be rejected.

Government Gazette Type	Publication Frequency	Publication Date	Submission Deadline	Cancellations Deadline
National Gazette	Weekly	Friday	Friday 15h00 for next Friday	Tuesday, 15h00 - 3 working days prior to publication
Regulation Gazette	Weekly	Friday	Friday 15h00 for next Friday	Tuesday, 15h00 - 3 working days prior to publication
Petrol Price Gazette	Monthly	Tuesday before 1st Wednesday of the month	One day before publication	1 working day prior to publication
Road Carrier Permits	Weekly	Friday	Thursday 15h00 for next Friday	3 working days prior to publication
Unclaimed Monies (Justice, Labour or Lawyers)	January / September 2 per year	Last Friday	One week before publication	3 working days prior to publication
Parliament (Acts, White Paper, Green Paper)	As required	Any day of the week	None	3 working days prior to publication
Manuals	Bi- Monthly	2nd and last Thursday of the month	One week before publication	3 working days prior to publication
State of Budget (National Treasury)	Monthly	30th or last Friday of the month	One week before publication	3 working days prior to publication
Extraordinary Gazettes	As required	Any day of the week	*Before 10h00 on publication date*	*Before 10h00 on publication date*
Legal Gazettes A, B and C	Weekly	Friday	One week before publication	Tuesday, 15h00 - 3 working days prior to publication
Tender Bulletin	Weekly	Friday	Friday 15h00 for next Friday	Tuesday, 15h00 - 3 working days prior to publication
Gauteng	Weekly	Wednesday	Two weeks before publication	3 days **after** submission deadline
Eastern Cape	Weekly	Monday	One week before publication	3 working days prior to publication
Northern Cape	Weekly	Monday	One week before publication	3 working days prior to publication
North West	Weekly	Tuesday	One week before publication	3 working days prior to publication
KwaZulu-Natal	Weekly	Thursday	One week before publication	3 working days prior to publication
Limpopo	Weekly	Friday	One week before publication	3 working days prior to publication
Mpumalanga	Weekly	Friday	One week before publication	3 working days prior to publication

Government Gazette Type	Publication Frequency	Publication Date	Submission Deadline	Cancellations Deadline
Gauteng Liquor License Gazette	Monthly	Wednesday before the First Friday of the month	Two weeks before publication	3 working days **after** submission deadline
Northern Cape Liquor License Gazette	Monthly	First Friday of the month	Two weeks before publication	3 working days **after** submission deadline
National Liquor License Gazette	Monthly	First Friday of the month	Two weeks before publication	3 working days **after** submission deadline
Mpumalanga Liquor License Gazette	Bi-Monthly	Second & Fourth Friday	One week before publication	3 working days prior to publication

Extraordinary Gazettes

3. *Extraordinary Gazettes* can have only one publication date. If multiple publications of an *Extraordinary Gazette* are required, a separate Z95/Z95Prov *Adobe* Forms for each publication date must be submitted.

Notice Submission Process

4. Download the latest *Adobe* form, for the relevant notice to be placed, from the **Government Printing Works** website www.gpwonline.co.za.

5. The *Adobe* form needs to be completed electronically using *Adobe Acrobat* / *Acrobat Reader*. Only electronically completed *Adobe* forms will be accepted. No printed, handwritten and/or scanned *Adobe* forms will be accepted.

6. The completed electronic *Adobe* form has to be submitted via email to submit.egazette@gpw.gov.za. The form needs to be submitted in its original electronic *Adobe* format to enable the system to extract the completed information from the form for placement in the publication.

7. Every notice submitted **must** be accompanied by an official **GPW** quotation. This must be obtained from the *eGazette* Contact Centre.

8. Each notice submission should be sent as a single email. The email **must** contain **all documentation relating to a particular notice submission**.

   8.1. Each of the following documents must be attached to the email as a separate attachment:

   8.1.1. An electronically completed *Adobe* form, specific to the type of notice that is to be placed.

   8.1.1.1. For National *Government Gazette* or *Provincial Gazette* notices, the notices must be accompanied by an electronic Z95 or Z95Prov *Adobe* form

   8.1.1.2. The notice content (body copy) **MUST** be a separate attachment.

   8.1.2. A copy of the official **Government Printing Works** quotation you received for your notice. *(Please see Quotation section below for further details)*

   8.1.3. A valid and legible Proof of Payment / Purchase Order: **Government Printing Works** account customer must include a copy of their Purchase Order**. Non-Government Printing Works** account customer needs to submit the proof of payment for the notice

   8.1.4. Where separate notice content is applicable (Z95, Z95 Prov and TForm 3, it should **also** be attached as a separate attachment. *(Please see the Copy Section below, for the specifications)*.

   8.1.5. Any additional notice information if applicable.

9. The electronic *Adobe* form will be taken as the primary source for the notice information to be published. Instructions that are on the email body or covering letter that contradicts the notice form content will not be considered. The information submitted on the electronic *Adobe* form will be published as-is.

10. To avoid duplicated publication of the same notice and double billing, Please submit your notice **ONLY ONCE.**

11. Notices brought to **GPW** by "walk-in" customers on electronic media can only be submitted in *Adobe* electronic form format. All "walk-in" customers with notices that are not on electronic *Adobe* forms will be routed to the Contact Centre where they will be assisted to complete the forms in the required format.

12. Should a customer submit a bulk submission of hard copy notices delivered by a messenger on behalf of any organisation e.g. newspaper publisher, the messenger will be referred back to the sender as the submission does not adhere to the submission rules.

Quotations

13. Quotations are valid until the next tariff change.

    13.1. ***Take note:*** **GPW**'s annual tariff increase takes place on ***1 April*** therefore any quotations issued, accepted and submitted for publication up to ***31 March*** will keep the old tariff. For notices to be published from 1 April, a quotation must be obtained from **GPW** with the new tariffs. Where a tariff increase is implemented during the year, **GPW** endeavours to provide customers with 30 days' notice of such changes.

14. Each quotation has a unique number.

15. Form Content notices must be emailed to the *eGazette* Contact Centre for a quotation.

    15.1. The *Adobe* form supplied is uploaded by the Contact Centre Agent and the system automatically calculates the cost of your notice based on the layout/format of the content supplied.

    15.2. It is critical that these *Adobe* Forms are completed correctly and adhere to the guidelines as stipulated by **GPW**.

16. **APPLICABLE ONLY TO GPW ACCOUNT HOLDERS**:

    16.1. **GPW** Account Customers must provide a valid **GPW** account number to obtain a quotation.

    16.2. Accounts for **GPW** account customers **must** be active with sufficient credit to transact with **GPW** to submit notices.

        16.2.1. If you are unsure about or need to resolve the status of your account, please contact the **GPW** Finance Department prior to submitting your notices. (If the account status is not resolved prior to submission of your notice, the notice will be failed during the process).

17. **APPLICABLE ONLY TO CASH CUSTOMERS:**

    17.1. Cash customers doing **bulk payments** must use a **single email address** in order to use the **same proof of payment** for submitting multiple notices.

18. The responsibility lies with you, the customer, to ensure that the payment made for your notice(s) to be published is sufficient to cover the cost of the notice(s).

19. Each quotation will be associated with one proof of payment / purchase order / cash receipt.

    19.1. This means that <u>**the quotation number can only be used once to make a payment.**</u>

COPY (SEPARATE NOTICE CONTENT DOCUMENT)

20. Where the copy is part of a separate attachment document for Z95, Z95Prov and TForm03

 20.1. Copy of notices must be supplied in a separate document and may not constitute part of any covering letter, purchase order, proof of payment or other attached documents.

 The content document should contain only one notice. (You may include the different translations of the same notice in the same document).

 20.2. The notice should be set on an A4 page, with margins and fonts set as follows:

 Page size = A4 Portrait with page margins: Top = 40mm, LH/RH = 16mm, Bottom = 40mm; Use font size: Arial or Helvetica 10pt with 11pt line spacing;

 Page size = A4 Landscape with page margins: Top = 16mm, LH/RH = 40mm, Bottom = 16mm; Use font size: Arial or Helvetica 10pt with 11pt line spacing;

CANCELLATIONS

21. Cancellation of notice submissions are accepted by **GPW** according to the deadlines stated in the table above in point 2. Non-compliance to these deadlines will result in your request being failed. Please pay special attention to the different deadlines for each gazette. Please note that any notices cancelled after the cancellation deadline will be published and charged at full cost.

22. Requests for cancellation must be sent by the original sender of the notice and must accompanied by the relevant notice reference number (N-) in the email body.

AMENDMENTS TO NOTICES

23. With effect from 01 October 2015, **GPW** will not longer accept amendments to notices. The cancellation process will need to be followed according to the deadline and a new notice submitted thereafter for the next available publication date.

REJECTIONS

24. All notices not meeting the submission rules will be rejected to the customer to be corrected and resubmitted. Assistance will be available through the Contact Centre should help be required when completing the forms. (012-748 6200 or email info.egazette@gpw.gov.za). Reasons for rejections include the following:

 24.1. Incorrectly completed forms and notices submitted in the wrong format, will be rejected.

 24.2. Any notice submissions not on the correct *Adobe* electronic form, will be rejected.

 24.3. Any notice submissions not accompanied by the proof of payment / purchase order will be rejected and the notice will not be processed.

 24.4. Any submissions or re-submissions that miss the submission cut-off times will be rejected to the customer. The Notice needs to be re-submitted with a new publication date.

Approval of notices

25. Any notices other than legal notices are subject to the approval of the Government Printer, who may refuse acceptance or further publication of any notice.

26. No amendments will be accepted in respect to separate notice content that was sent with a Z95 or Z95Prov notice submissions. The copy of notice in layout format (previously known as proof-out) is only provided where requested, for Advertiser to see the notice in final Gazette layout. Should they find that the information submitted was incorrect, they should request for a notice cancellation and resubmit the corrected notice, subject to standard submission deadlines. The cancellation is also subject to the stages in the publishing process, i.e. If cancellation is received when production (printing process) has commenced, then the notice cannot be cancelled.

Government Printer Indemnified Against Liability

27. The Government Printer will assume no liability in respect of—

27.1. any delay in the publication of a notice or publication of such notice on any date other than that stipulated by the advertiser;

27.2. erroneous classification of a notice, or the placement of such notice in any section or under any heading other than the section or heading stipulated by the advertiser;

27.3. any editing, revision, omission, typographical errors or errors resulting from faint or indistinct copy.

Liability of advertiser

28. Advertisers will be held liable for any compensation and costs arising from any action which may be instituted against the Government Printer in consequence of the publication of any notice.

Customer inquiries

Many of our customers request immediate feedback/confirmation of notice placement in the gazette from our Contact Centre once they have submitted their notice – While **GPW** deems it one of their highest priorities and responsibilities to provide customers with this requested feedback and the best service at all times, we are only able to do so once we have started processing your notice submission.
GPW has a 2-working day turnaround time for processing notices received according to the business rules and deadline submissions.
Please keep this in mind when making inquiries about your notice submission at the Contact Centre.

29. Requests for information, quotations and inquiries must be sent to the Contact Centre ONLY.

30. Requests for Quotations (RFQs) should be received by the Contact Centre at least **2 working days** before the submission deadline for that specific publication.

GOVERNMENT PRINTING WORKS - BUSINESS RULES

PAYMENT OF COST

31. The Request for Quotation for placement of the notice should be sent to the Gazette Contact Centre as indicated above, prior to submission of notice for advertising.

32. Payment should then be made, or Purchase Order prepared based on the received quotation, prior to the submission of the notice for advertising as these documents i.e. proof of payment or Purchase order will be required as part of the notice submission, as indicated earlier.

33. Every proof of payment must have a valid **GPW** quotation number as a reference on the proof of payment document.

34. Where there is any doubt about the cost of publication of a notice, and in the case of copy, an enquiry, accompanied by the relevant copy, should be addressed to the Gazette Contact Centre, **Government Printing Works**, Private Bag X85, Pretoria, 0001 email: info.egazette@gpw.gov.za before publication.

35. Overpayment resulting from miscalculation on the part of the advertiser of the cost of publication of a notice will not be refunded, unless the advertiser furnishes adequate reasons why such miscalculation occurred. In the event of underpayments, the difference will be recovered from the advertiser, and future notice(s) will not be published until such time as the full cost of such publication has been duly paid in cash or electronic funds transfer into the **Government Printing Works** banking account.

36. In the event of a notice being cancelled, a refund will be made only if no cost regarding the placing of the notice has been incurred by the **Government Printing Works**.

37. The **Government Printing Works** reserves the right to levy an additional charge in cases where notices, the cost of which has been calculated in accordance with the List of Fixed Tariff Rates, are subsequently found to be excessively lengthy or to contain overmuch or complicated tabulation.

PROOF OF PUBLICATION

38. Copies of any of the *Government Gazette* or *Provincial Gazette* can be downloaded from the **Government Printing Works** website www.gpwonline.co.za free of charge, should a proof of publication be required.

39. Printed copies may be ordered from the Publications department at the ruling price. The **Government Printing Works** will assume no liability for any failure to post or for any delay in despatching of such *Government Gazette*(s)

GOVERNMENT PRINTING WORKS CONTACT INFORMATION

Physical Address:	Postal Address:	GPW Banking Details:
Government Printing Works	Private Bag X85	**Bank:** ABSA Bosman Street
149 Bosman Street	Pretoria	**Account No.:** 405 7114 016
Pretoria	0001	**Branch Code:** 632-005

For Gazette and Notice submissions: Gazette Submissions: **E-mail:** submit.egazette@gpw.gov.za

For queries and quotations, contact: Gazette Contact Centre: **E-mail:** info.egazette@gpw.gov.za
Tel: 012-748 6200

Contact person for subscribers: Mrs M. Toka: **E-mail:** subscriptions@gpw.gov.za
Tel: 012-748-6066 / 6060 / 6058
Fax: 012-323-9574

Government Notices • Goewermentskennisgewings

DEPARTMENT OF MINERAL RESOURCES AND ENERGY

NO. 1015 **25 SEPTEMBER 2020**

DETERMINATION UNDER SECTION 34(1) OF THE ELECTRICITY REGULATION ACT, 2006 (ACT NO. 4 OF 2006)

The Minister of Mineral Resources and Energy ("the Minister"), in consultation with the National Energy Regulator of South Africa ("NERSA"), acting under section 34(1) of the Electricity Regulation Act, 2006 (Act No. 4 of 2006) (as amended) (the **ERA**) and the Electricity Regulations on New Generation Capacity (published as GNR. 399 in Government Gazette No. 34262 dated 04 May 2011) ("Regulations"), has determined as follows:

1. that new generation capacity is needed to be procured to contribute towards energy security, accordingly,

1.1 6800 megawatts (MW) should be procured to be generated from renewable energy sources (PV and Wind) , which represents the capacity allocated under the headings "PV" and "Wind", for the years 2022 to 2024, in Table 5 of the Integrated Resource Plan for Electricity 2019 - 2030 (published as GN 1360 of 18 October 2019 in *Government Gazette* No. 42784)("IRP 2019");

1.2 513 megawatts (MW) should be procured to be generated from storage, which represents the capacity allocated under the heading "Storage", for the year 2022, in Table 5 of the Integrated Resource Plan for Electricity 2019 - 2030 (published as GN 1360 of 18 October 2019 in Government Gazette No. 42784)("IRP 2019");

1.3 3000 megawatts (MW) should be procured to be generated from gas, which represents the capacity allocated under the heading "Gas & Diesel", for the years 2024 to 2027, in Table 5 of the Integrated Resource Plan for Electricity 2019 - 2030 (published as GN 1360 of 18 October 2019 in Government Gazette No. 42784)("IRP 2019");

1.4 1500 megawatts (MW) should be generated from coal, which represents the

1

Page 1 of 3

capacity allocated under the heading "Coal", for the years 2023 to 2027, in Table 5 of the Integrated Resource Plan for Electricity 2019 - 2030 (published as GN 1360 of 18 October 2019 in Government Gazette No. 42784)("IRP 2019");

2. electricity produced from the new generation capacity ("the electricity") shall be procured through one or more tendering procedures which are fair, equitable, transparent, competitive and cost-effective and shall constitute IPP procurement programmes as contemplated in the Regulations ("procurement programmes");

3. the procurement programmes shall target connection to the Grid for the new generation capacity as soon as reasonably possible in line with the timetable set out in Table 5 of the IRP 2019. Deviations from the timetable set out in Table 5 are permitted to the extent necessary taking into account all relevant factors including prevailing energy security risks, the time required for efficient procurement and the required construction timelines for such new generation capacity facility;

4. the electricity may only be sold to the entity designated as the buyer in paragraph 7 below, and only in accordance with the power purchase agreements and other project agreements to be concluded in the course of the procurement programmes;

5. the procurer in respect of the procurement programmes will be the Department of Mineral Resources and Energy;

6. the role of the procurer will be to conduct the procurement programmes, including preparing any requests for proposals and/or related and associated documentation, negotiating the power purchase agreements, facilitating the conclusion of the other projects agreements, and facilitating the satisfaction of any conditions precedent to financial close which are within its control;

J

7. the electricity must be purchased by Eskom Holdings SOC Limited;

8. the electricity must be purchased from independent power producers.

Concurrence to this Determination given by the National Energy Regulator of South Africa on the below mentioned date: **Signed:** ____________ **MR JACOB MODISE** **CHAIRPERSON: NERSA** **DATE:** 02/09/2020	*Determination made by the Minister of Mineral Resources and Energy on the below mentioned date:* **Signed:** ____________ **MR GWEDE MANTASHE, MP** **MINISTER: MINERAL RESOUCES AND ENERGY** **DATE:** 18/02/2020

DEPARTMENT OF SPORTS, ARTS AND CULTURE

NO. 1016 **25 SEPTEMBER 2020**

SOUTH AFRICAN HERITAGE RESOURCES AGENCY

DECLARATION OF THE ROCKLANDS COMMUNITY HALL; MITCHELL'S PLAIN; CAPE TOWN, WESTERN CAPE AS A NATIONAL HERITAGE SITE

By virtue of the powers vested in the South African Heritage Resources Agency, in terms of section 27 (5) of the National Heritage Resources Act (No. 25 of 1999) SAHRA hereby declares The Rocklands Community Hall; Erf 11553; Mitchell's Plain; Cape Town, Western Cape as a National Heritage Site.

Statement of Significance

Rocklands Community Hall, built by the City of Cape Town Council in 1981, was the venue of an historic gathering on 20th August 1983 which saw the establishment of the United Democratic Front (UDF) and signified a turning point in the struggle against Apartheid.

The UDF was formed to unite people and organisations across South Africa despite racial, social and religious differences, and called for a united non-racial, non-sexist democratic South Africa. The gathering was attended by over 500 organisations from youth/student organisations, trade unions, church groups, civic, and women organisations, in response to the social economic and political changes that had been taking place since the 1976 Youth Uprisings. This included, and was in fact, spearheaded by, the introduction of the Tricameral Parliamentary system, a government system along racial lines which excluded the majority (Black) South Africans.

The gathering at Rocklands heralded a new phase in the Liberation Struggle as the UDF placed itself at the forefront of intensified and sustained mass protests that took place across South Africa between 1984 and 1986. The UDF demonstrated that a diverse coalition of groups and individuals could stand together, even in the most difficult times of suppression, despite differences in ideologies, to successfully put pressure on the Apartheid regime.

Socially, Rocklands Community Hall was built as a multi-amenities facility to provide for the social and recreational needs of the Mitchell's Plains community (many of whom were forcefully removed from District 6), a "people's place". Rocklands continues to be such a "people's place" to the residents of Mitchell's Plain, providing various social and recreational needs such as issuing of social grants, sports clubs, church services, library, creche and senior citizens meeting place.

Architecturally, Rocklands Hall was one of eight halls built by the City of Cape Town in the Cape Flats between 1970s and 1980s, based on the design by Graham Parker. Parker was awarded the Architectural Award of Merit by the Cape Provincial Institute of Architects for the design. This led to the design being used for several community halls across South Africa.

Schedule

The demarcation of the site, inclusive of the Rocklands Community Hall (both minor and main halls), the UDF Memorial and Memorial Square, Community Health Care Centre and the Library situated is as follows:

Site Name	**Erf No / Farm**	**Province**	**Nearest Town**	**Municipality**	**Survey Diagram**
Rocklands Community Hall	Erf 11553, Mitchell's Plain	Western Cape	Cape Town	City of Cape Town	47/81

END

DEPARTMENT OF SPORTS, ARTS AND CULTURE

NO. 1017 **25 SEPTEMBER 2020**

SOUTH AFRICAN HERITAGE RESOURCES AGENCY

DECLARATION OF THE HISTORICAL PORTION OF THE PHOENIX SETTLEMENT, INANDA, ETHEKWINI, KWAZULU-NATAL AS A NATIONAL HERITAGE SITE

By virtue of the powers vested in the South African Heritage Resources Agency, in terms of section 27 (5) of the National Heritage Resources Act (No. 25 of 1999) SAHRA hereby declares the historical portion of the Phoenix Settlement, including the Sarvodaya House, Kastur Bhuvan House, Printing Press Building, and Museum, on the remainder of Portion 498 of the Farm Piezang Revier FT, Indanda; eThekwini, KwaZulu-Natal as a National Heritage Site.

Statement of Significance
"The historical portion of the Phoenix Settlement is closely associated with Mahatma Gandhi's last decade in South Africa, his personal transformation (including race), his formulation of Satyagraha and his connection and understanding of liberation struggles in South Africa.

It is recognised that Gandhi was a product of the era in which he was raised, that his political concerns in South Africa focused primarily on the plight of British Indians, that he volunteered to serve the ambulance corps for the British as a demonstration of loyalty to the empire in two important anti-colonial events in South Africa and that, in the early years of his stay in South Africa, he used disparaging British colonial language in respect of Africans. However, it is also recognised that during the last decade of his stay in South Africa, Gandhi went through a personal transformation in his thinking regarding the colonial orientation of his youth. He posed many questions to himself as he experienced increased victimization by South African authorities. He tended to the wounded Zulu while he served in the ambulance corps and became interested in learning more about the racial discrimination endured by Africans and other people of colour. His early remarks about Africans were replaced by comments of admiration, support and a clearly expressed vision of a future South Africa that would be free of race. Gandhi's period in South Africa and his work within the South African Indian Congress, their alliance with South African Native National Congress (ANC), and the African People's Organization, was a political, and philosophical learning curve.

The Phoenix Settlement, devoted to Gandhi's philosophy of Sarvodaya (The Welfare of All) and the principles of Satyagraha, has played an important spiritual and political role throughout its long history by promoting social justice, peace, and equality. Gandhi established the settlement as an experimental communal farm, one guided by respect for all people, and as a challenge to colonial norms of segregation, languages and religions. He used a printing press and newspaper as a means to mobilize resistance and promote ethical and moral human development. He believed that communities like Phoenix advocating communal living would form a sound basis for decolonisation and the struggle against social injustice. These principles continue to be honoured through the work that the Phoenix Settlement does both *within the surrounding community and abroad. Gandhi's own transformation, search for truth and enlightenment, principles of fairness, justice, non-violence and peace towards all people, continues to be a beacon of inspiration today and into the future."*

Schedule

The demarcation of the site is as follows:

Site Name	Erf/Farm Number	Province	Town	Municipality	SG Diagram	Deeds
Historical Portion of the Phoenix Settlement	R/498 Piezang Revier 805 FT	KwaZulu-Natal	Inanda	eThekwini	2700/2005	2434/1913

Boundary Co-ordinates

Points	Latitude	Longitude
1	-29.70730419	30.9766849
10	-29.70763928	30.97636994
11	-29.70749601	30.97632419
12	-29.70743963	30.97633599
13	-29.70730419	30.9766849
2	-29.70768394	30.97695821
3	-29.70782184	30.97723399
4	-29.70808698	30.97725418
5	-29.7082763	30.97706792
6	-29.70833769	30.97681648
7	-29.70845373	30.97647213
8	-29.70776644	30.97611638
9	-29.7076822	30.97625274

END

DEPARTMENT OF TRADE, INDUSTRY AND COMPETITION

NO. 1018 **25 SEPTEMBER 2020**

Companies and Intellectual Property Commission

a member of the dtic group

CUSTOMER NOTICE

Notice No. 43 of 2020

Submission of Annual Financial Statements using Generally Recognized Accounting Principles (GRAP) in XBRL

The 1st July 2018 marked a significant milestone in the CIPC's journey in adopting XBRL as a digital platform and standard of financial reporting which supported the submission of Annual Financial Statements (AFS's) generated based on the International Financial Reporting Standards (IFRS). The submission of AFS's that were generated based on Generally Recognized Accounting Principles (GRAP) will now be supported from 01 October 2020.

State Owned Companies (SOC's) who previously could not submit their GRAP standard based AFS's in the XBRL format because it was not supported will from the 1st of October 2020 be able to submit their AFS's in the XBRL format as opposed to submitting Financial Accountability Supplements (FAS's) in the process of them filing their Annual Returns (AR's).

From 01 October 2020 until 30 September 2021, SOC's whose financials are based on the GRAP standard must voluntarily file their GRAP standard based AFS in the XBRL format.

From 01 October 2021, it will become mandatory for all SOC's to submit AFS's in the XBRL format in compliance with the Companies Act, Act 71 of 2008 as amended.

Yours faithfully,

Adv. Rory Voller

Commissioner: CIPC

15 **September 2020**

DEPARTMENT OF WATER AND SANITATION

NO. 1019 **25 SEPTEMBER 2020**

NATIONAL WATER ACT, 1998
(ACT NO. 36 OF 1998)

RESERVE DETERMINATION FOR THE WATER RESOURCES OF THE VAAL WATER MANAGEMENT AREA

I, Lindiwe Sisulu, Minister of Human Settlements, Water and Sanitation, in terms of section 16(1) of the National Water Act, 1998 (Act No. 36 of 1998), hereby determine the Reserve for the water resources in the the Vaal Water Management Area, as set out in the Schedule.

L N SISULU (MP)
MINISTER OF HUMAN SETTLEMENTS, WATER AND SANITATION
DATE: 05/03/2020

SCHEDULE

1. DESCRIPTION OF WATER RESOURCE

1.1 The Reserve is determined for all or part of every significant water resource within the Vaal Water Management Area as set out below:

Water Management Area: Vaal

Drainage Regions: C Primary Drainage Region:

C11, C12, C13, C21, C22, C23, C81, C82, C83, C24, C25, C41, C42, C43, C60, C70, C31, C32, C33, C91, C92, C41, C42
(excluding the Modder Riet catchment, C51 and C52; and excluding the Molopo catchment, D41 and D42 of the Vaal Water Management Area)

Rivers: Vaal, Wilge, Klip, Klein Vaal, Waterval, Suikerbosrand, Blesbokspruit, Mooi, Vals, Schoonspruit, Sand, Vet, Harts

2. ACRONYMS AND DEFINITIONS

2.1 Acronyms

BAS	Best Attainable State
BHN	Basic Human Needs
CAWC	Co-ordinated Water Bird Counts
CBA	Critical Biodiversity Areas
EC	Ecological Category
EcoSpecs	Ecological Specifications
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
ESA	Ecological Support Areas
EWR	Ecological Water Requirement
GRAII	Groundwater Resource Assessment Phase II
GRDM	Groundwater Resource Directed Measures
GRUs	Groundwater Resource Units
IS	Importance and Sensitivity
MAR	Mean Annual Runoff
MCM	Million Cubic Metres
nMAR	Natural Mean Annual Runoff
PES	Present Ecological Status
REC	Recommended Ecological Category
TEC	Target Ecological Category
TPCs	Thresholds of Potential Concern
WUL	Water Use Licence

2.2 Definitions

In this Determination, unless the context otherwise indicates—

"Baseflow" means a sustained low flow in rivers during dry or fair weather conditions, but not necessarily all contributed by groundwater and includes contribution from delayed interflow and groundwater discharge;

"Class of a Water Resource" means a set of desired characteristics for use and ecological condition for significant water resources in a given catchment (integrated unit of analysis). The Class must describe the extent of use of the water resource; the Reserve; the resource quality objectives and the determination of the allocable portion of the water resource for use. Water resources must be classified into one of the three classes, Class I water resource Class II water resource and Class III water resource;

"Ecological Importance and Sensitivity" (EIS) means key indicators in the ecological classification of water resources. Ecological importance relates to the presence, representativeness and diversity of species of biota and habitat. Ecological sensitivity relates to the vulnerability of the habitat and biota to modifications that may occur in flows, water levels and physico-chemical conditions;

"Ecological Water Requirements" (EWR) means the flow patterns (magnitude, timing and duration) and water quality needed to maintain a riverine ecosystem in a particular condition. This term is used to refer to both the quantity and quality components;

"EWR Sites" means specific points on the river as determined through the site selection process. An EWR site consists of a length of river which may consist of various cross-sections for both hydraulic and ecological purposes. These sites provide sufficient indicators to assess environmental flows and assess the condition of biophysical components (drivers such as hydrology, geomorphology and physico-chemical) and biological responses (viz. fish, invertebrates and riparian vegetation);

"Present Ecological State" (PES) means a category indicating the current health or integrity of various biological attributes of the water resource, compared to the natural or close to natural reference conditions. The results of the process are provided as Ecological Categories (ECs) ranging from A (near natural) to F (completely modified) for the PES;

"Recharge" means the addition of water to the zone of saturation, either by downward percolation of precipitation or surface water and/ or the lateral migration of groundwater from adjacent aquifers;

"Recommended Ecological Category" (REC) means an ecological category indicating the ecological management target for a water resource based on its ecological classification that should be attained. Categories range from Category A (unmodified, natural) to Category D (largely modified);

"River Node" (biophysical node) means modelling points representative of an upstream reach or area of an aquatic eco-system (rivers, wetlands, estuaries and groundwater) for which a suite of relationships apply;

"Sub-quaternary catchments" means a finer subdivision of the quaternary catchments (the catchment areas of tributaries of main stem rivers in quaternary catchments);

"Target Ecological Category" (TEC) means the ecological condition assigned to a water resource by the Minister that reflects the ecological condition of that water resource in terms of the deviation of its biophysical components from the natural reference condition. The ultimate target to achieve a sustainable system both ecologically and economically taking into account the PES and REC.

3. RESERVE DETERMINATION

3.1 The Reserve which includes the Ecological Water Requirements (EWRs) and the Basic Human Needs Reserve (BHN) for the Rivers at EWR sites and selected biophysical nodes in the Vaal Water Management Area is set out in **section 4**. The Vaal Water Management Area locality and EWR sites are indicated in **Figure 1**.

3.2 The water quality component of the Reserve for the Rivers at the EWR sites in the Vaal catchment is set out in **section 5**.

3.3 The Groundwater Reserve for Water Quantity and Water Quality for the Vaal Water Management Area is set out in **section 6**.

3.4 The ecological specifications for the Wetlands of the Vaal Water Management Area is set out in **section 7**.

4. RESERVE DETERMINATION FOR RIVERS

The Reserve determination and ecological categorisation for the rivers of the Vaal catchment area, where the Reserve is expressed as a percentage of the natural MAR (NMAR) for the respective catchments (cumulative):

Table 4.1: The Reserve for the Rivers at the EWR sites which include the EWRs to protect the aquatic ecosystem and the BHN requirements

Quaternary Catchment	Water Resource	Water Resource Class	PES	EIS	TEC[5]	MAR (MCM)[1]	Reserve[2] (%MAR)	Ecological Reserve[3] (%MAR)	Basic human needs (BHN) Reserve[4] (%MAR)
C11J	Vaal River – EWR 1	II	B/C	High	B/C	332.3*	39.411	39.41	0.001
C11M	Vaal River – EWR 2	II	C	Moderate	C	457.7#	13.610	13.61	0.00022
C12F	Waterval – EWR WA1	III	D	Low	D	76.71#	3.501	3.5	0.0007
C12G	Waterval – EWR WA2	III	D	Low	D	147.43#	6.4003	6.4	0.00027
C12H	Vaal River – EWR 3	II	C	Moderate	C	858.1#	14.300	14.3	0.00004
C22F	Vaal River – EWR 4	III	C	High	B/C	1977.3•	21.550	21.55	0.00015
C23L	Vaal River – EWR 5	III	C/D	High	C	2288•	34.100	34.1	0.00004
C13D	Klip River – EWR 6	II	B/C	Moderate	B/C	95.3#	26.542	26.54	0.0021
C81A	Wilge River – EWR 7	II	A/B	High	A/B	23.5#	45.893	45.88	0.0128
C82C	Wilge River – EWR 8	II	C	Moderate	C	474.3#	11.770	11.77	0.00006
C21C	Suikerbosrand – EWR 9	II	C	High	B/C	31.3#	41.893	41.89	0.0032
C21G	Suikerbosrand – EWR 10	III	C/D	Moderate	C/D	149.27*	34.391	34.39	0.0007
C21F	Blesbokspruit – EWR 11	III	D	Low	D	100.69*	18.145	18.14	0.0050
C11C	Klein Vaal River – RE-EWR 1	II	C	Moderate	C	26.09#	24.725	24.71	0.0153
C23G	Mooi River – RE-EWR 2	III	D	Low	D	37.7#	19.061	19.05	0.0106
C24B	Vaal River – EWR 12	III	D	Moderate	D	1574.64*	28.280	28.28	0.00009
C24J	Vaal River – EWR 13	III	C/D	Moderate	C/D	1638.37•	35.800	35.8	0.00009
C60J	Vals River – EWR 14	III	C/D	Moderate	C/D	145.79#	17.050	17.05	0.00034
C43A	Vet River – EWR 15	III	C/D	Moderate	C/D	253.15*	18.200	18.2	0.00028
C41E	Klein Vet – RE – EWR 3	II	C	Moderate	C	49.56#	19.540	19.54	0.00028
C42J	Sand – EWR RD1	III	C/D	Moderate	B/C	140.76#	23.820	23.82	0.00007
C42L	Sand – EWR RD2	III	C	Moderate	B/C	180.692#	23.490	23.49	0.00011
C24E	Schoonspruit – EWR S1	III	C	Low	C	59.38#	35.805	35.8	0.0049
C24G	Schoonspruit – EWR S3	III	C/D	Low	C/D	89.96#	30.902	30.9	0.0018
C24H	Schoonspruit – EWR S4	III	C/D	Low	C/D	102.09#	31.203	31.2	0.0034
C91A	Vaal – EWR 16	III	D	Moderate	D	3242.51*	13.020	13.02	0.00007
C33C	Harts – EWR 17	II	D	Moderate	D	147.85*	51.6034	51.60	0.0034
C92B	Vaal – EWR 18	III	C	Moderate	C	1177.28*	21.871	21.87	0.00060

1) MAR is the Mean Annual Runoff (# Based on natural flow at the EWR site; * Based on present day flow at the EWR site; • Based on observed flow at the EWR site).
2) The Reserve is the total requirement that accounts for both the Ecological Reserve and the Basic Human Needs Reserve (BHN).
3) Ecological Reserve requirement represents the long-term mean based on the MAR. If the MAR changes, this volume will also change.
4) Represents the BHN requirement as a percentage of the MAR. Basic human needs includes the population directly reliant on rivers, streams and springs for water supply (derived from 2011 Census data)
5) Target Ecological Category (TEC): The ultimate target to achieve a sustainable system both ecologically and economically taking into account the PES and REC.

ECOLOGICAL WATER REQUIREMENTS SITE INFORMATION

EWR Site	EWR site name	River	Sub-quaternary river reach	Coordinates		Quaternary catchment
				Latitude	Longitude	
EWR1	Uitkoms	Vaal	C11J-01838	S26.872800	E29.613840	C11J
EWR2	Grootdraai	Vaal	C11M-01894	S26.92110	E29.27929	C11M
EWR WA1	Waterval_1	Waterval	C12F-01722	S26.64608	E29.01857	C12F
EWR WA2	Waterval_2	Waterval	C12G-01896	S26.88543	E28.88357	C12G
EWR3	Gladdedrift	Vaal	C12C-01997	S26.99087	E28.72971	C12H
EWR4	De Neys	Vaal	C22F-01737	S26.84262	E28.11230	C22F
EWR5	Skandinavia	Vaal	C22L-01792	S26.93243	E27.01367	C23L
EWR6	Klip	Klip	C13D-02226	S27.36166	E29.48503	C13D
EWR7	Upper Wilge	Wilge	C81A-02790	S28.20185	E29.55827	C81A
EWR8	Bavaria	Wilge	C82C-2505	S27.80017	E28.76778	C82C
EWR9	Suikerbos Upstream	Suikerbosrand	C21C-01675	S26.64670	E28.38197	C21C
EWR10	Suikerbos Downstream	Suikerbosrand	C21G-01627	S26.68137	E28.16798	C21G
EWR11	Blesbokspruit	Blesbokspruit	C21F-01447	S26.47892	E28.42488	C21F
RE-EWR1	Klein Vaal	Klein Vaal	C11C-01846	S26.912750	E30.174970	C11C
RE-EWR2	Mooi River	Mooi	C23G-01250	S26.258670	E27.159730	C23G
EWR12	Vaal River: Vermaasdrift	Vaal	C24B-01817	S26.93615	E26.85025	C24B
EWR13	Vaal River: Regina bridge	Vaal	C24J-02016	S27.10413	E26.52185	C24J
EWR14	Vals River: Proklameersdrift	Vals	C60J-02262	S27.48685	E26.81320	C60J
EWR15	Vet River: Fisantkraal	Vet	C43A-02561	S27.93482	E26.12569	C43A
RE-EWR 3	Klein-Vet, just downstream of Winburg	Klein Vet	C41E-03132	S28.564708	E26.943946	C41E
EWR RD1	At Meloding	Sand	C42J-02716	S28.1131994	E26.9080556	C42J
EWR RD2	At Steel Bridge	Sand	C42L-02635	S28.1228333	E26.5855555	C42L
EWR S1	EWR S1	Schoonspruit	C24E-01164	S26.31172	E26.31172	C24E
EWR S3	EWR S3	Schoonspruit	C24G-01661	S26.67500	E26.586108	C24G
EWR S4	EWR S4	Schoonspruit	C24H-01860	S26.93333	E26.66528	C24H
EWR16	Downstream Bloemhof Dam	Vaal	C91A-02391	S27.65541	E25.59564	C91A
EWR17	Lloyds weir on Harts River	Harts	C33C-02836	S28.37694	E24.30305	C33C
EWR18	Schmidtsdrift	Vaal	C92B-02903	S28.70758	E24.07578	C92B

Table 4.2: The Reserve for the Rivers at the priority biophysical nodes with High Ecological importance

Quaternary catchment	Node	River	Sub-quaternary river reach	PES	Ecological Importance	REC	Ecological Reserve (%NMAR)	BHN Reserve (%NMAR)	Total Reserve (%NMAR)	NMAR (MCM/a)
C11A	UA.1	Vaal	C11A-01460	B/C	High	B/C	44.09	0.053	44.143	13.27
C13C	UB.1	Klip	C13C-02550	B	High	B	63.86	0.018	63.878	5.67
C13D	UB.2	Klip	C13D-02416	B/C	High	B/C	38.86	0.004	38.864	54
C13D	UB.3	Klip	C13D-02284	B/C	High	B	44.26	0.003	44.263	68.04
C13E	UB.6	Kommandospruit	C13E-02228	B/C	High	B	50.66	0.006	50.666	33.6
C81A	UC1.1	Wilge	C81A-02790	B	High	B	45.69	0.004	45.694	69.03
C81L	UC1.3	Meul	C81L-02594	B	High	B	57.25	0.008	57.258	26.49
C81G	UC2.3	Klerkspruit	C81G-02882	B	High	B	69.45	0.017	69.467	5.85
C83G	UD.4	Liebenbergsvlei	C83G-02364	B/C	High	B/C	62.48	0.006	62.486	4.74
C83H	UD.5	Liebenbergsvlei	C83H-02395	B/C	High	B	64.50	0.015	64.515	2.66
C12A	UH.1	Suikerbosrant	C12A-01567	B/C	High	B	47.17	0.002	47.172	28.65

5. WATER QUALITY COMPONENT OF THE ECOLOGICAL RESERVE FOR RIVERS

The ecological specifications for water quality for the maintenance of the Reserve target ecological category at each EWR site is detailed in Tables 5.1 to Table 5.18. These are the values of water quality parameters (threshold concentrations) that should not be exceeded in order to meet the water quality attribute of the TEC.

Table 5.1: EWR1: Water Quality Ecological Specifications

River: Vaal		**EWR 1: at Uitkoms**	**Water quality monitoring site/gauge:** C1H007/ VS4 GDDC11
Inorganic Salts	$MgSO_4$	The 95th percentile of the data must be ≤ 28 mg/L	
	Na_2SO_4	The 95th percentile of the data must be ≤ 38 mg/L	
	$MgCl_2$	The 95th percentile of the data must be ≤ 36 mg/L	
	$CaCl_2$	The 95th percentile of the data must be ≤ 69 mg/L	
	NaCl	The 95th percentile of the data must be ≤ 243 mg/L	
	$CaSO_4$	The 95th percentile of the data must be ≤ 351 mg/L	
Physical variables	Electrical Conductivity	The 95th percentile of the data must be ≤ 70 mS/m	
	pH	The 5th percentile of the data must be 6.5 to 8.0, and the 95th percentile 8.0 to 8.8	
	Dissolved oxygen	The 5th percentile of the data must be ≥ 7.0 mg/L	
Nutrients	Total inorganic Nitrogen (TIN)	The 50th percentile of the data must be ≤ 0.7 mg/L	
	PO_4-P	The 50th percentile of the data must be ≤ 0.020 mg/L	
Response variables	Chl-a phytoplankton	The 50th percentile of the data must be < 20 µg/L	
	Chl-a periphyton	The 50th percentile of the data must be < 21 mg/m^2	
Toxics	Ammonia	The 95th percentile of the data must be ≤ 0.044 mg/L	
	Atrazine	The 95th percentile of the data must be ≤ 0.064 mg/l	
	Fluoride	The 95th percentile of the data must be ≤ 2.5 mg/L	
	Endosulfan	The 95th percentile of the data must be ≤ 0.13 µg/l	

Table 5.2: EWR2: Water Quality Ecological Specifications

River: Vaal		**EWR 2: Downstream Grootdraai**	**Water quality monitoring site/gauge**: C1H019
Inorganic Salts	$MgSO_4$	The 95th percentile of the data must be ≤ 23 mg/L	
	Na_2SO_4	The 95th percentile of the data must be ≤ 33 mg/L	
	$MgCl_2$	The 95th percentile of the data must be ≤ 30 mg/L	
	$CaCl_2$	The 95th percentile of the data must be ≤ 57 mg/L	
	NaCl	The 95th percentile of the data must be ≤ 191 mg/L	
	$CaSO_4$	The 95th percentile of the data must be ≤ 351 mg/L	
Physical variables	EC	The 95th percentile of the data must be ≤ 30 mS/m	
	pH	The 5th percentile of the data must be 6.5 to 8.0, and the 95th percentile 8.0 to 8.8	
	Temperature	Small deviation from the natural temperature range	
	Dissolved oxygen	The 5th percentile of the data must be ≥7.5mg/L	
Nutrients	Total inorganic Nitrogen (TIN)	The 50th percentile of the data must be ≤ 0.25 mg/L	
	PO_4-P	The 50th percentile of the data must be ≤0.025mg/L	
Response variables	Chl-a phytoplankton	The 50th percentile of the data must be <18 µg/L	
	Chl-a periphyton	The 50th percentile of the data must be ≤ 16 mg/m^2	
Toxics	Ammonia	The 95th percentile of the data must be ≤ 0.044 mg/L	
	Fluoride	The 95th percentile of the data must be ≤ 1.5 mg/L	

Table 5.3: EWR3: Water Quality Ecological Specifications

River: Vaal		**EWR 3: at Gladdedrift**	**Water quality monitoring site/gauge**: C1H012
Inorganic Salts	$MgSO_4$	The 95th percentile of the data must be ≤ 37 mg/L	
	Na_2SO_4	The 95th percentile of the data must be ≤ 33 mg/L	
	$MgCl_2$	The 95th percentile of the data must be ≤ 30 mg/L	
	$CaCl_2$	The 95th percentile of the data must be ≤ 57 mg/L	
	NaCl	The 95th percentile of the data must be ≤ 191 mg/L	
	$CaSO_4$	The 95th percentile of the data must be ≤ 351 mg/L	
Physical variables	EC	The 95th percentile of the data must be ≤ 55 mS/m	
	pH	The 5th percentile of the data must be 6.5 to 8.0 and the 95th percentile 8.0 to 8.8	
	Dissolved oxygen	The 5th percentile of the data must be ≥ 7.5 mg/L	
Nutrients	Total inorganic Nitrogen (TIN)	The 50th percentile of the data must be ≤ 0.25 mg/L	
	PO_4-P	The 50th percentile of the data must be ≤ 0.125 mg/L	
Response variables	Chl-a phytoplankton	The 50th percentile of the data must be < 20 µg/L	
	Chl-a periphyton	The 50th percentile of the data must be ≤ 21 mg/m^2	
Toxics	Ammonia	The 95th percentile of the data must be ≤ 0.1 mg/L	
	Fluoride	The 95th percentile of the data must be ≤ 1.5 mg/L	

Table 5.4: EWR4: Water Quality Ecological Specifications

River: Vaal		**EWR 4: at De Neys**	**Water quality monitoring site/gauge**: C1H012
Inorganic Salts	$MgSO_4$	The 95th percentile of the data must be ≤ 37 mg/L	
	Na_2SO_4	The 95th percentile of the data must be ≤ 33 mg/L	
	$MgCl_2$	The 95th percentile of the data must be ≤ 30 mg/L	
	$CaCl_2$	The 95t^{h} percentile of the data must be ≤ 57 mg/L	
	NaCl	The 95th percentile of the data must be ≤ 191 mg/L	
	$CaSO_4$	The 95th percentile of the data must be ≤ 351 mg/L	
Physical variables	EC	The 95th percentile of the data must be ≤ 30 mS/m	
	pH	The 5th percentile of the data must be 6.5 to 8.0 and the 95th percentile 8.0 to 8.8	
	Dissolved oxygen	The 5t^{h} percentile of the data must be ≥ 7 mg/L	
Nutrients	Total inorganic Nitrogen (TIN)	The 50th percentile of the data must be ≤ 0.7 mg/L	
	PO_4-P	The 50th percentile of the data must be ≤ 0.125 mg/L	
Response variables	Chl-a phytoplankton	The 50th percentile of the data must be <10 µg/L	
	Chl-a periphyton	The 50th percentile of the data must be ≤ 1.7 mg/m^2	
Toxics	Ammonia	The 95th percentile of the data must be ≤ 0.1 mg/L	
	Fluoride	The 95th percentile of the data must be ≤ 1.5 mg/L	

Table 5.5: EWR5: Water Quality Ecological Specifications

River: Vaal		**EWR 5: Skandinavia**	**Water quality monitoring site/gauge:** C2H122
Inorganic Salts	$MgSO_4$	The 95th percentile of the data must be ≤ 37 mg/L	
	Na_2SO_4	The 95th percentile of the data must be ≤ 51 mg/L	
	$MgCl_2$	The 95th percentile of the data must be ≤ 36 mg/L	
	$CaCl_2$	The 95th percentile of the data must be ≤ 105 mg/L	
	NaCl	The 95th percentile of the data must be ≤ 191 mg/L	
	$CaSO_4$	The 95th percentile of the data must be ≤ 351 mg/L	
Physical variables	EC	The 95th percentile of the data must be ≤ 85 mS/m	
	pH	The 5th percentile of the data must be 6.5 to 8.0 and the 95th percentile 8.8 to 9.2	
	Temperature	Temperatures should be close to natural range	
	Dissolved oxygen	The 5th percentile of the data must be ≥ 6 mg/L	
Nutrients	Total inorganic Nitrogen (TIN)	The 50th percentile of the data must be ≤ 1.0 mg/L	
	PO_4-P	The 50th percentile of the data must be ≤ 0.025 mg/L	
Response variables	Chl-a phytoplankton	The 50th percentile of the data must be ≤ 20 µg/L	
Toxics	Chl-a periphyton	The 50th percentile of the data must be ≤ 21 mg/m^2	
	Ammonia	The 95th percentile of the data must be ≤ 0.073 mg/L	
	Fluoride	The 95th percentile of the data must be ≤ 1.5 mg/L	
Inorganic ions	Sulphate	The 95th percentile of the data must be ≤ 200 mg/L	

Table 5.6: EWR6: Water Quality Ecological Specifications

River: Klip		**EWR 6:** Klip	**Water quality monitoring site/gauge**: **C1H002** (Downstream site in C13F)
Inorganic Salts	$MgSO_4$	The 95th percentile of the data must be ≤ 28 mg/L	
	Na_2SO_4	The 95th percentile of the data must be ≤ 20 mg/L	
	$MgCl_2$	The 95th percentile of the data must be ≤ 15 mg/L	
	$CaCl_2$	The 95th percentile of the data must be ≤ 21 mg/L	
	NaCl	The 95th percentile of the data must be ≤ 45 mg/L	
	$CaSO_4$	The 95th percentile of the data must be ≤ 351 mg/L	
Physical variables	EC	The 95th percentile of the data must be ≤ 55 mS/m	
	pH	The 5th percentile of the data must be 6.5 to 8.0 and the 95th percentile 8.0 to 8.8	
	Temperature	Temperatures should be close to natural range	
	Dissolved oxygen	Must be between 7 and 8 mg/L	
	Turbidity	Vary by a small amount from the natural turbidity range, minor silting of instream habitats acceptable	
Nutrients	Total inorganic Nitrogen (TIN)	The 50th percentile of the data must be ≤ 0.75 mg/L	
	PO_4-P	The 50th percentile of the data must be ≤ 0.020 mg/L	
Response variables	Chl-a phytoplankton	The 50th percentile of the data must be < 15 µg/L	
	Chl-a periphyton	The 50th percentile of the data must be < 12 mg/m^2	
Toxics	Ammonia	The 95th percentile of the data must be ≤ 0.044 mg/L	
	Fluoride	The 95th percentile of the data must be ≤ 1.5 mg/L	

Table 5.7: EWR7: Water Quality Ecological Specifications

River: Wilge		**EWR 7: Upper Wilge**	**Water quality monitoring site/gauge:** No weir/WQ site in vicinity of EWR site
Inorganic Salts	$MgSO_4$	The 95th percentile of the data must be < 23 mg/L	
	Na_2SO_4	The 95th percentile of the data must be < 33 mg/L	
	$MgCl_2$	The 95th percentile of the data must be < 30 mg/L	
	$CaCl_2$	The 95th percentile of the data must be < 57 mg/L	
	NaCl	The 95th percentile of the data must be < 191 mg/L	
	$CaSO_4$	The 95th percentile of the data must be < 351 mg/L	
Physical variables	EC	The 95th percentile of the data must be < 55 mS/m	
	pH	The 5th percentile of the data must be 6.5 to 8.0, and the 95th percentile 8.8 to 9.2	
	Temperature	Small deviation from the natural temperature range	
	Dissolved oxygen	The 5t^{h} percentile of the data must be ≥ 8 mg/L	
	Turbidity	Vary by a small amount from the natural turbidity range, minor silting of instream habitats acceptable	
Nutrients	Total inorganic Nitrogen (TIN)	The 50th percentile of the data must be between < 0.7 mg/L	
	PO_4-P	The 50th percentile of the data must be < 0.025 mg/L	
Response variables	Chl-a phytoplankton	The 50th percentile of the data must be ≤ 15 µgL	
	Chl-a periphyton	The 50th percentile of the data must be ≤ 12 mg/m^2	
Toxics	Ammonia	The 95th percentile of the data must be ≤ 0.044 mg/L	
	Fluoride	The 95th percentile of the data must be ≤ 1.5 mg/L	

Table 5.8: EWR8: Water Quality Ecological Specifications

River: Wilge		**EWR 8: Bavaria**	**Water quality monitoring site/gauge:** C8H028
Inorganic Salts	$MgSO_4$	The 95th percentile of the data must be < 16 mg/L	
	Na_2SO_4	The 95th percentile of the data must be < 20 mg/L	
	$MgCl_2$	The 95th percentile of the data must be < 15 mg/L	
	$CaCl_2$	The 95th percentile of the data must be < 21 mg/L	
	NaCl	The 95th percentile of the data must be < 45 mg/L	
	$CaSO_4$	The 95th percentile of the data must be < 351 mg/L	
Physical variables	EC	The 95th percentile of the data must be <55 mS/m	
	pH	The 5th percentile of the data must be 6.5 to 8.0 and the 95th percentile 8.0 to 8.8	
	Temperature	Small deviation from the natural temperature range	
	Dissolved oxygen	The 5th percentile of the data must be ≥ 8 mg/L	
	Turbidity	Vary by a small amount from the natural turbidity range, minor silting of instream habitats acceptable	
Nutrients	Total inorganic Nitrogen (TIN)	The 50th percentile of the data must be between <0.7 mg/L	
	PO_4-P	The 50th percentile of the data must be < 0.025 mg/L	
Response variables	Chl-a phytoplankton	The 50th percentile of the data must be < 20 ug/L	
	Chl-a periphyton	The 50th percentile of the data must be < 21 mg/m^2	
Toxics	Ammonia	The 95th percentile of the data must be ≤ 0.073 mg/L	
	Fluoride	The 95th percentile of the data must be ≤ 1.5 mg/L	

Table 5.9: EWR9: Water Quality Ecological Specifications

River: Suikerbosrand		**EWR 9: Upstream**	**Water quality monitoring site/gauge**: C2H131
Inorganic Salts	$MgSO_4$	The 95th percentile of the data must be < 37 mg/L	
	Na_2SO_4	The 95th percentile of the data must be < 51 mg/L	
	$MgCl_2$	The 95th percentile of the data must be < 30 mg/L	
	$CaCl_2$	The 95th percentile of the data must be < 57 mg/L	
	NaCl	The 95th percentile of the data must be < 45 mg/L	
	$CaSO_4$	The 95th percentile of the data must be < 351 mg/L	
Physical variables	EC	The 95th percentile of the data must be < 55 mS/m	
	pH	The 5th percentile of the data must be 6.5 – 8.0 and the 95th percentile 8.0 - 8.8	
	Temperature	Small deviation from the natural temperature range	
	Dissolved oxygen	The 5th percentile of the data must be ≥ 8 mg/L	
	Turbidity	Vary by a small amount from the natural turbidity range, minor silting of instream habitats acceptable	
Nutrients	Total inorganic Nitrogen (TIN)	The 50th percentile of the data must be < 0.7 mg/L	
	PO_4-P	The 50th percentile of the data must be < 0.020 mg/L	
Response variables	Chl-a phytoplankton	The 50th percentile of the data must be < 20 µg/L	
	Chl-a periphyton	The 50th percentile of the data must < 21 mg/m^2	
Toxics	Ammonia	The 95th percentile of the data must be ≤ 0.073 mg/L	
	Fluoride	The 95th percentile of the data must be ≤ 1.5 mg/L	

Table 5.10: EWR10: Water Quality Ecological Specifications

River: Suikerbosrand		**EWR 10: Downstream**	**Water quality monitoring site/gauge**: C2H070
Inorganic Salts	$MgSO_4$	The 95th percentile of the data must be < 37 mg/L	
	Na_2SO_4	The 95th percentile of the data must be < 51 mg/L	
	$MgCl_2$	The 95th percentile of the data must be <51 mg/L	
	$CaCl_2$	The 95th percentile of the data must be <105 mg/L	
	NaCl	The 95th percentile of the data must be < 191 mg/L	
	$CaSO_4$	The 95th percentile of the data must be < 351 mg/L	
Physical variables	EC	The 95th percentile of the data must be < 85 mS/m	
	pH	The 5th percentile of the data must be between 6.5 – 8.0 and the 95th percentile 8.0 - 8.8	
	Temperature	Small deviation from the natural temperature range	
	Dissolved oxygen	The 5th percentile of the data must be ≥ 7 mg/L	
Nutrients	Total inorganic Nitrogen (TIN)	The 50th percentile of the data must be < 0.7 mg/L	
	PO_4-P	The 50th percentile of the data must be < 0.125 mg/L	
Response variables	Chl-a phytoplankton	The 50th percentile of the data must be < 30 µg/L	
	Chl-a periphyton	The 50th percentile of the data must be < 21 mg/m^2	
Toxics	Ammonia	The 95th percentile of the data must be ≤ 0.100 mg/L	
	Fluoride	The 95th percentile of the data must be ≤ 1.5 mg/L	

Table 5.11: EWR11: Water Quality Ecological Specifications

River: Blesbokspruit		EWR 11: Blesbokspruit	Water quality monitoring site/gauge: C2H185
Inorganic Salts	$MgSO_4$	The 95th percentile of the data must be < 37 mg/L	
	Na_2SO_4	The 95th percentile of the data must be < 51 mg/L	
	$MgCl_2$	The 95th percentile of the data must be < 36 mg/L	
	$CaCl_2$	The 95th percentile of the data must be <105 mg/L	
	NaCl	The 95th percentile of the data must be < 389 mg/L	
	$CaSO_4$	The 95th percentile of the data must be < 351 mg/L	
Physical variables	EC	The 95th percentile of the data must be < 85 mS/m	
	pH	The 5th percentile of the data must be 6.5 – 8.0 and the 95th percentile 8.0 - 8.8	
	Temperature	Moderate change from the natural temperature range	
	Dissolved oxygen	The 5th percentile of the data must be ≥ 6.0 mg/L	
	Turbidity	Initiate baseline monitoring for this variable	
Nutrients	Total inorganic Nitrogen (TIN)	The 50th percentile of the data must be ≤ 0.70 mg/L	
	PO_4-P	The 50th percentile of the data must be ≤ 0.125 mg/L	
Response variables	Chl-a phytoplankton	The 50th percentile of the data must be < 20 µg/L	
	Chl-a periphyton	The 50th percentile of the data must be ≤ 21 mg/m^2	
Toxics	Ammonia	The 95th percentile of the data must be ≤ 0.100 mg/L	
	Atrazine	The 95th percentile of the data must be ≤ 100 ug/L	
	Fluoride	The 95th percentile of the data must be ≤ 3.0 mg/L)	
	Endosulfan	The 95th percentile of the data must be ≤ 0.200 µg/L	

Table 5.12: EWR12: Water Quality Ecological Specifications

River: Vaal		EWR 12: at Vermaasdrift	Water quality monitoring site/gauge: C2H007
Inorganic Salts	$MgSO_4$	The 95th percentile of the data must be ≤ 37 mg/L	
	Na_2SO_4	The 95th percentile of the data must be ≤ 51 mg/L	
	$MgCl_2$	The 5th and 95th percentile of the data must be ≤ 51 mg/L	
	$CaCl_2$	The 95th percentile of the data must be ≤ 105 mg/L	
	NaCl	The 95th percentile of the data must be ≤ 191 mg/L	
	$CaSO_4$	The 95th percentile of the data must be ≤ 351 mg/L	
Physical variables	EC	The 95th percentile of the data must be ≤ 70 mS/m	
	pH	The 5th percentile of the data must be 7.5 to 8.0 and the 95th percentile 8.8 to 9.2	
	Dissolved oxygen	The 5th percentile of the data must be ≥ 7.5 mg/L	
	Turbidity	Vary by a small amount from the natural turbidity range	
	TDS	The 95th percentile data must be ≤560mg/L	
Nutrients	Total inorganic Nitrogen (TIN)	The 50th percentile of the data must be ≤ 1.0 mg/L	
	PO_4-P	The 50th percentile of the data must be ≤ 0.125 mg/L	
Response variables	Chl-a phytoplankton	The 50th percentile of the data must be ≤ 30 µg/L	
	Chl-a periphyton	The 50th percentile of the data must be ≤ 84 mg/m^2	
Toxics	Ammonia	The 95th percentile of the data must be ≤ 0.1 mg/L	
	Fluoride	The 95th percentile of the data must be ≤ 1.5 mg/L	
	Cyanide	The 95th percentile data must be ≤ 0.05 mg/L	
	Aluminium	The 95th percentile data must be ≤ 0.1 mg/L	
	Uranium	The 95th percentile data must be ≤ 0.030 mg/L	
Inorganic ions	Sulphate	The 95th percentile data must be ≤ 160 mg/L	
	Magnesium	The 95th percentile data must be ≤ 33 mg/L	

Table 5.13: EWR13: Water Quality Ecological Specifications

River: Vaal		**EWR 13: At Regina Bridge**	**Water quality monitoring site/gauge:** C2H022
Inorganic Salts	$MgSO_4$	The 95th percentile of the data must be ≤ 37 mg/L	
	Na_2SO_4	The 95th percentile of the data must be ≤ 51 mg/L	
	$MgCl_2$	The 95th percentile of the data must be ≤ 51 mg/L	
	NaCl	The 95th percentile of the data must be ≤ 191mg/L	
	$CaCl_2$	The 95th percentile of the data must be ≤ 105 mg/L	
	$CaSO_4$	The 95th percentile of the data must be ≤ 351 mg/L	
Physical variables	EC	The 95th percentile of the data must be ≤ 70 mS/m	
	pH	The 5th percentile of the data must be 7.5 to 8.0, and the 95th percentile 8.0 to 8.8	
	Temperature	Small deviation from the natural temperature range	
	Dissolved oxygen	The 5th percentile of the data must be ≥ 6 mg/L	
	Turbidity	Vary by a small amount from the natural turbidity range	
	TDS	The 95th percentile data must be ≤ 560 mg/L	
Nutrients	Total inorganic Nitrogen (TIN)	The 50th percentile of the data must be ≤ 4.0 mg/L	
	PO_4-P	The 50th percentile of the data must be ≤ 0.125 mg/L	
Response variables	Chl-a phytoplankton	The 50th percentile of the data must be ≤ 30 µg/L	
	Chl-a periphyton	The 50th percentile of the data must be ≤ 84 mg/m^2	
Toxics	Ammonia	The 95th percentile of the data must be ≤ 0.0438 mg/L	
	Fluoride	The 95th percentile of the data must be ≤ 1.5 mg/L	
	Aluminium	The 95th percentile data must be ≤ 0.1 mg/L	
	Cyanide	The 95th percentile data must be ≤ 0.05 mg/L	
	Uranium	The 95th percentile data must be ≤ 0.030 mg/L	
Inorganic ions	Magnesium	The 95th percentile data must be ≤ 33 mg/L	
	Sulphate	The 95th percentile data must be ≤ 160 mg/L	

Table 5.14: EWR14: Water Quality Ecological Specifications

River: Vals		**EWR 14: Proklameersdrift**	**Water quality monitoring site/gauge: C6H007**
Inorganic Salts	$MgSO_4$	The 95th percentile of the data must be ≤ 37 mg/L	
	Na_2SO_4	The 95th percentile of the data must be ≤ 51 mg/L	
	$MgCl_2$	The 95th percentile of the data must be ≤ 51 mg/L	
	$CaCl_2$	The 95th percentile of the data must be ≤ 191mg/L	
	NaCl	The 95th percentile of the data must be ≤ 105 mg/L	
	$CaSO_4$	The 95th percentile of the data must be ≤ 351 mg/L	
Physical variables	EC	The 95th percentile of the data must be ≤ 85 mS/m	
	pH	The 5th percentile of the data must be 5.5 to 6.0 and the 95th percentile 8.8 to 9.2	
	Temperature	Small deviation from the natural temperature range	
	Dissolved oxygen	The 5th percentile of the data must be ≥ 8 mg/L	
	Turbidity	Vary by a 10% from the natural turbidity range	
Nutrients	Total inorganic Nitrogen (TIN)	The 50th percentile of the data must be ≤ 0.7 mg/L	
	PO_4-P	The 50th percentile of the data must be ≤ 0.125mg/L	
Response variables	Chl-a phytoplankton	The 50th percentile of the data must be ≤ 30ug/L	
	Chl-a periphyton	The 50th percentile of the data must be ≤ 84 mg/m^2	
Toxics	Ammonia	The 95th percentile of the data must be ≤ 0.073 mg/L	
	Fluoride	The 95th percentile of the data must be ≤ 1.5 mg/L	

Table 5.15: EWR15: Water Quality Ecological Specifications

River: Vet		EWR 15: at Fisantkraal	Water quality monitoring site/gauge: C4H004
Inorganic Salts	$MgSO_4$	The 95th percentile of the data must be ≤ 37 mg/L	
	Na_2SO_4	The 95th percentile of the data must be ≤ 51 mg/L	
	$MgCl_2$	The 95th percentile of the data must be ≤ 36 mg/L	
	$CaCl_2$	The 95th percentile of the data must be ≤ 69 mg/L	
	NaCl	The 95^{th} percentile of the data must be ≤ 191 mg/L	
	$CaSO_4$	The 95th percentile of the data must be ≤ 351 mg/L	
Physical variables	EC	The 95th percentile of the data must be ≤ 80 mS/m	
	pH	The 5th percentile of the data must be 6.5 – 8.0, and the 95th percentile 8.0 – 8.8	
	Temperature	Small deviation from the natural temperature range	
	Dissolved oxygen	The 5^{th} percentile of the data must be ≥ 6.0 mg/L	
	Turbidity	Vary by a small amount from the natural turbidity range	
Nutrients	Total inorganic Nitrogen (TIN)	The 50^{th} percentile of the data must be ≤ 0.7 mg/L	
	PO_4-P	The 50^{th} percentile of the data must be ≤ 0.058 mg/L	
Response variables	Chl-a phytoplankton	The 50^{th} percentile of the data must be ≤ 25 µg/L	
	Chl-a periphyton	The 50^{th} percentile of the data must be ≤ 84 mg/m^2	
Toxics	Ammonia	The 95^{th} percentile of the data must be ≤ 0.072 mg/L	
	Fluoride	The 95^{th} percentile of the data must be ≤ 1.5 mg/L	
Inorganic ions	Sulphate	The 95th percentile data must be ≤ 120 mg/L	
	Chloride	The 95th percentile data must be ≤ 100 mg/L	

Table 5.16: EWR16: Water Quality Ecological Specifications

River: Vaal		EWR 16: Downstream Bloemhof Dam	Water quality monitoring site/gauge: C9H021
Inorganic Salts	$MgSO_4$	The 95^{th} percentile of the data must be ≤ 28 mg/L	
	Na_2SO_4	The 95^{th} percentile of the data must be ≤ 51 mg/L	
	$MgCl_2$	The 95^{th} percentile of the data must be ≤ 30 mg/L	
	$CaCl_2$	- The 95^{th} percentile of the data must be ≤ 69 mg/L	
	NaCl	The 95^{th} percentile of the data must be ≤ 191mg/L	
	$CaSO_4$	The 95^{th} percentile of the data must be ≤ 351 mg/L	
Physical variables	EC	The 95th percentile of the data must be ≤ 55 mS/m	
	pH	The 5^{th} percentile of the data must be between 6.5 to 8.0, and the 95^{th} percentile between 8.0 to 8.8	
	Temperature	Small deviation from the natural temperature range	
	Dissolved oxygen	The 5^{th} percentile of the data must be ≥ 6 mg/L	
	Turbidity	Vary by a small amount from the natural turbidity range	
Nutrients	Total inorganic Nitrogen (TIN)	The 50^{th} percentile of the data must be ≤ 0.25 mg/L	
	PO_4-P	The 50^{th} percentile of the data must be ≤ 0.025 mg/L	
Response variables	Chl-a phytoplankton	The 50th percentile of the data must be ≤ 30 µg/L	
	Chl-a periphyton	The 50^{th} percentile of the data must be ≤ 84 mg/m^2	
Toxics	Ammonia as Nitrogen	The 95th percentile of the data must be ≤ 0.073 mg/L	
	Fluoride	The 95^{th} percentile of the data must be ≤ 3.0 mg/L	
	Atrazine	The 95^{th} percentile data must be ≤ 0.100 mg/L	
	Endosulfan	The 95^{th} percentile data must be ≤ 0.2 µg/L	

Table 5.17: EWR17: Water Quality Ecological Specifications

River: Harts		**EWR 17: Lloyds weir**	**Water quality monitoring site/gauge**: C3H016
Inorganic Salts	$MgSO_4$	The 95th percentile of the data must be ≤ 37 mg/L	
	Na_2SO_4	The 95th percentile of the data must be ≤ 51 mg/L	
	$MgCl_2$	The 95th percentile of the data must be ≤ 51 mg/L	
	$CaCl_2$	The 95th percentile of the data must be ≤ 105 mg/L	
	NaCl	The 95th percentile of the data must be ≤ 389 mg/L	
	$CaSO_4$	The 95th percentile of the data must be ≤ 351 mg/L	
Physical variables	EC	The 95th percentile of the data must be ≤ 111 mS/m	
	pH	The 5th percentile of the data must be 6.5 to 8.0 and the 95th percentile 8.0 to 8.8	
	Temperature	Small deviation from the natural temperature range	
	Dissolved oxygen	5th percentile of the data must be ≥ 6.0 mg/L	
	Turbidity	Vary by a small amount from the natural turbidity range	
Nutrients	Total inorganic Nitrogen (TIN)	The 50th percentile of the data must be ≤ 1.0 mg/L	
	PO_4-P	The 50th percentile of the data must be ≤ 0.025 mg/L	
Response variables	Chl-a phytoplankton	The 50th percentile of the data must be ≤ 30ug/L	
	Chl-a periphyton	The 50th percentile of the data must be ≤ 84 mg/m^2	
Toxics	Ammonia as Nitrogen	The 95th percentile of the data must be ≤ 0.073 mg/L	
	Fluoride	The 95th percentile of the data must be ≤ 1.5 mg/L	

Table 5.18: EWR18: Water Quality Ecological Specifications

River: Vaal		**EWR 18: at Schmidtsdrift**	**Water quality monitoring site/gauge**: **C9H024**
Inorganic Salts	$MgSO_4$	The 95th percentile of the data must be ≤ 28 mg/L	
	Na_2SO_4	The 95th percentile of the data must be ≤ 51 mg/L	
	$MgCl_2$	The 95th percentile of the data must be ≤ 30 mg/L	
	$CaCl_2$	The 95th percentile of the data must be ≤ 105 mg/L	
	NaCl	The 95th percentile of the data must be ≤ 191 mg/L	
	$CaSO_4$	The 95th percentile of the data must be ≤ 351 mg/L	
Physical variables	EC	The 95th percentile of the data must be ≤ 85 mS/m	
	pH	The 5th percentile of the data must be 6.5 to 8.0 and the 95th percentile 8.0 to 8.8	
	Dissolved oxygen	The 5th percentile of the data must be ≥ 4 mg/L	
	Turbidity	Vary by a small amount from the natural turbidity range	
Nutrients	Total inorganic Nitrogen (TIN)	The 50th percentile of the data must be ≤ 0.7 mg/L	
	PO_4-P	The 50th percentile of the data must be ≤ 0.125 mg/L	
Response variables	Chl-a phytoplankton	The 50th percentile of the data must be ≤ 30 µg/L	
	Chl-a periphyton	The 50th percentile of the data must be ≤ 84 mg/m^2	
Toxics	Ammonia as Nitrogen	The 95th percentile of the data must be ≤ 0.073 mg/L	
	Fluoride	The 95th percentile of the data must be ≤ 1.5 mg/L	

Table 5.19: EWR WA1: Water Quality Ecological Specifications

River: Waterval		EWR WA1: Waterval_1	Water quality monitoring site/gauge: C1H036
Physical variables	EC	The 95th percentile of the data must be ≤ 85 mS/m	
	pH	The 5th percentile of the data must be 5.0 to 5.6 and the 95th percentile 9.2 to 10.0	
	Dissolved oxygen	The 5th percentile of the data must be ≥ 6.5 mg/L	
Nutrients	Nitrate (NO_3) + Nitrite (NO_2)	The 50th percentile of the data must be ≤ 4.0 mg/L	
	PO_4-P	The 50^{th} percentile of the data must be ≤ 0.125 mg/L	
Response variables	Chl-a phytoplankton	The 50^{th} percentile of the data must be ≤ 30 µg/L	
	Chl-a periphyton	The 50th percentile of the data must be ≤ 84 mg/m^2	
Toxics	Ammonia as Nitrogen	The 95th percentile of the data must be ≤ 0.1 mg/L	
	Fluoride	The 95^{th} percentile of the data must be ≤ 3.0 mg/L	
	Atrazine	The 95^{th} percentile data must be ≤ 0.1 mg/L	
	Endosulfan	The 95^{th} percentile data must be ≤ 0.20 µg/L	
	Cadmium (hard)	The 95^{th} percentile data must be ≤ 0.005 mg/L	
	Chromium (VI)	The 95^{th} percentile data must be ≤ 0.2 mg/L	
	Copper (hard)	The 95^{th} percentile data must be ≤ 0.008 mg/L	
	Manganese	The 95^{th} percentile data must be ≤ 1.3 mg/L	
	Lead (hard)	The 95^{th} percentile data must be ≤ 0.013 mg/L	
	Mercury	The 95^{th} percentile data must be ≤ 0.0017 mg/L	
	Selenium	The 95^{th} percentile data must be ≤ 0.030 mg/L	
	Zinc	The 95^{th} percentile data must be ≤ 0.036 mg/L	

Table 5.20: EWR WA2: Water Quality Ecological Specifications

River: Waterval		EWR WA2: Waterval_2	Water quality monitoring site/gauge: C1H030
Physical variables	EC	The 95th percentile of the data must be ≤ 85 mS/m	
	pH	The 5th percentile of the data must be 5.0 to 5.6 and the 95th percentile 9.2 to 10.0	
	Dissolved oxygen	The 5th percentile of the data must be ≥ 6.5 mg/L	
Nutrients	Nitrate (NO_3) + Nitrite (NO_2)	The 50th percentile of the data must be ≤ 4.0 mg/L	
	PO_4-P	The 50^{th} percentile of the data must be ≤ 0.125mg/L	
Response variables	Chl-a phytoplankton	The 50^{th} percentile of the data must be ≤ 30 µg/L	
	Chl-a periphyton	The 50th percentile of the data must be ≤84 mg/m^2	
Toxics	Ammonia as Nitrogen	The 95th percentile of the data must be ≤ 0.1 mg/L	
	Fluoride	The 95^{th} percentile of the data must be ≤ 3.0 mg/L	
	Atrazine	The 95^{th} percentile data must be ≤ 0.1 mg/L	
	Endosulfan	The 95^{th} percentile data must be ≤ 0.20 µg/L	
	Cadmium (hard)	The 95^{th} percentile data must be ≤ 0.005 mg/L	
	Chromium (VI)	The 95^{th} percentile data must be ≤ 0.2 mg/L	
	Copper (hard)	The 95^{th} percentile data must be ≤ 0.008 mg/L	
	Manganese	The 95^{th} percentile data must be ≤ 1.3 mg/L	
	Lead (hard)	The 95^{th} percentile data must be ≤ 0.013 mg/L	
	Mercury	The 95^{th} percentile data must be ≤ 0.0017 mg/L	
	Selenium	The 95^{th} percentile data must be ≤ 0.030 mg/L	
	Zinc	The 95^{th} percentile data must be ≤ 0.036 mg/L	

Table 5.21: EWR S1: Water Quality Ecological Specifications

River: Schoonspruit		**EWR S1: downstream Schoonspruit Eye**	**Water quality monitoring site/gauge**: No site in vicinity
Physical variables	EC	The 95th percentile of the data must be ≤ 55 mS/m	
	pH	The 5th percentile of the data must be 5.6 to 6.0 and the 95th percentile 8.0 to 8.5	
	Dissolved oxygen	The 5th percentile of the data must be ≥ 7.0 mg/L	
Nutrients	Nitrate (NO_3) + Nitrite (NO_2)	The 50th percentile of the data must be ≤ 2.5 mg/L	
	PO_4-P	The 50^{th} percentile of the data must be ≤ 0.02 mg/L	
Response variables	Chl-a phytoplankton	The 50^{th} percentile of the data must be ≤ 10 µg/L	
	Chl-a periphyton	The 50th percentile of the data must be ≤ 12 mg/m^2	

Table 5.22: EWR S3: Water Quality Ecological Specifications

River: Schoonspruit		**EWR S3: downstream Taaibosspruit and Rietspruit confluence**	**Water quality monitoring site/gauge**: No active site
Physical variables	EC	The 95th percentile of the data must be ≤ 70 mS/m	
	pH	The 5th percentile of the data must be 5.2 to 5.4 and the 95th percentile 9.3 to 9.6	
	Dissolved oxygen	The 5th percentile of the data must be ≥ 6.5 mg/L	
Nutrients	Nitrate (NO_3) + Nitrite (NO_2)	The 50th percentile of the data must be ≤ 2.5 mg/L	
	PO_4-P	The 50^{th} percentile of the data must be ≤ 0.125 mg/L	
Response variables	Chl-a phytoplankton	The 50^{th} percentile of the data must be ≤ 20 µg/L	
	Chl-a periphyton	The 50th percentile of the data must be ≤ 21 mg/m^2	

Table 5.23: EWR S4: Water Quality Ecological Specifications

River: Schoonspruit		**EWR S4: downstream Johan Neser Dam**	**Water quality monitoring site/gauge**: **C2H073**
Physical variables	EC	The 95th percentile of the data must be ≤ 85 mS/m	
	pH	The 5th percentile of the data must be 5.2 to 5.4 and the 95th percentile 9.3 to 9.6	
	Dissolved oxygen	The 5th percentile of the data must be ≥ 6.5 mg/L	
Nutrients	Nitrate (NO_3) + Nitrite (NO_2)	The 50th percentile of the data must be ≤ 2.5 mg/L	
	PO_4-P	The 50^{th} percentile of the data must be ≤ 0.125 mg/L	
Response variables	Chl-a phytoplankton	The 50^{th} percentile of the data must be ≤ 20 µg/L	
	Chl-a periphyton	The 50th percentile of the data must be ≤ 21 mg/m^2	
Inorganic ions	Sulphate	The 95th percentile of the data must be ≤ 200 mg/L	
Toxics	Ammonia as Nitrogen	The 95th percentile of the data must be ≤ 0.073 mg/L	
	Aluminium	The 95^{th} percentile of the data must be ≤ 0.1 mg/L	
	Manganese	The 95^{th} percentile of the data must be ≤0.250 mg/L	
	Uranium	The 95^{th} percentile of the data must be ≤0.03 mg/L	
	Iron	The 95^{th} percentile of the data must be ≤0.25 mg/L	
	Chromium (VI)	The 95^{th} percentile data must be ≤ 0.2 mg/L	
	Copper (hard)	The 95^{th} percentile data must be ≤ 0.008 mg/L	
	Cyanide (free)	The 95^{th} percentile data must be ≤ 0.050 mg/L	

6. RESERVE FOR GROUNDWATER

Table 6.1 below presents the Groundwater Reserve for the Vaal Catchment area derived using the Groundwater Resources Directed Measures (GRDM) methodology.

The prescribed GRDM algorithm was used and an "allocable groundwater" volume (MCM/annum) was calculated (Column K of Table 6.1). This algorithm as per the GRDM protocols, indicates the component of the annual recharge that is still available after Basic Human Needs, baseflow requirements and the current water use is subtracted from the calculated groundwater recharge.

The groundwater quality for each quaternary catchment, where available in a data count of >9, was applied and the ranking of the groundwater quality is according to the classification system as defined in the guideline: "Quality of Domestic Water Supplies Volume 1: Assessment Guide". 1998. Water Research Commission, the Department of Water Affairs and Forestry & the Department of Health. Report No. TT 101/98.

NOTE: Water Quality Classification system for Domestic Water Supplies based on increasing effects

Class 0: Ideal water quality, suitable for lifetime use, with no effects on the user.

Class I: Water in this class is safe for lifetime use but falls short of the ideal water quality in that there may be instances of adverse health effects, but these are usually mild, and overt health effects are almost sub-clinical and difficult to demonstrate. Water in Class I does not cause health effects under normal circumstances. Aesthetic effects may, however, be apparent.

Class II: Water in this class is defined as that where adverse health effects are unusual for limited short-term use. Adverse health effects may become more common particularly with prolonged use over many years, or with lifetime use. This class represents water suitable for short-term or emergency use only, but not necessarily suitable for continuous use over a lifetime.

Class III: This water has constituents in a concentration range where serious health effects might be anticipated, particularly in infants or elderly people with short-term use, and even more so with longer term use. The water in this class is not suitable for use as drinking water without appropriate treatment.

Table 6.1: GRDM for the Vaal River Water Management Area

A	B	C	D	E	F	G	H	I	J	K
Quaternary Catchment	Area (km²)	Mean Annual Precipitation (mm)	Recharge (Mm³/a)	% Mean Annual Precipitation	Population (minimum level)	Basic Human Needs (Mm³/a)	Groundwater Component of Baseflow (Mm³/a)	Total Reserve (Mm³/a)	Groundwater Use (Mm³/a)	Allocable Groundwater Total (Mm³/a)
UPPER VAAL CATCHMENT										
C11A	719	743	38.93	7.3	1955	0.02	6.46	6.48	0.00	32.45
C11B	535	705	26.49	7.0	2142	0.02	4.60	4.62	0.09	21.78
C11C	449	765	22.16	6.5	1277	0.01	4.39	4.40	0.14	17.62
C11D	372	702	17.05	6.5	965	0.01	3.17	3.18	0.17	13.70
C11E	1155	697	46.63	5.8	23889	0.22	9.74	9.96	1.26	35.41
C11F	929	705	39.67	6.1	31634	0.29	7.56	7.85	0.39	31.43
C11G	432	659	17.01	6.0	1460	0.01	3.00	3.01	0.22	13.78
C11H	1103	664	40.16	5.5	33924	0.31	6.76	7.07	1.38	31.71
C11J	1001	658	36.15	5.5	3106	0.03	6.76	6.79	0.48	28.88
C11K	340	633	11.47	5.3	2970	0.03	1.82	1.85	0.31	9.31
C11L	947	675	32.74	5.1	6416	0.06	6.77	6.83	0.49	25.42
C11M	795	637	23.38	4.6	38506	0.35	4.69	5.04	0.43	17.91
C12A	484	614	12.10	4.1	758	0.01	3.26	3.27	0.00	8.83
C12B	478	631	14.40	4.8	2461	0.02	3.18	3.20	0.13	11.07
C12C	666	605	18.66	4.6	4257	0.04	4.19	4.23	0.17	14.26
C12D	898	667	32.75	5.5	53555	0.49	5.27	5.76	3.78	23.21
C12E	497	641	16.87	5.3	1960	0.02	2.80	2.82	0.26	13.79
C12F	834	635	29.46	5.6	3241	0.03	4.43	4.46	0.36	24.64
C12G	570	640	21.20	5.8	6797	0.06	3.17	3.23	0.20	17.77
C12H	355	618	11.26	5.1	16104	0.15	1.54	1.69	0.08	9.49
C12J	344	615	9.67	4.6	627	0.01	1.49	1.50	0.17	8.00
C12K	479	657	19.93	6.3	2739	0.02	2.36	2.38	0.09	17.46
C12L	887	648	31.99	5.6	2116	0.02	4.12	4.14	3.77	24.08
C13A	594	779	27.18	5.9	2807	0.03	6.54	6.57	0.21	20.40
C13B	615	683	21.93	5.2	2395	0.02	5.42	5.44	0.27	16.22
C13C	836	724	35.96	5.9	5970	0.05	8.14	8.19	0.04	27.73
C13D	895	698	32.67	5.2	1742	0.02	8.23	8.25	0.11	24.31
C13E	602	699	21.94	5.2	1130	0.01	5.55	5.56	0.01	16.37
C13F	611	692	19.25	4.6	1525	0.01	5.16	5.17	0.03	14.05
C13G	434	674	14.14	4.8	15885	0.14	3.57	3.71	0.01	10.42
C13H	588	628	15.36	4.2	1688	0.02	3.99	4.01	0.02	11.33
C21A	707	674	26.89	5.6	4853	0.04	4.78	4.82	0.06	22.01
C21B	431	697	9.70	3.2	19019	0.17	4.16	4.33	0.23	5.14
C21C	438	674	9.85	3.3	8820	0.08	3.97	4.05	0.13	5.67
C21D	446	698	8.56	2.8	180660	1.65	4.20	5.85	0.84	1.87
C21E	628	691	9.21	2.1	40363	0.37	5.82	6.19	0.22	2.80
C21F	427	704	9.49	3.2	71170	0.65	4.04	4.69	0.59	4.21
C21G	462	667	9.38	3.0	2339	0.02	4.03	4.05	0.03	5.30
C22A	548	695	19.56	5.4	517617	4.73	5.37	11.77	1.41	6.38
C22B	391	691	11.22	4.7	237009	2.16	3.75	5.27	1.47	4.48
C22C	465	684	14.72	4.5	96073	0.88	4.38	11.05	0.03	3.64
C22D	345	701	12.24	9.2	30823	0.28	3.27	7.83	2.34	2.07
C22E	532	669	12.13	3.4	13549	0.12	4.81	4.93	0.91	6.29
C22F	440	655	7.01	2.4	109440	1.00	4.01	5.01	0.05	1.95
C22G	830	613	25.77	5.1	2596	0.02	6.93	6.95	0.47	18.35

A	B	C	D	E	F	G	H	I	J	K
Quaternary Catchment	Area (km^2)	Mean Annual Precipitation (mm)	Recharge (Mm^3/a)	% Mean Annual Precipitation	Population (minimum level)	Basic Human Needs (Mm^3/a)	Groundwater Component of Baseflow (Mm^3/a)	Total Reserve (Mm^3/a)	Groundwater Use (Mm^3/a)	Allocable Groundwater Total (Mm^3/a)
C22H	454	639	9.35	3.2	282162	2.57	3.89	6.46	0.07	2.82
C22J	669	633	15.25	3.6	14856	0.14	5.62	5.76	0.24	9.25
C22K	434	644	18.27	6.5	58152	0.53	3.91	4.44	0.34	13.49
C23A	258	612	7.39	4.7	1028	0.01	1.64	1.65	0.12	5.62
C23B	701	619	27.63	6.4	2152	0.02	4.54	4.56	0.40	22.67
C23C	1069	609	23.13	3.6	42653	0.39	6.27	6.66	0.60	15.87
C23D	510	664	25.79	7.6	99677	0.91	10.49	11.40	4.93	9.46
C23E	850	631	35.84	6.7	64933	0.59	15.97	11.93	34.23	0.00
C23F	1324	605	47.38	5.9	2373	0.01	22.97	15.89	0.28	31.21
C23G	613	597	27.18	7.4	1605	0.01	10.44	10.45	2.32	14.41
C23H	451	604	12.43	4.6	8385	0.08	7.69	7.77	0.27	4.39
C23J	890	620	19.05	3.5	25528	0.23	4.65	4.88	0.63	13.54
C23K	396	607	10.76	4.5	1605	0.01	1.97	1.98	0.26	8.52
C23L	1211	612	24.44	3.3	40749	0.37	6.10	17.07	0.73	6.64
C81A	382	882	22.72	6.7	323	0.00	3.52	3.52	0.05	19.15
C81B	576	763	26.44	6.0	1374	0.01	4.51	4.52	0.08	21.84
C81C	250	730	9.88	5.4	230	0.00	1.96	1.96	0.03	7.89
C81D	195	735	8.31	5.8	216	0.00	1.53	1.53	0.03	6.75
C81E	642	658	22.34	5.3	21029	0.19	4.61	4.80	0.10	17.44
C81F	688	892	46.15	7.5	236987	2.16	8.17	10.33	0.35	35.47
C81G	435	722	19.86	6.3	3855	0.04	4.25	4.29	0.09	15.48
C81H	358	638	12.37	5.4	1227	0.01	2.52	2.53	0.04	9.80
C81J	392	612	12.88	5.4	1496	0.01	2.51	2.52	0.06	10.30
C81K	359	623	12.34	5.5	793	0.01	2.34	2.35	0.05	9.94
C81L	793	740	35.97	6.1	689	0.01	6.18	6.19	0.11	29.67
C81M	1092	662	38.82	5.4	2936	0.03	7.82	7.85	0.16	30.81
C82A	582	670	21.75	5.6	1303	0.01	4.18	4.19	0.08	17.48
C82B	493	660	16.88	5.2	4736	0.04	3.48	3.52	0.07	13.29
C82C	353	646	12.39	5.4	978	0.01	2.42	2.43	0.07	9.89
C82D	572	623	19.50	5.5	1849	0.02	3.78	3.80	0.16	15.54
C82E	622	666	20.73	5.0	1725	0.02	4.37	4.39	0.04	16.30
C82F	483	639	14.02	4.5	827	0.01	3.25	3.26	0.01	10.75
C82G	580	655	18.14	4.8	1086	0.01	3.99	4.00	0.09	14.05
C82H	782	614	20.70	4.3	1537	0.01	4.89	4.90	0.19	15.61
C83A	746	692	31.27	6.1	3635	0.03	7.04	7.07	0.07	24.13
C83B	251	668	9.95	5.9	2141	0.02	2.27	2.29	0.03	7.63
C83C	828	663	30.60	5.6	39056	0.36	7.16	7.52	0.10	22.98
C83D	465	650	17.05	5.6	1761	0.02	4.04	4.06	0.05	12.94
C83E	426	654	15.46	5.6	1918	0.02	3.61	3.63	0.11	11.72
C83F	875	637	32.35	5.8	2266	0.02	5.72	5.74	11.23	15.38
C83G	695	647	24.23	5.4	14040	0.13	4.69	4.82	0.21	19.20
C83H	547	646	16.23	4.6	4173	0.04	3.50	3.54	0.24	12.45
C83J	222	641	6.68	4.7	18257	0.17	1.38	1.55	0.11	5.02
C83K	548	635	16.63	4.8	943	0.01	2.66	2.67	0.24	13.72
C83L	825	641	23.21	4.4	2014	0.02	3.96	3.98	0.05	19.18
C83M	1100	639	31.72	4.5	9691	0.09	5.14	5.23	0.39	26.10
MIDDLE VAAL CATCHMENT										
C24A	839	582.6	18.6	4.18	5 017	0.1	3.94	4.04	0.3	14.26

A	B	C	D	E	F	G	H	I	J	K
Quaternary Catchment	Area (km²)	Mean Annual Precipitation (mm)	Recharge (Mm^3/a)	% Mean Annual Precipitation	Population (minimum level)	Basic Human Needs (Mm^3/a)	Groundwater Component of Baseflow (Mm^3/a)	Total Reserve (Mm^3/a)	Groundwater Use (Mm^3/a)	Allocable Groundwater Total (Mm^3/a)
C24B	530	561.0	16.31	5.49	31 256	0.29	2.28	2.57	5.1	8.64
C24C	1350	586.9	96.98	12.24	25 663	0.23	21.55	21.8	14.9	60.30
C24D	364	584.3	3.99	1.88	3 079	0.03	1.70	1.73	0.2	2.06
C24E	925	560.0	21.87	6.23	51389	0.47	3.75	4.22	7.51	10.14
C24F	2020	577.5	55.91	5.52	29827	0.27	8.86	9.13	1.30	45.48
C24G	985	581.6	11.75	2.05	20 852	0.19	4.42	4.61	0.3	6.84
C24H	840	574.9	10.81	2.24	5 225	0.05	0.74	0.79	1.4	8.62
C24J	2109	550.9	22.31	1.88	17403	0.16	1.62	1.78	0.80	19.73
C25A	863	542.8	12.49	2.67	2 998	0.03	0.67	0.70	0.5	11.29
C25B	1888	510.0	18.16	1.89	63 942	0.58	1.19	1.77	0.6	15.79
C25C	1210	523.0	7.02	1.84	5004	0.09	0.83	0.92	0.80	5.30
C25D	1202	526.1	8.74	1.21	60167	0.67	0.85	1.52	0.60	6.62
C25E	1536	510.7	8.3	1.01	10597	0.11	0.98	1.09	1.90	5.34
C25F	2218	481.9	10.48	0.96	3706	0.06	1.14	1.20	0.60	8.68
C41A	1078	598.2	9.04	1.41	54136	0.74	5.24	5.98	1.10	1.96
C41B	1005	598.2	9.51	1.58	20033	0.27	4.89	5.16	0.40	3.95
C41C	1095	594.7	10.09	1.55	21 292	0.19	5.28	5.47	0.3	4.32
C41D	1155	549.5	4.94	0.78	29 024	0.26	4.87	5.13	0.3	0.00
C41E	391	519.0	0.62	0.30	2 629	0.02	1.28	1.30	0.1	0.00
C41F	556	494.9	0.56	0.20	8 630	0.08	1.54	1.62	0.2	0.00
C41G	272	516.8	0.29	0.21	130.00	0.00	0.64	0.64	0.1	0.00
C41H	887	499.2	2.32	0.52	8 669	0.08	2.24	2.32	0.2	0.00
C41J	556	494.6	2.16	0.79	11 390	0.10	1.38	1.48	0.1	0.58
C42A	695	632.0	8.77	2.00	5 110	0.05	6.08	6.13	0.3	2.34
C42B	727	581.0	5.10	1.21	1 903	0.02	5.21	5.23	0.3	0.00
C42C	793	625.6	6.27	1.26	8 731	0.08	6.75	6.83	0.3	0.00
C42D	663	555.5	1.71	0.46	21 992	0.20	4.20	4.40	0.3	0.00
C42E	750	564.0	2.93	0.69	6 150	0.06	4.99	5.05	0.3	0.00
C42F	734	568.2	1.42	0.34	39 809	0.36	4.91	5.27	0.2	0.00
C42G	555	550.4	0.82	0.27	6 876	0.06	3.43	3.49	0.2	0.00
C42H	445	541.1	0.53	0.22	41 319	0.38	2.62	3.00	1.1	0.00
C42J	1014	530.8	1.99	0.37	12 391	0.11	5.69	5.80	0.4	0.00
C42K	668	522.1	0.67	0.19	587.00	0.01	3.59	3.60	0.9	0.00
C42L	511	505.2	0.96	0.37	1 182	0.01	2.33	2.34	0.1	0.00
C43A	1491	482.2	3.37	0.47	26 707	0.24	0.37	0.61	0.3	2.46
C43B	723	494.0	1.26	0.35	1 854	0.02	0.20	0.22	0.2	0.84
C43C	913	469.0	3.17	0.74	9 364	0.09	0.20	0.29	0.3	2.58
C43D	1475	464.0	3.95	0.58	24 645	0.22	0.31	0.53	0.4	3.02
C60A	859	632.8	10.01	1.84	2 340	0.02	5.74	5.76	0.2	4.05
C60B	1022	617.8	10.11	1.60	10 790	0.10	6.52	6.62	0.5	2.99
C60C	1047	578.4	5.51	0.91	8 469	0.08	5.69	5.77	0.4	0.00
C60D	645	552.7	2.53	0.71	2 567	0.02	3.05	3.07	0.2	0.00
C60E	664	563.9	2.76	0.74	7 788	0.07	3.50	3.57	0.6	0.00
C60F	659	558.2	1.94	0.53	96 217	0.88	3.23	4.11	0.2	0.00
C60G	782	539.2	2.28	0.54	1 300	0.01	3.45	3.46	2.1	0.00
C60H	1232	514.8	2.69	0.42	6 274	0.06	0.26	0.32	0.3	2.07
C60J	959	550.6	10.02	1.90	6 169	0.06	0.28	0.34	0.8	8.88
C70A	613	628.1	7.02	1.82	2 218	0.02	4.71	4.73	0.5	1.79

A	B	C	D	E	F	G	H	I	J	K
Quaternary Catchment	Area (km^2)	Mean Annual Precipitation (mm)	Recharge (Mm^3/a)	% Mean Annual Precipitation	Population (minimum level)	Basic Human Needs (Mm^3/a)	Groundwater Component of Baseflow (Mm^3/a)	Total Reserve (Mm^3/a)	Groundwater Use (Mm^3/a)	Allocable Groundwater Total (Mm^3/a)
C70B	660	612.6	4.74	1.17	6 715	0.06	4.70	4.76	0.4	0.00
C70C	887	616.0	5.92	1.08	4 114	0.04	6.28	6.32	0.4	0.00
C70D	675	586.6	3.82	0.96	2 012	0.02	4.20	4.22	0.6	0.00
C70E	693	580.4	7.67	1.91	13 034	0.12	4.16	4.28	0.2	3.19
C70F	564	576.4	4.95	1.52	2 141	0.02	3.34	3.36	0.2	1.39
C70G	901	579.1	7.15	1.37	2 745	0.03	5.34	5.37	0.3	1.48
C70H	251	570.4	1.92	1.34	3 081	0.03	1.43	1.46	0.1	0.36
C70J	521	577.3	6.45	2.14	3 602	0.03	3.05	3.08	0.2	3.17
C70K	891	567.4	9.39	1.86	3 050	0.03	4.92	4.95	0.7	3.74
LOWER VAAL CATCHMENT										
C31A	1402	330.00	32.68	7.00	28400	0.71	5.55	6.26	0.77	25.65
C31B	1743	230.00	20.59	5.00	4400	0.11	11.07	11.18	1.15	8.26
C31C	1635	280.00	21.79	5.00	800	0.02	9.33	9.35	1.45	10.99
C31D	1493	300.00	22.95	5.00	30400	0.76	5.55	6.31	0.57	16.07
C31E	2958	270.00	37.91	5.00	65600	1.64	20.31	21.95	2.33	13.64
C31F	1787	205.00	12.92	3.00	63600	1.59	9.92	11.51	1.41	0.00
C32A	1403	165.00	8.62	3.50	25200	0.63	6.91	7.54	1.08	0.00
C32B	2997	225.00	31.22	5.00	123200	3.08	25.63	28.71	2.52	0.00
C32C	1657	245.00	15.24	3.50	<1000	0.00	9.69	9.69	0.79	4.76
C32D	4134	240.00	60.26	6.00	40000	1.00	16.63	17.63	3.26	39.37
C33A	2855	245.00	35.29	5.00	57600	1.44	10.69	12.13	1.06	22.10
C33B	2830	230.00	36.55	5.00	17600	0.44	6.58	7.02	0.83	28.70
C33C	4141	190.00	35.06	4.50	2400	0.06	11.44	11.50	0.97	22.59
C91A	2545	170.00	16.81	3.50	11200	0.28	7.86	8.14	0.77	7.90
C91B	4675	270.00	59.66	4.50	2800	0.07	21.89	21.96	1.11	36.59
C91C	3133	240.00	33.55	4.00	10400	0.26	7.18	7.44	0.18	25.93
C91D	2694	265.00	27.83	4.00	22000	0.55	3.55	4.10	0.46	23.27
C91E	1506	190.00	9.32	3.00	36400	0.91	3.16	4.07	0.42	4.83
C92A	3913	180.00	27.50	4.00	24000	0.60	9.80	10.40	0.88	16.22
C92B (68%)[1]	1341	190.00	9.00	3.50	<1000	0.00	5.63	5.63	0.32	3.15
C92C (67%)[1]	1332	185.00	10.00	4.00	6600	0.17	5.38	5.55	0.65	3.90
D-Catchment	Groundwater Classification and Resource Quality Objectives not underta									

Gw = Groundwater.
[1] Only the upper parts (indicated as percentages of the total quaternary catchment area) falls in the Lower Vaal Water Management Area.

Light grey scanned rows: Quaternary Catchments containing at least 25% Dolomite Water Areas (*i.e.* significant aquifer systems).

Table 7.1: Ecological specfifications for priority wetlands in the Vaal Water Management Area

IUA	Quaternary Catchment	Wetland Name	Wetland Type	PES	IS	REC	TEC	Ecological Specifications Protection, Maintenance and Management Requirements
UA	C11H	Headwaters of the Blesbokspruit (Upper Vaal)	Unchannelled Valley Bottom	C	High	B/C	C	Diffuse water distribution is required to optimise the water quality enhancement functions. The unchannelled nature of sections of the wetland must be maintained. Maintain existing vegetation structure and composition. Lateral flow inputs to the wetland must be protected through application of hydrological buffers determined via hydro-pedological assessments undertaken as part of an Environmental Impact Asessment (EIA) and/or Water Use Licence (WUL) applications, and strict licensing conditions including monitoring of the systems should apply. Any application for development including mining likely to impact this system, besides going through the normal licensing processes, should also include as a minimum an Intermediate Level Wetland Reserve which includes flow modelling (surface and groundwater including interflow) of scenarios to establish the potential impact in terms of achieving the REC.
UB	C13C	Vanger	Unchannelled Valley Bottom	A	Very High	A	A	Diffuse water distribution is required to optimise hydrological and biodiversity support functions. Maintain in natural or near-natural ecological condition for the purpose of the long-term protection of important biodiversity and as an important landscape feature. Ensure that the site and its catchment contributes towards the Critically Biodiversity Areas 1 and Ecological Support Areas 2 landscape level purpose for the site to represent and maintain a viable representative sample of this ecosystem types and its associated biodiversity. Maintain the existing flow distribution and retention patterns in the system to maintain the existing vegetation structure and composition. Lateral flow inputs to the wetland must be protected through application of hydrological buffers determined via hydro-pedological assessments undertaken as part of EIA and/or WUL applications, and strict licensing conditions including monitoring of the systems should apply.

IUA	Quaternary Catchment	Wetland Name	Wetland Type	PES	IS	REC	TEC	Ecological Specifications Protection, Maintenance and Management Requirements
UB	C13C	Seekoeivlei	Floodplain	E[1]	Very High	D	D	Diffuse water distribution is required to optimise hydrological and biodiversity support functions. Implement measures to improve the state of the wetland towards a more natural ecological condition and manage per the protected area management plan objectives. Protect the wetland and its catchment for the purpose of the long-term protection of important biodiversity and as an important landscape feature. Ensure that the site and its catchment contributes towards the Critically Biodiversity Areas 1, Ecological Support Areas 1 and 2 landscape level purpose for the site to represent and maintain a viable representative sample of this ecosystem type and its associated biodiversity. Improve the existing flow distribution and retention patterns in the system to restore the some of the lost ecological and hydrological functionality of the system and improve vegetation structure and composition. Lateral flow inputs to the wetland must be protected through application of hydrological buffers determined via hydro-pedological assessments undertaken as part of EIA and/or WUL applications, and strict licensing conditions including monitoring of the systems should apply. Monitor effluent originating from the upstream urban areas which are known to cause frequent sewage spill, as well as runoff from the solid waste site. Identify and prioritise wetland rehabilitation requirements to be implemented by the already engaged Working for Wetlands programme.
UC1	C81B	Murphy's Rust	Unchannelled and Channelled Valley Bottom	C	Very High	B	B/C	Implement measures to improve or at least maintain the ecological condition of the system for the purpose of the long-term protection of important biodiversity and as an important landscape feature. Ensure that the site and its catchment contributes towards the Critically Biodiversity Areas 1 and Ecological Support Areas 2 landscape level purpose for the site to represent and maintain a viable representative sample of this ecosystem types and its associated biodiversity. Maintain the existing flow distribution and retention patterns in the system. Maintain existing vegetation structure and composition as well as low disturbance levels for continued support of threatened biodiversity. Currently unchannelled wetlands must be maintained as unchannelled systems. Flow inputs to the wetland must be protected through application of hydrological buffers determined via hydro-pedological assessments undertaken as part of EIA and/or WUL applications, and strict licensing conditions including monitoring of the systems should apply. Apply the precautionary principle for disturbance of unknown impact. Any application for development that is likely to impact this system, besides going through the normal licensing processes, should also include as a minimum an Intermediate Level Wetland Reserve which includes flow modelling (surface and groundwater including interflow) of scenarios to establish the potential impact in terms of achieving the REC.

[1] The system is in a PES category of E (Seriously Modified) but has a Very High IS as it is a Ramsar Site (Designated as a Wetland of International Importance in terms of the Ramsar Convention). A PES category of E is not sustainable so the TEC is recommended to be the same as the REC and is set one category higher than the PES. Rehabilitation intervention would be required to improve the PES. Achieving an improvement in the PES of this system should thus be prioritised.

IUA	Quaternary Catchment	Wetland Name	Wetland Type	PES	IS	REC	TEC	Ecological Specifications Protection, Maintenance and Management Requirements
UC1	C81A	Bedford wetland complex	Unchannelled Valley Bottom	C	Very High	B	B/C	Maintain the naturally simulated water release from the Bedford Dam to ensure unaltered hydrological regime. Diffuse water distribution is required to optimise hydrological and biodiversity support functions. Maintain the near-natural ecological condition for the purpose of the long-term protection of important biodiversity and as an important landscape feature. Ensure that the site and its catchment contributes towards the Critical Biodiversity Area (CBA1) and ESA2 landscape level purpose for the site to represent and maintain a viable representative sample of this ecosystem types and its associated biodiversity. Maintain the existing flow distribution and retention patterns in the system. Maintain existing vegetation structure and composition as well as low disturbance levels for continued support of threatened biodiversity. Currently unchannelled wetlands must be maintained as unchannelled systems. No erosion gullies (no incision of channels or headcuts) can be permitted to develop within the wetland. This is an unchannelled wetland and is very sensitive to erosion and incision. Flow releases from the Bedford dam must simulate the natural hydrological regime required to maintain the wetland in its existing state. The approved Reserve for the wetland recommends both baseflow and flood releases for the wetland. The baseflows are required to ensure shallow inundation of the valley floor, particularly within those parts of the valley floor supporting mixed sedge marsh. This is required not only to provide potentially suitable habitat for the critically endangered White winged flufftail, and breeding habitat for Wattled cranes, but to ensure saturation of the peat in the system. This will also create favourable conditions for the functioning of the wetland and the provision of ecosystem services through maximizing contact between the water column and the wetland sediments. The function of these higher flows helps to achieve a level of wetland habitat maintenance (for the smaller inundation events) and to allow for some scour of the weakly developed channels (in the case of the larger, more infrequent flushing events). Monitoring should be aimed at determining whether or not the recommended baseflow and flood releases are achieving the desired objectives for the wetland and the REC. It should also be for detecting change, especially changes related to the hydrological regime to inform future water releases. Future potential impact of development applications must be determined as part of EIA and/or WUL applications, and strict licensing conditions including monitoring of the systems should apply. Apply the precautionary principle for disturbance of unknown impact. Monitoring of existing wetland rehabilitation structures is required to ensure the continued performance of the structures.
UC1	C81A	Upper Wilge	Floodplain	B	High	A/B	B	Floods are needed to inundate the floodplain thereby providing the wetting regime required for supporting the floodplain vegetation that are dependent on flooding for their life cycles.

GROUNDWATER RESERVE – WATER QUALITY COMPONENT

The groundwater quality of quaternary catchments with available hydrochemistry data was assessed against the domestic water target water quality ranges as shown in Table 6.2 and Table 6.3. A summary of the results for the groundwater quality classification at quaternary level in terms of the basic human needs requirement is included in the tables that follow (Tables 6.4 – 6.72).

Table 6.2: **Chemical water quality**

Chemical Parameter	**Water Quality Ranges**[1]				
	Units	**Class 0**	**Class I**	**Class II**	**Class III**
Calcium as Ca	mg/l	0 - 80	80 - 150	150 - 300	> 300
Magnesium as Mg	mg/l	0 - 30	30 - 70	70 - 100	> 100
Potassium as K	mg/l	0 - 25	25 - 50	50 - 100	> 100
Sodium as Na	mg/l	0 - 100	100 - 200	200 - 400	> 400
Chloride as Cl	mg/l	0 - 100	100 - 200	200 - 600	> 600
Sulphate as SO_4	mg/l	0 - 200	200 - 400	400 - 600	> 600
Nitrate as $NO_{x\text{-}}$ N	mg/l	0 - 6	6 - 10	10 - 20	> 20
Fluoride as F	mg/l	< 0.7	0.7 - 1.0	1.0 - 1.5	> 1.5
Total hardness as $CaCO_3$*	mg/l	0 - 200	200 - 300	300 - 600	> 600

1) Reference: Classification System in terms of - Water Research Commission: Quality of Domestic Water Supplies – Volume 1. Report No. TT 101/98, Second Edition, 1998.
2) * For catchments where the hydrochemistry for the checmical parameter total hardness only, exhibits elevated concentrations due to natural conditions, the water quality was categorised as one class range higher as no human health impacts are known to occur. Resulting impacts relate to scaling of domestic appliances.

Table 6.3: **Physical water quality**

Physical Parameter	**Water Quality Ranges**[2]				
	Units	**Class 0**	**Class I**	**Class II**	**Class III**
pH (pH Units)		6 - 9	5 - 6 & 9 - 9.5	4.5 – 5 & 9.5 - 10	< 4 or > 10
Total Dissolved Solids	mg/l	0 - 450	450 - 1000	1000 - 2400	> 2400
Electrical Conductivity	mS/m	0 - 70	70 - 150	150 - 370	> 370

3) Reference: Classification System in terms of - Water Research Commission: Quality of Domestic Water Supplies – Volume 1. Report No. TT 101/98, Second Edition, 1998.

The water quality for the following quaternary catchments were not assessed due to insufficient information (lack of representable groundwater quality data):

- C11A; C11B; C11C; C11D; C11E; C11F; C11G; C11J; C11K; C11L; C11M
- C12A; C12B; C12C; C12E; C12F; C12G; C12H; C12J; C12K; C12L
- C13A; C13B; C13C; C13D; C13E; C13F; C13G
- C21A; C21B
- C22G, C22K
- C23A; C23C
- C25D
- C41B; C41C; C41E; C41F; C41G; C41H; C41J
- C42A; C42B; C42C; C42D; C42E; C42F; C42G; C42H; C42J; C42K; C42L
- C43C; C43D
- C60A; C60B; C60C; C60D; C60F; C60G; C60H; C60J
- C70A; C70B; C70C; C70E; C70F; C70G; C70H; C70J; C70K
- C81A; C81B; C81C; C81D; C81E; C81G; C81H; C81J; C81K; C81L; C81M
- C82A; C82C; C82D; C82E; C82F; C82G
- C83A; C83C; C83D; C83E; C83F; C83G; C83H; C83JC83K; C83L; C83M

Table 6.4: Groundwater Quality Reserve – Quaternary catchment C11H

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: *C11H			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		37	8.20	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	37	79.70	<150	88
Calcium as Ca	mg/l	37	78.65	<150	87
Magnesium as Mg	mg/l	37	36.28	<70	39
Sodium as Na	mg/l	37	48.76	<200	54
Potassium as K	mg/l	37	4.24	<50	4.7
Total Hardness as $CaCO_3$	mg/l	37	345.8	<300	380
Chloride as Cl	mg/l	37	32.32	<200	36
Sulphate as SO_4	mg/l	37	61.58	<400	68
Nitrate as NO_x-N	mg/l	37	4.75	<10	5.2
Fluoride as F	mg/l	37	0.35	<1.0	0.39
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC *et al*. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
* Indicates that only post-1995 hydrochemical datasets for the specific quaternary catchment were used.

Table 6.5: Groundwater Quality Reserve – Quaternary catchment C12D

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: *C12D			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		34	8.13	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	34	89.25	<150	98
Calcium as Ca	mg/l	34	84.75	<150	93
Magnesium as Mg	mg/l	34	48.91	<70	54
Sodium as Na	mg/l	34	29.33	<200	32
Potassium as K	mg/l	34	8.34	<50	9
Total Hardness as $CaCO_3$	mg/l	34	413	<300	454
Chloride as Cl	mg/l	34	44.61	<200	49
Sulphate as SO_4	mg/l	34	96.36	<400	106
Nitrate as NO_x-N	mg/l	34	3.63	<10	4
Fluoride as F	mg/l	34	0.28	<1.0	0.3
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC *et al*. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
* Indicates that only post-1995 hydrochemical datasets for the specific quaternary catchment were used

Table 6.6: Groundwater Quality Reserve – Quaternary catchment C21C

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C21C			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		67	7.65	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	67	57.20	<150	63
Calcium as Ca	mg/l	67	40.10	<150	44
Magnesium as Mg	mg/l	67	19.40	<70	21
Sodium as Na	mg/l	67	39.10	<200	43
Potassium as K	mg/l	67	4.98	<50	5
Total Hardness as $CaCO_3$	mg/l	67	180	<300	198
Chloride as Cl	mg/l	67	43.40	<200	48
Sulphate as SO_4	mg/l	67	31.60	<400	35
Nitrate as NO_x-N	mg/l	67	0.10	<10	0.11
Fluoride as F	mg/l	67	0.71	<1.0	0.78
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.7: Groundwater Quality Reserve – Quaternary catchment C21D

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C21D♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		17	7.37	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	17	27.50	<150	30
Calcium as Ca	mg/l	17	19.10	<150	21
Magnesium as Mg	mg/l	17	11	<70	12
Sodium as Na	mg/l	17	13.40	<200	15
Potassium as K	mg/l	17	2.20	<50	2.4
Total Hardness as $CaCO_3$	mg/l	17	101.60	<300	112
Chloride as Cl	mg/l	17	8.50	<200	9
Sulphate as SO_4	mg/l	17	6.10	<400	7
Nitrate as NO_x-N	mg/l	17	0.23	<10	0.25
Fluoride as F	mg/l	17	0.12	<1.0	0.13
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.8: Groundwater Quality Reserve – Quaternary catchment C21E

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C21E♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		11	7.52	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	11	51.90	<150	57
Calcium as Ca	mg/l	11	39.70	<150	44
Magnesium as Mg	mg/l	11	20.90	<70	23
Sodium as Na	mg/l	11	26.00	<200	29
Potassium as K	mg/l	11	10.43	<50	11
Total Hardness as $CaCO_3$	mg/l	11	185.2	<300	203
Chloride as Cl	mg/l	11	29.50	<200	32
Sulphate as SO_4	mg/l	11	32.30	<400	36
Nitrate as NO_x-N	mg/l	11	1.73	<10	1.9
Fluoride as F	mg/l	11	0.17	<1.0	0.19
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.9: Groundwater Quality Reserve – Quaternary catchment C21F

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: *C21F			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		31	7.92	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	31	41.80	<150	46
Calcium as Ca	mg/l	31	39.34	<150	43
Magnesium as Mg	mg/l	31	19.71	<70	22
Sodium as Na	mg/l	31	10.72	<200	12
Potassium as K	mg/l	31	0.50	<50	1
Total Hardness as $CaCO_3$	mg/l	31	179.5	<300	198
Chloride as Cl	mg/l	31	25.60	<200	28
Sulphate as SO_4	mg/l	31	12.87	<400	14
Nitrate as NO_x-N	mg/l	31	2.88	<10	3.21
Fluoride as F	mg/l	31	0.13	<1.0	0.15
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
* Indicates that only post-1995 hydrochemical datasets for the specific quaternary catchment were used

Table 6.10: Groundwater Quality Reserve – Quaternary catchment C21G

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C21G♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		15	7.58	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	15	48.30	<150	53
Calcium as Ca	mg/l	15	32	<150	35
Magnesium as Mg	mg/l	15	20.80	<70	23
Sodium as Na	mg/l	15	23.80	<200	26
Potassium as K	mg/l	15	3.23	<50	4
Total Hardness as $CaCO_3$	mg/l	15	165.6	<300	182
Chloride as Cl	mg/l	15	12.409	<200	14
Sulphate as SO_4	mg/l	15	12.40	<400	14
Nitrate as NO_x-N	mg/l	15	1.52	<10	2
Fluoride as F	mg/l	15	0.21	<1.0	0.23
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.11: Groundwater Quality Reserve – Quaternary catchment C22A

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C22A			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		45	8.00	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	45	46.5	<150	51
Calcium as Ca	mg/l	45	38.6	<150	43
Magnesium as Mg	mg/l	45	29.0	<70	32
Sodium as Na	mg/l	45	8.00	<200	8.8
Potassium as K	mg/l	45	0.96	<50	1.1
Total Hardness as $CaCO_3$	mg/l	45	215.8	<300	237
Chloride as Cl	mg/l	45	5.8	<200	6.4
Sulphate as SO_4	mg/l	45	90.0	<400	99
Nitrate as NO_x-N	mg/l	45	4.07	<10	4.5
Fluoride as F	mg/l	45	0.10	<1.0	0.11
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.12: Groundwater Quality Reserve – Quaternary catchment C22B

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C22B♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		53	7.70	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	53	134.10	<150	148
Calcium as Ca	mg/l	53	106.45	<150	117
Magnesium as Mg	mg/l	53	58.70	<70	65
Sodium as Na	mg/l	53	46.25	<200	51
Potassium as K	mg/l	53	3.75	<50	4
Total Hardness as $CaCO_3$	mg/l	53	507.5	<300	558
Chloride as Cl	mg/l	53	55.10	<200	61
Sulphate as SO_4	mg/l	53	308.70	<400	340
Nitrate as NO_x-N	mg/l	53	2.40	<10	2.6
Fluoride as F	mg/l	53	0.15	<1.0	0.17
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.13: Groundwater Quality Reserve – Quaternary catchment C22C

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C22C			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		123	7.79	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	123	57	<150	63
Calcium as Ca	mg/l	123	44.0	<150	50
Magnesium as Mg	mg/l	123	32.0	<70	35
Sodium as Na	mg/l	123	14.8	<200	16
Potassium as K	mg/l	123	1.84	<50	2
Total Hardness as $CaCO_3$	mg/l	123	241.6	<300	266
Chloride as Cl	mg/l	123	16.8	<200	19
Sulphate as SO_4	mg/l	123	23.2	<400	26
Nitrate as NO_x-N	mg/l	123	2.38	<10	2.6
Fluoride as F	mg/l	123	0.10	<1.0	0.11
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.14: Groundwater Quality Reserve – Quaternary catchment C22D

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C22D♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		182	7.60	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	182	38.15	<150	42
Calcium as Ca	mg/l	182	35.90	<150	39
Magnesium as Mg	mg/l	182	22.85	<70	25
Sodium as Na	mg/l	182	6.30	<200	7
Potassium as K	mg/l	182	0.84	<50	1
Total Hardness as $CaCO_3$	mg/l	182	182	<300	200
Chloride as Cl	mg/l	182	6.25	<200	7
Sulphate as SO_4	mg/l	182	9	<400	10
Nitrate as NO_x-N	mg/l	182	1.20	<10	1.3
Fluoride as F	mg/l	182	0.10	<1.0	0.11
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset

Table 6.15: Groundwater Quality Reserve – Quaternary catchment C22E

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C22E♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		181	7.68	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	181	38.70	<150	43
Calcium as Ca	mg/l	181	33.80	<150	37
Magnesium as Mg	mg/l	181	22.90	<70	25
Sodium as Na	mg/l	181	10.10	<200	11
Potassium as K	mg/l	181	0.94	<50	1
Total Hardness as $CaCO_3$	mg/l	181	178.70	<300	197
Chloride as Cl	mg/l	181	7.10	<200	8
Sulphate as SO_4	mg/l	181	9.70	<400	11
Nitrate as NO_x-N	mg/l	181	1.05	<10	1.2
Fluoride as F	mg/l	181	0.13	<1.0	0.14
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset

Table 6.16: Groundwater Quality Reserve – Quaternary catchment C22F

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C22F♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		39	7.60	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	39	48.30	<150	53
Calcium as Ca	mg/l	39	42.70	<150	47
Magnesium as Mg	mg/l	39	22.30	<70	25
Sodium as Na	mg/l	39	18	<200	20
Potassium as K	mg/l	39	1.61	<50	2
Total Hardness as $CaCO_3$	mg/l	39	198.5	<300	218
Chloride as Cl	mg/l	39	14.40	<200	16
Sulphate as SO_4	mg/l	39	10.30	<400	11
Nitrate as NO_x-N	mg/l	39	0.50	<10	0.55
Fluoride as F	mg/l	39	0.20	<1.0	0.22
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset

Table 6.17: Groundwater Quality Reserve – Quaternary catchment C22H

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C22H♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		30	7.21	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	30	18.30	<150	20
Calcium as Ca	mg/l	30	14.50	<150	16
Magnesium as Mg	mg/l	30	6	<70	7
Sodium as Na	mg/l	30	7.05	<200	8
Potassium as K	mg/l	30	0.91	<50	1
Total Hardness as $CaCO_3$	mg/l	30	60.9	<300	67
Chloride as Cl	mg/l	30	4.45	<200	5
Sulphate as SO_4	mg/l	30	4.70	<400	5
Nitrate as NO_x-N	mg/l	30	0.11	<10	0.12
Fluoride as F	mg/l	30	0.14	<1.0	0.15
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset

Table 6.18: Groundwater Quality Reserve – Quaternary catchment C22J

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C22J♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		30	7.40	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	30	56.10	<150	62
Calcium as Ca	mg/l	30	47.70	<150	52
Magnesium as Mg	mg/l	30	27.65	<70	30
Sodium as Na	mg/l	30	23.75	<200	26
Potassium as K	mg/l	30	1.17	<50	1.3
Total Hardness as $CaCO_3$	mg/l	30	233.0	<300	256
Chloride as Cl	mg/l	30	17.35	<200	19
Sulphate as SO_4	mg/l	30	21.85	<400	24
Nitrate as NO_x-N	mg/l	30	4.29	<10	5
Fluoride as F	mg/l	30	0.21	<1.0	0.23
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset

Table 6.19: Groundwater Quality Reserve – Quaternary catchment C23B

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C23B♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		16	7.64	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	16	43.10	<150	47
Calcium as Ca	mg/l	16	31.05	<150	34
Magnesium as Mg	mg/l	16	20.45	<70	23
Sodium as Na	mg/l	16	15.95	<200	18
Potassium as K	mg/l	16	2.37	<50	3
Total Hardness as $CaCO_3$	mg/l	16	161.7	>300	178
Chloride as Cl	mg/l	16	13.30	<200	15
Sulphate as SO_4	mg/l	16	10.25	<400	11
Nitrate as NO_x-N	mg/l	16	2.44	<10	3
Fluoride as F	mg/l	16	0.23	<1.0	0.25
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset

Table 6.20: Groundwater Quality Reserve – Quaternary catchment C23C

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: *C23C			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		35	7.92	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	35	64.80	<150	71
Calcium as Ca	mg/l	35	42.45	<150	47
Magnesium as Mg	mg/l	35	27.76	<70	31
Sodium as Na	mg/l	35	53.10	<200	58
Potassium as K	mg/l	35	4.61	<50	5
Total Hardness as $CaCO_3$	mg/l	35	220.3	<300	242
Chloride as Cl	mg/l	35	24.50	<200	26
Sulphate as SO_4	mg/l	35	19.40	<400	21
Nitrate as NO_x-N	mg/l	35	4.07	<10	5
Fluoride as F	mg/l	35	0.42	<1.0	0.46
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
* Indicates that only post-1995 hydrochemical datasets for the specific quaternary catchment were used.

Table 6.21: Groundwater Quality Reserve – Quaternary catchment C23D

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C23D♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		74	7.08	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	74	20.40	<150	22
Calcium as Ca	mg/l	74	16	<150	18
Magnesium as Mg	mg/l	74	10.70	<70	12
Sodium as Na	mg/l	74	3.80	<200	4
Potassium as K	mg/l	74	0.78	<50	1
Total Hardness as $CaCO_3$	mg/l	74	84.0	<300	92
Chloride as Cl	mg/l	74	2.25	<200	2.5
Sulphate as SO_4	mg/l	74	12.90	<400	14
Nitrate as NO_x-N	mg/l	74	0.53	<10	1
Fluoride as F	mg/l	74	0.05	<1.0	0.06
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset

Table 6.22: Groundwater Quality Reserve – Quaternary catchment C23E

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C23E♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		34	7.56	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	34	50.4	<150	55
Calcium as Ca	mg/l	34	51.1	<150	56
Magnesium as Mg	mg/l	34	33.7	<70	37
Sodium as Na	mg/l	34	9.9	<200	11
Potassium as K	mg/l	34	1.29	<50	1.4
Total Hardness as $CaCO_3$	mg/l	34	266.4	<300	293
Chloride as Cl	mg/l	34	5.15	<200	6
Sulphate as SO_4	mg/l	34	24.6	<400	27
Nitrate as NO_x-N	mg/l	34	1.96	<10	2
Fluoride as F	mg/l	34	0.05	<1.0	0.06
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset

Table 6.23: Groundwater Quality Reserve – Quaternary catchment C23F

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C23F♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		14	7.72	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	14	31.20	<150	34
Calcium as Ca	mg/l	14	30.90	<150	34
Magnesium as Mg	mg/l	14	16.75	<70	18
Sodium as Na	mg/l	14	3.40	<200	4
Potassium as K	mg/l	14	0.90	<50	1
Total Hardness as $CaCO_3$	mg/l	14	146.1	<300	161
Chloride as Cl	mg/l	14	3.35	<200	3.7
Sulphate as SO_4	mg/l	14	2	<400	2.2
Nitrate as NO_x-N	mg/l	14	1	<10	1.1
Fluoride as F	mg/l	14	0.12	<1.0	0.13
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset

Table 6.24: Groundwater Quality Reserve – Quaternary catchment C23G

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C23G♣			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		196	7.78	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	196	88.95	<150	98
Calcium as Ca	mg/l	196	79.95	<150	88
Magnesium as Mg	mg/l	196	44.55	<70	49
Sodium as Na	mg/l	196	44.35	<200	48
Potassium as K	mg/l	196	1.88	<50	2
Total Hardness as $CaCO_3$	mg/l	196	383.1	<300	421
Chloride as Cl	mg/l	196	45.40	<200	50
Sulphate as SO_4	mg/l	196	228.05	<400	251
Nitrate as NO_x-N	mg/l	196	2.11	<10	2.3
Fluoride as F	mg/l	196	0.11	<1.0	0.12
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♣ Based on long-term hydrochemistry dataset from only one monitoring (spring/eye) site in the quaternary catchment

Table 6.25: Groundwater Quality Reserve – Quaternary catchment C23H

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C23H			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		19	7.91	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	19	43.70	<150	48
Calcium as Ca	mg/l	19	44	<150	48
Magnesium as Mg	mg/l	19	24.60	<70	27
Sodium as Na	mg/l	19	11.40	<200	13
Potassium as K	mg/l	19	1.14	<50	1.25
Total Hardness as $CaCO_3$	mg/l	19	211.3	<300	232
Chloride as Cl	mg/l	19	7.20	<200	8
Sulphate as SO_4	mg/l	19	5.20	<400	6
Nitrate as NO_x-N	mg/l	19	3.11	<10	3.4
Fluoride as F	mg/l	19	0.13	<1.0	0.14
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.26: Groundwater Quality Reserve – Quaternary catchment C23J

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C23J♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		20	7.73	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	20	44.2	<150	49
Calcium as Ca	mg/l	20	28.3	<150	31
Magnesium as Mg	mg/l	20	31.0	<70	34
Sodium as Na	mg/l	20	14.3	<200	16
Potassium as K	mg/l	20	1.50	<50	1.65
Total Hardness as $CaCO_3$	mg/l	20	198.3	<300	218
Chloride as Cl	mg/l	20	8.40	<200	9.0
Sulphate as SO_4	mg/l	20	7.45	<400	8.20
Nitrate as NO_x-N	mg/l	20	0.79	<10	0.87
Fluoride as F	mg/l	20	0.22	<1.0	0.24
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.27: Groundwater Quality Reserve – Quaternary catchment C23K

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C23K♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		9	7.76	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	9	39.50	<150	43
Calcium as Ca	mg/l	9	44.50	<150	49
Magnesium as Mg	mg/l	9	19.20	<70	21
Sodium as Na	mg/l	9	15.70	<200	17
Potassium as K	mg/l	9	1.07	<50	1.1
Total Hardness as $CaCO_3$	mg/l	9	190.2	<300	209
Chloride as Cl	mg/l	9	6.10	<200	7
Sulphate as SO_4	mg/l	9	4	<400	4.5
Nitrate as NO_x-N	mg/l	9	2.32	<10	3
Fluoride as F	mg/l	9	0.18	<1.0	0.2
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset

Table 6.28: Groundwater Quality Reserve – Quaternary catchment C23L

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C23L♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		26	7.20	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	26	34.70	<150	38
Calcium as Ca	mg/l	26	33.55	<150	37
Magnesium as Mg	mg/l	26	16.80	<70	18
Sodium as Na	mg/l	26	10.25	<200	11
Potassium as K	mg/l	26	1.47	<50	2
Total Hardness as $CaCO_3$	mg/l	26	153	<300	168
Chloride as Cl	mg/l	26	5.90	<200	6
Sulphate as SO_4	mg/l	26	2	<400	2.2
Nitrate as NO_x-N	mg/l	26	0.87	<10	1
Fluoride as F	mg/l	26	0.13	<1.0	0.14
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset

Table 6.29 Groundwater Quality Reserve – Quaternary catchment C24A

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C24A			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		112	7.40	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	112	108.05	<150	119
Calcium as Ca	mg/l	112	89.95	<150	99
Magnesium as Mg	mg/l	112	74.30	<70	82
Sodium as Na	mg/l	112	70.35	<200	77
Potassium as K	mg/l	112	7.74	<50	9
Total Hardness as $CaCO_3$	mg/l	112	529.3	<300	582
Chloride as Cl	mg/l	112	67.05	<200	74
Sulphate as SO_4	mg/l	112	323.45	<400	356
Nitrate as NO_x-N	mg/l	112	1.99	<10	2
Fluoride as F	mg/l	112	0.16	<1.0	0.18
				Water Quality Class	Class 2

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.30: Groundwater Quality Reserve – Quaternary catchment C24B

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C24B♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		13	7.17	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	13	361.20	<150	397
Calcium as Ca	mg/l	13	458.60	<150	504
Magnesium as Mg	mg/l	13	225.40	<70	248
Sodium as Na	mg/l	13	118.90	<200	131
Potassium as K	mg/l	13	20.14	<50	22
Total Hardness as $CaCO_3$	mg/l	13	2073.3	<300	2281
Chloride as Cl	mg/l	13	143.40	<200	158
Sulphate as SO_4	mg/l	13	2109.90	<400	2321
Nitrate as NO_x-N	mg/l	13	4.82	<10	5.3
Fluoride as F	mg/l	13	0.22	<1.0	0.24
				Water Quality Class	Class 3

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset

Table 6.31: Groundwater Quality Reserve – Quaternary catchment C24C

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C24C			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		161	7.95	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	161	40.70	<150	45
Calcium as Ca	mg/l	161	34	<150	37
Magnesium as Mg	mg/l	161	29.20	<70	32
Sodium as Na	mg/l	161	4.60	<200	5
Potassium as K	mg/l	161	1.43	<50	2
Total Hardness as $CaCO_3$	mg/l	161	205.1	<300	226
Chloride as Cl	mg/l	161	5.70	<200	6
Sulphate as SO_4	mg/l	161	2	<400	2.2
Nitrate as NO_x-N	mg/l	161	1.97	<10	2.2
Fluoride as F	mg/l	161	0.05	<1.0	0.06
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.32: Groundwater Quality Reserve – Quaternary catchment C24D

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C24D			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		10	7.70	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	10	24.30	<150	27
Calcium as Ca	mg/l	10	16.95	<150	19
Magnesium as Mg	mg/l	10	10.10	<70	11
Sodium as Na	mg/l	10	13.90	<200	15
Potassium as K	mg/l	10	3.03	<50	3.3
Total Hardness as $CaCO_3$	mg/l	10	83.9	<300	92
Chloride as Cl	mg/l	10	5.05	<200	6
Sulphate as SO_4	mg/l	10	7.05	<400	8
Nitrate as NO_x-N	mg/l	10	3.46	<10	3.8
Fluoride as F	mg/l	10	0.13	<1.0	0.15
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.33: Groundwater Quality Reserve – Quaternary catchment C24E

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C24E			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		48	7.89	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	48	48.80	<150	54
Calcium as Ca	mg/l	48	35.45	<150	39
Magnesium as Mg	mg/l	48	35.75	<70	39
Sodium as Na	mg/l	48	7.20	<200	8
Potassium as K	mg/l	48	1.37	<50	2
Total Hardness as $CaCO_3$	mg/l	48	235.7	<300	259
Chloride as Cl	mg/l	48	12.15	<200	13
Sulphate as SO_4	mg/l	48	2	<400	2.2
Nitrate as NO_x-N	mg/l	48	5.21	<10	6
Fluoride as F	mg/l	48	0.13	<1.0	0.14
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.34: Groundwater Quality Reserve – Quaternary catchment C24F

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C24F			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		175	7.84	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	175	46.30	<150	51
Calcium as Ca	mg/l	175	40	<150	44
Magnesium as Mg	mg/l	175	26.90	<70	30
Sodium as Na	mg/l	175	7.70	<200	8
Potassium as K	mg/l	175	1.80	<50	2
Total Hardness as $CaCO_3$	mg/l	175	211	<300	232
Chloride as Cl	mg/l	175	30.50	<200	34
Sulphate as SO_4	mg/l	175	2	<400	2.2
Nitrate as NO_x-N	mg/l	175	6.62	<10	7
Fluoride as F	mg/l	175	0.05	<1.0	0.06
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.35: Groundwater Quality Reserve – Quaternary catchment C24G

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C24G			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		23	7.80	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	23	38	<150	42
Calcium as Ca	mg/l	23	33.70	<150	37
Magnesium as Mg	mg/l	23	15.70	<70	17
Sodium as Na	mg/l	23	14.70	<200	16
Potassium as K	mg/l	23	1.99	<50	2.2
Total Hardness as $CaCO_3$	mg/l	23	148.8	<300	164
Chloride as Cl	mg/l	23	7.60	<200	8.4
Sulphate as SO_4	mg/l	23	11.80	<400	13
Nitrate as NO_x-N	mg/l	23	3.21	<10	3.5
Fluoride as F	mg/l	23	0.31	<1.0	0.34
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.36: Groundwater Quality Reserve – Quaternary catchment C24H

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C24H♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		42	7.80	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	42	51.40	<150	57
Calcium as Ca	mg/l	42	46.10	<150	51
Magnesium as Mg	mg/l	42	25.80	<70	28
Sodium as Na	mg/l	42	14.85	<200	16
Potassium as K	mg/l	42	1.59	<50	1.75
Total Hardness as $CaCO_3$	mg/l	42	221.4	<300	244
Chloride as Cl	mg/l	42	15.40	<200	17
Sulphate as SO_4	mg/l	42	11.55	<400	13
Nitrate as NO_x-N	mg/l	42	3.67	<10	4.0
Fluoride as F	mg/l	42	0.27	<1.0	0.29
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.37: Groundwater Quality Reserve – Quaternary catchment C24J

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C24J			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		22	7.64	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	22	42.60	<150	43
Calcium as Ca	mg/l	22	36.30	<150	37
Magnesium as Mg	mg/l	22	16.30	<70	17
Sodium as Na	mg/l	22	24.85	<200	26
Potassium as K	mg/l	22	1.06	<50	2
Total Hardness as $CaCO_3$	mg/l	22	157.3	<300	173.5
Chloride as Cl	mg/l	22	10.45	<200	11
Sulphate as SO_4	mg/l	22	7.55	<400	8
Nitrate as NO_x-N	mg/l	22	1.62	<10	2
Fluoride as F	mg/l	22	0.22	<1.0	0.24
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.38: Groundwater Quality Reserve – Quaternary catchment C25A

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C25A♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		9	7.84	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	9	53.60	<150	59
Calcium as Ca	mg/l	9	30	<150	33
Magnesium as Mg	mg/l	9	24.90	<70	27
Sodium as Na	mg/l	9	33.40	<200	37
Potassium as K	mg/l	9	1.37	<50	2
Total Hardness as $CaCO_3$	mg/l	9	177.4	<300	195
Chloride as Cl	mg/l	9	17	<200	19
Sulphate as SO_4	mg/l	9	14.20	<400	16
Nitrate as NO_x-N	mg/l	9	3.10	<10	3.4
Fluoride as F	mg/l	9	0.82	<1.0	0.9
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.39: Groundwater Quality Reserve – Quaternary catchment QC C25B

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: *C25B			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		16	8.29	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	16	136.95	<150	151
Calcium as Ca	mg/l	16	27.32	<150	30
Magnesium as Mg	mg/l	16	15.25	<70	17
Sodium as Na	mg/l	16	267.18	<200	294
Potassium as K	mg/l	16	5.03	<50	6.0
Total Hardness as $CaCO_3$	mg/l	16	131.0	<300	144
Chloride as Cl	mg/l	16	117.83	<200	130
Sulphate as SO_4	mg/l	16	33.93	<400	37
Nitrate as NO_x-N	mg/l	16	0.35	<10	0.4
Fluoride as F	mg/l	16	2.38	<1.0	2.62
				Water Quality Class	Class 3

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
* Indicates that only post-1995 hydrochemical datasets for the specific quaternary catchment were used.

Table 6.40: Groundwater Quality Reserve – Quaternary catchment C25C

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C25C			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		28	8.13	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	28	50.45	<150	56
Calcium as Ca	mg/l	28	46.63	<150	51
Magnesium as Mg	mg/l	28	27.52	<70	30
Sodium as Na	mg/l	28	14.95	<200	16
Potassium as K	mg/l	28	1.93	<50	2
Total Hardness as $CaCO_3$	mg/l	28	229.8	<300	253
Chloride as Cl	mg/l	28	8.77	<200	10
Sulphate as SO_4	mg/l	28	4.32	<400	5
Nitrate as NO_x-N	mg/l	28	9.57	<10	11
Fluoride as F	mg/l	28	0.13	<1.0	0.15
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.41: Groundwater Quality Reserve – Quaternary catchment C25E

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C25E			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		11	7.99	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	11	67.70	<150	74
Calcium as Ca	mg/l	11	48.30	<150	53
Magnesium as Mg	mg/l	11	20.70	<70	23
Sodium as Na	mg/l	11	19.80	<200	22
Potassium as K	mg/l	11	2.75	<50	3
Total Hardness as $CaCO_3$	mg/l	11	205.8	<300	226
Chloride as Cl	mg/l	11	17.80	<200	20
Sulphate as SO_4	mg/l	11	8.90	<400	10
Nitrate as NO_x-N	mg/l	11	13.07	<10	14
Fluoride as F	mg/l	11	0.18	<1.0	0.2
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.42: Groundwater Quality Reserve – Quaternary catchment C25F

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C25F♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		22	7.75	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	22	27.20	<150	30
Calcium as Ca	mg/l	22	20.92	<150	23
Magnesium as Mg	mg/l	22	12.30	<70	14
Sodium as Na	mg/l	22	4.10	<200	5
Potassium as K	mg/l	22	1	<50	1.1
Total Hardness as $CaCO_3$	mg/l	22	102.9	<300	113
Chloride as Cl	mg/l	22	1.50	<200	2
Sulphate as SO_4	mg/l	22	11.45	<400	13
Nitrate as NO_x-N	mg/l	22	0.84	<10	1.0
Fluoride as F	mg/l	22	0.05	<1.0	0.06
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.43: Groundwater Quality Reserve – Quaternary catchment QC C31A

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C31A			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		187	7.82	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	187	60.90	<150	67
Calcium as Ca	mg/l	187	59	<150	65
Magnesium as Mg	mg/l	187	34.30	<70	38
Sodium as Na	mg/l	187	13.10	<200	14
Potassium as K	mg/l	187	2.19	<50	2.4
Total Hardness as $CaCO_3$	mg/l	187	288.6	<300	317
Chloride as Cl	mg/l	187	27	<200	30
Sulphate as SO_4	mg/l	187	2	<400	2.2
Nitrate as NO_x-N	mg/l	187	4.96	<10	5.5
Fluoride as F	mg/l	187	0.12	<1.0	0.13
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.44: Groundwater Quality Reserve – Quaternary catchment C31B

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C31B♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		69	7.87	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	69	74.80	<150	82
Calcium as Ca	mg/l	69	80.80	<150	89
Magnesium as Mg	mg/l	69	36.90	<70	41
Sodium as Na	mg/l	69	23.30	<200	26
Potassium as K	mg/l	69	3.10	<50	3.3
Total Hardness as $CaCO_3$	mg/l	69	353.7	<300	389
Chloride as Cl	mg/l	69	35.70	<200	39
Sulphate as SO_4	mg/l	69	11.30	<400	12
Nitrate as NO_x-N	mg/l	69	14.05	<10	15
Fluoride as F	mg/l	69	0.23	<1.0	0.25
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.45: Groundwater Quality Reserve – Quaternary catchment C31C

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C31C♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		41	7.61	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	41	42.90	<150	47
Calcium as Ca	mg/l	41	30.1	<150	33.1
Magnesium as Mg	mg/l	41	18.10	<70	20
Sodium as Na	mg/l	41	24.80	<200	27
Potassium as K	mg/l	41	2.73	<50	3
Total Hardness as $CaCO_3$	mg/l	41	154.2	<300	169
Chloride as Cl	mg/l	41	11.60	<200	13
Sulphate as SO_4	mg/l	41	10.10	<400	11
Nitrate as NO_x-N	mg/l	41	9.76	<10	11
Fluoride as F	mg/l	41	0.25	<1.0	0.28
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.46: Groundwater Quality Reserve – Quaternary catchment C31D

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C31D♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		23	8.05	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	23	83	<150	91
Calcium as Ca	mg/l	23	83.20	<150	92
Magnesium as Mg	mg/l	23	41.30	<70	45
Sodium as Na	mg/l	23	49.60	<200	55
Potassium as K	mg/l	23	4.43	<50	5
Total Hardness as $CaCO_3$	mg/l	23	377.8	<300	416
Chloride as Cl	mg/l	23	56.20	<200	62
Sulphate as SO_4	mg/l	23	19	<400	21
Nitrate as NO_x-N	mg/l	23	10.56	<10	12
Fluoride as F	mg/l	23	0.42	<1.0	0.46
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.47: Groundwater Quality Reserve – Quaternary catchment C31E

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C31E♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		82	7.88	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	82	74.85	<150	82
Calcium as Ca	mg/l	82	70.85	<150	78
Magnesium as Mg	mg/l	82	30.50	<70	34
Sodium as Na	mg/l	82	44.50	<200	49
Potassium as K	mg/l	82	3.57	<50	4
Total Hardness as $CaCO_3$	mg/l	82	302.5	<300	333
Chloride as Cl	mg/l	82	42.95	<200	47
Sulphate as SO_4	mg/l	82	18.95	<400	21
Nitrate as NO_x-N	mg/l	82	14.37	<10	16
Fluoride as F	mg/l	82	0.34	<1.0	0.37
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.48: Groundwater Quality Reserve – Quaternary catchment C31F

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C31F♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		35	7.28	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	35	57.20	<150	63
Calcium as Ca	mg/l	35	43.30	<150	48
Magnesium as Mg	mg/l	35	21.90	<70	24
Sodium as Na	mg/l	35	43.20	<200	48
Potassium as K	mg/l	35	2.97	<50	3.3
Total Hardness as $CaCO_3$	mg/l	35	198.3	<300	218
Chloride as Cl	mg/l	35	26.90	<200	30
Sulphate as SO_4	mg/l	35	23.60	<400	26
Nitrate as NO_x-N	mg/l	35	13.28	<10	15
Fluoride as F	mg/l	35	0.35	<1.0	0.39
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.49: Groundwater Quality Reserve – Quaternary catchment C32A

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C32A♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		135	7.92	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	135	88.30	<150	97
Calcium as Ca	mg/l	135	69.90	<150	77
Magnesium as Mg	mg/l	135	34.60	<70	38
Sodium as Na	mg/l	135	71.70	<200	79
Potassium as K	mg/l	135	3.10	<50	3.4
Total Hardness as $CaCO_3$	mg/l	135	316.00	<300	349
Chloride as Cl	mg/l	135	45.20	<200	50
Sulphate as SO_4	mg/l	135	18.80	<400	21
Nitrate as NO_x-N	mg/l	135	15.87	<10	17
Fluoride as F	mg/l	135	0.55	<1.0	0.61
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.50: Groundwater Quality Reserve – Quaternary catchment C32B

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C32B			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		896	7.91	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	896	80.95	<150	89
Calcium as Ca	mg/l	896	56	<150	62
Magnesium as Mg	mg/l	896	44.60	<70	49
Sodium as Na	mg/l	896	39.70	<200	44
Potassium as K	mg/l	896	3.18	<50	3.5
Total Hardness as $CaCO_3$	mg/l	896	323.5	<300	356
Chloride as Cl	mg/l	896	43.90	<200	48
Sulphate as SO_4	mg/l	896	18.40	<400	20
Nitrate as NO_x-N	mg/l	896	7.05	<10	7.8
Fluoride as F	mg/l	896	0.40	<1.0	0.44
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.51: Groundwater Quality Reserve – Quaternary catchment C32C

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C32C			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		98	7.94	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	98	71.80	<150	79
Calcium as Ca	mg/l	98	58	<150	64
Magnesium as Mg	mg/l	98	43.35	<70	48
Sodium as Na	mg/l	98	37.35	<200	41
Potassium as K	mg/l	98	2.70	<50	3.0
Total Hardness as $CaCO_3$	mg/l	98	323.3	<300	356
Chloride as Cl	mg/l	98	29.30	<200	32
Sulphate as SO_4	mg/l	98	22.70	<400	25
Nitrate as NO_x-N	mg/l	98	5.90	<10	6.5
Fluoride as F	mg/l	98	0.40	<1.0	0.44
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.52: Groundwater Quality Reserve – Quaternary catchment C32D

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C32D			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		148	8.14	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	148	85.65	<150	94
Calcium as Ca	mg/l	148	76.09	<150	84
Magnesium as Mg	mg/l	148	64.0	<70	70
Sodium as Na	mg/l	148	13.30	<200	15
Potassium as K	mg/l	148	0.67	<50	0.74
Total Hardness as $CaCO_3$	mg/l	148	455.4	<300	501
Chloride as Cl	mg/l	148	33.08	<200	36
Sulphate as SO_4	mg/l	148	44.35	<400	49
Nitrate as NO_x-N	mg/l	148	7.51	<10	8.3
Fluoride as F	mg/l	148	0.29	<1.0	0.32
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.53: Groundwater Quality Reserve – Quaternary catchment C33A

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C33A♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		264	8	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	264	85.95	<150	95
Calcium as Ca	mg/l	264	69.05	<150	76
Magnesium as Mg	mg/l	264	69.20	<70	76
Sodium as Na	mg/l	264	13.40	<200	15
Potassium as K	mg/l	264	0.95	<50	1.1
Total Hardness as $CaCO_3$	mg/l	264	457.4	<300	503
Chloride as Cl	mg/l	264	36	<200	40
Sulphate as SO_4	mg/l	264	31.30	<400	34
Nitrate as NO_x-N	mg/l	264	5.80	<10	6.4
Fluoride as F	mg/l	264	0.33	<1.0	0.36
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.54: Groundwater Quality Reserve – Quaternary catchment C33B

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C33B♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		388	7.97	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	388	80.15	<150	88
Calcium as Ca	mg/l	388	59.60	<150	66
Magnesium as Mg	mg/l	388	62.45	<70	69
Sodium as Na	mg/l	388	14.40	<200	16
Potassium as K	mg/l	388	1.21	<50	1.3
Total Hardness as $CaCO_3$	mg/l	388	406.0	<300	447
Chloride as Cl	mg/l	388	31.40	<200	35
Sulphate as SO_4	mg/l	388	21.30	<400	23
Nitrate as NO_x-N	mg/l	388	5.67	<10	6.2
Fluoride as F	mg/l	388	0.24	<1.0	0.26
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.55: Groundwater Quality Reserve – Quaternary catchment C33C

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C33C♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		290	7.99	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	290	71.80	<150	79
Calcium as Ca	mg/l	290	65.10	<150	72
Magnesium as Mg	mg/l	290	44.30	<70	49
Sodium as Na	mg/l	290	13	<200	14
Potassium as K	mg/l	290	2.07	<50	2.3
Total Hardness as $CaCO_3$	mg/l	290	345.0	<300	380
Chloride as Cl	mg/l	290	30.65	<200	34
Sulphate as SO_4	mg/l	290	16.35	<400	18
Nitrate as NO_x-N	mg/l	290	3.99	<10	4.4
Fluoride as F	mg/l	290	0.21	<1.0	0.23
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.56: Groundwater Quality Reserve – Quaternary catchment C41A

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C41A			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		17	7.97	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	17	71.50	<150	79
Calcium as Ca	mg/l	17	74.90	<150	82
Magnesium as Mg	mg/l	17	29.20	<70	32
Sodium as Na	mg/l	17	56.10	<200	62
Potassium as K	mg/l	17	2.62	<50	2.9
Total Hardness as $CaCO_3$	mg/l	17	307.3	<300	338
Chloride as Cl	mg/l	17	11.80	<200	13
Sulphate as SO_4	mg/l	17	25.18	<400	28
Nitrate as NO_x-N	mg/l	17	2.51	<10	2.8
Fluoride as F	mg/l	17	0.28	<1.0	0.31
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.57: Groundwater Quality Reserve – Quaternary catchment C41D

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C41D♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		14	8.18	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	14	82.35	<150	91
Calcium as Ca	mg/l	14	65	<150	72
Magnesium as Mg	mg/l	14	26.50	<70	29
Sodium as Na	mg/l	14	65.15	<200	72
Potassium as K	mg/l	14	2.30	<50	2.5
Total Hardness as $CaCO_3$	mg/l	14	271.4	<300	299
Chloride as Cl	mg/l	14	30.05	<200	33
Sulphate as SO_4	mg/l	14	21.40	<400	24
Nitrate as NO_x-N	mg/l	14	4.50	<10	5.0
Fluoride as F	mg/l	14	0.40	<1.0	0.43
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.58: Groundwater Quality Reserve – Quaternary catchment C43B

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C43B♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		15	7.60	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	15	70	<150	77
Calcium as Ca	mg/l	15	69.30	<150	76
Magnesium as Mg	mg/l	15	39.90	<70	44
Sodium as Na	mg/l	15	22.70	<200	25
Potassium as K	mg/l	15	2.32	<50	2.6
Total Hardness as $CaCO_3$	mg/l	15	337.4	<300	371
Chloride as Cl	mg/l	15	25.50	<200	28
Sulphate as SO_4	mg/l	15	41.90	<400	46
Nitrate as NO_x-N	mg/l	15	0.07	<10	0.08
Fluoride as F	mg/l	15	0.20	<1.0	0.22
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.59: Groundwater Quality Reserve – Quaternary catchment C60E

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C60E			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		12	7.90	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	12	64.30	<150	71
Calcium as Ca	mg/l	12	43.90	<150	48
Magnesium as Mg	mg/l	12	15.80	<70	17
Sodium as Na	mg/l	12	42.30	<200	47
Potassium as K	mg/l	12	1.01	<50	1.1
Total Hardness as $CaCO_3$	mg/l	12	174.7	<300	192
Chloride as Cl	mg/l	12	20.50	<200	23
Sulphate as SO_4	mg/l	12	12	<400	13.2
Nitrate as NO_x-N	mg/l	12	1.91	<10	2.10
Fluoride as F	mg/l	12	0.24	<1.0	0.26
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.60: Groundwater Quality Reserve – Quaternary catchment C70D

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: * C70D			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		21	8.11	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	21	77.50	<150	85
Calcium as Ca	mg/l	21	62.72	<150	69
Magnesium as Mg	mg/l	21	23.75	<70	26
Sodium as Na	mg/l	21	70.50	<200	78
Potassium as K	mg/l	21	4.93	<50	5
Total Hardness as $CaCO_3$	mg/l	21	254.4	<300	280
Chloride as Cl	mg/l	21	29.17	<200	32
Sulphate as SO_4	mg/l	21	68.34	<400	75
Nitrate as NO_x-N	mg/l	21	1.76	<10	1.9
Fluoride as F	mg/l	21	0.60	<1.0	0.66
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
* Indicates that only post-1995 hydrochemical datasets for the specific quaternary catchment were used.

Table 6.61: Groundwater Quality Reserve – Quaternary catchment C81F

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C81F♣			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		18	7.25	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	18	28.90	<150	32
Calcium as Ca	mg/l	18	24.75	<150	27
Magnesium as Mg	mg/l	18	6.30	<70	6.9
Sodium as Na	mg/l	18	20	<200	22
Potassium as K	mg/l	18	1.30	<50	1.4
Total Hardness as $CaCO_3$	mg/l	18	87.7	<300	97
Chloride as Cl	mg/l	18	1.50	<200	1.7
Sulphate as SO_4	mg/l	18	2	<400	2.2
Nitrate as NO_x-N	mg/l	18	0.31	<10	0.34
Fluoride as F	mg/l	18	0.21	<1.0	0.23
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♣ Samples only from monitoring done in 1976.

Table 6.62: Groundwater Quality Reserve – Quaternary catchment C82B

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: *C82B			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		29	8.21	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	29	39.90	<150	44
Calcium as Ca	mg/l	29	32.23	<150	35
Magnesium as Mg	mg/l	29	13.98	<70	15
Sodium as Na	mg/l	29	27.60	<200	30
Potassium as K	mg/l	29	3.39	<50	3.7
Total Hardness as $CaCO_3$	mg/l	29	138.0	<300	152
Chloride as Cl	mg/l	29	25.24	<200	28
Sulphate as SO_4	mg/l	29	22.16	<400	24
Nitrate as NO_x-N	mg/l	29	0.17	<10	0.19
Fluoride as F	mg/l	29	0.32	<1.0	0.35
				Water Quality Class	Class 0

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
* Indicates that only post-1995 hydrochemical datasets for the specific quaternary catchment were used.

Table 6.63: Groundwater Quality Reserve – Quaternary catchment C82H

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C82H			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		18	8.07	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	18	85.15	<150	94
Calcium as Ca	mg/l	18	65.77	<150	72
Magnesium as Mg	mg/l	18	27.34	<100	30
Sodium as Na	mg/l	18	89.79	<200	99
Potassium as K	mg/l	18	1.08	<50	1.2
Total Hardness as $CaCO_3$	mg/l	18	276.8	<300	305
Chloride as Cl	mg/l	18	20.71	<200	23
Sulphate as SO_4	mg/l	18	22.56	<400	25
Nitrate as NO_x-N	mg/l	18	0.38	<10	0.41
Fluoride as F	mg/l	18	0.78	<1.0	0.85
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.64: Groundwater Quality Reserve – Quaternary catchment C83B

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: *C83B			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		33	7.98	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	33	60	<150	66
Calcium as Ca	mg/l	33	52.12	<150	57
Magnesium as Mg	mg/l	33	27.20	<70	30
Sodium as Na	mg/l	33	33.50	<200	37
Potassium as K	mg/l	33	0.85	<50	0.9
Total Hardness as $CaCO_3$	mg/l	33	242.82	<300	267
Chloride as Cl	mg/l	33	28.89	<200	32
Sulphate as SO_4	mg/l	33	35.06	<400	39
Nitrate as NO_x-N	mg/l	33	0.79	<10	0.9
Fluoride as F	mg/l	33	0.29	<1.0	0.32
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
* Indicates that only post-1995 hydrochemical datasets for the specific quaternary catchment were used.

Table 6.65: Groundwater Quality Reserve – Quaternary catchment C91A

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C91A♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		14	8.41	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	14	70.10	<150	77
Calcium as Ca	mg/l	14	27.45	<150	30
Magnesium as Mg	mg/l	14	36.85	<70	41
Sodium as Na	mg/l	14	59.70	<200	66
Potassium as K	mg/l	14	4.02	<50	4.4
Total Hardness as $CaCO_3$	mg/l	14	220.3	<300	242
Chloride as Cl	mg/l	14	44.40	<200	49
Sulphate as SO_4	mg/l	14	60.20	<400	66
Nitrate as NO_x-N	mg/l	14	3.05	<10	3.4
Fluoride as F	mg/l	14	0.28	<1.0	0.30
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.66: Groundwater Quality Reserve – Quaternary catchment C91B

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C91B♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		41	7.90	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	41	96.00	<150	106
Calcium as Ca	mg/l	41	50.50	<150	56
Magnesium as Mg	mg/l	41	46.40	<70	51
Sodium as Na	mg/l	41	70.40	<200	77
Potassium as K	mg/l	41	2.30	<50	2.5
Total Hardness as $CaCO_3$	mg/l	41	317.2	<300	349
Chloride as Cl	mg/l	41	68.50	<200	75
Sulphate as SO_4	mg/l	41	60.20	<400	66
Nitrate as NO_x-N	mg/l	41	7.02	<10	7.7
Fluoride as F	mg/l	41	0.56	<1.0	0.62
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.67: Groundwater Quality Reserve – Quaternary catchment C91C

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C91C			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		33	8.12	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	33	98.90	<150	109
Calcium as Ca	mg/l	33	82.90	<150	91
Magnesium as Mg	mg/l	33	62.57	<70	69
Sodium as Na	mg/l	33	25.81	<200	28
Potassium as K	mg/l	33	3.33	<50	3.7
Total Hardness as $CaCO_3$	mg/l	33	464.7	<300	511
Chloride as Cl	mg/l	33	92.36	<200	102
Sulphate as SO_4	mg/l	33	54.36	<400	60
Nitrate as NO_x-N	mg/l	33	14.42	<10	16
Fluoride as F	mg/l	33	0.41	<1.0	0.45
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).

Table 6.68: Groundwater Quality Reserve – Quaternary catchment C91D

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C91D♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		15	7.90	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	15	71.30	<150	78
Calcium as Ca	mg/l	15	49.60	<150	55
Magnesium as Mg	mg/l	15	38.80	<70	43
Sodium as Na	mg/l	15	30.30	<200	33
Potassium as K	mg/l	15	2.91	<50	3.2
Total Hardness as $CaCO_3$	mg/l	15	283.6	<300	312
Chloride as Cl	mg/l	15	35.00	<200	39
Sulphate as SO_4	mg/l	15	36.50	<400	40
Nitrate as NO_x-N	mg/l	15	2.55	<10	2.8
Fluoride as F	mg/l	15	0.64	<1.0	0.7
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.69: Groundwater Quality Reserve – Quaternary catchment C91E

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C91E♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		29	8.00	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	29	113.20	<150	125
Calcium as Ca	mg/l	29	78.20	<150	86
Magnesium as Mg	mg/l	29	61.10	<70	67
Sodium as Na	mg/l	29	53.90	<200	59
Potassium as K	mg/l	29	1.80	<50	2.0
Total Hardness as $CaCO_3$	mg/l	29	446.9	<300	492
Chloride as Cl	mg/l	29	69.50	<200	76
Sulphate as SO_4	mg/l	29	116.80	<400	128
Nitrate as NO_x-N	mg/l	29	7.45	<10	8.2
Fluoride as F	mg/l	29	0.58	<1.0	0.64
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.70: Groundwater Quality Reserve – Quaternary catchment C92A

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C92A♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		298	8.09	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	298	49.10	<150	54
Calcium as Ca	mg/l	298	51.35	<150	56
Magnesium as Mg	mg/l	298	19.20	<70	21
Sodium as Na	mg/l	298	10.58	<200	12
Potassium as K	mg/l	298	2.29	<50	2.5
Total Hardness as $CaCO_3$	mg/l	298	207.3	<300	228
Chloride as Cl	mg/l	298	20.35	<200	22
Sulphate as SO_4	mg/l	298	20.45	<400	23
Nitrate as NO_x-N	mg/l	298	2.31	<10	2.5
Fluoride as F	mg/l	298	0.17	<1.0	0.19
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.71: Groundwater Quality Reserve – Quaternary catchment C92B

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C92B♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		46	8.22	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	46	100.20	<150	110
Calcium as Ca	mg/l	46	82.85	<150	91
Magnesium as Mg	mg/l	46	73.40	<70	81
Sodium as Na	mg/l	46	29.05	<200	32
Potassium as K	mg/l	46	3.28	<50	3.6
Total Hardness as $CaCO_3$	mg/l	46	509.1	<300	560
Chloride as Cl	mg/l	46	55.55	<200	61
Sulphate as SO_4	mg/l	46	42.25	<400	46
Nitrate as NO_x-N	mg/l	46	6.14	<10	6.8
Fluoride as F	mg/l	46	0.31	<1.0	0.34
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

Table 6.72: Groundwater Quality Reserve – Quaternary catchment C92C

Chemical Parameter	Unit	Vaal WMA – Quaternary catchment: C92C♦			
		[A]	[B]	[C]	[D]
		No. of Samples	GW quality (median value)[1]	BHN Limit[2]	Groundwater Quality Reserve[3]
pH		100	8.27	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Electrical Conductivity	mS/m	100	87.60	<150	96
Calcium as Ca	mg/l	100	83.55	<150	92
Magnesium as Mg	mg/l	100	56.10	<70	62
Sodium as Na	mg/l	100	20.95	<200	23
Potassium as K	mg/l	100	4.13	<50	4.5
Total Hardness as $CaCO_3$	mg/l	100	439.6	<300	484
Chloride as Cl	mg/l	100	50.85	<200	56
Sulphate as SO_4	mg/l	100	32.30	<400	36
Nitrate as NO_x-N	mg/l	100	4.29	<10	4.7
Fluoride as F	mg/l	100	0.33	<1.0	0.36
				Water Quality Class	Class 1

[1] Based on long-term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9);
[2] Upper limit of Class I water quality [Drinking] (WRC et al. 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10% (with the exception of pH).
♦ Based on pre-1995 hydrochemistry dataset (most representative spatial dataset)

7. PROTECTION AND MANAGEMENT REQUIREMENTS FOR PRIORITY WETLANDS

Priority wetlands in the Vaal River catchment area includes those wetlands which display an ecological sensitivity of High or Very High. Additional priority wetlands were identified taking cognisance of inter alia unique features, red data species and peat wetlands. Recommended ecological categories (REC) and ecological specifications for the priority wetlands in the Vaal Water Management Area are presented in Table 7.1. The Present Ecological State (PES), Importance and Sensitivity (IS) for the identified priority wetlands are also presented.

Note:
Acronyms referred to in Table 7-1:

- CBA: Critical Biodiversity Area
- ESA: Ecological Support Areas
- EIA: Environmental Impact Assessment
- REC: Recommended Ecological Category
- TEC: Target Ecological Category
- WUL: Water Use Licence

IUA	Quaternary Catchment	Wetland Name	Wetland Type	PES	IS	REC	TEC	Ecological Specifications Protection, Maintenance and Management Requirements
								Maintain in natural or near-natural ecological condition for the purpose of the long-term protection of important biodiversity and as an important landscape feature. Ensure that the site and its catchment contributes towards the CBA1 and ESA2 landscape level purpose for the site to represent and maintain a viable representative sample of this ecosystem types and its associated biodiversity. Maintain the existing flow distribution and retention patterns in the system to maintain the existing vegetation structure and composition. Lateral flow inputs to the wetland must be protected through application of hydrological buffers determined via hydro-pedological assessments undertaken as part of EIA and/or WUL applications, and strict licensing conditions including monitoring of the systems should apply.
UC1	C81L	Meul	Floodplain	B	High	A/B	B	Floods are needed to inundate the floodplain thereby providing the wetting regime required for supporting the floodplain vegetation that are dependent on flooding for their life cycles Maintain in natural or near-natural ecological condition for the purpose of the long-term protection of important biodiversity and as an important landscape feature. Ensure that the site and its catchment contributes towards the ESA1 and ESA2 landscape level purpose for the site to represent and maintain a viable representative sample of this ecosystem types and its associated biodiversity. Maintain the existing flow distribution and retention patterns in the system to maintain the existing vegetation structure and composition. Lateral flow inputs to the wetland must be protected through application of hydrological buffers determined via hydro-pedological assessments undertaken as part of EIA and/or WUL applications, and strict licensing conditions including monitoring of the systems should apply.
UI	C21E	Blesbokspruit[2]	Flooded Valley Bottom (artificially supported)	D	High	C/D	D	In order to improve the state of the wetland, the following should be considered: • Management interventions to re-establish certain habitat types necessary for certain bird species; • Improved treatment of mine water, waste water and effluent discharges at source prior to release in to the wetland areas; • Engineering of some sections of the wetland to create oxidation zones to effect improved water quality. This will also recreate some of the open water habitats that were associated with high waterfowl numbers in the 1970s and 1980's; • Prioritisation and protection of the few reaches where the species rich, seasonally wet grassland still occurs; and • Monitoring to ensure that the specified water quality standards in terms of discharge are adhered to and enforced.

[2] The system is a Ramsar Site (Designated as a Wetland of International Importance in terms of the Ramsar Convention) and is regarded as being important from both a birdlife and hydro-functional perspective

IUA	Quaternary Catchment	Wetland Name	Wetland Type	PES	IS	REC	TEC	Ecological Specifications Protection, Maintenance and Management Requirements
								Furthermore these previous studies recommended further work to understand the effects of changing the flows through the system. There has been concern that introducing variability in flow to the system could result in some of the sediments undergoing chemical changes resulting in the mobilization of certain heavy metals and uranium, thereby creating health risks. More clarity on this issue would be required before any recommendation related to changing the flows through the system could be made with any confidence that it would not result in health risks. Liaise with interested and affected parties to develop and implement a collaborative Management, Rehabilitation and Monitoring Plan for the wetland
UI	C22D	Klip River wetland	Unchannelled and Channelled Valley Bottom	D/E	Moderate	D	D	Historically the flows in this system were much lower than present day, but due to the altered channel geometry – the incision of the channel in to the wetland – larger flows are now required to inundate the floodplain than would have been necessary under the Reference channel condition. Even so, the present day flows are much higher than the estimated ecological water requirements for the reach. The present day wet season baseflows even exceed the estimated annual flood requirement for the D REC. If the TEC is to be improved from the current D/E to a D or higher, then baseflows need to be reduced. If the flows cannot be reduced then it is very unlikely that the improved D condition of the wetland reach will be achieved. If the flows are reduced then this would open up opportunities for some rehabilitation actions, such as small weirs that could be used to reinstate local baselevels to counteract the impacts of the incised channels. These sorts of structures in the mainstem would be able to raise the water and rewet the valley bottom and associated peat substrates. Rehabilitation actions in the Klip River catchment should focus on: • Attenuating urban stormwater peaks (in the smaller tributaries); • Stabilising headcuts in the mainstem and larger tributaries; and • Raising the watertable and rewetting the valley bottom peats of the main tributaries. Liaise with interested and affected parties to develop and implement a collaborative Management, Rehabilitation and Monitoring Plan for the wetland.
UI	C22B	Natalspruit	Unchannelled and Channelled Valley Bottom	D	High	C/D	D	Diffuse water distribution is required to optimise the water quality enhancement functions. Therefore it is important to maintain and if possible enhance the existing flow distribution and retention patterns in the system. Unchannelled sections of the wetland must be maintained as unchannelled and existing vegetation structure and composition should at least be retained or improved. Lateral flow inputs to the wetland must be protected through application of hydrological buffers determined via hydro-pedological assessments undertaken as part of EIA and/or WUL applications, and strict licensing conditions including monitoring of the systems should apply. The wetland should be assessed to identify potential rehabilitation measures that will improve its current state and the functions it is performing.

IUA	Quaternary Catchment	Wetland Name	Wetland Type	PES	IS	REC	TEC	Ecological Specifications Protection, Maintenance and Management Requirements
								Liaise with interested and affected parties to develop and implement a collaborative Management, Rehabilitation and Monitoring Plan for the wetland.
UK	C23B	Kromelmboog-spruit	Floodplain and Channelled Valley Bottom	C	High	B/C	C	Maintain in natural or near-natural ecological condition for the purpose of the long-term protection of important biodiversity and as an important landscape feature. Ensure that the site and its catchment contributes towards the ESA1 and ESA2 landscape level purpose for the site to represent and maintain a viable representative sample of this ecosystem types and its associated biodiversity. Maintain and enhance the existing flow distribution and retention patterns in the system. Currently unchannelled wetlands must be maintained as unchannelled systems. Maintain existing vegetation structure and composition. Lateral flow inputs to the wetland must be protected through application of hydrological buffers determined via hydro-pedological assessments undertaken as part of EIA and/or WUL applications, and strict licensing conditions including monitoring of the systems should apply. The wetland should be assessed to identify potential rehabilitation measures that will improve its current state.
UL	C23F	Boovenste Oog	Peat wetland (dolomitic eye)	B/C	High	B	B	Maintaining the perennial nature of the system and a diffuse water distribution pattern across the system are key features which determine it's ecological as well as functional importance. Maintain in natural or near-natural ecological condition for the purpose of the long-term protection of important biodiversity, flow regulation function, and as an important and unique landscape feature. Maintain good water quality normally associated with dolomitic aquifers and associated eyes/springs. Prevent over-abstraction form the associated dolomitic aquifer. Maintain the natural fish and macro-invertebrate diversity of the system and prevent the introduction of exotic taxa. A management plan should be developed and implemented for the system. It has previously been suggested that reclaiming peripheral shallow open water habitats with adequate reed corridors left between the open water areas would enhance the biodiversity of the system. It was also suggested that infilling of some of the excavated canals in the system would allow for an improvement in the PES. In developing the management plan, these suggestions should be investigated further. Determine a Preliminary Wetland and Groundwater Reserve for the system as well as protection and management requirements for the groundwater to protect the associated dolomitic aquifer and flows into the system.

IUA	Quaternary Catchment	Wetland Name	Wetland Type	PES	IS	REC	TEC	Ecological Specifications Protection, Maintenance and Management Requirements
UL	C23F	Mooi	Unchannelled Valley Bottom	D	High	C/D	C/D	Diffuse water distribution is required to optimise hydrological and biodiversity support functions. Maintain and where possible improve the ecological condition for the purpose of the long-term protection of hydrological functions, biodiversity and as an important landscape feature. Maintain a viable representative sample of this ecosystem type and its associated biodiversity. Implement measures to improve the existing flow distribution and retention patterns in the system to maintain the existing vegetation structure and composition.
UL	C23G	Gerhard Minnebron	Peat wetland	C	High	B/C	C	Maintaining the perennial nature of the system and a diffuse water distribution pattern across the system are key features which determine it's ecological as well as functional importance. Maintain the current ecological condition for the purpose of the long-term protection of the remaining peat, important biodiversity, flow regulation and water quality enhancement functions, and as an important and unique landscape feature. Maintain and where possible improve the natural flow distribution and retention patterns in the system. Maintain good water quality normally associated with dolomitic aquifers and associated peat wetlands. Since peatlands require low energy flow with permanent saturation and anaerobic conditions for peat to be able to accumulate or at least not decompose, it is important that these conditions are met in order to maintain the system. At worst, maintaining the system based on a TEC of C would mean that it would be important to maintain a daily flow as recommended in the Preliminary Reserve in order to constantly replenished the peat and keep it saturated, thus preventing any chance of it drying out, oxidizing and decomposing or burning. On the other hand, improving the system based on an REC of B/C would mean that it would be important to increase the daily flow into the peatland as indicated in the Preliminary Reserve. This would allow inundation of the system thus facilitating the accretion or accumulation of peat via the creation of anaerobic conditions within the rhizomatous zone, thus creating conditions favourable for accumulation of organic matter derived from the seasonal die off of rhizomes. This would result in an improvement in the system via the re-wetting of lateral habitats, the inundation of currently exposed peat, and the re-establishment of the natural peat accumulation process, particularly in those areas where peat has previously been mined. Prevent over-abstraction form the associated dolomitic aquifer. Ensure implementation of the rehabilitation measures recommended for the peat mining that has taken place in the system. A management and rehabilitation plan should be developed and implemented for the system. Update the existing Preliminary Wetland Reserve and determine a Preliminary Groundwater Reserve for the system as well as protection and management requirements for the groundwater to protect the associated dolomitic aquifer and flows into the system.

IUA	Quaternary Catchment	Wetland Name	Wetland Type	PES	IS	REC	TEC	Ecological Specifications Protection, Maintenance and Management Requirements
UL	C23E	Abe Bailey Nature Reserve Wetlands	Unchannelled and Channelled Valley Bottom	D[3]	High	C	C	Implement measures to improve the ecological condition for the purpose of the long-term protection of important biodiversity and as an important landscape feature. Ensure that the site and its catchment contributes towards the CBA and ESA landscape level purpose for the site to represent and maintain a viable representative sample of this ecosystem types and its associated biodiversity. Maintain and where possible enhance the existing flow distribution and retention patterns in the system. Excessive nutrient inputs should be identified and addressed.
UL	C23H and C23L	O.P.M. Prozesky Bird Sanctuary	Floodplain	E[4]	High	D	D	Implement measures to improve the current ecological condition for the purpose of the long-term protection of important biodiversity and as an important landscape feature. Ensure that the site and its catchment contributes towards the CBA landscape level purpose for the site to represent and maintain a viable representative sample of this ecosystem types and its associated biodiversity. Maintain and enhance the existing flow distribution and retention patterns in the system. Excessive nutrient inputs should be identified and addressed.
MA	C70K	Witpan	Pan	F[5]	High	D	D	Implement measures to improve the current state (ecological condition) of the system for it to continue to provide existing services. Excessive nutrient inputs to the system should be identified and addressed.
MC	C24C	Pan and wetland complex - Leliefontein	Pan, Seeps and Unchannelled Valley Bottom	C	High	B/C	C	Maintain in the current ecological condition for the purpose of the long-term protection of the biodiversity and as an important landscape feature. Maintain or improve existing ecological diversity and interconnectivity of the pan and associated wetland system. Water quantity and quality impacts must be managed so as not to undermine the ecological value of the pan and its associated wetland.

3 As this system is associated with a Nature Reserve, the TEC is recommended to be the same as the REC and is set one category higher than the PES

4 The system is in a PES category of E (Seriously Modified) but has a High IS as it is regarded as an important sanctuary for birdlife. A PES category of E is not sustainable so the TEC is recommended to be the same as the REC and is set one category higher than the PES

5 The system is in a PES category of F (Critically Modified) but has a High IS as it is regarded as an important sanctuary for birdlife. A PES category of F is not sustainable so the TEC is recommended to be the same as the REC and is set two categories higher than the PES

IUA	Quaternary Catchment	Wetland Name	Wetland Type	PES	IS	REC	TEC	Ecological Specifications Protection, Maintenance and Management Requirements
MC	C24C	Vetpan	Pan	C	High	B/C	C	Maintain in the current ecological condition for the purpose of the long-term protection of the biodiversity and as an important landscape feature. Maintain or improve existing ecological diversity and interconnectivity of the pan and associated drainage system and surrounding natural habitats. Water quantity and quality impacts must be managed so as not to undermine the ecological value of the pan and its associated wetland.
MC	C24C	Klippan and wetland system associated with Klippan	Pan and Unchannelled Valley Bottom	C	High	B/C	C	Maintain in current ecological condition for the purpose of the long-term protection of important biodiversity and as an important landscape feature. Ensure that the site and its catchment contributes towards the CBA and ESA landscape level purpose for the site to represent and maintain a viable representative sample of this ecosystem types and its associated biodiversity. Water quantity and quality impacts must be managed so as not to undermine the ecological value of the pan and its associated wetland. Maintain and enhance the existing flow distribution and retention patterns in the system. Currently unchannelled wetlands must be maintained as unchannelled systems. Maintain existing vegetation structure and composition. The wetland should be assessed to identify potential rehabilitation measures that will improve its current state.
MC	C24C	Upper section of the Schoonspruit peatland and the Schoonspruit eye	Peat wetland and dolomitic eye	B	Very High	A	B	Maintaining the perennial nature of the system and a diffuse water distribution pattern across the system are key features which determine it's ecological as well as functional importance. Maintain in natural or near-natural ecological condition for the purpose of the long-term protection of important biodiversity, peat, flow regulation function, and as an important and unique landscape feature. Maintain the natural flow distribution and retention patterns in the system. Maintain good water quality normally associated with dolomitic aquifers and associated eyes/springs. Prevent over-abstraction form the associated dolomitic aquifer. Maintain the natural fish and macro-invertebrate diversity of the system and prevent the introduction of exotic taxa. A management plan should be developed and implemented for the system in consultation with interested and affected parties. Determine a Preliminary Wetland and Groundwater Reserve for the system as well as protection and management requirements for the groundwater to protect the associated dolomitic aquifer and flows into the system.

IUA	Quaternary Catchment	Wetland Name	Wetland Type	PES	IS	REC	TEC	Ecological Specifications Protection, Maintenance and Management Requirements
MC	C24F	Floodplain and lower section of the Taaibosspruit	Floodplain and Unchannelled Valley Bottom	C	High	B/C	C	Floods are needed to inundate the floodplain thereby providing the wetting regime required for supporting the floodplain vegetation that are dependent on flooding for their life cycles. The lower section of the wetland is unchannelled and should remain as such as it is likely to provide water quality enhancement functions and habitat that is different from the rest of the system. This enhances the biodiversity of the wetland. Maintain in the current ecological condition and where possible improve the condition of the system for the purpose of the long-term protection of important biodiversity and as an important landscape feature. Maintain the existing flow distribution and retention patterns in the system to maintain the existing vegetation structure and composition. Unchannelled sections of the wetland must be maintained as unchannelled and existing vegetation structure and composition should at least be retained or improved. Lateral flow inputs to the wetland must be protected through application of hydrological buffers determined via hydro-pedological assessments undertaken as part of EIA and/or WUL applications, and strict licensing conditions including monitoring of the systems should apply. The wetland should be assessed to identify potential rehabilitation measures that will improve its current state and the functions it is performing.
MC	C24G	Floodplain of the Schoonspruit including Mahemsvlei	Floodplain	C	High	B/C	C	Floods are needed to inundate the floodplain thereby providing the wetting regime required for supporting the floodplain vegetation that are dependent on flooding for their life cycles. Maintain in the current ecological condition and where possible improve the condition of the system for the purpose of the long-term protection of important biodiversity and as an important landscape feature. Maintain the existing flow distribution and retention patterns in the system to maintain the existing vegetation structure and composition. Lateral flow inputs to the wetland must be protected through application of hydrological buffers determined via hydro-pedological assessments undertaken as part of EIA and/or WUL applications, and strict licensing conditions including monitoring of the systems should apply. The wetland should be assessed to identify potential rehabilitation measures that will improve its current state and the functions it is performing.

IUA	Quaternary Catchment	Wetland Name	Wetland Type	PES	IS	REC	TEC	Ecological Specifications Protection, Maintenance and Management Requirements
MC	C24C and C24E	Lower section of the Schoonspruit peatland	Peat wetland	D	Very High	C	C	Maintaining the perennial nature of the system and a diffuse water distribution pattern across the system are key features which determine it's ecological as well as functional importance. Improve the ecological condition of the system for the purpose of the long-term protection of important biodiversity, peat, flow regulation function, and as an important and unique landscape feature. Maintain the natural flow distribution and retention patterns in the system. Maintain good water quality normally associated with dolomitic aquifers and associated eyes/springs. Prevent over-abstraction form the associated dolomitic aquifer. Prevent and manage over-abstraction/diversion of flows/water from the peatland. Maintain the natural fish and macro-invertebrate diversity of the system and prevent the introduction of exotic taxa. A management plan should be developed and implemented for the system in consultation with interested and affected parties. Determine a Preliminary Wetland and Groundwater Reserve for the system as well as protection and management requirements for the groundwater to protect the associated dolomitic aquifer and flows into the system.
MA	C70G	Grootvlei in a tributary of the Heuningspruit and on the Heuningspruit	Unchannelled and Channelled Valley Bottom	D	High	C/D	D	Maintain and where possible improve the current ecological condition for the purpose of the long-term protection of important biodiversity and as an important landscape feature. Ensure that the site and its catchment contributes towards the CBA1, ESA1 and ESA2 landscape level purpose for the site to represent and maintain a viable representative sample of this ecosystem types and its associated biodiversity. Maintain and enhance the existing flow distribution and retention patterns in the system. Currently unchannelled wetlands must be maintained as unchannelled systems. Maintain existing vegetation structure and composition. Lateral flow inputs to the wetland must be protected through application of hydrological buffers determined via hydro-pedological assessments undertaken as part of EIA and/or WUL applications, and strict licensing conditions including monitoring of the systems should apply. The wetland should be assessed to identify potential rehabilitation measures that will improve its current state.
MA	C70K	Wetland system adjacent to Viljoenskroon	Unchannelled and Channelled Valley Bottom	E[6]	High	D	D	Maintain and enhance the existing flow distribution and retention patterns in the system. Pressure from sewage spills, physical obstruction, informal settlements and other in upstream area needs to be attended to.

[6] The system is in a PES category of E (Seriously Modified) but has a High IS due to its hydro-functional importance. A PES category of E is not sustainable so the TEC is recommended to be the same as the REC and is set one category higher than the PES

IUA	Quaternary Catchment	Wetland Name	Wetland Type	PES	IS	REC	TEC	Ecological Specifications Protection, Maintenance and Management Requirements
								Currently unchannelled wetlands must be maintained as unchannelled systems. Maintain or improve existing vegetation structure and composition. The wetland should be assessed to identify potential rehabilitation measures that will improve its current state and ability to improve water quality.
MA	C70K	Groot Rietpan	Pan	D	High	C/D	C/D	Implement measures to improve the current ecological condition for the purpose of the long-term protection of important biodiversity and as an important landscape feature. Ensure that the site and its catchment contribute towards the CBA2 landscape level purpose for the site to represent and maintain a viable representative sample of this ecosystem types and its associated biodiversity. Maintain and enhance the existing flow distribution and retention patterns in the system. Monitor nutrient and sediment inputs from immediate catchments area. The wetland should be assessed to identify potential rehabilitation measures to restore the hydrology to a more natural state.
MF	C25B	Upper reaches of the Sandspruit (immediately north of Kutloanong)	Unchannelled and Channelled Valley Bottom	D	High	C/D	D	Maintain and where possible improve the current ecological condition for the purpose of the long-term protection of important biodiversity and as an important landscape feature. Ensure that the site and its catchment contributes towards the CBA1 and ESA1 landscape level purpose for the site to represent and maintain a viable representative sample of this ecosystem types and its associated biodiversity. Maintain and where possible enhance the existing flow distribution and retention patterns in the system. Pressure from sewage spills, physical obstruction, informal settlements and other in upstream area needs to be attended to. Currently unchannelled wetlands must be maintained as unchannelled systems. Maintain or improve existing vegetation structure and composition. Lateral flow inputs to the wetland must be protected through application of hydrological buffers determined via hydro-pedological assessments undertaken as part of EIA and/or WUL applications, and strict licensing conditions including monitoring of the systems should apply. The wetland should be assessed to identify potential rehabilitation measures that will improve its ability to enhance water quality.
MF and MD2	C25B, C25F and C43B	Pan cluster around Wesselbron including Volstruispan to the north	Pan cluster	C	High	B/C	B/C	Maintain in near-natural ecological condition for the purpose of the long-term protection of important biodiversity and as an important landscape feature. Ensure that the site and its catchment contributes towards the ESA1 and ESA2 landscape level purpose for the site to represent and maintain a viable representative sample of this ecosystem types and its associated biodiversity.

IUA	Quaternary Catchment	Wetland Name	Wetland Type	PES	IS	REC	TEC	Ecological Specifications Protection, Maintenance and Management Requirements
								Protect the water quality and ecological characteristics of the different pans associated with the cluster to ensure that they continue to provide the biodiversity support functions typically associated with the different pan types present. Maintain or improve existing ecological diversity and interconnectivity of individual depression wetlands (pans).
MD2	C43B	Flamingo Pan	Pan	F[7]	High	D	D	Implement measures to improve the current state of the pan for it to continue to provide existing services. Excessive nutrient and pollution inputs should be identified and addressed. Propose and implement physical and management interventions where required.
ME2	C43A	Bultfontein Pan	Pan	D	High	C/D	C/D	In consultation with interested and affected parties explore and where feasible implement measures to improve the hydrological regime towards a more natural state. Prevent sewage effluent from flowing into the wetland system. Assess and monitor the impact of salt works and other activities on the hydrology and the biodiversity support function of the wetland. Propose and implement physical and management interventions where required.
MD2	C43B	Toronto Pan	Pan	F[8]	High	D	D	Implement measures to improve the current state of the pan for it to continue to provide existing services. Excessive nutrient and pollution inputs should be identified and addressed. Propose and implement physical and management interventions where required.
LA1	C31D	Barberspan[9]	Pan	C	Very High	B	B/C	Maintain and if possible improve the current ecological condition for the purpose of the long-term protection of important biodiversity and as an important wetland and landscape feature. Excessive nutrient and sediment inputs should be identified and addressed. Liaise with interested and affected parties to develop a collaborative management and monitoring plan together with that for Leeupan.

[7] The system is in a PES category of F (Critically Modified) but has a High IS as it is regarded as an important sanctuary for birdlife. A PES category of F is not sustainable so the TEC is recommended to be the same as the REC and is set two categories higher than the PES

[8] The system is in a PES category of F (Critically Modified) but has a High IS as it is regarded as an important sanctuary for birdlife. A PES category of F is not sustainable so the TEC is recommended to be the same as the REC and is set two categories higher than the PES

[9] The system is a Ramsar Site (Designated as a Wetland of International Importance in terms of the Ramsar Convention)

IUA	Quaternary Catchment	Wetland Name	Wetland Type	PES	IS	REC	TEC	Ecological Specifications Protection, Maintenance and Management Requirements
LA1	C31D	Leeupan	Pan	C[10]	High	B/C	B/C	Implement measures to improve the ecological condition for the purpose of the long-term protection of important biodiversity and as an important landscape feature. Excessive nutrient and/or sediment inputs should be identified and addressed. Liaise with interested and affected parties to develop a collaborative management and monitoring plan together with that for Barberspan.
LA2	C31E	Harts River Floodplain	Floodplain	C	High	B/C	B/C	Erosion and channel incision threaten to undermine the flood attenuation functions of the wetland. It is also important to ensure the protection and maintenance of the floodplain habitats which support biodiversity. Implement measures to improve the current condition of the wetland for the purpose of the long-term protection of important biodiversity and as an important landscape feature. Maintain a viable representative sample of this ecosystem types and its associated biodiversity. Maintain and enhance the existing flow distribution and retention patterns in the system and maintain the hydrological and ecological link to Barberspan. Maintain existing vegetation structure and composition.
LB	C91E	Kamferpan[11]	Pan	C	Very High	B	B/C	Maintain and where possible improve the state of thepan for it to continue to provide existing hydrological and biodiversity support services. Excessive nutrient and pollution inputs should be identified and addressed. Continuation of existing efforts to prevent sewage input and managing of water levels to prevent flooding of breeding areas. Monitor threats such as eutrophication and reed encroachment. Liaise with interested and affected parties to develop a collaborative management and monitoring plan for the pan.
LB	C91B	Gannapan	Pan	C	High	B/C	B/C	Maintain and where possible improve the current ecological condition for the purpose of the long-term protection of important biodiversity and as an important landscape feature. Ensure that the site and its catchment contributes towards the CBA1, CBA2 and ESA1 landscape level purpose for the site to represent and maintain a viable representative sample of this ecosystem types and its associated biodiversity.

[10] As this system is associated with the Barberspan Ramsar Site, the TEC is recommended to be the same as the REC and is set half a category higher than the PES

[11] Although largely artificially maintained, this system is a critical breeding site for Lesser Flamingo and strict protection requirements should be applied to ensure it remains a successful breeding site for this species

IUA	Quaternary Catchment	Wetland Name	Wetland Type	PES	IS	REC	TEC	Ecological Specifications Protection, Maintenance and Management Requirements
LB	C92A	Silverstreams Pan (The Great Pan) and associated Wetland Complex	Pans, Unchannelled Valley Bottom and Springs	B	High	A/B	B	Maintain existing hydrological regime and ecological processes to protect the pans and springs and associated wetland habitats in current ecological state. Maintain the natural flow distribution and retention patterns in the system. Maintain good water quality normally associated with dolomitic aquifers and associated eyes/springs. Prevent over-abstraction form the associated dolomitic aquifer. A management plan should be developed and implemented for the system in consultation with interested and affected parties. Determine a Preliminary Wetland and Groundwater Reserve for the system as well as protection and management requirements for the groundwater to protect the associated dolomitic aquifer, associated springs and flows into the system.

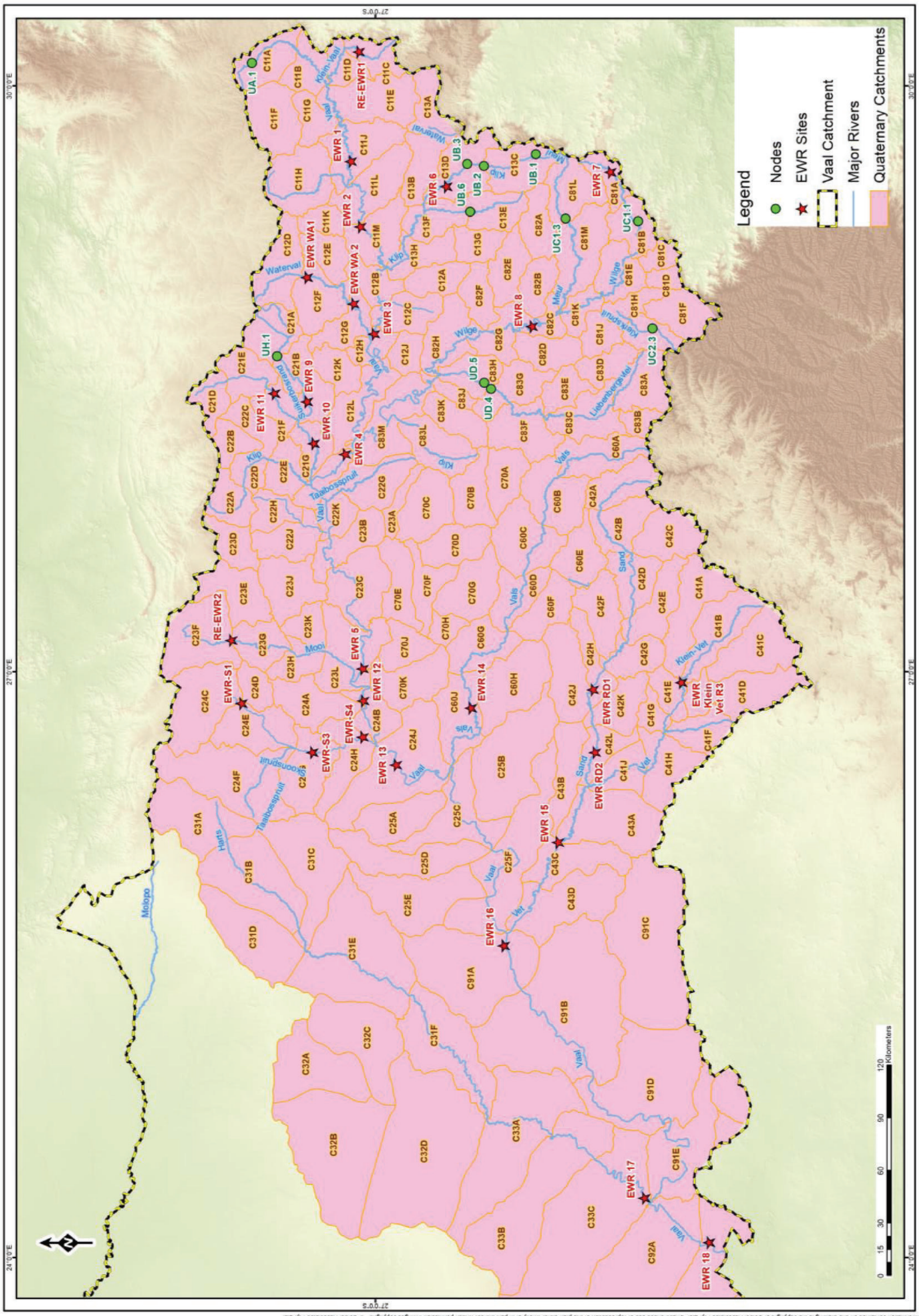


Figure 1: Map of the Vaal Water Management Area illustrating the quaternary catchments and EWR and node sites

76

DEPARTEMENT VAN WATER EN SANITASIE

NO. 1019 **25 SEPTEMBER 2020**

NASIONALE WATERWET, 1998
(WETNR 36 VAN 1998)

RESERWEBEPALING VIR DIE WATERHULPBRONNE VAN DIE VAAL-WATERBESTUURSAREA

Ek, Lindiwe Sisulu, Minister van Menslike Nedersettings, Water en Sanitasie, kragtens artikel 16 (1) van die Nasionale Waterwet, 1998 (Wetnr 36 van 1998), publiseer hiermee die Reserwebepaling vir die waterhulpbronne van die Vaal-waterbestuursarea, soos in die bylae uiteengesit.

L N SISULU (LP)
MINISTER VAN MENSLIKE NEDERSETTINGS, WATER EN SANITASIE
DATUM: 05|03|2020

BYLAE

1. BESKRYWING VAN WATERHULPBRON

1.1 Die Reserwe word vir alle of 'n gedeelte van elke belangrike waterhulpbron binne die Vaal-waterbestuursarea bepaal, soos hier onder uiteengesit:

Waterbestuursrea: Vaal

Dreineringsgebiede: C Primêre dreineringsgebied:

C11, C12, C13, C21, C22, C23, C81, C82, C83, C24, C25, C41, C42, C43, C60, C70, C31, C32, C33, C91, C92, C41, C42
(met uitsondering van die Modder Riet-opvanggebied, C51 en C52; en met uitsondering van die Molopo-opvanggebied, D41 en D42 van die Vaal-waterbestuursarea)

Riviere: Vaal, Wilge, Klip, Klein Vaal, Waterval, Suikerbosrand, Blesbokspruit, Mooi, Vals, Schoonspruit, Sand, Vet, Harts

2. AFKORTINGS EN WOORDOMSKRYWINGS

2.1 Afkortings

BBT	Beste Bereikbare Toestand
BMB	Basiese Menslike Behoefte
GWT	Gekoördineerde Watervoël Telling
CBA	Kritiese Biodiversiteitsgebiede
EK	Ekologiese Kategorie
ES	Ekologiese Spesifikasie
OIA	Omgewingsimpakassessering
EBS	Ekologiese Belang en Sensitiwiteit
EOG	Ekologiese Ondersteuningsgebiede
EWV	Ekologiese Watervereiste
GHAII	Grondwaterhulpbron-assessering Fase II
GHGM	Grondwaterhulpbrongerigte Maatreëls
GHE	Grondwaterhulpbron-eenheid
BS	Belang en Sensitiwiteit
GJA	Gemiddelde Jaarlikse Afvloei
MKM	Miljioen Kubieke Meter
nGJA	Natuurlike Gemiddelde Jaarlikse Afvloei
HES	Huidige Ekologiese Status
AEK	Aanbevole Ekologiese Kategorie
TEK	Teiken Ekologiese Kategorie
DPB	Drumpel van Potensiële Belang
WGL	Watergebruiklisensie

2.2 Woordomskrywings

Basisvloei is 'n volgehoue lae vloei in riviere gedurende droë of redelike weertoestande, maar nie noodwendig alles deur grondwater bygedra nie; insluitend bydrae van vertraagde intervloei en grondwaterafvoer.

Klas waterhhulpbron: Die klasvoorskrywe is 'n stel gewenste kenmerke vir gebruik en ekologiese toestand vir belangrike waterhulpbronne in 'n gegegewe opvanggebied (geïntegreerde eenheid van analise). Die klas moet die gebruiksomvang van die waterhulpbron; die reserwe; die hulpbrongehaltemikpunte en die bepaling van die allokeerbare gebruiksporsie van die waterhulpbron beskryf. Waterhulpbronne moet in een van die drie klasse geklassifiseer word; Klas **I**-waterhulpbron, Klas **II**-waterhulpbron en Klas **III**-waterhulpbron.

Ekologiese Belang en Sensitiwiteit (EBS): Sleutel aanwysers in die ekologiese klassifikasie van waterhulpbronne. Ekologiese belang is verwant aan die teenwoordigheid, verteenwoordigheid en diversiteit van spesie van biota en habitat. Ekologiese sensitiwiteit is verwant aan die kwesbaarheid van die habitat en biota vir veranderings wat in vloei, watervlakke en fisio-chemiese toestande mag plaasvind.

Ekologiese Watervereistes (EWV): Die vloeipatrone (grootte, tydsberekening en duur) en watergehalte benodig om 'n vlei-ekosisteem in 'n spesifieke toestand in stand te hou. Hierdie term word gebruik om te verwys na beide die hoeveelheid- en gehaltekomponente.

Ekologiese Watervereiste (EWV)-terreine: Spesifieke plekke op die rivier soos bepaal deur die terrein seleksieproses. 'n EWV-terrein bestaan uit 'n lengte van rivier wat uit verskeie dwarsdeursnee vir beide hidrouliese en ekologiese doeleindes mag bestaan. Hierdie terreine voorsien genoeg aanwysers om omgewingsvloei te assesseer en die toestand van biofisiese komponente te assesseer (aandrywers soos hidrologie, geomorfologie en fisies-chemies) en biologiese gedrag (naamliks vis, ongewerwelde diere en oewerplantegroei).

Huidige Ekologiese Status (HES): 'n Kategorie wat die huidige gesondheid of integriteit van verskeie biologiese attribute van die waterhulpbron Eenheid, in vergelyking met die natuurlike of naby aan natuurlike verwysingstoestande. Die uitslae van die proses word as Ekologiese Kategorieë (EK'e) voorsien en wissel van A (naby natuurlik) tot F (heeltemal verander) vir die HES.

Hervulling is die byvoeging van water tot die versadigingzone, óf deur afwaarts deursyfering van neerslag óf oppervlakwater en/of die laterale migrasie van grondwater uit aangrensende waterdraers.

Aanbevole Ekologiese Kategorie (AEK): 'n Ekologiese kategorie wat die ekologiese bestuur teiken vir 'n waterhulpbron Eenheid gebaseer op sy ekologiese klassifikasie wat verkry moet word. Kategorieë wissel van Kategorie A (onveranderd, natuurlik) tot Kategorie D (grootliks verander).

Riviernodus (biofisiese nodus): Dit is boetseerplekke wat 'n stroomop boloop of area van 'n akwatiese ekosisteem (riviere, vleilande, riviermonde en grondwater) verteenwoordig, waarvoor 'n reeks verhoudinge van toepassing is.

Subkwartêr opvanggebiede: 'n Fyner onderafdeling van die kwartêr opvanggebiede (die opvanggebiede van byriviere van hooftakriviere in kwartêr opvanggebiede).

Teiken Ekologiese Kategorie (TEK): Beteken die aangetekende ekologiese toestand deur die Minister aan 'n waterhulpbron wat die ekologiese toestand van daardie waterhulpbron reflekteer in terme van die afwyking van sy biofisiese komponente van die natuurlike verwysingtoestand. Die uiterste teiken om 'n volhoubare sisteem, beide ekologies en ekonomies, te bereik in agneming van die HES en AEK.

3. RE SERWEBEPALING

3.1 Die reserwe wat die Ekologiese Watervereistes (EWV's) en die Basiese Menslike Behoefte (BMB) Reserwe vir die riviere by EWV-terreine en geselekteerde biofisiese nodusse in die Vaal-waterbestuursarea insluit, word in **afdeling 4** uiteengesit. Die Vaal-waterbestuursarea lokaliteit en EWV-terreine word in **Figuur 1** aangedui.

3.2 Die watergehaltekomponent van die reserwe vir die riviere by die EWV-terreine in die Vaal-opvanggebied kragtens artikel 16(1) van die Wet word in **afdeling 5** uiteengesit.

3.3 Die Grondwater Reserwe vir Waterhoeveelheid en Watergehalte kragtens artikel 16(1) van die Wet vir die Vaal-waterbestuursarea word in **afdeling 6** uiteengesit.

3.4 Die ekologiese spesifikasies vir die vleilande kragtens artikel 16(1) van die Wet vir die Vaal-waterbestuursarea word in **afdeling 7** uiteengesit.

4. RESERWEBEPALING VIR RIVIERE

Die reserwebepaling en ekologiese kategorisering kragtens artikel (16)(1) vir die riviere van die Vaal-opvanggebied, waar die Reserwe weergegee word as 'n persentasie van die natuurlike gemiddelde jaarlikse afvloei (NGJA) vir die onderskeie opvanggebiede (kumulatief):

Tabel 4.1: Die Reserwe vir die riviere by die EWV-terreine wat die EWV's insluit om die akwatiese ekosisteem te beskerm en die BMB-vereistes

Kwartêr Opvanggebied	Waterhulpbron	Waterhulp bronklas	HES	EBS	TEK[5]	GJA (MKM)[1]	Reserwe[2] (%GJA)	Ekologiese Reserwe[3] (%GJA)	Basiese Menslike Behoefte (BMB) Reserwe[4] (%GJA)
C11J	Vaalrivier – EWV 1	II	B/C	Hoog	B/C	332.3*	39.411	39.41	0.001
C11M	Vaalrivier – EWV 2	II	C	Matig	C	457.7#	13.610	13.61	0.00022
C12F	Waterval – EWV WA1	III	D	Laag	D	76.71#	3.501	3.5	0.0007
C12G	Waterval – EWV WA2	III	D	Laag	D	147.43#	6.4003	6.4	0.00027
C12H	Vaalrivier – EWV 3	II	C	Matig	C	858.1#	14.300	14.3	0.00004
C22F	Vaalrivier – EWV 4	III	C	Hoog	B/C	1977.3•	21.550	21.55	0.00015
C23L	Vaalrivier – EWV 5	III	C/D	Hoog	C	2288•	34.100	34.1	0.00004
C13D	Kliprivier – EWV 6	II	B/C	Matig	B/C	95.3#	26.542	26.54	0.0021
C81A	Wilgerivier – EWV 7	II	A/B	Hoog	A/B	23.5#	45.893	45.88	0.0128
C82C	Wilgerivier – EWV 8	II	C	Matig	C	474.3#	11.770	11.77	0.00006
C21C	Suikerbosrand – EWV 9	II	C	Hoog	B/C	31.3#	41.893	41.89	0.0032
C21G	Suikerbosrand – EWV 10	III	C/D	Matig	C/D	149.27*	34.391	34.39	0.0007
C21F	Blesbokspruit – EWV 11	III	D	Laag	D	100.69*	18.145	18.14	0.0050
C11C	Klein Vaalrivier – RE-EWV 1	II	C	Matig	C	26.09#	24.725	24.71	0.0153
C23G	Mooirivier – RE-EWV 2	III	D	Laag	D	37.7#	19.061	19.05	0.0106
C24B	Vaalrivier – EWV 12	III	D	Matig	D	1574.64*	28.280	28.28	0.00009
C24J	Vaalrivier – EWV 13	III	C/D	Matig	C/D	1638.37•	35.800	35.8	0.00009
C60J	Valsrivier – EWV 14	III	C/D	Matig	C/D	145.79#	17.050	17.05	0.00034
C43A	Vetrivier – EWV 15	III	C/D	Matig	C/D	253.15*	18.200	18.2	0.00028
C41E	Klein Vet – RE – EWV 3	II	C	Matig	C	49.56#	19.540	19.54	0.00028
C42J	Sand – EWV RD1	III	C/D	Matig	B/C	140.76#	23.820	23.82	0.00007
C42L	Sand – EWV RD2	III	C	Matig	B/C	180.692#	23.490	23.49	0.00011
C24E	Schoonspruit – EWV S1	III	C	Laag	C	59.38#	35.805	35.8	0.0049
C24G	Schoonspruit – EWV S3	III	C/D	Laag	C/D	89.96#	30.902	30.9	0.0018
C24H	Schoonspruit – EWV S4	III	C/D	Laag	C/D	102.09#	31.203	31.2	0.0034
C91A	Vaal – EWV 16	III	D	Matig	D	3242.51*	13.020	13.02	0.00007
C33C	Harts – EWV 17	II	D	Matig	D	147.85*	51.6034	51.60	0.0034
C92B	Vaal – EWV 18	III	C	Matig	C	1177.28*	21.871	21.87	0.00060

1) GJA is the Gemiddelde Jaarlikse Afvloei (#Gebaseer op natuurlike vloei by die EWV-terrein; * Gebaseer op hedendaagse vloei by die EWV-terrein; • Gebaseer op geobserveerde vloei by die EWV-terrein).
2) Die reserwe is die totale vereiste wat rekenskap gee vir beide die ekologiese reserwe en die basiese menslike behoeftes (BMB) reserwe.
3) Ekologiese Reserwe-vereiste verteenwoordig die langtermyn gemiddeld gebaseer op die GJA. Indien die GJA verander, sal hierdie volume ook verander.
4) Verteenwoordig die BMB-vereiste as 'n persentasie van die GJA. Basiese menslike behoeftes sluit in die bevolking wat direk op riviere, strome en waterbronne vir watervoorsiening staat maak (afkomstig van 2011 sensus-data)
5) Teiken Ekologiese Kategorie (TEK): Die uiterste teiken om 'n volhoubare sisteem, beide ekologies en ekonomies, te bereik in agneming van die HES en AEK.

EKOLOGIESE WATERVEREISTES-TERREININLIGTING

EWV-terrein	Naam van EWV-terrein	Rivier	Subkwartêr rivier boloop	Koördinate		Kwartêr opvanggebied
				Breedtegraad	Lengtegraad	
EWV1	Uitkoms	Vaal	C11J-01838	S26.872800	E29.613840	C11J
EWV2	Grootdraai	Vaal	C11M-01894	S26.92110	E29.27929	C11M
EWV WA1	Waterval_1	Waterval	C12F-01722	S26.64608	E29.01857	C12F
EWV WA2	Waterval_2	Waterval	C12G-01896	S26.88543	E28.88357	C12G
EWV3	Gladdedrift	Vaal	C12C-01997	S26.99087	E28.72971	C12H
EWV4	De Neys	Vaal	C22F-01737	S26.84262	E28.11230	C22F
EWV5	Skandinavia	Vaal	C22L-01792	S26.93243	E27.01367	C23L
EWV6	Klip	Klip	C13D-02226	S27.36166	E29.48503	C13D
EWV7	Boonste Wilge	Wilge	C81A-02790	S28.20185	E29.55827	C81A
EWV8	Bavaria	Wilge	C82C-2505	S27.80017	E28.76778	C82C
EWV9	Suikerbos Stroomop	Suikerbosrand	C21C-01675	S26.64670	E28.38197	C21C
EWV10	Suikerbos Stroomaf	Suikerbosrand	C21G-01627	S26.68137	E28.16798	C21G
EWV11	Blesbokspruit	Blesbokspruit	C21F-01447	S26.47892	E28.42488	C21F
RE-EWV1	Klein Vaal	Klein Vaal	C11C-01846	S26.912750	E30.174970	C11C
RE-EWV2	Mooirivier	Mooi	C23G-01250	S26.258670	E27.159730	C23G
EWV12	Vaalrivier: Vermaasdrift	Vaal	C24B-01817	S26.93615	E26.85025	C24B
EWV13	Vaalrivier: Regina bridge	Vaal	C24J-02016	S27.10413	E26.52185	C24J
EWV14	Valsrivier: Proklameersdrift	Vals	C60J-02262	S27.48685	E26.81320	C60J
EWV15	Vetrivier: Fisantkraal	Vet	C43A-02561	S27.93482	E26.12569	C43A
RE-EWV 3	Klein-Vet, net stroomaf vanaf Winburg	Klein Vet	C41E-03132	S28.564708	E26.943946	C41E
EWV RD1	By Meloding	Sand	C42J-02716	S28.1131994	E26.9080556	C42J
EWV RD2	By Steel Bridge	Sand	C42L-02635	S28.1228333	E26.5855555	C42L
EWV S1	EWV S1	Schoonspruit	C24E-01164	S26.31172	E26.31172	C24E
EWV S3	EWV S3	Schoonspruit	C24G-01661	S26.67500	E26.586108	C24G
EWV S4	EWV S4	Schoonspruit	C24H-01860	S26.93333	E26.66528	C24H
EWV16	Stroomaf Bloemhof Dam	Vaal	C91A-02391	S27.65541	E25.59564	C91A
EWV17	Lloyds Stuwal op Hartsrivier	Harts	C33C-02836	S28.37694	E24.30305	C33C
EWV18	Schmidtsdrift	Vaal	C92B-02903	S28.70758	E24.07578	C92B

Tabel 4.2: Die reserwe vir die riviere by die prioriteit biofisiese nodusse met hoë ekologiese belang

Kwartêr Opvanggebied	Nodus	Rivier	Subkwartêr rivier boloop	HES	Ekologiese Belang	AEK	Ekologiese Reserwe (%NGJA)	BMB Reserwe (%NGJA)	Totale Reserwe (%NGJA)	NGJA (MKM/a)
C11A	UA.1	Vaal	C11A-01460	B/C	Hoog	B/C	44.09	0.053	44.143	13.27
C13C	UB.1	Klip	C13C-02550	B	Hoog	B	63.86	0.018	63.878	5.67
C13D	UB.2	Klip	C13D-02416	B/C	Hoog	B/C	38.86	0.004	38.864	54
C13D	UB.3	Klip	C13D-02284	B/C	Hoog	B	44.26	0.003	44.263	68.04
C13E	UB.6	Kommandospruit	C13E-02228	B/C	Hoog	B	50.66	0.006	50.666	33.6
C81A	UC1.1	Wilge	C81A-02790	B	Hoog	B	45.69	0.004	45.694	69.03
C81L	UC1.3	Meul	C81L-02594	B	Hoog	B	57.25	0.008	57.258	26.49
C81G	UC2.3	Klerkspruit	C81G-02882	B	Hoog	B	69.45	0.017	69.467	5.85
C83G	UD.4	Liebenbergsvlei	C83G-02364	B/C	Hoog	B/C	62.48	0.006	62.486	4.74
C83H	UD.5	Liebenbergsvlei	C83H-02395	B/C	Hoog	B	64.50	0.015	64.515	2.66
C12A	UH.1	Suikerbosrant	C12A-01567	B/C	Hoog	B	47.17	0.002	47.172	28.65

5. WATERGEHALTE KOMPONENT VAN DIE EKOLOGIESE RESERWE VIR RIVIERE

Die ekologiese spesifikasies vir watergehalte vir die handhawing van die reserwe teiken ekologiese kategorie by elke EWV-terrein word in Tabelle 5.1 to Table 5.18 gedetailleer. Dit is die waardes van watergehalte parameters (drumpelkonsentrasies) wat nie oorskry moet word nie om aan die watergehalte-atribuut van die TEK te voldoen.

Tabel 5.1: EWV1: Watergehalte ekologiese spesifikasies

Rivier: Vaal		**EWV 1: by Uitkoms**	**Watergehalte monitering terrein/standaard:** C1H007/VS4 GDDC11
Anorganiese soute	$MgSO_4$	Die 95^{ste} persentiel van die data moet ≤ 28 mg/ℓ wees	
	Na_2SO_4	Die 95^{ste} persentiel van die data moet ≤ 38 mg/ℓ wees	
	$MgC\ell_2$	Die 95^{ste} persentiel van die data moet ≤ 36 mg/ℓ wees	
	$CaC\ell_2$	Die 95^{ste} persentiel van die data moet ≤ 69 mg/ℓ wees	
	$NaC\ell$	Die 95^{ste} persentiel van die data moet ≤ 243 mg/ℓ wees	
	$CaSO_4$	Die 95^{ste} persentiel van die data moet ≤ 351 mg/ℓ wees	
Fisiese veranderlikes	Elektriese geleidingsvermoë	Die 95^{ste} persentiel van die data moet ≤ 70 mS/m wees	
	pH	Die 5^{de} persentiel van die data moet 6.5 tot 8.0 wees en die 95^{ste} persentiel moet 8.0 tot 8.8 wees	
	Opgeloste suurstof	Die 5^{de} persentiel van die data moet ≥ 7.0 mg/ℓ wees	
Voedingstowwe	Totaal anorganiese stikstof (TIN)	Die 50^{ste} persentiel van die data moet ≤ 0.7 mg/ℓ wees	
	PO_4-P	Die 50^{ste} persentiel van die data moet ≤ 0.020 mg/ℓ wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50^{ste} persentiel van die data moet < 20 µg/ℓ wees	
	Chl-a perifiton	Die 50^{ste} persentiel van die data moet < 21 mg/m² wees	
Gifstowwe	Ammoniak	Die 95^{ste} persentiel van die data moet ≤ 0.044 mg/ℓ wees	
	Atrasien	Die 95^{ste} persentiel van die data moet ≤ 0.064 mg/ℓ wees	
	Fluoried	Die 95^{ste} persentiel van die data moet ≤ 2.5 mg/ℓ wees	
	Endosulfaan	Die 95^{ste} persentiel van die data moet ≤ 0.13 µg/ℓ wees	

Tabel 5.2: EWV2: Watergehalte ekologiese spesifikasies

Rivier: Vaal		**EWV 2: Stroomaf Grootdraai**	**Watergehalte monitering terrein/standaard**: C1H019
Anorganiese soute	$MgSO_4$	Die 95^{ste} persentiel van die data moet ≤ 23 mg/ℓ wees	
	Na_2SO_4	Die 95^{ste} persentiel van die data moet ≤ 33 mg/ℓ wees	
	$MgC\ell_2$	Die 95^{ste} persentiel van die data moet ≤ 30 mg/ℓ wees	
	$CaC\ell_2$	Die 95^{ste} persentiel van die data moet ≤ 57 mg/ℓ wees	
	$NaC\ell$	Die 95^{ste} persentiel van die data moet ≤ 191 mg/ℓ wees	
	$CaSO_4$	Die 95^{ste} persentiel van die data moet ≤ 351 mg/ℓ wees	
Fisiese veranderlikes	EK	Die 95^{ste} persentiel van die data moet ≤ 30 mS/m wees	
	pH	Die 5^{de} persentiel van die data moet 6.5 tot 8.0 wees en die 95^{ste} persentiel moet 8.0 tot 8.8 wees	
	Temperatuur	Klein afwyking van die natuurlike temperatuurreeks	
	Opgeloste suurstof	Die 5^{de} persentiel van die data moet ≥7.5mg/ℓ wees	
Voedingstowwe	Totaal anorganiese stikstof (TIN)	Die 50^{ste} persentiel van die data moet ≤ 0.25 mg/ℓ wees	
	PO_4-P	Die 50^{ste} persentiel van die data moet ≤0.025mg/ℓ wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50^{ste} persentiel van die data moet <18 µg/ℓ wees	
	Chl-a perifiton	Die 50^{ste} persentiel van die data moet ≤ 16 mg/m² wees	
Gifstowwe	Ammoniak	Die 95^{ste} persentiel van die data moet ≤ 0.044 mg/ℓ wees	
	Fluoried	Die 95^{ste} persentiel van die data moet ≤ 1.5 mg/ℓ wees	

Tabel 5.3: EWV3: Watergehalte ekologiese spesifikasies

Rivier: Vaal		**EWV 3: by Gladdedrift**	**Watergehalte monitering terrein/standaard**: C1H012
Anorganiese soute	$MgSO_4$	Die 95ste persentiel van die data moet ≤ 37 mg/ℓ wees	
	Na_2SO_4	Die 95ste persentiel van die data moet ≤ 33 mg/ℓ wees	
	$MgC\ell_2$	Die 95ste persentiel van die data moet ≤ 30 mg/ℓ wees	
	$CaC\ell_2$	Die 95ste persentiel van die data moet ≤ 57 mg/ℓ wees	
	$NaC\ell$	Die 95ste persentiel van die data moet ≤ 191 mg/ℓ wees	
	$CaSO_4$	Die 95ste persentiel van die data moet ≤ 351 mg/ℓ wees	
Fisiese veranderlikes	EK	Die 95ste persentiel van die data moet ≤ 55 mS/m wees	
	pH	Die 5de persentiel van die data moet 6.5 tot 8.0 wees en die 95ste persentiel moet 8.0 tot 8.8 wees	
	Opgeloste suurstof	Die 5de persentiel van die data moet ≥ 7.5 mg/ℓ wees	
Voedingstowwe	Totaal anorganiese stikstof (TIN)	Die 50ste persentiel van die data moet ≤ 0.25 mg/ℓ wees	
	PO_4-P	Die 50ste persentiel van die data moet ≤ 0.125 mg/ℓ wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50ste persentiel van die data moet < 20 µg/ℓ wees	
	Chl-a perifiton	Die 50ste persentiel van die data moet ≤ 21 mg/m^2 wees	
Gifstowwe	Ammoniak	Die 95ste persentiel van die data moet ≤ 0.1 mg/ℓ wees	
	Fluoried	Die 95ste persentiel van die data moet ≤ 1.5 mg/ℓ wees	

Tabel 5.4: EWV4: Watergehalte ekologiese spesifikasies

Rivier: Vaal		**EWV 4: by De Neys**	**Watergehalte monitering terrein/standaard**: C1H012
Anorganiese soute	$MgSO_4$	Die 95ste persentiel van die data moet ≤ 37 mg/ℓ wees	
	Na_2SO_4	Die 95ste persentiel van die data moet ≤ 33 mg/ℓ wees	
	$MgC\ell_2$	Die 95ste persentiel van die data moet ≤ 30 mg/ℓ wees	
	$CaC\ell_2$	Die 95ste persentiel van die data moet ≤ 57 mg/ℓ wees	
	$NaC\ell$	Die 95ste persentiel van die data moet ≤ 191 mg/ℓ wees	
	$CaSO_4$	Die 95ste persentiel van die data moet ≤ 351 mg/ℓ wees	
Fisiese veranderlikes	EK	Die 95ste persentiel van die data moet ≤ 30 mS/m wees	
	pH	Die 5de persentiel van die data moet 6.5 tot 8.0 wees en die 95ste persentiel moet 8.0 tot 8.8 wees	
	Opgeloste suurstof	Die 5de persentiel van die data moet ≥ 7 mg/ℓ wees	
Voedingstowwe	Totaal anorganiese stikstof (TIN)	Die 50ste persentiel van die data moet ≤ 0.7 mg/ℓ wees	
	PO_4-P	Die 50ste persentiel van die data moet ≤ 0.125 mg/ℓ wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50ste persentiel van die data moet <10 µg/ℓ wees	
	Chl-a perifiton	Die 50ste persentiel van die data moet ≤ 1.7 mg/m^2 wees	
Gifstowwe	Ammoniak	Die 95ste persentiel van die data moet ≤ 0.1 mg/ℓ wees	
	Fluoried	Die 95ste persentiel van die data moet ≤ 1.5 mg/ℓ wees	

Tabel 5.5: EWV5: Watergehalte ekologiese spesifikasies

Rivier: Vaal		**EWV 5: Skandinavia**	**Watergehalte monitering terrein/standaard:** C2H122
Anorganiese soute	$MgSO_4$	Die 95ste persentiel van die data moet ≤ 37 mg/ℓ wees	
	Na_2SO_4	Die 95ste persentiel van die data moet ≤ 51 mg/ℓ wees	
	$MgC\ell_2$	Die 95ste persentiel van die data moet ≤ 36 mg/ℓ wees	
	$CaC\ell_2$	Die 95ste persentiel van die data moet ≤ 105 mg/ℓ wees	
	$NaC\ell$	Die 95ste persentiel van die data moet ≤ 191 mg/ℓ wees	
	$CaSO_4$	Die 95ste persentiel van die data moet ≤ 351 mg/ℓ wees	
Fisiese veranderlikes	EK	Die 95ste persentiel van die data moet ≤ 85 mS/m wees	
	pH	Die 5de persentiel van die data moet 6.5 tot 8.0 wees en die 95ste persentiel moet 8.8 tot 9.2 wees	

	Temperatuur	Temperatuur moet naby die natuurlike reeks wees
	Opgeloste suurstof	Die 5^{de} persentiel van die data moet ≥ 6 mg/ℓ wees
Voedingstowwe	Totaal anorganiese stikstof (TIN)	Die 50^{ste} persentiel van die data moet ≤ 1.0 mg/ℓ wees
	PO_4-P	Die 50^{ste} persentiel van die data moet ≤ 0.025 mg/ℓ wees
Gedrag veranderlikes	Chl-a fitoplankton	Die 50^{ste} persentiel van die data moet ≤ 20 µg/ℓ wees
Gifstowwe	Chl-a perifiton	Die 50^{ste} persentiel van die data moet ≤ 21 mg/m^2 wees
	Ammoniak	Die 95^{ste} persentiel van die data moet ≤ 0.073 mg/ℓ wees
	Fluoried	Die 95^{ste} persentiel van die data moet ≤ 1.5 mg/ℓ wees
Anorganiese ione	Vitrioel	Die 95^{ste} persentiel van die data moet ≤ 200 mg/ℓ wees

Tabel 5.6: EWV6: Watergehalte ekologiese spesifikasies

Rivier: Klip		**EWV 6:** Klip	**Watergehalte monitering terrein/standaard**: **C1H002** (Stroomaf-terrein in C13F)
Anorganiese soute	$MgSO_4$	Die 95^{ste} persentiel van die data moet ≤ 28 mg/ℓ wees	
	Na_2SO_4	Die 95^{ste} persentiel van die data moet ≤ 20 mg/ℓ wees	
	$MgCℓ_2$	Die 95^{ste} persentiel van die data moet ≤ 15 mg/ℓ wees	
	$CaCℓ_2$	Die 95^{ste} persentiel van die data moet ≤ 21 mg/ℓ wees	
	NaCℓ	Die 95^{ste} persentiel van die data moet ≤ 45 mg/ℓ wees	
	$CaSO_4$	Die 95^{ste} persentiel van die data moet ≤ 351 mg/ℓ wees	
Fisiese veranderlikes	EK	Die 95^{ste} persentiel van die data moet ≤ 55 mS/m wees	
	pH	Die 5^{de} persentiel van die data moet 6.5 tot 8.0 wees en die 95^{ste} persentiel moet 8.0 tot 8.8 wees	
	Temperatuur	Temperatuur moet naby aan natuurlike reeks wees	
	Opgeloste suurstof	Moet tussen 7 en 8 mg/ℓ wees	
	Troebelheid	Wissel met ’n klein getal van die natuurlike troebelheidreeks, mindere versanding van instroomhabitatte aanvaarbaar	
Voedingstowwe	Totaal anorganiese stikstof (TIN)	Die 50^{ste} persentiel van die data moet ≤ 0.75 mg/ℓ wees	
	PO_4-P	Die 50^{ste} persentiel van die data moet ≤ 0.020 mg/ℓ wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50^{ste} persentiel van die data moet < 15 µg/ℓ wees	
	Chl-a perifiton	Die 50^{ste} persentiel van die data moet < 12 mg/m^2 wees	
Gifstowwe	Ammoniak	Die 95^{ste} persentiel van die data moet ≤ 0.044 mg/ℓ wees	
	Fluoried	Die 95^{ste} persentiel van die data moet ≤ 1.5 mg/ℓ wees	

Tabel 5.7: EWV7: Watergehalte ekologiese spesifikasies

Rivier: Wilge		**EWV 7: Boonste Wilge**	**Watergehalte monitering terrein/standaard:** Geen dam/WG-terrein in omgewing van EWV-terrein
Anorganiese soute	$MgSO_4$	Die 95^{ste} persentiel van die data moet < 23 mg/ℓ wees	
	Na_2SO_4	Die 95^{ste} persentiel van die data moet < 33 mg/ℓ wees	
	$MgCℓ_2$	Die 95^{ste} persentiel van die data moet < 30 mg/ℓ wees	
	$CaCℓ_2$	Die 95^{ste} persentiel van die data moet < 57 mg/ℓ wees	
	NaCℓ	Die 95^{ste} persentiel van die data moet < 191 mg/ℓ wees	
	$CaSO_4$	Die 95^{ste} persentiel van die data moet < 351 mg/ℓ wees	
Fisiese veranderlikes	EK	Die 95^{ste} persentiel van die data moet < 55 mS/m wees	
	pH	Die 5^{de} persentiel van die data moet 6.5 tot 8.0 wees en die 95^{ste} persentiel moet 8.8 tot 9.2 wees	
	Temperatuur	Klein afwyking van die natuurlike temperatuurreeks	
	Opgeloste suurstof	Die 5^{de} persentiel van die data moet ≥ 8 mg/ℓ wees	
	Troebelheid	Wissel met ’n klein getal van die natuurlike troebelheidreeks, mindere versanding van instroomhabitatte aanvaarbaar	
Voedingstowwe	Total anorganiese stikstof (TIN)	Die 50^{ste} persentiel van die data moet tussen < 0.7 mg/ℓ wees	

	PO_4-P	Die 50ste persentiel van die data moet < 0.025 mg/ℓ wees
Gedrag veranderlikes	Chl-a fitoplankton	Die 50ste persentiel van die data moet ≤ 15 µg/ℓ wees
	Chl-a perifiton	Die 50ste persentiel van die data moet ≤ 12 mg/m^2 wees
Gifstowwe	Ammoniak	Die 95ste persentiel van die data moet ≤ 0.044 mg/ℓ wees
	Fluoried	Die 95ste persentiel van die data moet ≤ 1.5 mg/ℓ wees

Tabel 5.8: EWV8: Watergehalte ekologiese spesifikasies

Rivier: Wilge		**EWV 8: Bavaria**	**Watergehalte monitering terrein/standaard:** C8H028
Anorganiese soute	$MgSO_4$	Die 95ste persentiel van die data moet < 16 mg/ℓ wees	
	Na_2SO_4	Die 95ste persentiel van die data moet < 20 mg/ℓ wees	
	$MgCl_2$	Die 95ste persentiel van die data moet < 15 mg/ℓ wees	
	$CaCl_2$	Die 95ste persentiel van die data moet < 21 mg/ℓ wees	
	NaCl	Die 95ste persentiel van die data moet < 45 mg/ℓ wees	
	$CaSO_4$	Die 95ste persentiel van die data moet < 351 mg/ℓ wees	
Fisiese veranderlikes	EK	Die 95ste persentiel van die data moet < 55 mS/m wees	
	pH	Die 5de persentiel van die data moet 6.5 tot 8.0 wees en die 95ste persentiel moet 8.0 tot 8.8 wees	
	Temperatuur	Klein afwyking van die natuurlike temperatuurreeks	
	Opgeloste suurstof	Die 5de persentiel van die data moet ≥ 8 mg/ℓ wees	
	Troebelheid	Wissel met 'n klein getal van die natuurlike troebelheidreeks, mindere versanding van instroomhabitatte aanvaarbaar	
Voedingstowwe	Totaal anorganiese stikstof (TIN)	Die 50ste persentiel van die data moet tussen < 0.7 mg/ℓ wees	
	PO_4-P	Die 50ste persentiel van die data moet < 0.025 mg/ℓ wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50ste persentiel van die data moet < 20 ug/ℓ wees	
	Chl-a perifiton	Die 50ste persentiel van die data moet < 21 mg/m^2 wees	
Gifstowwe	Ammoniak	Die 95ste persentiel van die data moet ≤ 0.073 mg/ℓ wees	
	Fluoried	Die 95ste persentiel van die data moet ≤ 1.5 mg/ℓ wees	

Tabel 5.9: EWV9: Watergehalte ekologiese spesifikasies

Rivier: Suikerbosrand		**EWV 9: Stroomop**	**Watergehalte monitering terrein/standaard**: C2H131
Anorganiese soute	$MgSO_4$	Die 95ste persentiel van die data moet < 37 mg/ℓ wees	
	Na_2SO_4	Die 95ste persentiel van die data moet < 51 mg/ℓ wees	
	$MgC\ell_2$	Die 95ste persentiel van die data moet < 30 mg/ℓ wees	
	$CaC\ell_2$	Die 95ste persentiel van die data moet < 57 mg/ℓ wees	
	NaCℓ	Die 95ste persentiel van die data moet < 45 mg/ℓ wees	
	$CaSO_4$	Die 95ste persentiel van die data moet < 351 mg/ℓ wees	
Fisiese veranderlikes	EK	Die 95ste persentiel van die data moet < 55 mS/m wees	
	pH	Die 5de persentiel van die data moet 6.5 tot 8.0 wees en die 95ste persentiel moet 8.0 tot 8.8 wees	
	Temperatuur	Klein afwyking van die natuurlike temperatuurreeks	
	Opgeloste suurstof	Die 5de persentiel van die data moet ≥ 8 mg/ℓ wees	
	Troebelheid	Wissel met 'n klein getal van die natuurlike troebelheidreeks, mindere versanding van instroomhabitatte aanvaarbaar	
Voedingstowwe	Totaal anorganiese stikstof (TIN)	Die 50ste persentiel van die data moet < 0.7 mg/ℓ wees	
	PO_4-P	Die 50ste persentiel van die data moet < 0.020 mg/ℓ wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50ste persentiel van die data moet < 20 µg/ℓ wees	
	Chl-a perifiton	Die 50ste persentiel van die data moet < 21 mg/m^2 wees	
Gifstowwe	Ammoniak	Die 95ste persentiel van die data moet ≤ 0.073 mg/ℓ wees	
	Fluoried	Die 95ste persentiel van die data moet ≤ 1.5 mg/ℓ wees	

Tabel 5.10: EWV10: Watergehalte ekologiese spesifikasies

Rivier: Suikerbosrand		**EWV 10: Stroomaf**	**Watergehalte monitering terrein/standaard**: C2H070
Anorganiese soute	$MgSO_4$	Die 95ste persentiel van die data moet < 37 mg/ℓ wees	
	Na_2SO_4	Die 95ste persentiel van die data moet < 51 mg/ℓ wees	
	MgCℓ₂ → $MgC\ell_2$	Die 95ste persentiel van die data moet < 51 mg/ℓ wees	
	$CaC\ell_2$	Die 95ste persentiel van die data moet < 105 mg/ℓ wees	
	NaCℓ	Die 95ste persentiel van die data moet < 191 mg/ℓ wees	
	$CaSO_4$	Die 95ste persentiel van die data moet < 351 mg/ℓ wees	
Fisiese veranderlikes	EK	Die 95ste persentiel van die data moet < 85 mS/m wees	
	pH	Die 5de persentiel van die data moet tussen 6.5 tot 8.0 wees en die 95ste persentiel moet 8.0 tot 8.8 wees	
	Temperatuur	Klein afwyking van die natuurlike temperatuurreeks	
	Opgeloste suurstof	Die 5de persentiel van die data moet ≥ 7 mg/ℓ wees	
Voedingstowwe	Totaal anorganiese stikstof (TIN)	Die 50ste persentiel van die data moet < 0.7 mg/ℓ wees	
	PO_4-P	Die 50ste persentiel van die data moet < 0.125 mg/ℓ wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50ste persentiel van die data moet < 30 µg/ℓ wees	
	Chl-a perifiton	Die 50ste persentiel van die data moet < 21 mg/m² wees	
Gifstowwe	Ammoniak	Die 95ste persentiel van die data moet ≤ 0.100 mg/ℓ wees	
	Fluoried	Die 95ste persentiel van die data moet ≤ 1.5 mg/ℓ wees	

Tabel 5.11: EWV11: Watergehalte ekologiese spesifikasies

Rivier: Blesbokspruit		**EWV 11: Blesbokspruit**	**Watergehalte monitering terrein/standaard:** C2H185
Anorganiese soute	$MgSO_4$	Die 95ste persentiel van die data moet < 37 mg/ℓ wees	
	Na_2SO_4	Die 95ste persentiel van die data moet < 51 mg/ℓ wees	
	$MgC\ell_2$	Die 95ste persentiel van die data moet < 36 mg/ℓ wees	
	$CaC\ell_2$	Die 95ste persentiel van die data moet <105 mg/ℓ wees	
	NaCℓ	Die 95ste persentiel van die data moet < 389 mg/ℓ wees	
	$CaSO_4$	Die 95ste persentiel van die data moet < 351 mg/ℓ wees	
Fisiese veranderlikes	EK	Die 95ste persentiel van die data moet < 85 mS/m wees	
	pH	Die 5de persentiel van die data moet 6.5 tot 8.0 wees en die 95ste persentiel moet 8.0 tot 8.8 wees	
	Temperature	Matige verandering vanaf die natuurlike temperatuurreeks	
	Opgeloste suurstof	Die 5de persentiel van die data moet ≥ 6.0 mg/ℓ wees	
	Troebelheid	Inisieer grondlynmonitering vir hierdie veranderlike	
Voedingstowwe	Totaal anorganiese stikstof (TIN)	Die 50ste persentiel van die data moet ≤ 0.70 mg/ℓ wees	
	PO_4-P	Die 50ste persentiel van die data moet ≤ 0.125 mg/L wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50ste persentiel van die data moet < 20 µg/ℓ wees	
	Chl-a perifiton	Die 50ste persentiel van die data moet ≤ 21 mg/m² wees	
Gifstowwe	Ammoniak	Die 95ste persentiel van die data moet ≤ 0.100 mg/ℓ wees	
	Atrasien	Die 95ste persentiel van die data moet ≤ 100 ug/ℓ wees	
	Fluoried	Die 95ste persentiel van die data moet ≤ 3.0 mg/ℓ) wees	
	Endosulfan	Die 95ste persentiel van die data moet ≤ 0.200 µg/ℓ wees	

Tabel 5.12: EWV12: Watergehalte ekologiese spesifikasies

Rivier: Vaal		**EWV 12: by Vermaasdrift**	**Watergehalte monitering terrein/standaard**: C2H007
Anorganiese soute	$MgSO_4$	Die 95ste persentiel van die data moet ≤ 37 mg/ℓ wees	
	Na_2SO_4	Die 95ste persentiel van die data moet ≤ 51 mg/ℓ wees	
	$MgC\ell_2$	Die 5de en 95ste persentiel van die data moet ≤ 51 mg/ℓ wees	
	$CaC\ell_2$	Die 95ste persentiel van die data moet ≤ 105 mg/ℓ wees	
	NaCℓ	Die 95ste persentiel van die data moet ≤ 191 mg/ℓ wees	
	$CaSO_4$	Die 95ste persentiel van die data moet ≤ 351 mg/ℓ wees	
Fisiese veranderlikes	EK	Die 95ste persentiel van die data moet ≤ 70 mS/m wees	
	pH	Die 5de persentiel van die data moet 7.5 tot 8.0 wees en die 95ste persentiel moet 8.8 tot 9.2 wees	
	Opgeloste suurstof	Die 5de persentiel van die data moet ≥ 7.5 mg/ℓ wees	
	Troebelheid	Wissel met 'n klein getal van die natuurlike troebelheidreeks	
	TDS	Die 95ste persentiel van die data moet ≤560mg/ℓ wees	
Voedingstowwe	Totaal anorganiese stikstof (TIN)	Die 50ste persentiel van die data moet ≤ 1.0 mg/ℓ wees	
	PO_4-P	Die 50ste persentiel van die data moet ≤ 0.125 mg/ℓ wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50ste persentiel van die data moet ≤ 30 µg/ℓ wees	
	Chl-a perifiton	Die 50ste persentiel van die data moet ≤ 84 mg/m^2 wees	
Gifstowwe	Ammoniak	Die 95ste persentiel van die data moet ≤ 0.1 mg/ℓ wees	
	Fluoried	Die 95ste persentiel van die data moet ≤ 1.5 mg/ℓ wees	
	Sianied	Die 95ste persentiel van die data moet ≤ 0.05 mg/ℓ wees	
	Aluminium	Die 95ste persentiel van die data moet ≤ 0.1 mg/ℓ wees	
	Uraan	Die 95ste persentiel van die data moet ≤ 0.030 mg/ℓ wees	
Anorganiese ione	Vitrioel	Die 95ste persentiel van die data moet ≤ 160 mg/ℓ wees	
	Magnesium	Die 95ste persentiel van die data moet ≤ 33 mg/ℓ wees	

Tabel 5.13: EWV13: Watergehalte ekologiese spesifikasies

Rivier: Vaal		**EWV 13: By Regina Bridge**	**Watergehalte monitering terrein/standaard:** C2H022
Anorganiese soute	$MgSO_4$	Die 95ste persentiel van die data moet ≤ 37 mg/ℓ wees	
	Na_2SO_4	Die 95ste persentiel van die data moet ≤ 51 mg/ℓ wees	
	$MgC\ell_2$	Die 95ste persentiel van die data moet ≤ 51 mg/ℓ wees	
	NaCℓ	Die 95ste persentiel van die data moet ≤ 191mg/ℓ wees	
	$CaC\ell_2$	Die 95ste persentiel van die data moet ≤ 105 mg/ℓ wees	
	$CaSO_4$	Die 95ste persentiel van die data moet ≤ 351 mg/ℓ wees	
Fisiese veranderlikes	EK	Die 95ste persentiel van die data moet ≤ 70 mS/m wees	
	pH	Die 5de persentiel van die data moet 7.5 tot 8.0 wees en die 95ste persentiel moet 8.0 tot 8.8 wees	
	Temperatuur	Klein afwyking van die natuurlike temperatuurreeks	
	Opgeloste suurstof	Die 5de persentiel van die data moet ≥ 6 mg/ℓ wees	
	Troebelheid	Wissel met 'n klein getal van die natuurlike troebelheidreeks	
	TDS	Die 95ste persentiel van die data moet ≤ 560 mg/ℓ wees	
Voedingstowwe	Totaal anorganiese stikstof (TIN)	Die 50ste persentiel van die data moet ≤ 4.0 mg/ℓ wees	
	PO_4-P	Die 50ste persentiel van die data moet ≤ 0.125 mg/ℓ wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50ste persentiel van die data moet ≤ 30 µg/ℓ wees	
	Chl-a perifiton	Die 50ste persentiel van die data moet ≤ 84 mg/m^2 wees	
Gifstowwe	Ammoniak	Die 95ste persentiel van die data moet ≤ 0.0438 mg/ℓ wees	
	Fluoried	Die 95ste persentiel van die data moet ≤ 1.5 mg/ℓ wees	
	Aluminium	Die 95ste persentiel van die data moet ≤ 0.1 mg/ℓ wees	
	Sianied	Die 95ste persentiel van die data moet ≤ 0.05 mg/ℓ wees	
	Uraan	Die 95ste persentiel van die data moet ≤ 0.030 mg/ℓ wees	

Anorganiese ione	Magnesium	Die 95ste persentiel van die data moet ≤ 33 mg/ℓ wees
	Vitrioel	Die 95ste persentiel van die data moet ≤ 160 mg/ℓ wees

Tabel 5.14: EWV14: Watergehalte ekologiese spesifikasies

Rivier: Vals		**EWV 14: Proklameersdrift**	**Watergehalte monitering terrein/standaard: C6H007**
Anorganiese soute	$MgSO_4$	Die 95ste persentiel van die data moet ≤ 37 mg/ℓ wees	
	Na_2SO_4	Die 95ste persentiel van die data moet ≤ 51 mg/ℓ wees	
	$MgCℓ_2$	Die 95ste persentiel van die data moet ≤ 51 mg/ℓ wees	
	$CaCℓ_2$	Die 95ste persentiel van die data moet ≤ 191mg/ℓ wees	
	NaCℓ	Die 95ste persentiel van die data moet ≤ 105 mg/ℓ wees	
	$CaSO_4$	Die 95ste persentiel van die data moet ≤ 351 mg/ℓ wees	
Fisiese veranderlikes	EK	Die 95ste persentiel van die data moet ≤ 85 mS/m wees	
	pH	Die 5de persentiel van die data moet 5.5 to 6.0 en the 95th percentile 8.8 to 9.2	
	Temperatuur	Klein afwyking van die natuurlike temperatuurreeks	
	Opgeloste suurstof	Die 5de persentiel van die data moet ≥ 8 mg/ℓ wees	
	Troebelheid	Wissel met 10% van die natuurlike troebelheidreeks	
Voedingstowwe	Totaal anorganiese stikstof (TIN)	Die 50ste persentiel van die data moet ≤ 0.7 mg/ℓ wees	
	PO_4-P	Die 50ste persentiel van die data moet ≤ 0.125mg/ℓ wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50ste persentiel van die data moet ≤ 30ug/ℓ wees	
	Chl-a perifiton	Die 50ste persentiel van die data moet ≤ 84 mg/m² wees	
Gifstowwe	Ammoniak	Die 95ste persentiel van die data moet ≤ 0.073 mg/ℓ wees	
	Fluoried	Die 95ste persentiel van die data moet ≤ 1.5 mg/ℓ wees	

Tabel 5.15: EWV15: Watergehalte ekologiese spesifikasies

Rivier: Vet		**EWV 15: by Fisantkraal**	**Watergehalte monitering terrein/standaard: C4H004**
Anorganiese soute	$MgSO_4$	Die 95ste persentiel van die data moet ≤ 37 mg/ℓ wees	
	Na_2SO_4	Die 95ste persentiel van die data moet ≤ 51 mg/ℓ wees	
	$MgCℓ_2$	Die 95ste persentiel van die data moet ≤ 36 mg/ℓ wees	
	$CaCℓ_2$	Die 95ste persentiel van die data moet ≤ 69 mg/ℓ wees	
	NaCℓ	Die 95ste persentiel van die data moet ≤ 191 mg/ℓ wees	
	$CaSO_4$	Die 95ste persentiel van die data moet ≤ 351 mg/ℓ wees	
Fisiese veranderlikes	EK	Die 95ste persentiel van die data moet ≤ 80 mS/m wees	
	pH	Die 5de persentiel van die data moet 6.5 tot 8.0 wees en die 95ste persentiel moet 8.0 tot 8.8 wees	
	Temperatuur	Klein afwyking van die natuurlike temperatuurreeks	
	Opgeloste suurstof	Die 5de persentiel van die data moet ≥ 6.0 mg/ℓ wees	
	Troebelheid	Wissel met 'n klein getal van die natuurlike troebelheidreeks	
Voedingstowwe	Totaal anorganiese stikstof (TIN)	Die 50ste persentiel van die data moet ≤ 0.7 mg/ℓ wees	
	PO_4-P	Die 50ste persentiel van die data moet ≤ 0.058 mg/ℓ wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50ste persentiel van die data moet ≤ 25 µg/ℓ wees	
	Chl-a perifiton	Die 50ste persentiel van die data moet ≤ 84 mg/m² wees	
Gifstowwe	Ammoniak	Die 95ste persentiel van die data moet ≤ 0.072 mg/ℓ wees	
	Fluoried	Die 95ste persentiel van die data moet ≤ 1.5 mg/ℓ wees	
Anorganiese ione	Vitrioel	Die 95ste persentiel van die data moet ≤ 120 mg/ℓ wees	
	Chloried	Die 95ste persentiel van die data moet ≤ 100 mg/ℓ wees	

Tabel 5.16: EWV16: Watergehalte ekologiese spesifikasies

Rivier: Vaal		**EWV 16: Stroomaf Bloemhof Dam**	**Watergehalte monitering terrein/standaard: C9H021**
Anorganiese soute	$MgSO_4$	Die 95^{ste} persentiel van die data moet ≤ 28 mg/ℓ wees	
	Na_2SO_4	Die 95^{ste} persentiel van die data moet ≤ 51 mg/ℓ wees	
	$MgC\ell_2$	Die 95^{ste} persentiel van die data moet ≤ 30 mg/ℓ wees	
	$CaC\ell_2$	Die 95^{ste} persentiel van die data moet ≤ 69 mg/ℓ wees	
	$NaC\ell$	Die 95^{ste} persentiel van die data moet ≤ 191mg/ℓ wees	
	$CaSO_4$	Die 95^{ste} persentiel van die data moet ≤ 351 mg/ℓ wees	
Fisiese veranderlikes	EK	Die 95^{ste} persentiel van die data moet ≤ 55 mS/m wees	
	pH	Die 5^{de} persentiel van die data moet tussen 6.5 en 8.0 wees en die 95^{ste} persentiel moet tussen 8.0 en 8.8 wees	
	Temperatuur	Klein afwyking van die natuurlike temperatuurreeks	
	Opgeloste suurstof	Die 5^{de} persentiel van die data moet ≥ 6 mg/ℓ wees	
	Troebelheid	Wissel met 'n klein getal van die natuurlike troebelheidreeks	
Voedingstowwe	Totaal anorganiese stikstof (TIN)	Die 50^{ste} persentiel van die data moet ≤ 0.25 mg/ℓ wees	
	PO_4-P	Die 50^{ste} persentiel van die data moet ≤ 0.025 mg/ℓ wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50^{ste} persentiel van die data moet ≤ 30 µg/ℓ wees	
	Chl-a perifitoon	Die 50^{ste} persentiel van die data moet ≤ 84 mg/m^2 wees	
Gifstowwe	Ammoniak as stikstof	Die 95^{ste} persentiel van die data moet ≤ 0.073 mg/ℓ wees	
	Fluoried	Die 95^{ste} persentiel van die data moet ≤ 3.0 mg/ℓ wees	
	Atrasien	Die 95^{ste} persentiel van die data moet ≤ 0.100 mg/ℓ wees	
	Endosulfaan	Die 95^{ste} persentiel van die data moet ≤ 0.2 µg/ℓ wees	

Tabel 5.17: EWV17: Watergehalte ekologiese spesifikasies

Rivier: Harts		**EWV 17: Lloyds Stuwal**	**Watergehalte monitering terrein/standaard:** C3H016
Anorganiese soute	$MgSO_4$	Die 95^{ste} persentiel van die data moet ≤ 37 mg/ℓ wees	
	Na_2SO_4	Die 95^{ste} persentiel van die data moet ≤ 51 mg/ℓ wees	
	$MgC\ell_2$	Die 95^{ste} persentiel van die data moet ≤ 51 mg/ℓ wees	
	$CaC\ell_2$	Die 95^{ste} persentiel van die data moet ≤ 105 mg/ℓ wees	
	$NaC\ell$	Die 95^{ste} persentiel van die data moet ≤ 389 mg/ℓ wees	
	$CaSO_4$	Die 95^{ste} persentiel van die data moet ≤ 351 mg/ℓ wees	
Fisiese veranderlikes	EK	Die 95^{ste} persentiel van die data moet ≤ 111 mS/m wees	
	pH	Die 5^{de} persentiel van die data moet 6.5 tot 8.0 wees en die 95ste persentiel moet 8.0 tot 8.8 wees	
	Temperatuur	Klein afwyking van die natuurlike temperatuurreeks	
	Opgeloste suurstof	Die 5^{de} persentiel van die data moet ≥ 6.0 mg/ℓ wees	
	Troebelheid	Wissel met 'n klein getal van die natuurlike troebelheidreeks	
Voedingstowwe	Totaal anorganiese stikstof (TIN)	Die 50^{ste} persentiel van die data moet ≤ 1.0 mg/ℓ wees	
	PO_4-P	Die 50^{ste} persentiel van die data moet ≤ 0.025 mg/ℓ wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50^{ste} persentiel van die data moet ≤ 30ug/ℓ wees	
	Chl-a perifiton	Die 50^{ste} persentiel van die data moet ≤ 84 mg/m^2 wees	
Gifstowwe	Ammoniak as stikstof	Die 95^{ste} persentiel van die data moet ≤ 0.073 mg/ℓ wees	
	Fluoried	Die 95^{ste} persentiel van die data moet ≤ 1.5 mg/ℓ wees	

Tabel 5.18: EWV18: Watergehalte ekologiese spesifikasies

Rivier: Vaal		**EWV 18: by Schmidtsdrift**	**Watergehalte monitering terrein/standaard: C9H024**
Anorganiese soute	$MgSO_4$	Die 95ste persentiel van die data moet ≤ 28 mg/ℓ wees	
	Na_2SO_4	Die 95ste persentiel van die data moet ≤ 51 mg/ℓ wees	
	$MgCℓ_2$	Die 95ste persentiel van die data moet ≤ 30 mg/ℓ wees	
	$CaCℓ_2$	Die 95ste persentiel van die data moet ≤ 105 mg/ℓ wees	
	NaCℓ	Die 95ste persentiel van die data moet ≤ 191 mg/ℓ wees	
	$CaSO_4$	Die 95ste persentiel van die data moet ≤ 351 mg/ℓ wees	
Fisiese veranderlikes	EK	Die 95ste persentiel van die data moet ≤ 85 mS/m wees	
	pH	Die 5de persentiel van die data moet 6.5 tot 8.0 wees en die 95ste persentiel moet 8.0 tot 8.8 wees	
	Opgeloste suurstof	Die 5de persentiel van die data moet ≥ 4 mg/ℓ wees	
	Troebelheid	Wissel met 'n klein getal van die natuurlike troebelheidreeks	
Voedingstowwe	Totale anorganiese stikstof (TIN)	Die 50ste persentiel van die data moet ≤ 0.7 mg/ℓ wees	
	PO_4-P	Die 50ste persentiel van die data moet ≤ 0.125 mg/ℓ wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50ste persentiel van die data moet ≤ 30 µg/ℓ wees	
	Chl-a perifiton	Die 50ste persentiel van die data moet ≤ 84 mg/m^2 wees	
Gifstowwe	Ammoniak as stikstof	Die 95ste persentiel van die data moet ≤ 0.073 mg/ℓ wees	
	Fluoried	Die 95ste persentiel van die data moet ≤ 1.5 mg/ℓ wees	

Tabel 5.19: EWV WA1: Watergehalte ekologiese spesifikasies

Rivier: Waterval		**EWV WA1: Waterval_1**	**Watergehalte monitering terrein/standaard: C1H036**
Fisiese veranderlikes	EK	Die 95^{ste} persentiel van die data moet ≤ 85 mS/m wees	
	pH	Die 5^{de} persentiel van die data moet 5.0 tot 5.6 wees en die 95^{ste} persentiel moet 9.2 tot 10.0 wees	
	Opgeloste suurstof	Die 5^{de} persentiel van die data moet ≥ 6.5 mg/ℓ wees	
Voedingstowwe	Nitraat (NO_3) + Nitriet (NO_2)	Die 50^{ste} persentiel van die data moet ≤ 4.0 mg/ℓ wees	
	PO_4-P	Die 50^{ste} persentiel van die data moet ≤ 0.125 mg/ℓ wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50^{ste} persentiel van die data moet ≤ 30 µg/ℓ wees	
	Chl-a perifiton	Die 50^{ste} persentiel van die data moet ≤ 84 mg/m² wees	
Gifstowwe	Ammoniak as stikstof	Die 95^{ste} persentiel van die data moet ≤ 0.1 mg/ℓ wees	
	Fluoried	Die 95^{ste} persentiel van die data moet ≤ 3.0 mg/ℓ wees	
	Atrasien	Die 95^{ste} persentiel van die data moet ≤ 0.1 mg/ℓ wees	
	Endosulfaan	Die 95^{ste} persentiel van die data moet ≤ 0.20 µg/ℓ wees	
	Kadmium (hard)	Die 95^{ste} persentiel van die data moet ≤ 0.005 mg/ℓ wees	
	Chroom (VI)	Die 95^{ste} persentiel van die data moet ≤ 0.2 mg/ℓ wees	
	Koper (hard)	Die 95^{ste} persentiel van die data moet ≤ 0.008 mg/ℓ wees	
	Mangaan	Die 95^{ste} persentiel van die data moet ≤ 1.3 mg/ℓ wees	
	Lood (hard)	Die 95^{ste} persentiel van die data moet ≤ 0.013 mg/ℓ wees	
	Kwiksilwer	Die 95^{ste} persentiel van die data moet ≤ 0.0017 mg/ℓ wees	
	Selenium	Die 95^{ste} persentiel van die data moet ≤ 0.030 mg/ℓ wees	
	Sink	Die 95^{ste} persentiel van die data moet ≤ 0.036 mg/ℓ wees	

Tabel 5.20: EWV WA2: Watergehalte ekologiese spesifikasies

Rivier: Waterval		**EWV WA2: Waterval_2**	**Watergehalte monitering terrein/standaard: C1H030**
Fisiese veranderlikes	EK	Die 95^{ste} persentiel van die data moet ≤ 85 mS/m wees	
	pH	Die 5^{de} persentiel van die data moet 5.0 tot 5.6 wees en die 95^{ste} persentiel moet 9.2 tot 10.0 wees	
	Opgeloste suurstof	Die 5^{de} persentiel van die data moet ≥ 6.5 mg/ℓ wees	
Voedingstowwe	Nitraat (NO_3) + Nitriet (NO_2)	Die 50^{ste} persentiel van die data moet ≤ 4.0 mg/ℓ wees	
	PO_4-P	Die 50^{ste} persentiel van die data moet ≤ 0.125mg/ℓ wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50^{ste} persentiel van die data moet ≤ 30 µg/ℓ wees	
	Chl-a perifiton	Die 50^{ste} persentiel van die data moet ≤84 mg/m² wees	
Gifstowwe	Ammoniak as stikstof	Die 95^{ste} persentiel van die data moet ≤ 0.1 mg/ℓ wees	
	Fluoried	Die 95^{ste} persentiel van die data moet ≤ 3.0 mg/ℓ wees	
	Atrasien	Die 95^{ste} persentiel van die data moet ≤ 0.1 mg/ℓ wees	
	Endosulfaan	Die 95^{ste} persentiel van die data moet ≤ 0.20 µg/ℓ wees	
	Kadmium (hard)	Die 95^{ste} persentiel van die data moet ≤ 0.005 mg/ℓ wees	
	Chroom (VI)	Die 95^{ste} persentiel van die data moet ≤ 0.2 mg/ℓ wees	
	Koper (hard)	Die 95^{ste} persentiel van die data moet ≤ 0.008 mg/ℓ wees	
	Mangaan	Die 95^{ste} persentiel van die data moet ≤ 1.3 mg/ℓ wees	
	Lood (hard)	Die 95^{ste} persentiel van die data moet ≤ 0.013 mg/ℓ wees	
	Kwiksilver	Die 95^{ste} persentiel van die data moet ≤ 0.0017 mg/ℓ wees	
	Selenium	Die 95^{ste} persentiel van die data moet ≤ 0.030 mg/ℓ wees	
	Sink	Die 95^{ste} persentiel van die data moet ≤ 0.036 mg/ℓ wees	

Tabel 5.21: EWV S1: Watergehalte ekologiese spesifikasies

Rivier: Schoonspruit		**EWV S1: Stroomaf Schoonspruit Eye**	**Watergehalte monitering terrein/standaard**: Geen terrein in omgewing
Fisiese veranderlikes	EK	Die 95ste persentiel van die data moet ≤ 55 mS/m wees	
	pH	Die 5de persentiel van die data moet 5.6 tot 6.0 wees en die 95ste persentiel moet 8.0 tot 8.5 wees	
	Opgeloste suurstof	Die 5de persentiel van die data moet ≥ 7.0 mg/ℓ wees	
Voedingstowwe	Nitraat (NO_3) + Nitriet (NO_2)	Die 50ste persentiel van die data moet ≤ 2.5 mg/ℓ wees	
	PO_4-P	Die 50ste persentiel van die data moet ≤ 0.02 mg/ℓ wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50ste persentiel van die data moet ≤ 10 µg/ℓ wees	
	Chl-a perifiton	Die 50ste persentiel van die data moet ≤ 12 mg/m^2 wees	

Tabel 5.22: EWV S3: Watergehalte ekologiese spesifikasies

Rivier: Schoonspruit		**EWV S3: Stroomaf Taaibosspruit en Rietspruit-sameloop**	**Watergehalte monitering terrein/standaard**: Geen aktiewe terrein nie
Fisiese veranderlikes	EK	Die 95ste persentiel van die data moet ≤ 70 mS/m wees	
	pH	Die 5de persentiel van die data moet 5.2 tot 5.4 wees en die 95ste persentiel moet 9.3 tot 9.6 wees	
	Opgeloste suurstof	Die 5de persentiel van die data moet ≥ 6.5 mg/ℓ wees	
Voedingstowwe	Nitraat (NO_3) + Nitriet (NO_2)	Die 50ste persentiel van die data moet ≤ 2.5 mg/ℓ wees	
	PO_4-P	Die 50ste persentiel van die data moet ≤ 0.125 mg/ℓ wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50ste persentiel van die data moet ≤ 20 µg/ℓ wees	
	Chl-a perifiton	Die 50ste persentiel van die data moet ≤ 21 mg/m^2 wees	

Tabel 5.23: EWV S4: Watergehalte ekologiese spesifikasies

Rivier: Schoonspruit		**EWV S4: Stroomaf Johan Neser Dam**	**Watergehalte monitering terrein/standaard**: **C2H073**
Fisiese veranderlikes	EK	Die 95ste persentiel van die data moet ≤ 85 mS/m wees	
	pH	Die 5de persentiel van die data moet 5.2 tot 5.4 wees en die 95ste persentiel moet 9.3 tot 9.6 wees	
	Opgeloste suurstof	Die 5de persentiel van die data moet ≥ 6.5 mg/ℓ wees	
Voedingstowwe	Nitraat (NO_3) + Nitriet (NO_2)	Die 50ste persentiel van die data moet ≤ 2.5 mg/ℓ wees	
	PO_4-P	Die 50ste persentiel van die data moet ≤ 0.125 mg/ℓ wees	
Gedrag veranderlikes	Chl-a fitoplankton	Die 50ste persentiel van die data moet ≤ 20 µg/ℓ wees	
	Chl-a perifiton	Die 50ste persentiel van die data moet ≤ 21 mg/m^2 wees	
Anorganiese ione	Vitrioel	Die 95ste persentiel van die data moet ≤ 200 mg/ℓ wees	
Gifstowwe	Ammoniak as stikstof	Die 95ste persentiel van die data moet ≤ 0.073 mg/ℓ wees	
	Aluminium	Die 95ste persentiel van die data moet ≤ 0.1 mg/ℓ wees	
	Manganees	Die 95ste persentiel van die data moet ≤0.250 mg/ℓ wees	
	Uraan	Die 95ste persentiel van die data moet ≤0.03 mg/ℓ wees	
	Yster	Die 95ste persentiel van die data moet ≤0.25 mg/ℓ wees	
	Chroom (VI)	Die 95ste persentiel van die data moet ≤ 0.2 mg/ℓ wees	
	Koper (hard)	Die 95ste persentiel van die data moet ≤ 0.008 mg/ℓ wees	
	Sianied (vrye)	Die 95ste persentiel van die data moet ≤ 0.050 mg/ℓ wees	

6. RESERWE VIR GRONDWATER

Tabel 6.1 hier onder wys the Grondwater Reserwe vir die Vaal-opvanggebied afkomstig van die gebruik van die Grondwaterhulpbrongerigte Maatreëls (GHGM)-metodologie.

Die voorgeskrewe GHGM-algoritme is gebruik en ’n “allokeerbare grondwater” volume (MKM/annum) is bereken (Kolom K van Tabel 6.1). Hierdie algoritme volgens die GHGM-protokolle, dui aan die komponent van die jaarlikse hervulling wat nogsteeds beskikbaar is nadat Basiese Menslike Behoeftes, basisvloeivereistes en die huidige watergebruik van die berekende grondwaterhervulling afgetrek is.

Die grondwatergehalte vir elke kwartêr opvanggebied, waar beskikbaar in ’n datatelling van >9, is toegepas en die rangskikking van die grondwatergehalte volgens die klassifikasiestelsel soos omskryf in die riglyn: “Quality of Domestic Water Supplies Volume 1: Assessment Guide”. 1998. Water Navorsingskommissie, die Departement van Waterwese en Bosbou en die Departement van Gesondheid. Verslagnr TT 101/98.

LET WEL: Watergehalteklassifikasiestelsel vir plaaslike watervoorsiening gebaseer op toenemende effekte

Klas 0: Ideale watergehalte, geskik vir leeftydgebruik, met geen effekte op die gebruiker nie.

Klas I: Water in hierdie klas is veilig vir leeftydgebruik, maar skiet tekort aan die ideale watergehalte deurdat daar gevalle van teenspoedige gesondheidseffekte mag wees, maar dit is gewoonlik matig, en duidelike gesondheidseffekte is amper subklinies en moeilik om te demonstreer. Water in Klas I veroorsaak nie gesondheidseffekte onder normale omstandighede nie. Estetiese effekte mag dus dalk duidelik wees.

Klas II: Water in hierdie klas word omskryf as dié waar teenstrydige gesondheidseffekte ongewoon is vir beperkte korttermyn gebruik. Teenspoedige gesondheidseffekte mag dalk meer algemeen word veral met verlengde gebruik oor baie jare, of met leeftydgebruik. Hierdie klas verteenwoordig water slegs geskik vir korttermyn of noodgebruik, maar nie noodwendig geskik vir aanhoudende gebruik oor ‘n leeftyd nie.

Klas III: Hierdie water het kiesers in ’n konsentrasiereeks waar ernstige gesondheidseffekte dalk verwag mag word, veral in kinders of ouer mense met korttermyn gebruik, en selfs meer met langer termyn gebruik. Die water in hierdie klas is nie geskik vir gebruik as drinkwater sonder toepaslike behandeling nie.

Tabel 6.1: GHGM vir die Vaalrivier-waterbestuursarea

A	B	C	D	E	F	G	H	I	J	K
Kwartêr Opvanggebied	Area (km^2)	Gemiddelde Jaarlikse Neerslag (mm)	Hervulling (Mm^3/a)	% Gemiddelde Jaarlikse Neerslag	Bevolking (minimum vlak)	Basiese Menslike Behoeftes (Mm^3/a)	Grondwaterkomponent van Basisvloei (Mm^3/a)	Totale Reserwe (Mm^3/a)	Grondwatergebruik (Mm^3/a)	Allokeerbare Grondwater Totaal (Mm^3/a)
BOONSTE VAAL-OPVANGGEBIED										
C11A	719	743	38.93	7.3	1955	0.02	6.46	6.48	0.00	32.45
C11B	535	705	26.49	7.0	2142	0.02	4.60	4.62	0.09	21.78
C11C	449	765	22.16	6.5	1277	0.01	4.39	4.40	0.14	17.62
C11D	372	702	17.05	6.5	965	0.01	3.17	3.18	0.17	13.70
C11E	1155	697	46.63	5.8	23889	0.22	9.74	9.96	1.26	35.41
C11F	929	705	39.67	6.1	31634	0.29	7.56	7.85	0.39	31.43
C11G	432	659	17.01	6.0	1460	0.01	3.00	3.01	0.22	13.78
C11H	1103	664	40.16	5.5	33924	0.31	6.76	7.07	1.38	31.71
C11J	1001	658	36.15	5.5	3106	0.03	6.76	6.79	0.48	28.88
C11K	340	633	11.47	5.3	2970	0.03	1.82	1.85	0.31	9.31
C11L	947	675	32.74	5.1	6416	0.06	6.77	6.83	0.49	25.42
C11M	795	637	23.38	4.6	38506	0.35	4.69	5.04	0.43	17.91
C12A	484	614	12.10	4.1	758	0.01	3.26	3.27	0.00	8.83
C12B	478	631	14.40	4.8	2461	0.02	3.18	3.20	0.13	11.07
C12C	666	605	18.66	4.6	4257	0.04	4.19	4.23	0.17	14.26
C12D	898	667	32.75	5.5	53555	0.49	5.27	5.76	3.78	23.21
C12E	497	641	16.87	5.3	1960	0.02	2.80	2.82	0.26	13.79
C12F	834	635	29.46	5.6	3241	0.03	4.43	4.46	0.36	24.64
C12G	570	640	21.20	5.8	6797	0.06	3.17	3.23	0.20	17.77
C12H	355	618	11.26	5.1	16104	0.15	1.54	1.69	0.08	9.49
C12J	344	615	9.67	4.6	627	0.01	1.49	1.50	0.17	8.00
C12K	479	657	19.93	6.3	2739	0.02	2.36	2.38	0.09	17.46
C12L	887	648	31.99	5.6	2116	0.02	4.12	4.14	3.77	24.08
C13A	594	779	27.18	5.9	2807	0.03	6.54	6.57	0.21	20.40
C13B	615	683	21.93	5.2	2395	0.02	5.42	5.44	0.27	16.22
C13C	836	724	35.96	5.9	5970	0.05	8.14	8.19	0.04	27.73
C13D	895	698	32.67	5.2	1742	0.02	8.23	8.25	0.11	24.31
C13E	602	699	21.94	5.2	1130	0.01	5.55	5.56	0.01	16.37
C13F	611	692	19.25	4.6	1525	0.01	5.16	5.17	0.03	14.05
C13G	434	674	14.14	4.8	15885	0.14	3.57	3.71	0.01	10.42
C13H	588	628	15.36	4.2	1688	0.02	3.99	4.01	0.02	11.33
C21A	707	674	26.89	5.6	4853	0.04	4.78	4.82	0.06	22.01
C21B	431	697	9.70	3.2	19019	0.17	4.16	4.33	0.23	5.14
C21C	438	674	9.85	3.3	8820	0.08	3.97	4.05	0.13	5.67
C21D	446	698	8.56	2.8	180660	1.65	4.20	5.85	0.84	1.87
C21E	628	691	9.21	2.1	40363	0.37	5.82	6.19	0.22	2.80
C21F	427	704	9.49	3.2	71170	0.65	4.04	4.69	0.59	4.21
C21G	462	667	9.38	3.0	2339	0.02	4.03	4.05	0.03	5.30
C22A	548	695	19.56	5.4	517617	4.73	5.37	11.77	1.41	6.38
C22B	391	691	11.22	4.7	237009	2.16	3.75	5.27	1.47	4.48
C22C	465	684	14.72	4.5	96073	0.88	4.38	11.05	0.03	3.64
C22D	345	701	12.24	9.2	30823	0.28	3.27	7.83	2.34	2.07
C22E	532	669	12.13	3.4	13549	0.12	4.81	4.93	0.91	6.29
C22F	440	655	7.01	2.4	109440	1.00	4.01	5.01	0.05	1.95
C22G	830	613	25.77	5.1	2596	0.02	6.93	6.95	0.47	18.35

A	B	C	D	E	F	G	H	I	J	K
Kwartêr Opvanggebied	Area (km²)	Gemiddelde Jaarlikse Neerslag (mm)	Hervulling (Mm³/a)	% Gemiddelde Jaarlikse Neerslag	Bevolking (minimum vlak)	Basiese Menslike Behoeftes (Mm³/a)	Grondwaterkomponent van Basisvloei (Mm³/a)	Totale Reserwe (Mm³/a)	Grondwatergebruik (Mm³/a)	Allokeerbare Grondwater Totaal (Mm³/a)
C22H	454	639	9.35	3.2	282162	2.57	3.89	6.46	0.07	2.82
C22J	669	633	15.25	3.6	14856	0.14	5.62	5.76	0.24	9.25
C22K	434	644	18.27	6.5	58152	0.53	3.91	4.44	0.34	13.49
C23A	258	612	7.39	4.7	1028	0.01	1.64	1.65	0.12	5.62
C23B	701	619	27.63	6.4	2152	0.02	4.54	4.56	0.40	22.67
C23C	1069	609	23.13	3.6	42653	0.39	6.27	6.66	0.60	15.87
C23D	510	664	25.79	7.6	99677	0.91	10.49	11.40	4.93	9.46
C23E	850	631	35.84	6.7	64933	0.59	15.97	11.93	34.23	0.00
C23F	1324	605	47.38	5.9	2373	0.01	22.97	15.89	0.28	31.21
C23G	613	597	27.18	7.4	1605	0.01	10.44	10.45	2.32	14.41
C23H	451	604	12.43	4.6	8385	0.08	7.69	7.77	0.27	4.39
C23J	890	620	19.05	3.5	25528	0.23	4.65	4.88	0.63	13.54
C23K	396	607	10.76	4.5	1605	0.01	1.97	1.98	0.26	8.52
C23L	1211	612	24.44	3.3	40749	0.37	6.10	17.07	0.73	6.64
C81A	382	882	22.72	6.7	323	0.00	3.52	3.52	0.05	19.15
C81B	576	763	26.44	6.0	1374	0.01	4.51	4.52	0.08	21.84
C81C	250	730	9.88	5.4	230	0.00	1.96	1.96	0.03	7.89
C81D	195	735	8.31	5.8	216	0.00	1.53	1.53	0.03	6.75
C81E	642	658	22.34	5.3	21029	0.19	4.61	4.80	0.10	17.44
C81F	688	892	46.15	7.5	236987	2.16	8.17	10.33	0.35	35.47
C81G	435	722	19.86	6.3	3855	0.04	4.25	4.29	0.09	15.48
C81H	358	638	12.37	5.4	1227	0.01	2.52	2.53	0.04	9.80
C81J	392	612	12.88	5.4	1496	0.01	2.51	2.52	0.06	10.30
C81K	359	623	12.34	5.5	793	0.01	2.34	2.35	0.05	9.94
C81L	793	740	35.97	6.1	689	0.01	6.18	6.19	0.11	29.67
C81M	1092	662	38.82	5.4	2936	0.03	7.82	7.85	0.16	30.81
C82A	582	670	21.75	5.6	1303	0.01	4.18	4.19	0.08	17.48
C82B	493	660	16.88	5.2	4736	0.04	3.48	3.52	0.07	13.29
C82C	353	646	12.39	5.4	978	0.01	2.42	2.43	0.07	9.89
C82D	572	623	19.50	5.5	1849	0.02	3.78	3.80	0.16	15.54
C82E	622	666	20.73	5.0	1725	0.02	4.37	4.39	0.04	16.30
C82F	483	639	14.02	4.5	827	0.01	3.25	3.26	0.01	10.75
C82G	580	655	18.14	4.8	1086	0.01	3.99	4.00	0.09	14.05
C82H	782	614	20.70	4.3	1537	0.01	4.89	4.90	0.19	15.61
C83A	746	692	31.27	6.1	3635	0.03	7.04	7.07	0.07	24.13
C83B	251	668	9.95	5.9	2141	0.02	2.27	2.29	0.03	7.63
C83C	828	663	30.60	5.6	39056	0.36	7.16	7.52	0.10	22.98
C83D	465	650	17.05	5.6	1761	0.02	4.04	4.06	0.05	12.94
C83E	426	654	15.46	5.6	1918	0.02	3.61	3.63	0.11	11.72
C83F	875	637	32.35	5.8	2266	0.02	5.72	5.74	11.23	15.38
C83G	695	647	24.23	5.4	14040	0.13	4.69	4.82	0.21	19.20
C83H	547	646	16.23	4.6	4173	0.04	3.50	3.54	0.24	12.45
C83J	222	641	6.68	4.7	18257	0.17	1.38	1.55	0.11	5.02
C83K	548	635	16.63	4.8	943	0.01	2.66	2.67	0.24	13.72
C83L	825	641	23.21	4.4	2014	0.02	3.96	3.98	0.05	19.18
C83M	1100	639	31.72	4.5	9691	0.09	5.14	5.23	0.39	26.10
MIDDEL VAAL-OPVANGGEBIED										
C24A	839	582.6	18.6	4.18	5 017	0.1	3.94	4.04	0.3	14.26

A	B	C	D	E	F	G	H	I	J	K
Kwartêr Opvanggebied	Area (km²)	Gemiddelde Jaarlikse Neerslag (mm)	Hervulling (Mm³/a)	% Gemiddelde Jaarlikse Neerslag	Bevolking (minimum vlak)	Basiese Menslike Behoeftes (Mm³/a)	Grondwaterkomponent van Basisvloei (Mm³/a)	Totale Reserwe (Mm³/a)	Grondwatergebruik (Mm³/a)	Allokeerbare Grondwater Totaal (Mm³/a)
C24B	530	561.0	16.31	5.49	31 256	0.29	2.28	2.57	5.1	8.64
C24C	1350	586.9	96.98	12.24	25 663	0.23	21.55	21.8	14.9	60.30
C24D	364	584.3	3.99	1.88	3 079	0.03	1.70	1.73	0.2	2.06
C24E	925	560.0	21.87	6.23	51389	0.47	3.75	4.22	7.51	10.14
C24F	2020	577.5	55.91	5.52	29827	0.27	8.86	9.13	1.30	45.48
C24G	985	581.6	11.75	2.05	20 852	0.19	4.42	4.61	0.3	6.84
C24H	840	574.9	10.81	2.24	5 225	0.05	0.74	0.79	1.4	8.62
C24J	2109	550.9	22.31	1.88	17403	0.16	1.62	1.78	0.80	19.73
C25A	863	542.8	12.49	2.67	2 998	0.03	0.67	0.70	0.5	11.29
C25B	1888	510.0	18.16	1.89	63 942	0.58	1.19	1.77	0.6	15.79
C25C	1210	523.0	7.02	1.84	5004	0.09	0.83	0.92	0.80	5.30
C25D	1202	526.1	8.74	1.21	60167	0.67	0.85	1.52	0.60	6.62
C25E	1536	510.7	8.3	1.01	10597	0.11	0.98	1.09	1.90	5.34
C25F	2218	481.9	10.48	0.96	3706	0.06	1.14	1.20	0.60	8.68
C41A	1078	598.2	9.04	1.41	54136	0.74	5.24	5.98	1.10	1.96
C41B	1005	598.2	9.51	1.58	20033	0.27	4.89	5.16	0.40	3.95
C41C	1095	594.7	10.09	1.55	21 292	0.19	5.28	5.47	0.3	4.32
C41D	1155	549.5	4.94	0.78	29 024	0.26	4.87	5.13	0.3	0.00
C41E	391	519.0	0.62	0.30	2 629	0.02	1.28	1.30	0.1	0.00
C41F	556	494.9	0.56	0.20	8 630	0.08	1.54	1.62	0.2	0.00
C41G	272	516.8	0.29	0.21	130.00	0.00	0.64	0.64	0.1	0.00
C41H	887	499.2	2.32	0.52	8 669	0.08	2.24	2.32	0.2	0.00
C41J	556	494.6	2.16	0.79	11 390	0.10	1.38	1.48	0.1	0.58
C42A	695	632.0	8.77	2.00	5 110	0.05	6.08	6.13	0.3	2.34
C42B	727	581.0	5.10	1.21	1 903	0.02	5.21	5.23	0.3	0.00
C42C	793	625.6	6.27	1.26	8 731	0.08	6.75	6.83	0.3	0.00
C42D	663	555.5	1.71	0.46	21 992	0.20	4.20	4.40	0.3	0.00
C42E	750	564.0	2.93	0.69	6 150	0.06	4.99	5.05	0.3	0.00
C42F	734	568.2	1.42	0.34	39 809	0.36	4.91	5.27	0.2	0.00
C42G	555	550.4	0.82	0.27	6 876	0.06	3.43	3.49	0.2	0.00
C42H	445	541.1	0.53	0.22	41 319	0.38	2.62	3.00	1.1	0.00
C42J	1014	530.8	1.99	0.37	12 391	0.11	5.69	5.80	0.4	0.00
C42K	668	522.1	0.67	0.19	587.00	0.01	3.59	3.60	0.9	0.00
C42L	511	505.2	0.96	0.37	1 182	0.01	2.33	2.34	0.1	0.00
C43A	1491	482.2	3.37	0.47	26 707	0.24	0.37	0.61	0.3	2.46
C43B	723	494.0	1.26	0.35	1 854	0.02	0.20	0.22	0.2	0.84
C43C	913	469.0	3.17	0.74	9 364	0.09	0.20	0.29	0.3	2.58
C43D	1475	464.0	3.95	0.58	24 645	0.22	0.31	0.53	0.4	3.02
C60A	859	632.8	10.01	1.84	2 340	0.02	5.74	5.76	0.2	4.05
C60B	1022	617.8	10.11	1.60	10 790	0.10	6.52	6.62	0.5	2.99
C60C	1047	578.4	5.51	0.91	8 469	0.08	5.69	5.77	0.4	0.00
C60D	645	552.7	2.53	0.71	2 567	0.02	3.05	3.07	0.2	0.00
C60E	664	563.9	2.76	0.74	7 788	0.07	3.50	3.57	0.6	0.00
C60F	659	558.2	1.94	0.53	96 217	0.88	3.23	4.11	0.2	0.00
C60G	782	539.2	2.28	0.54	1 300	0.01	3.45	3.46	2.1	0.00
C60H	1232	514.8	2.69	0.42	6 274	0.06	0.26	0.32	0.3	2.07
C60J	959	550.6	10.02	1.90	6 169	0.06	0.28	0.34	0.8	8.88
C70A	613	628.1	7.02	1.82	2 218	0.02	4.71	4.73	0.5	1.79

A	B	C	D	E	F	G	H	I	J	K
Kwartêr Opvanggebied	Area (km²)	Gemiddelde Jaarlikse Neerslag (mm)	Hervulling (Mm³/a)	% Gemiddelde Jaarlikse Neerslag	Bevolking (minimum vlak)	Basiese Menslike Behoeftes (Mm³/a)	Grondwaterkomponent van Basisvloei (Mm³/a)	Totale Reserwe (Mm³/a)	Grondwatergebruik (Mm³/a)	Allokeerbare Grondwater Totaal (Mm³/a)
C70B	660	612.6	4.74	1.17	6 715	0.06	4.70	4.76	0.4	0.00
C70C	887	616.0	5.92	1.08	4 114	0.04	6.28	6.32	0.4	0.00
C70D	675	586.6	3.82	0.96	2 012	0.02	4.20	4.22	0.6	0.00
C70E	693	580.4	7.67	1.91	13 034	0.12	4.16	4.28	0.2	3.19
C70F	564	576.4	4.95	1.52	2 141	0.02	3.34	3.36	0.2	1.39
C70G	901	579.1	7.15	1.37	2 745	0.03	5.34	5.37	0.3	1.48
C70H	251	570.4	1.92	1.34	3 081	0.03	1.43	1.46	0.1	0.36
C70J	521	577.3	6.45	2.14	3 602	0.03	3.05	3.08	0.2	3.17
C70K	891	567.4	9.39	1.86	3 050	0.03	4.92	4.95	0.7	3.74
LAER VAAL-OPVANGGEBIED										
C31A	1402	330.00	32.68	7.00	28400	0.71	5.55	6.26	0.77	25.65
C31B	1743	230.00	20.59	5.00	4400	0.11	11.07	11.18	1.15	8.26
C31C	1635	280.00	21.79	5.00	800	0.02	9.33	9.35	1.45	10.99
C31D	1493	300.00	22.95	5.00	30400	0.76	5.55	6.31	0.57	16.07
C31E	2958	270.00	37.91	5.00	65600	1.64	20.31	21.95	2.33	13.64
C31F	1787	205.00	12.92	3.00	63600	1.59	9.92	11.51	1.41	0.00
C32A	1403	165.00	8.62	3.50	25200	0.63	6.91	7.54	1.08	0.00
C32B	2997	225.00	31.22	5.00	123200	3.08	25.63	28.71	2.52	0.00
C32C	1657	245.00	15.24	3.50	<1000	0.00	9.69	9.69	0.79	4.76
C32D	4134	240.00	60.26	6.00	40000	1.00	16.63	17.63	3.26	39.37
C33A	2855	245.00	35.29	5.00	57600	1.44	10.69	12.13	1.06	22.10
C33B	2830	230.00	36.55	5.00	17600	0.44	6.58	7.02	0.83	28.70
C33C	4141	190.00	35.06	4.50	2400	0.06	11.44	11.50	0.97	22.59
C91A	2545	170.00	16.81	3.50	11200	0.28	7.86	8.14	0.77	7.90
C91B	4675	270.00	59.66	4.50	2800	0.07	21.89	21.96	1.11	36.59
C91C	3133	240.00	33.55	4.00	10400	0.26	7.18	7.44	0.18	25.93
C91D	2694	265.00	27.83	4.00	22000	0.55	3.55	4.10	0.46	23.27
C91E	1506	190.00	9.32	3.00	36400	0.91	3.16	4.07	0.42	4.83
C92A	3913	180.00	27.50	4.00	24000	0.60	9.80	10.40	0.88	16.22
C92B (68%)[1]	1341	190.00	9.00	3.50	<1000	0.00	5.63	5.63	0.32	3.15
C92C (67%)[1]	1332	185.00	10.00	4.00	6600	0.17	5.38	5.55	0.65	3.90
D-Opvanggebied	Grondwaterklassifikasie en hulpbrongehalte doelwitte nie onderneem nie									

Gw = Grondwater.
[1] Slegs die boonste gedeeltes (aangedui as persentasies van die totale kwartêr opvanggebied) val binne die Laer Vaal-waterbestuursarea.

Ligte grys geskandeerde rye: Kwartêr Opvanggebiede wat ten minste 25% dolomiet watergebiede bevat (m.a.w. belangrike waterdraerstelsels).

GRONDWATER RESERWE – WATERGEHALTE KOMPONENT

Die grondwatergehalte van kwartêr opvanggebiede met beskikbare hidroskeikunde-data is geassesseer teen die plaaslike waterteiken- watergehaltereekse soos gewys in Tabel 6.2 en Tabel 6.3. 'n Opsomming van die uitslae vir die grondwatergehalteklassifikasie by kwartêr vlak in terme van die basiese menslike behoefte vereiste word ingesluit in the tabelle wat volg (Tabelle 6.4 – 6.72).

Tabel 6.2: **Chemiese watergehalte**

Chemiese Parameter	Watergehaltereekse[1]				
	Eeenhede	**Klas 0**	**Klas I**	**Klas II**	**Klas III**
Kalsium as Ca	mg/ℓ	0 - 80	80 - 150	150 - 300	> 300
Magnesium as Mg	mg/ℓ	0 - 30	30 - 70	70 - 100	> 100
Kalium as K	mg/ℓ	0 - 25	25 - 50	50 - 100	> 100
Natrium as Na	mg/ℓ	0 - 100	100 - 200	200 - 400	> 400
Chloried as Cℓ	mg/ℓ	0 - 100	100 - 200	200 - 600	> 600
Vitrioel as SO_4	mg/ℓ	0 - 200	200 - 400	400 - 600	> 600
Nitraat as NO_{x-} N	mg/ℓ	0 - 6	6 - 10	10 - 20	> 20
Fluoried as F	mg/ℓ	< 0.7	0.7 - 1.0	1.0 - 1.5	> 1.5
Totale hardheid as $CaCO_3$*	mg/ℓ	0 - 200	200 - 300	300 - 600	> 600

1) Verwysing: Klassifikasiestelsel in terme van - Waternavorsingskommissie: Gahalte van Huishoudelike Watervoorsiening – Volume 1. Verslagnr. TT 101/98, Tweede Uitgawe, 1998.
2) * Vir opvanggebiede waar die hidrochemie slegs vir die chemiese parameter totale hardheid is, vertoon verhewe konsentrasies weens natuurlike toestande, die watergehalte word hoër as een klasreeks gekategoriseer aangesien geen menslike gesondheidsimpakte bekend is om te gebeur nie. Gevolglike impakte hou verband met skalering van huishoudelike instrumente.

Tabel 6.3: **Fisiese watergehalte**

Fisiese Parameter	Watergehaltereekse[2]				
	Eenhede	**Klas 0**	**Klas I**	**Klas II**	**Klas III**
pH (pH-eenhede)		6 - 9	5 - 6 & 9 - 9.5	4.5 – 5 & 9.5 - 10	< 4 or > 10
Totale Opgeloste Vaste Kos	mg/ℓ	0 - 450	450 - 1000	1000 - 2400	> 2400
Elektriese geleidingsvermoë	mS/m	0 - 70	70 - 150	150 - 370	> 370

3) Verwysing: Klassifikasiestelsel in terme van - Waternavorsingskommissie: Gahalte van Huishoudelike Watervoorsiening – Volume 1. Verslagnr. TT 101/98, Tweede Uitgawe, 1998.

Die watergehalte vir die volgende kwartêr opvanggebiede is nie geassesseer nie weens ongenoegsame inligting (gebrek aan verteenwoordigbare grondwatergehaltedata):

- C11A; C11B; C11C; C11D; C11E; C11F; C11G; C11J; C11K; C11L; C11M
- C12A; C12B; C12C; C12E; C12F; C12G; C12H; C12J; C12K; C12L
- C13A; C13B; C13C; C13D; C13E; C13F; C13G
- C21A; C21B
- C22G, C22K
- C23A; C23C
- C25D
- C41B; C41C; C41E; C41F; C41G; C41H; C41J
- C42A; C42B; C42C; C42D; C42E; C42F; C42G; C42H; C42J; C42K; C42L
- C43C; C43D
- C60A; C60B; C60C; C60D; C60F; C60G; C60H; C60J
- C70A; C70B; C70C; C70E; C70F; C70G; C70H; C70J; C70K

- C81A; C81B; C81C; C81D; C81E; C81G; C81H; C81J; C81K; C81L; C81M
- C82A; C82C; C82D; C82E; C82F; C82G
- C83A; C83C; C83D; C83E; C83F; C83G; C83H; C83JC83K; C83L; C83M

Tabel 6.4: Grondwatergehalte Reserwe – Kwartêr opvanggebied C11H

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: *C11H			
		[A]	[B]	[C]	[D]
		Aantel monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		37	8.20	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	37	79.70	<150	88
Kalsium as Ca	mg/ℓ	37	78.65	<150	87
Magnesium as Mg	mg/ℓ	37	36.28	<70	39
Natrium as Na	mg/ℓ	37	48.76	<200	54
Atrium as K	mg/ℓ	37	4.24	<50	4.7
Totale hardheid as $CaCO_3$	mg/ℓ	37	345.8	<300	380
Chloried as Cl	mg/ℓ	37	32.32	<200	36
Vitrioel as SO_4	mg/ℓ	37	61.58	<400	68
Nitraat as NO_x-N	mg/ℓ	37	4.75	<10	5.2
Fluoried as F	mg/ℓ	37	0.35	<1.0	0.39
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2de Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
* Dui aan dat slegs na-1995 hidrochemiese datastelle vir die spesifieke kwartêr-opvanggebied gebruik is.

Tabel 6.5: Grondwatergehalte Reserwe – Kwartêr opvanggebied C12D

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: *C12D			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		34	8.13	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	34	89.25	<150	98
Kalsium as Ca	mg/ℓ	34	84.75	<150	93
Magnesium as Mg	mg/ℓ	34	48.91	<70	54
Natrium as Na	mg/ℓ	34	29.33	<200	32
Atrium as K	mg/ℓ	34	8.34	<50	9
Totale hardheid as $CaCO_3$	mg/ℓ	34	413	<300	454
Chloried as Cl	mg/ℓ	34	44.61	<200	49
Vitrioel as SO_4	mg/ℓ	34	96.36	<400	106
Nitraat as NO_x-N	mg/ℓ	34	3.63	<10	4
Fluoried as F	mg/ℓ	34	0.28	<1.0	0.3
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2de Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
* Dui aan dat slegs na-1995 hidrochemiese datastelle vir die spesifieke kwartêr-opvanggebied gebruik is.

Tabel 6.6: Grondwatergehalte Reserwe – Kwartêr opvanggebied C21C

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C21C			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		67	7.65	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	67	57.20	<150	63
Kalsium as Ca	mg/ℓ	67	40.10	<150	44
Magnesium as Mg	mg/ℓ	67	19.40	<70	21
Natrium as Na	mg/ℓ	67	39.10	<200	43
Atrium as K	mg/ℓ	67	4.98	<50	5
Totale hardheid as $CaCO_3$	mg/ℓ	67	180	<300	198
Chloried as Cl	mg/ℓ	67	43.40	<200	48
Vitrioel as SO_4	mg/ℓ	67	31.60	<400	35
Nitraat as NO_x-N	mg/ℓ	67	0.10	<10	0.11
Fluoried as F	mg/ℓ	67	0.71	<1.0	0.78
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2de Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).

Table 6.7: Grondwatergehalte Reserwe – Kwartêr opvanggebied C21D

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C21D♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		17	7.37	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	17	27.50	<150	30
Kalsium as Ca	mg/ℓ	17	19.10	<150	21
Magnesium as Mg	mg/ℓ	17	11	<70	12
Natrium as Na	mg/ℓ	17	13.40	<200	15
Atrium as K	mg/ℓ	17	2.20	<50	2.4
Totale hardheid as $CaCO_3$	mg/ℓ	17	101.60	<300	112
Chloried as Cl	mg/ℓ	17	8.50	<200	9
Vitrioel as SO_4	mg/ℓ	17	6.10	<400	7
Nitraat as NO_x-N	mg/ℓ	17	0.23	<10	0.25
Fluoried as F	mg/ℓ	17	0.12	<1.0	0.13
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2de Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Tabel 6.8: Grondwatergehalte Reserwe – Kwartêr opvanggebied C21E

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C21E♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		11	7.52	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	11	51.90	<150	57
Kalsium as Ca	mg/ℓ	11	39.70	<150	44
Magnesium as Mg	mg/ℓ	11	20.90	<70	23
Natrium as Na	mg/ℓ	11	26.00	<200	29
Atrium as K	mg/ℓ	11	10.43	<50	11
Totale hardheid as $CaCO_3$	mg/ℓ	11	185.2	<300	203
Chloried as Cl	mg/ℓ	11	29.50	<200	32
Vitrioel as SO_4	mg/ℓ	11	32.30	<400	36
Nitraat as NO_x-N	mg/ℓ	11	1.73	<10	1.9
Fluoried as F	mg/ℓ	11	0.17	<1.0	0.19
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2de Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Tabel 6.9: Grondwatergehalte Reserwe – Kwartêr opvanggebied C21F

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: *C21F			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		31	7.92	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	31	41.80	<150	46
Kalsium as Ca	mg/ℓ	31	39.34	<150	43
Magnesium as Mg	mg/ℓ	31	19.71	<70	22
Natrium as Na	mg/ℓ	31	10.72	<200	12
Atrium as K	mg/ℓ	31	0.50	<50	1
Totale hardheid as $CaCO_3$	mg/ℓ	31	179.5	<300	198
Chloried as Cl	mg/ℓ	31	25.60	<200	28
Vitrioel as SO_4	mg/ℓ	31	12.87	<400	14
Nitraat as NO_x-N	mg/ℓ	31	2.88	<10	3.21
Fluoried as F	mg/ℓ	31	0.13	<1.0	0.15
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2de Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
* Dui aan dat slegs na-1995 hidrochemiese datastelle vir die spesifieke kwartêr-opvanggebied gebruik is.

CONTINUES ON PAGE 130 - PART 2

Government Gazette
Staatskoerant

REPUBLIC OF SOUTH AFRICA
REPUBLIEK VAN SUID AFRIKA

Vol. 663 | 25 September / September 2020 | No. 43734

PART 2 OF 3

ISSN 1682-5843

43734

9 771682 584003

Tabel 6.10: Grondwatergehalte Reserwe – Kwartêr opvanggebied C21G

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C21G♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		15	7.58	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	15	48.30	<150	53
Kalsium as Ca	mg/ℓ	15	32	<150	35
Magnesium as Mg	mg/ℓ	15	20.80	<70	23
Natrium as Na	mg/ℓ	15	23.80	<200	26
Atrium as K	mg/ℓ	15	3.23	<50	4
Totale hardheid as $CaCO_3$	mg/ℓ	15	165.6	<300	182
Chloried as Cl	mg/ℓ	15	12.409	<200	14
Vitrioel as SO_4	mg/ℓ	15	12.40	<400	14
Nitraat as NO_x-N	mg/ℓ	15	1.52	<10	2
Fluoried as F	mg/ℓ	15	0.21	<1.0	0.23
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Table 6.11: Grondwatergehalte Reserwe – Kwartêr opvanggebied C22A

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C22A			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		45	8.00	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	45	46.5	<150	51
Kalsium as Ca	mg/ℓ	45	38.6	<150	43
Magnesium as Mg	mg/ℓ	45	29.0	<70	32
Natrium as Na	mg/ℓ	45	8.00	<200	8.8
Atrium as K	mg/ℓ	45	0.96	<50	1.1
Totale hardheid as $CaCO_3$	mg/ℓ	45	215.8	<300	237
Chloried as Cl	mg/ℓ	45	5.8	<200	6.4
Vitrioel as SO_4	mg/ℓ	45	90.0	<400	99
Nitraat as NO_x-N	mg/ℓ	45	4.07	<10	4.5
Fluoried as F	mg/ℓ	45	0.10	<1.0	0.11
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).

Table 6.12: Grondwatergehalte Reserwe – Kwartêr opvanggebied C22B

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C22B♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		53	7.70	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	53	134.10	<150	148
Kalsium as Ca	mg/ℓ	53	106.45	<150	117
Magnesium as Mg	mg/ℓ	53	58.70	<70	65
Natrium as Na	mg/ℓ	53	46.25	<200	51
Atrium as K	mg/ℓ	53	3.75	<50	4
Totale hardheid as $CaCO_3$	mg/ℓ	53	507.5	<300	558
Chloried as Cl	mg/ℓ	53	55.10	<200	61
Vitrioel as SO_4	mg/ℓ	53	308.70	<400	340
Nitraat as NO_x-N	mg/ℓ	53	2.40	<10	2.6
Fluoried as F	mg/ℓ	53	0.15	<1.0	0.17
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Table 6.13: Grondwatergehalte Reserwe – Kwartêr opvanggebied C22C

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C22C			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		123	7.79	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	123	57	<150	63
Kalsium as Ca	mg/ℓ	123	44.0	<150	50
Magnesium as Mg	mg/ℓ	123	32.0	<70	35
Natrium as Na	mg/ℓ	123	14.8	<200	16
Atrium as K	mg/ℓ	123	1.84	<50	2
Totale hardheid as $CaCO_3$	mg/ℓ	123	241.6	<300	266
Chloried as Cl	mg/ℓ	123	16.8	<200	19
Vitrioel as SO_4	mg/ℓ	123	23.2	<400	26
Nitraat as NO_x-N	mg/ℓ	123	2.38	<10	2.6
Fluoried as F	mg/ℓ	123	0.10	<1.0	0.11
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).

Table 6.14: Grondwatergehalte Reserwe – Kwartêr opvanggebied C22D

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C22D♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		182	7.60	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	182	38.15	<150	42
Kalsium as Ca	mg/ℓ	182	35.90	<150	39
Magnesium as Mg	mg/ℓ	182	22.85	<70	25
Natrium as Na	mg/ℓ	182	6.30	<200	7
Atrium as K	mg/ℓ	182	0.84	<50	1
Totale hardheid as $CaCO_3$	mg/ℓ	182	182	<300	200
Chloried as Cl	mg/ℓ	182	6.25	<200	7
Vitrioel as SO_4	mg/ℓ	182	9	<400	10
Nitraat as NO_x-N	mg/ℓ	182	1.20	<10	1.3
Fluoried as F	mg/ℓ	182	0.10	<1.0	0.11
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Tabel 6.15: Grondwatergehalte Reserwe – Kwartêr opvanggebied C22E

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C22E♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		181	7.68	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	181	38.70	<150	43
Kalsium as Ca	mg/ℓ	181	33.80	<150	37
Magnesium as Mg	mg/ℓ	181	22.90	<70	25
Natrium as Na	mg/ℓ	181	10.10	<200	11
Atrium as K	mg/ℓ	181	0.94	<50	1
Totale hardheid as $CaCO_3$	mg/ℓ	181	178.70	<300	197
Chloried as Cl	mg/ℓ	181	7.10	<200	8
Vitrioel as SO_4	mg/ℓ	181	9.70	<400	11
Nitraat as NO_x-N	mg/ℓ	181	1.05	<10	1.2
Fluoried as F	mg/ℓ	181	0.13	<1.0	0.14
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Tabel 6.16: Grondwatergehalte Reserwe – Kwartêr opvanggebied C22F

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C22F♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		39	7.60	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mg/ℓ	39	48.30	<150	53
Kalsium as Ca	mg/ℓ	39	42.70	<150	47
Magnesium as Mg	mg/ℓ	39	22.30	<70	25
Natrium as Na	mg/ℓ	39	18	<200	20
Atrium as K	mg/ℓ	39	1.61	<50	2
Totale hardheid as $CaCO_3$	mg/ℓ	39	198.5	<300	218
Chloried as Cl	mg/ℓ	39	14.40	<200	16
Vitrioel as SO_4	mg/ℓ	39	10.30	<400	11
Nitraat as NO_x-N	mg/ℓ	39	0.50	<10	0.55
Fluoried as F	mg/l	39	0.20	<1.0	0.22
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Tabel 6.17: Grondwatergehalte Reserwe – Kwartêr opvanggebied C22H

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C22H♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		30	7.21	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	30	18.30	<150	20
Kalsium as Ca	mg/ℓ	30	14.50	<150	16
Magnesium as Mg	mg/ℓ	30	6	<70	7
Natrium as Na	mg/ℓ	30	7.05	<200	8
Atrium as K	mg/ℓ	30	0.91	<50	1
Totale hardheid as $CaCO_3$	mg/ℓ	30	60.9	<300	67
Chloried as Cl	mg/ℓ	30	4.45	<200	5
Vitrioel as SO_4	mg/ℓ	30	4.70	<400	5
Nitraat as NO_x-N	mg/ℓ	30	0.11	<10	0.12
Fluoried as F	mg/ℓ	30	0.14	<1.0	0.15
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Tabel 6.18: Grondwatergehalte Reserwe – Kwartêr opvanggebied C22J

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C22J♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		30	7.40	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	30	56.10	<150	62
Kalsium as Ca	mg/ℓ	30	47.70	<150	52
Magnesium as Mg	mg/ℓ	30	27.65	<70	30
Natrium as Na	mg/ℓ	30	23.75	<200	26
Atrium as K	mg/ℓ	30	1.17	<50	1.3
Totale hardheid as $CaCO_3$	mg/ℓ	30	233.0	<300	256
Chloried as Cl	mg/ℓ	30	17.35	<200	19
Vitrioel as SO_4	mg/ℓ	30	21.85	<400	24
Nitraat as NO_x-N	mg/ℓ	30	4.29	<10	5
Fluoried as F	mg/ℓ	30	0.21	<1.0	0.23
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2de Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Tabel 6.19: Grondwatergehalte Reserwe – Kwartêr opvanggebied C23B

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C23B♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		16	7.64	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	16	43.10	<150	47
Kalsium as Ca	mg/ℓ	16	31.05	<150	34
Magnesium as Mg	mg/ℓ	16	20.45	<70	23
Natrium as Na	mg/ℓ	16	15.95	<200	18
Atrium as K	mg/ℓ	16	2.37	<50	3
Totale hardheid as $CaCO_3$	mg/ℓ	16	161.7	>300	178
Chloried as Cl	mg/ℓ	16	13.30	<200	15
Vitrioel as SO_4	mg/ℓ	16	10.25	<400	11
Nitraat as NO_x-N	mg/ℓ	16	2.44	<10	3
Fluoried as F	mg/ℓ	16	0.23	<1.0	0.25
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2de Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Table 6.20: Grondwatergehalte Reserwe – Kwartêr opvanggebied C23C

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: *C23C			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		35	7.92	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	35	64.80	<150	71
Kalsium as Ca	mg/ℓ	35	42.45	<150	47
Magnesium as Mg	mg/ℓ	35	27.76	<70	31
Natrium as Na	mg/ℓ	35	53.10	<200	58
Atrium as K	mg/ℓ	35	4.61	<50	5
Totale hardheid as $CaCO_3$	mg/ℓ	35	220.3	<300	242
Chloried as Cl	mg/ℓ	35	24.50	<200	26
Vitrioel as SO_4	mg/ℓ	35	19.40	<400	21
Nitraat as NO_x-N	mg/ℓ	35	4.07	<10	5
Fluoried as F	mg/ℓ	35	0.42	<1.0	0.46
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
* Dui aan dat slegs na-1995 hidrochemiese datastelle vir die spesifieke kwartêr-opvanggebied gebruik is.

Table 6.21: Grondwatergehalte Reserwe – Kwartêr opvanggebied C23D

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C23D♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		74	7.08	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	74	20.40	<150	22
Kalsium as Ca	mg/ℓ	74	16	<150	18
Magnesium as Mg	mg/ℓ	74	10.70	<70	12
Natrium as Na	mg/ℓ	74	3.80	<200	4
Atrium as K	mg/ℓ	74	0.78	<50	1
Totale hardheid as $CaCO_3$	mg/ℓ	74	84.0	<300	92
Chloried as Cl	mg/ℓ	74	2.25	<200	2.5
Vitrioel as SO_4	mg/ℓ	74	12.90	<400	14
Nitraat as NO_x-N	mg/ℓ	74	0.53	<10	1
Fluoried as F	mg/ℓ	74	0.05	<1.0	0.06
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Table 6.22: Grondwatergehalte Reserwe – Kwartêr opvanggebied C23E

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C23E♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		34	7.56	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	34	50.4	<150	55
Kalsium as Ca	mg/ℓ	34	51.1	<150	56
Magnesium as Mg	mg/ℓ	34	33.7	<70	37
Natrium as Na	mg/ℓ	34	9.9	<200	11
Atrium as K	mg/ℓ	34	1.29	<50	1.4
Totale hardheid as $CaCO_3$	mg/ℓ	34	266.4	<300	293
Chloried as Cl	mg/ℓ	34	5.15	<200	6
Vitrioel as SO_4	mg/ℓ	34	24.6	<400	27
Nitraat as NO_x-N	mg/ℓ	34	1.96	<10	2
Fluoried as F	mg/ℓ	34	0.05	<1.0	0.06
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Table 6.23: Grondwatergehalte Reserwe – Kwartêr opvanggebied C23F

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C23F♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		14	7.72	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	14	31.20	<150	34
Kalsium as Ca	mg/ℓ	14	30.90	<150	34
Magnesium as Mg	mg/ℓ	14	16.75	<70	18
Natrium as Na	mg/ℓ	14	3.40	<200	4
Atrium as K	mg/ℓ	14	0.90	<50	1
Totale hardheid as $CaCO_3$	mg/ℓ	14	146.1	<300	161
Chloried as Cl	mg/ℓ	14	3.35	<200	3.7
Vitrioel as SO_4	mg/ℓ	14	2	<400	2.2
Nitraat as NO_x-N	mg/ℓ	14	1	<10	1.1
Fluoried as F	mg/ℓ	14	0.12	<1.0	0.13
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Table 6.24: Grondwatergehalte Reserwe – Kwartêr opvanggebied C23G

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C23G♣			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		196	7.78	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	196	88.95	<150	98
Kalsium as Ca	mg/ℓ	196	79.95	<150	88
Magnesium as Mg	mg/ℓ	196	44.55	<70	49
Natrium as Na	mg/ℓ	196	44.35	<200	48
Atrium as K	mg/ℓ	196	1.88	<50	2
Totale hardheid as $CaCO_3$	mg/ℓ	196	383.1	<300	421
Chloried as Cl	mg/ℓ	196	45.40	<200	50
Vitrioel as SO_4	mg/ℓ	196	228.05	<400	251
Nitraat as NO_x-N	mg/ℓ	196	2.11	<10	2.3
Fluoried as F	mg/ℓ	196	0.11	<1.0	0.12
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♣ Gebaseer op langtermyn hidroskeikunde-datastel vanaf slegs een moniteringsterrein (veer/oog) in die kwartêr opvanggebied

Table 6.25: Grondwatergehalte Reserwe – Kwartêr opvanggebied C23H

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C23H			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		19	7.91	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	19	43.70	<150	48
Kalsium as Ca	mg/ℓ	19	44	<150	48
Magnesium as Mg	mg/ℓ	19	24.60	<70	27
Natrium as Na	mg/ℓ	19	11.40	<200	13
Atrium as K	mg/ℓ	19	1.14	<50	1.25
Totale hardheid as $CaCO_3$	mg/ℓ	19	211.3	<300	232
Chloried as Cl	mg/ℓ	19	7.20	<200	8
Vitrioel as SO_4	mg/ℓ	19	5.20	<400	6
Nitraat as NO_x-N	mg/ℓ	19	3.11	<10	3.4
Fluoried as F	mg/ℓ	19	0.13	<1.0	0.14
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).

Table 6.26: Grondwatergehalte Reserwe – Kwartêr opvanggebied C23J

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C23J♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		20	7.73	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	20	44.2	<150	49
Kalsium as Ca	mg/ℓ	20	28.3	<150	31
Magnesium as Mg	mg/ℓ	20	31.0	<70	34
Natrium as Na	mg/ℓ	20	14.3	<200	16
Atrium as K	mg/ℓ	20	1.50	<50	1.65
Totale hardheid as $CaCO_3$	mg/ℓ	20	198.3	<300	218
Chloried as Cl	mg/ℓ	20	8.40	<200	9.0
Vitrioel as SO_4	mg/ℓ	20	7.45	<400	8.20
Nitraat as NO_x-N	mg/ℓ	20	0.79	<10	0.87
Fluoried as F	mg/ℓ	20	0.22	<1.0	0.24
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Tabel 6.27: Grondwatergehalte Reserwe – Kwartêr opvanggebied C23K

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C23K♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		9	7.76	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	9	39.50	<150	43
Kalsium as Ca	mg/ℓ	9	44.50	<150	49
Magnesium as Mg	mg/ℓ	9	19.20	<70	21
Natrium as Na	mg/ℓ	9	15.70	<200	17
Atrium as K	mg/ℓ	9	1.07	<50	1.1
Totale hardheid as $CaCO_3$	mg/ℓ	9	190.2	<300	209
Chloried as Cl	mg/ℓ	9	6.10	<200	7
Vitrioel as SO_4	mg/ℓ	9	4	<400	4.5
Nitraat as NO_x-N	mg/ℓ	9	2.32	<10	3
Fluoried as F	mg/ℓ	9	0.18	<1.0	0.2
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Table 6.28: Grondwatergehalte Reserwe – Kwartêr opvanggebied C23L

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C23L♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		26	7.20	9.5 – 5.0 ($\pm$0.05)	9.5 – 5.0 ($\pm$0.05)
Elektriese geleidingsvermoë	mS/m	26	34.70	<150	38
Kalsium as Ca	mg/ℓ	26	33.55	<150	37
Magnesium as Mg	mg/ℓ	26	16.80	<70	18
Natrium as Na	mg/ℓ	26	10.25	<200	11
Atrium as K	mg/ℓ	26	1.47	<50	2
Totale hardheid as $CaCO_3$	mg/ℓ	26	153	<300	168
Chloried as Cl	mg/ℓ	26	5.90	<200	6
Vitrioel as SO_4	mg/ℓ	26	2	<400	2.2
Nitraat as NO_x-N	mg/ℓ	26	0.87	<10	1
Fluoried as F	mg/ℓ	26	0.13	<1.0	0.14
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2de Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Tabel 6.29 Grondwatergehalte Reserwe – Kwartêr opvanggebied C24A

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C24A			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		112	7.40	9.5 – 5.0 ($\pm$0.05)	9.5 – 5.0 ($\pm$0.05)
Elektriese geleidingsvermoë	mS/m	112	108.05	<150	119
Kalsium as Ca	mg/ℓ	112	89.95	<150	99
Magnesium as Mg	mg/ℓ	112	74.30	<70	82
Natrium as Na	mg/ℓ	112	70.35	<200	77
Atrium as K	mg/ℓ	112	7.74	<50	9
Totale hardheid as $CaCO_3$	mg/ℓ	112	529.3	<300	582
Chloried as Cl	mg/ℓ	112	67.05	<200	74
Vitrioel as SO_4	mg/ℓ	112	323.45	<400	356
Nitraat as NO_x-N	mg/ℓ	112	1.99	<10	2
Fluoried as F	mg/ℓ	112	0.16	<1.0	0.18
				Watergehalteklas	Class 2

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2de Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).

Table 6.30: Grondwatergehalte Reserwe – Kwartêr opvanggebied C24B

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C24B♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		13	7.17	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	13	361.20	<150	397
Kalsium as Ca	mg/ℓ	13	458.60	<150	504
Magnesium as Mg	mg/ℓ	13	225.40	<70	248
Natrium as Na	mg/ℓ	13	118.90	<200	131
Atrium as K	mg/ℓ	13	20.14	<50	22
Totale hardheid as $CaCO_3$	mg/ℓ	13	2073.3	<300	2281
Chloried as Cl	mg/ℓ	13	143.40	<200	158
Vitrioel as SO_4	mg/ℓ	13	2109.90	<400	2321
Nitraat as NO_x-N	mg/ℓ	13	4.82	<10	5.3
Fluoried as F	mg/ℓ	13	0.22	<1.0	0.24
				Watergehalteklas	Class 3

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2de Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Table 6.31: Grondwatergehalte Reserwe – Kwartêr opvanggebied C24C

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C24C			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		161	7.95	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	161	40.70	<150	45
Kalsium as Ca	mg/ℓ	161	34	<150	37
Magnesium as Mg	mg/ℓ	161	29.20	<70	32
Natrium as Na	mg/ℓ	161	4.60	<200	5
Atrium as K	mg/ℓ	161	1.43	<50	2
Totale hardheid as $CaCO_3$	mg/ℓ	161	205.1	<300	226
Chloried as Cl	mg/ℓ	161	5.70	<200	6
Vitrioel as SO_4	mg/ℓ	161	2	<400	2.2
Nitraat as NO_x-N	mg/ℓ	161	1.97	<10	2.2
Fluoried as F	mg/ℓ	161	0.05	<1.0	0.06
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2de Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).

Table 6.32: Grondwatergehalte Reserwe – Kwartêr opvanggebied C24D

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C24D			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		10	7.70	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	10	24.30	<150	27
Kalsium as Ca	mg/ℓ	10	16.95	<150	19
Magnesium as Mg	mg/ℓ	10	10.10	<70	11
Natrium as Na	mg/ℓ	10	13.90	<200	15
Atrium as K	mg/ℓ	10	3.03	<50	3.3
Totale hardheid as $CaCO_3$	mg/ℓ	10	83.9	<300	92
Chloried as Cl	mg/ℓ	10	5.05	<200	6
Vitrioel as SO_4	mg/ℓ	10	7.05	<400	8
Nitraat as NO_x-N	mg/ℓ	10	3.46	<10	3.8
Fluoried as F	mg/ℓ	10	0.13	<1.0	0.15
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2de Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).

Table 6.33: Grondwatergehalte Reserwe – Kwartêr opvanggebied C24E

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C24E			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		48	7.89	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	48	48.80	<150	54
Kalsium as Ca	mg/ℓ	48	35.45	<150	39
Magnesium as Mg	mg/ℓ	48	35.75	<70	39
Natrium as Na	mg/ℓ	48	7.20	<200	8
Atrium as K	mg/ℓ	48	1.37	<50	2
Totale hardheid as $CaCO_3$	mg/ℓ	48	235.7	<300	259
Chloried as Cl	mg/ℓ	48	12.15	<200	13
Vitrioel as SO_4	mg/ℓ	48	2	<400	2.2
Nitraat as NO_x-N	mg/ℓ	48	5.21	<10	6
Fluoried as F	mg/ℓ	48	0.13	<1.0	0.14
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2de Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).

Table 6.34: Grondwatergehalte Reserwe – Kwartêr opvanggebied C24F

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C24F			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		175	7.84	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	175	46.30	<150	51
Kalsium as Ca	mg/ℓ	175	40	<150	44
Magnesium as Mg	mg/ℓ	175	26.90	<70	30
Natrium as Na	mg/ℓ	175	7.70	<200	8
Atrium as K	mg/ℓ	175	1.80	<50	2
Totale hardheid as $CaCO_3$	mg/ℓ	175	211	<300	232
Chloried as Cl	mg/ℓ	175	30.50	<200	34
Vitrioel as SO_4	mg/ℓ	175	2	<400	2.2
Nitraat as NO_x-N	mg/ℓ	175	6.62	<10	7
Fluoried as F	mg/ℓ	175	0.05	<1.0	0.06
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).

Table 6.35: Grondwatergehalte Reserwe – Kwartêr opvanggebied C24G

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C24G			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		23	7.80	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	23	38	<150	42
Kalsium as Ca	mg/ℓ	23	33.70	<150	37
Magnesium as Mg	mg/ℓ	23	15.70	<70	17
Natrium as Na	mg/ℓ	23	14.70	<200	16
Atrium as K	mg/ℓ	23	1.99	<50	2.2
Totale hardheid as $CaCO_3$	mg/ℓ	23	148.8	<300	164
Chloried as Cl	mg/ℓ	23	7.60	<200	8.4
Vitrioel as SO_4	mg/ℓ	23	11.80	<400	13
Nitraat as NO_x-N	mg/ℓ	23	3.21	<10	3.5
Fluoried as F	mg/ℓ	23	0.31	<1.0	0.34
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).

Table 6.36: Grondwatergehalte Reserwe – Kwartêr opvanggebied C24H

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C24H♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		42	7.80	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	42	51.40	<150	57
Kalsium as Ca	mg/ℓ	42	46.10	<150	51
Magnesium as Mg	mg/ℓ	42	25.80	<70	28
Natrium as Na	mg/ℓ	42	14.85	<200	16
Atrium as K	mg/ℓ	42	1.59	<50	1.75
Totale hardheid as $CaCO_3$	mg/ℓ	42	221.4	<300	244
Chloried as Cl	mg/ℓ	42	15.40	<200	17
Vitrioel as SO_4	mg/ℓ	42	11.55	<400	13
Nitraat as NO_x-N	mg/ℓ	42	3.67	<10	4.0
Fluoried as F	mg/ℓ	42	0.27	<1.0	0.29
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Table 6.37: Grondwatergehalte Reserwe – Kwartêr opvanggebied C24J

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C24J			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		22	7.64	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	22	42.60	<150	43
Kalsium as Ca	mg/ℓ	22	36.30	<150	37
Magnesium as Mg	mg/ℓ	22	16.30	<70	17
Natrium as Na	mg/ℓ	22	24.85	<200	26
Atrium as K	mg/ℓ	22	1.06	<50	2
Totale hardheid as $CaCO_3$	mg/ℓ	22	157.3	<300	173.5
Chloried as Cl	mg/ℓ	22	10.45	<200	11
Vitrioel as SO_4	mg/ℓ	22	7.55	<400	8
Nitraat as NO_x-N	mg/ℓ	22	1.62	<10	2
Fluoried as F	mg/ℓ	22	0.22	<1.0	0.24
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).

Table 6.38: Grondwatergehalte Reserwe – Kwartêr opvanggebied C25A

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C25A♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		9	7.84	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	9	53.60	<150	59
Kalsium as Ca	mg/ℓ	9	30	<150	33
Magnesium as Mg	mg/ℓ	9	24.90	<70	27
Natrium as Na	mg/ℓ	9	33.40	<200	37
Atrium as K	mg/ℓ	9	1.37	<50	2
Totale hardheid as $CaCO_3$	mg/ℓ	9	177.4	<300	195
Chloried as Cl	mg/ℓ	9	17	<200	19
Vitrioel as SO_4	mg/ℓ	9	14.20	<400	16
Nitraat as NO_x-N	mg/ℓ	9	3.10	<10	3.4
Fluoried as F	mg/ℓ	9	0.82	<1.0	0.9
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Tabel 6.39: Grondwatergehalte Reserwe – Kwartêr opvanggebied QC C25B

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: *C25B			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		16	8.29	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	16	136.95	<150	151
Kalsium as Ca	mg/ℓ	16	27.32	<150	30
Magnesium as Mg	mg/ℓ	16	15.25	<70	17
Natrium as Na	mg/ℓ	16	267.18	<200	294
Atrium as K	mg/ℓ	16	5.03	<50	6.0
Totale hardheid as $CaCO_3$	mg/ℓ	16	131.0	<300	144
Chloried as Cl	mg/ℓ	16	117.83	<200	130
Vitrioel as SO_4	mg/ℓ	16	33.93	<400	37
Nitraat as NO_x-N	mg/ℓ	16	0.35	<10	0.4
Fluoried as F	mg/ℓ	16	2.38	<1.0	2.62
				Watergehalteklas	Class 3

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
* Dui aan dat slegs na-1995 hidrochemiese datastelle vir die spesifieke kwartêr-opvanggebied gebruik is.

Tabel 6.40: Grondwatergehalte Reserwe – Kwartêr opvanggebied C25C

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C25C			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		28	8.13	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	28	50.45	<150	56
Kalsium as Ca	mg/ℓ	28	46.63	<150	51
Magnesium as Mg	mg/ℓ	28	27.52	<70	30
Natrium as Na	mg/ℓ	28	14.95	<200	16
Atrium as K	mg/ℓ	28	1.93	<50	2
Totale hardheid as $CaCO_3$	mg/ℓ	28	229.8	<300	253
Chloried as Cl	mg/ℓ	28	8.77	<200	10
Vitrioel as SO_4	mg/ℓ	28	4.32	<400	5
Nitraat as NO_x-N	mg/ℓ	28	9.57	<10	11
Fluoried as F	mg/ℓ	28	0.13	<1.0	0.15
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2de Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).

Table 6.41: Grondwatergehalte Reserwe – Kwartêr opvanggebied C25E

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C25E			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		11	7.99	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	11	67.70	<150	74
Kalsium as Ca	mg/ℓ	11	48.30	<150	53
Magnesium as Mg	mg/ℓ	11	20.70	<70	23
Natrium as Na	mg/ℓ	11	19.80	<200	22
Atrium as K	mg/ℓ	11	2.75	<50	3
Totale hardheid as $CaCO_3$	mg/ℓ	11	205.8	<300	226
Chloried as Cl	mg/ℓ	11	17.80	<200	20
Vitrioel as SO_4	mg/ℓ	11	8.90	<400	10
Nitraat as NO_x-N	mg/ℓ	11	13.07	<10	14
Fluoried as F	mg/ℓ	11	0.18	<1.0	0.2
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2de Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).

Table 6.42: Grondwatergehalte Reserwe – Kwartêr opvanggebied C25F

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C25F♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		22	7.75	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	22	27.20	<150	30
Kalsium as Ca	mg/ℓ	22	20.92	<150	23
Magnesium as Mg	mg/ℓ	22	12.30	<70	14
Natrium as Na	mg/ℓ	22	4.10	<200	5
Atrium as K	mg/ℓ	22	1	<50	1.1
Totale hardheid as $CaCO_3$	mg/ℓ	22	102.9	<300	113
Chloried as Cl	mg/ℓ	22	1.50	<200	2
Vitrioel as SO_4	mg/ℓ	22	11.45	<400	13
Nitraat as NO_x-N	mg/ℓ	22	0.84	<10	1.0
Fluoried as F	mg/ℓ	22	0.05	<1.0	0.06
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Table 6.43: Grondwatergehalte Reserwe – Kwartêr opvanggebied KO C31A

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C31A			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		187	7.82	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	187	60.90	<150	67
Kalsium as Ca	mg/ℓ	187	59	<150	65
Magnesium as Mg	mg/ℓ	187	34.30	<70	38
Natrium as Na	mg/ℓ	187	13.10	<200	14
Atrium as K	mg/ℓ	187	2.19	<50	2.4
Totale hardheid as $CaCO_3$	mg/ℓ	187	288.6	<300	317
Chloried as Cl	mg/ℓ	187	27	<200	30
Vitrioel as SO_4	mg/ℓ	187	2	<400	2.2
Nitraat as NO_x-N	mg/ℓ	187	4.96	<10	5.5
Fluoried as F	mg/ℓ	187	0.12	<1.0	0.13
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).

Tabel 6.44: Grondwatergehalte Reserwe – Kwartêr opvanggebied C31B

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C31B♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		69	7.87	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	69	74.80	<150	82
Kalsium as Ca	mg/ℓ	69	80.80	<150	89
Magnesium as Mg	mg/ℓ	69	36.90	<70	41
Natrium as Na	mg/ℓ	69	23.30	<200	26
Atrium as K	mg/ℓ	69	3.10	<50	3.3
Totale hardheid as $CaCO_3$	mg/ℓ	69	353.7	<300	389
Chloried as Cl	mg/ℓ	69	35.70	<200	39
Vitrioel as SO_4	mg/ℓ	69	11.30	<400	12
Nitraat as NO_x-N	mg/ℓ	69	14.05	<10	15
Fluoried as F	mg/ℓ	69	0.23	<1.0	0.25
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Tabel 6.45: Grondwatergehalte Reserwe – Kwartêr opvanggebied C31C

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C31C♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		41	7.61	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	41	42.90	<150	47
Kalsium as Ca	mg/ℓ	41	30.1	<150	33.1
Magnesium as Mg	mg/ℓ	41	18.10	<70	20
Natrium as Na	mg/ℓ	41	24.80	<200	27
Atrium as K	mg/ℓ	41	2.73	<50	3
Totale hardheid as $CaCO_3$	mg/ℓ	41	154.2	<300	169
Chloried as Cl	mg/ℓ	41	11.60	<200	13
Vitrioel as SO_4	mg/ℓ	41	10.10	<400	11
Nitraat as NO_x-N	mg/ℓ	41	9.76	<10	11
Fluoried as F	mg/ℓ	41	0.25	<1.0	0.28
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Table 6.46: Grondwatergehalte Reserwe – Kwartêr opvanggebied C31D

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C31D♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		23	8.05	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	23	83	<150	91
Kalsium as Ca	mg/ℓ	23	83.20	<150	92
Magnesium as Mg	mg/ℓ	23	41.30	<70	45
Natrium as Na	mg/ℓ	23	49.60	<200	55
Atrium as K	mg/ℓ	23	4.43	<50	5
Totale hardheid as $CaCO_3$	mg/ℓ	23	377.8	<300	416
Chloried as Cl	mg/ℓ	23	56.20	<200	62
Vitrioel as SO_4	mg/ℓ	23	19	<400	21
Nitraat as NO_x-N	mg/ℓ	23	10.56	<10	12
Fluoried as F	mg/ℓ	23	0.42	<1.0	0.46
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Tabel 6.47: Grondwatergehalte Reserwe – Kwartêr opvanggebied C31E

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C31E♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		82	7.88	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	82	74.85	<150	82
Kalsium as Ca	mg/ℓ	82	70.85	<150	78
Magnesium as Mg	mg/ℓ	82	30.50	<70	34
Natrium as Na	mg/ℓ	82	44.50	<200	49
Atrium as K	mg/ℓ	82	3.57	<50	4
Totale hardheid as $CaCO_3$	mg/ℓ	82	302.5	<300	333
Chloried as Cl	mg/ℓ	82	42.95	<200	47
Vitrioel as SO_4	mg/ℓ	82	18.95	<400	21
Nitraat as NO_x-N	mg/ℓ	82	14.37	<10	16
Fluoried as F	mg/ℓ	82	0.34	<1.0	0.37
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Table 6.48: Grondwatergehalte Reserwe – Kwartêr opvanggebied C31F

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C31F♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		35	7.28	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	35	57.20	<150	63
Kalsium as Ca	mg/ℓ	35	43.30	<150	48
Magnesium as Mg	mg/ℓ	35	21.90	<70	24
Natrium as Na	mg/ℓ	35	43.20	<200	48
Atrium as K	mg/ℓ	35	2.97	<50	3.3
Totale hardheid as $CaCO_3$	mg/ℓ	35	198.3	<300	218
Chloried as Cl	mg/ℓ	35	26.90	<200	30
Vitrioel as SO_4	mg/ℓ	35	23.60	<400	26
Nitraat as NO_x-N	mg/ℓ	35	13.28	<10	15
Fluoried as F	mg/ℓ	35	0.35	<1.0	0.39
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Table 6.49: Grondwatergehalte Reserwe – Kwartêr opvanggebied C32A

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C32A♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		135	7.92	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	135	88.30	<150	97
Kalsium as Ca	mg/ℓ	135	69.90	<150	77
Magnesium as Mg	mg/ℓ	135	34.60	<70	38
Natrium as Na	mg/ℓ	135	71.70	<200	79
Atrium as K	mg/ℓ	135	3.10	<50	3.4
Totale hardheid as $CaCO_3$	mg/ℓ	135	316.00	<300	349
Chloried as Cl	mg/ℓ	135	45.20	<200	50
Vitrioel as SO_4	mg/ℓ	135	18.80	<400	21
Nitraat as NO_x-N	mg/ℓ	135	15.87	<10	17
Fluoried as F	mg/ℓ	135	0.55	<1.0	0.61
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Table 6.50: Grondwatergehalte Reserwe – Kwartêr opvanggebied C32B

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C32B			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		896	7.91	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	896	80.95	<150	89
Kalsium as Ca	mg/ℓ	896	56	<150	62
Magnesium as Mg	mg/ℓ	896	44.60	<70	49
Natrium as Na	mg/ℓ	896	39.70	<200	44
Atrium as K	mg/ℓ	896	3.18	<50	3.5
Totale hardheid as $CaCO_3$	mg/ℓ	896	323.5	<300	356
Chloried as Cl	mg/ℓ	896	43.90	<200	48
Vitrioel as SO_4	mg/ℓ	896	18.40	<400	20
Nitraat as NO_x-N	mg/ℓ	896	7.05	<10	7.8
Fluoried as F	mg/ℓ	896	0.40	<1.0	0.44
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2de Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).

Table 6.51: Grondwatergehalte Reserwe – Kwartêr opvanggebied C32C

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C32C			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		98	7.94	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	98	71.80	<150	79
Kalsium as Ca	mg/ℓ	98	58	<150	64
Magnesium as Mg	mg/ℓ	98	43.35	<70	48
Natrium as Na	mg/ℓ	98	37.35	<200	41
Atrium as K	mg/ℓ	98	2.70	<50	3.0
Totale hardheid as $CaCO_3$	mg/ℓ	98	323.3	<300	356
Chloried as Cl	mg/ℓ	98	29.30	<200	32
Vitrioel as SO_4	mg/ℓ	98	22.70	<400	25
Nitraat as NO_x-N	mg/ℓ	98	5.90	<10	6.5
Fluoried as F	mg/ℓ	98	0.40	<1.0	0.44
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2de Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).

Table 6.52: Grondwatergehalte Reserwe – Kwartêr opvanggebied C32D

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C32D			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		148	8.14	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	148	85.65	<150	94
Kalsium as Ca	mg/ℓ	148	76.09	<150	84
Magnesium as Mg	mg/ℓ	148	64.0	<70	70
Natrium as Na	mg/ℓ	148	13.30	<200	15
Atrium as K	mg/ℓ	148	0.67	<50	0.74
Totale hardheid as $CaCO_3$	mg/ℓ	148	455.4	<300	501
Chloried as Cl	mg/ℓ	148	33.08	<200	36
Vitrioel as SO_4	mg/ℓ	148	44.35	<400	49
Nitraat as NO_x-N	mg/ℓ	148	7.51	<10	8.3
Fluoried as F	mg/ℓ	148	0.29	<1.0	0.32
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).

Table 6.53: Grondwatergehalte Reserwe – Kwartêr opvanggebied C33A

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C33A♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		264	8	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	264	85.95	<150	95
Kalsium as Ca	mg/ℓ	264	69.05	<150	76
Magnesium as Mg	mg/ℓ	264	69.20	<70	76
Natrium as Na	mg/ℓ	264	13.40	<200	15
Atrium as K	mg/ℓ	264	0.95	<50	1.1
Totale hardheid as $CaCO_3$	mg/ℓ	264	457.4	<300	503
Chloried as Cl	mg/ℓ	264	36	<200	40
Vitrioel as SO_4	mg/ℓ	264	31.30	<400	34
Nitraat as NO_x-N	mg/ℓ	264	5.80	<10	6.4
Fluoried as F	mg/ℓ	264	0.33	<1.0	0.36
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Table 6.54: Grondwatergehalte Reserwe – Kwartêr opvanggebied C33B

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C33B♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		388	7.97	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	388	80.15	<150	88
Kalsium as Ca	mg/ℓ	388	59.60	<150	66
Magnesium as Mg	mg/ℓ	388	62.45	<70	69
Natrium as Na	mg/ℓ	388	14.40	<200	16
Atrium as K	mg/ℓ	388	1.21	<50	1.3
Totale hardheid as $CaCO_3$	mg/ℓ	388	406.0	<300	447
Chloried as Cl	mg/ℓ	388	31.40	<200	35
Vitrioel as SO_4	mg/ℓ	388	21.30	<400	23
Nitraat as NO_x-N	mg/ℓ	388	5.67	<10	6.2
Fluoried as F	mg/ℓ	388	0.24	<1.0	0.26
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2de Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Table 6.55: Grondwatergehalte Reserwe – Kwartêr opvanggebied C33C

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C33C♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		290	7.99	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	290	71.80	<150	79
Kalsium as Ca	mg/ℓ	290	65.10	<150	72
Magnesium as Mg	mg/ℓ	290	44.30	<70	49
Natrium as Na	mg/ℓ	290	13	<200	14
Atrium as K	mg/ℓ	290	2.07	<50	2.3
Totale hardheid as $CaCO_3$	mg/ℓ	290	345.0	<300	380
Chloried as Cl	mg/ℓ	290	30.65	<200	34
Vitrioel as SO_4	mg/ℓ	290	16.35	<400	18
Nitraat as NO_x-N	mg/ℓ	290	3.99	<10	4.4
Fluoried as F	mg/ℓ	290	0.21	<1.0	0.23
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2de Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Table 6.56: Grondwatergehalte Reserwe – Kwartêr opvanggebied C41A

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C41A			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		17	7.97	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	17	71.50	<150	79
Kalsium as Ca	mg/ℓ	17	74.90	<150	82
Magnesium as Mg	mg/ℓ	17	29.20	<70	32
Natrium as Na	mg/ℓ	17	56.10	<200	62
Atrium as K	mg/ℓ	17	2.62	<50	2.9
Totale hardheid as $CaCO_3$	mg/ℓ	17	307.3	<300	338
Chloried as Cl	mg/ℓ	17	11.80	<200	13
Vitrioel as SO_4	mg/ℓ	17	25.18	<400	28
Nitraat as NO_x-N	mg/ℓ	17	2.51	<10	2.8
Fluoried as F	mg/ℓ	17	0.28	<1.0	0.31
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Table 6.57: Grondwatergehalte Reserwe – Kwartêr opvanggebied C41D

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C41D♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		14	8.18	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	14	82.35	<150	91
Kalsium as Ca	mg/ℓ	14	65	<150	72
Magnesium as Mg	mg/ℓ	14	26.50	<70	29
Natrium as Na	mg/ℓ	14	65.15	<200	72
Atrium as K	mg/ℓ	14	2.30	<50	2.5
Totale hardheid as $CaCO_3$	mg/ℓ	14	271.4	<300	299
Chloried as Cl	mg/ℓ	14	30.05	<200	33
Vitrioel as SO_4	mg/ℓ	14	21.40	<400	24
Nitraat as NO_x-N	mg/ℓ	14	4.50	<10	5.0
Fluoried as F	mg/ℓ	14	0.40	<1.0	0.43
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Table 6.58: Grondwatergehalte Reserwe – Kwartêr opvanggebied C43B

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C43B♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		15	7.60	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	15	70	<150	77
Kalsium as Ca	mg/ℓ	15	69.30	<150	76
Magnesium as Mg	mg/ℓ	15	39.90	<70	44
Natrium as Na	mg/ℓ	15	22.70	<200	25
Atrium as K	mg/ℓ	15	2.32	<50	2.6
Totale hardheid as $CaCO_3$	mg/ℓ	15	337.4	<300	371
Chloried as Cl	mg/ℓ	15	25.50	<200	28
Vitrioel as SO_4	mg/ℓ	15	41.90	<400	46
Nitraat as NO_x-N	mg/ℓ	15	0.07	<10	0.08
Fluoried as F	mg/ℓ	15	0.20	<1.0	0.22
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Table 6.59: Grondwatergehalte Reserwe – Kwartêr opvanggebied C60E

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C60E			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		12	7.90	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	12	64.30	<150	71
Kalsium as Ca	mg/l	12	43.90	<150	48
Magnesium as Mg	mg/l	12	15.80	<70	17
Natrium as Na	mg/l	12	42.30	<200	47
Atrium as K	mg/l	12	1.01	<50	1.1
Totale hardheid as $CaCO_3$	mg/l	12	174.7	<300	192
Chloried as Cl	mg/l	12	20.50	<200	23
Vitrioel as SO_4	mg/l	12	12	<400	13.2
Nitraat as NO_x-N	mg/l	12	1.91	<10	2.10
Fluoried as F	mg/l	12	0.24	<1.0	0.26
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).

Tabel 6.60: Grondwatergehalte Reserwe – Kwartêr opvanggebied C70D

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: * C70D			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		21	8.11	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	21	77.50	<150	85
Kalsium as Ca	mg/ℓ	21	62.72	<150	69
Magnesium as Mg	mg/ℓ	21	23.75	<70	26
Natrium as Na	mg/ℓ	21	70.50	<200	78
Atrium as K	mg/ℓ	21	4.93	<50	5
Totale hardheid as $CaCO_3$	mg/ℓ	21	254.4	<300	280
Chloried as Cl	mg/ℓ	21	29.17	<200	32
Vitrioel as SO_4	mg/ℓ	21	68.34	<400	75
Nitraat as NO_x-N	mg/ℓ	21	1.76	<10	1.9
Fluoried as F	mg/ℓ	21	0.60	<1.0	0.66
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
* Dui aan dat slegs na-1995 hidrochemiese datastelle vir die spesifieke kwartêr-opvanggebied gebruik is.

Tabel 6.61: Grondwatergehalte Reserwe – Kwartêr opvanggebied C81F

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C81F♣			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		18	7.25	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	18	28.90	<150	32
Kalsium as Ca	mg/ℓ	18	24.75	<150	27
Magnesium as Mg	mg/ℓ	18	6.30	<70	6.9
Natrium as Na	mg/ℓ	18	20	<200	22
Atrium as K	mg/ℓ	18	1.30	<50	1.4
Totale hardheid as $CaCO_3$	mg/ℓ	18	87.7	<300	97
Chloried as Cl	mg/ℓ	18	1.50	<200	1.7
Vitrioel as SO_4	mg/ℓ	18	2	<400	2.2
Nitraat as NO_x-N	mg/ℓ	18	0.31	<10	0.34
Fluoried as F	mg/ℓ	18	0.21	<1.0	0.23
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♣ Monsters slegs vanaf monitering gedoen in 1976.

Table 6.62: Grondwatergehalte Reserwe – Kwartêr opvanggebied C82B

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: *C82B			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		29	8.21	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	29	39.90	<150	44
Kalsium as Ca	mg/ℓ	29	32.23	<150	35
Magnesium as Mg	mg/ℓ	29	13.98	<70	15
Natrium as Na	mg/ℓ	29	27.60	<200	30
Atrium as K	mg/ℓ	29	3.39	<50	3.7
Totale hardheid as $CaCO_3$	mg/ℓ	29	138.0	<300	152
Chloried as Cl	mg/ℓ	29	25.24	<200	28
Vitrioel as SO_4	mg/ℓ	29	22.16	<400	24
Nitraat as NO_x-N	mg/ℓ	29	0.17	<10	0.19
Fluoried as F	mg/ℓ	29	0.32	<1.0	0.35
				Watergehalteklas	Klas 0

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
* Dui aan dat slegs na-1995 hidrochemiese datastelle vir die spesifieke kwartêr-opvanggebied gebruik is.

Tabel 6.63: Grondwatergehalte Reserwe – Kwartêr opvanggebied C82H

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C82H			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		18	8.07	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	18	85.15	<150	94
Kalsium as Ca	mg/ℓ	18	65.77	<150	72
Magnesium as Mg	mg/ℓ	18	27.34	<100	30
Natrium as Na	mg/ℓ	18	89.79	<200	99
Atrium as K	mg/ℓ	18	1.08	<50	1.2
Totale hardheid as $CaCO_3$	mg/ℓ	18	276.8	<300	305
Chloried as Cl	mg/ℓ	18	20.71	<200	23
Vitrioel as SO_4	mg/ℓ	18	22.56	<400	25
Nitraat as NO_x-N	mg/ℓ	18	0.38	<10	0.41
Fluoried as F	mg/ℓ	18	0.78	<1.0	0.85
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).

Table 6.64: Grondwatergehalte Reserwe – Kwartêr opvanggebied C83B

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: *C83B			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		33	7.98	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	33	60	<150	66
Kalsium as Ca	mg/ℓ	33	52.12	<150	57
Magnesium as Mg	mg/ℓ	33	27.20	<70	30
Natrium as Na	mg/ℓ	33	33.50	<200	37
Atrium as K	mg/ℓ	33	0.85	<50	0.9
Totale hardheid as $CaCO_3$	mg/ℓ	33	242.82	<300	267
Chloried as Cl	mg/ℓ	33	28.89	<200	32
Vitrioel as SO_4	mg/ℓ	33	35.06	<400	39
Nitraat as NO_x-N	mg/ℓ	33	0.79	<10	0.9
Fluoried as F	mg/ℓ	33	0.29	<1.0	0.32
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
* Dui aan dat slegs na-1995 hidrochemiese datastelle vir die spesifieke kwartêr-opvanggebied gebruik is.

Tabel 6.65: Grondwatergehalte Reserwe – Kwartêr opvanggebied C91A

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C91A♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		14	8.41	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	14	70.10	<150	77
Kalsium as Ca	mg/ℓ	14	27.45	<150	30
Magnesium as Mg	mg/ℓ	14	36.85	<70	41
Natrium as Na	mg/ℓ	14	59.70	<200	66
Atrium as K	mg/ℓ	14	4.02	<50	4.4
Totale hardheid as $CaCO_3$	mg/ℓ	14	220.3	<300	242
Chloried as Cl	mg/ℓ	14	44.40	<200	49
Vitrioel as SO_4	mg/ℓ	14	60.20	<400	66
Nitraat as NO_x-N	mg/ℓ	14	3.05	<10	3.4
Fluoried as F	mg/ℓ	14	0.28	<1.0	0.30
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Tabel 6.66: Grondwatergehalte Reserwe – Kwartêr opvanggebied C91B

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C91B♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		41	7.90	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	41	96.00	<150	106
Kalsium as Ca	mg/ℓ	41	50.50	<150	56
Magnesium as Mg	mg/ℓ	41	46.40	<70	51
Natrium as Na	mg/ℓ	41	70.40	<200	77
Atrium as K	mg/ℓ	41	2.30	<50	2.5
Totale hardheid as $CaCO_3$	mg/ℓ	41	317.2	<300	349
Chloried as Cl	mg/ℓ	41	68.50	<200	75
Vitrioel as SO_4	mg/ℓ	41	60.20	<400	66
Nitraat as NO_x-N	mg/ℓ	41	7.02	<10	7.7
Fluoried as F	mg/ℓ	41	0.56	<1.0	0.62
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Tabel 6.67: Grondwatergehalte Reserwe – Kwartêr opvanggebied C91C

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C91C			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		33	8.12	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	33	98.90	<150	109
Kalsium as Ca	mg/ℓ	33	82.90	<150	91
Magnesium as Mg	mg/ℓ	33	62.57	<70	69
Natrium as Na	mg/ℓ	33	25.81	<200	28
Atrium as K	mg/ℓ	33	3.33	<50	3.7
Totale hardheid as $CaCO_3$	mg/ℓ	33	464.7	<300	511
Chloried as Cl	mg/ℓ	33	92.36	<200	102
Vitrioel as SO_4	mg/ℓ	33	54.36	<400	60
Nitraat as NO_x-N	mg/ℓ	33	14.42	<10	16
Fluoried as F	mg/ℓ	33	0.41	<1.0	0.45
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).

Tabel 6.68: Grondwatergehalte Reserwe – Kwartêr opvanggebied C91D

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C91D♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		15	7.90	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	15	71.30	<150	78
Kalsium as Ca	mg/ℓ	15	49.60	<150	55
Magnesium as Mg	mg/ℓ	15	38.80	<70	43
Natrium as Na	mg/ℓ	15	30.30	<200	33
Atrium as K	mg/ℓ	15	2.91	<50	3.2
Totale hardheid as $CaCO_3$	mg/ℓ	15	283.6	<300	312
Chloried as Cl	mg/ℓ	15	35.00	<200	39
Vitrioel as SO_4	mg/ℓ	15	36.50	<400	40
Nitraat as NO_x-N	mg/ℓ	15	2.55	<10	2.8
Fluoried as F	mg/ℓ	15	0.64	<1.0	0.7
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Tabel 6.69: Grondwatergehalte Reserwe – Kwartêr opvanggebied C91E

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C91E♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		29	8.00	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	29	113.20	<150	125
Kalsium as Ca	mg/ℓ	29	78.20	<150	86
Magnesium as Mg	mg/ℓ	29	61.10	<70	67
Natrium as Na	mg/ℓ	29	53.90	<200	59
Atrium as K	mg/ℓ	29	1.80	<50	2.0
Totale hardheid as $CaCO_3$	mg/ℓ	29	446.9	<300	492
Chloried as Cl	mg/ℓ	29	69.50	<200	76
Vitrioel as SO_4	mg/ℓ	29	116.80	<400	128
Nitraat as NO_x-N	mg/ℓ	29	7.45	<10	8.2
Fluoried as F	mg/ℓ	29	0.58	<1.0	0.64
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et al*. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Tabel 6.70: Grondwatergehalte Reserwe – Kwartêr opvanggebied C92A

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C92A♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		298	8.09	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	298	49.10	<150	54
Kalsium as Ca	mg/ℓ	298	51.35	<150	56
Magnesium as Mg	mg/ℓ	298	19.20	<70	21
Natrium as Na	mg/ℓ	298	10.58	<200	12
Atrium as K	mg/ℓ	298	2.29	<50	2.5
Totale hardheid as $CaCO_3$	mg/ℓ	298	207.3	<300	228
Chloried as Cl	mg/ℓ	298	20.35	<200	22
Vitrioel as SO_4	mg/ℓ	298	20.45	<400	23
Nitraat as NO_x-N	mg/ℓ	298	2.31	<10	2.5
Fluoried as F	mg/ℓ	298	0.17	<1.0	0.19
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Tabel 6.71: Grondwatergehalte Reserwe – Kwartêr opvanggebied C92B

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C92B♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	GW-gehalte (middelwaarde)[1]	BMB Beperking[2]	Grondwatergehalte Reserwe[3]
pH		46	8.22	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	46	100.20	<150	110
Kalsium as Ca	mg/ℓ	46	82.85	<150	91
Magnesium as Mg	mg/ℓ	46	73.40	<70	81
Natrium as Na	mg/ℓ	46	29.05	<200	32
Atrium as K	mg/ℓ	46	3.28	<50	3.6
Totale hardheid as $CaCO_3$	mg/ℓ	46	509.1	<300	560
Chloried as Cl	mg/ℓ	46	55.55	<200	61
Vitrioel as SO_4	mg/ℓ	46	42.25	<400	46
Nitraat as NO_x-N	mg/ℓ	46	6.14	<10	6.8
Fluoried as F	mg/ℓ	46	0.31	<1.0	0.34
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

Tabel 6.72: Grondwatergehalte Reserwe – Kwartêr opvanggebied C92C

Chemiese Parameter	Eenheid	Vaal WMA – Kwartêr opvanggebied: C92C♦			
		[A]	[B]	[C]	[D]
		Aantal monsters	**GW-gehalte (middelwaarde)[1]**	**BMB Beperk[2]**	**Grondwatergehalte Reserwe[3]**
pH		100	8.27	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Elektriese geleidingsvermoë	mS/m	100	87.60	<150	96
Calciu m as Ca	mg/ℓ	100	83.55	<150	92
Magnesium as Mg	mg/ℓ	100	56.10	<70	62
Natrium as Na	mg/ℓ	100	20.95	<200	23
Atrium as K	mg/ℓ	100	4.13	<50	4.5
Totale hardheid as $CaCO_3$	mg/ℓ	100	439.6	<300	484
Chloried as Cl	mg/ℓ	100	50.85	<200	56
Vitrioel as SO_4	mg/ℓ	100	32.30	<400	36
Nitraat as NO_x-N	mg/ℓ	100	4.29	<10	4.7
Fluoried as F	mg/ℓ	100	0.33	<1.0	0.36
				Watergehalteklas	Klas 1

[1] Gebaseer op langtermyn grondwatergehaltedatastelle (DWS Waterbestuurstelsel). Minimum aantal analise gebruik vir die statistiese evaluering is nege (9);
[2] Boonste beperking van Klas I-watergehalte (drinkwater) (WRC *et a*l. 2[de] Weergawe, 1998, Volume 1: Assesseringsgids); en
[3] Middelwaarde plus 10% (met die uitsondering van pH).
♦ Gebaseer op voor-1995 hidrochemiese datastel (mees verteenwoordigende ruimtedatastel)

7. BESKERMINGS- EN BESTUURSVEREISTES VIR PRIORITEITVLEILANDE

Prioriteitvleilande in die Vaalrivier-opvanggebied sluit in daardie vleilande wat 'n hoë of baie hoë ekologiese sensitiwiteit vertoon. Addisionele prioriteitvleilande is geïdentifiseer met inagneming van, onder andere, unieke wesenstrekke, rooi data spesie en veenvleilande. Aanbevole ekologiese kategorieë (AEK) en ekologiese spesifikasies vir die prioriteitvleilande in die Vaal-waterbestuursgebied word in Tabel 7.1 voorgelê. Die huidige ekologiese status (HES) en die Belang en Sensitiwiteit (BS) van die geïdentifiseerde prioriteitvleilande word ook voorgelê.

Let wel:
Afkortings verwys na in Tabel 7-1:

- CBA: Kritiese Biodiversiteitsgebied
- EOG: Ekologiese Ondersteuningsgebied
- OIA: Omgewingsimpakassessering
- AEK: Aanbevole Ekologiese Kategorie
- TEK: Teiken Ekologiese Kategorie
- WGL: Watergebruiklisensie

Tabel 7.1: Ekologiese spesfikasies vir prioriteitvleilande in die Vaal-waterbestuursarea

IUA	Kwartêr Opvanggebied	Naam van vleiland	Soort vleiland	HES	BS	AEK	TEK	Ekologiese Spesifikasies Beskermings-, Handhawing- en Bestuursvereistes
UA	C11H	Hoofwater van die Blesbokspruit (Boonste Vaal)	Ongekanaliseerde valleibodem	C	Hoog	B/C	C	Diffuse waterverspreiding word vereis om die watergehalte vebeteringsfunksies te optimiseer. Die ongekanaliseerde aard van gedeeltes van die vleiland moet in stand gehou word. Hou bestaande plantegroeistruktuur en –samestelling in stand. Laterale vloei-ingange tot die vleiland moet beskerm word deur aanwending van hidrologiese buffers te bepaal deur hidro-pedologiese assesserings te onderneem as deel van Omgewingsimpakassessering- (OIA) en/of Watergebruiklisensie- (WGL) aansoeke en streng lisensiëringstoestande, insluitend monitering van die sisteme, moet van toepassing wees. Enige aansoek vir ontwikkeling insluitend mynwese wat waarskynlik 'n impak op hierdie sisteem sal hê, derhalwe om deur die normale lisensiëringsprosesse te gaan, moet ook as 'n minimum 'n Intermediêrevlak Vleiland Reserwe insluit wat vloei modelering (oppervlak en grondwater insluitend intervloei) van scenarios insluit om die potensiële impak vas te stel om die AEK te bereik.
UB	C13C	Vanger	Ongekanaliseerde valleibodem	A	Baie hoog	A	A	Diffuse waterverspreiding word vereis om hidrologiese en biodiversiteitsondersteuningsfunksies te optimiseer. In 'n natuurlike of naby-natuurlike ekologiese toestand vir die langtermyn beskerming van belangrike biodiversiteit en as 'n belangrike landskapkenmerk in stand te hou. Maak seker dat die terrein en die opvanggebied bydra tot die Kritiese Biodiversiteitgebiede 1- en Ekologiese Ondersteuningsgebiede 2-landskapvlakdoel vir die terrein om 'n lewensvatbare verteenwoordigende monster van hierdie soort ekosisteme en die geassosieerde biodiversiteit te verteenwoordig en in stand te hou. Instandhoudig van die bestaande vloeiverdeling en retensiepatrone in die sisteem om die bestaande plantegroeistruktuur en -samestelling in stand te hou. Laterale vloei-ingange tot die vleiland moet beskerm word deur aanwending van hidrologiese buffers te bepaal deur hidro-pedologiese assesserings te onderneem as deel van OIA- en/of WGL-aansoeke en streng lisensiëringstoestande, insluitend monitering van die sisteme, moet van toepassing wees.

IUA	Kwartêr Opvanggebied	Naam van vleiland	Soort vleiland	HES	BS	AEK	TEK	Ekologiese Spesifikasies Beskermings-, Handhawing- en Bestuursvereistes
UB	C13C	Seekoeivlei	Vloedvlakte	E[1]	Baie hoog	D	D	Diffuse waterverspreiding word vereis om hidrologiese en biodiversiteitsondersteuningsfunksies te optimiseer. Implimenteer maatreëls om die toestand van die vleiland tot 'n meer natuurlike ekologiese toestand te verbeter en bestuur volgens die beskermde gebied bestuursplan-doelwitte. Beskerm die vleiland en die opvanggebied vir die langtermyn beskerming van belangrike biodiversiteit en as 'n belangrike landskapkenmerk. Maak seker dat die terrein en die opvanggebied bydra tot die Kritiese Biodiversiteitgebiede 1, Ekologiese Ondersteuningsgebiede 1 en 2 landskapvlakdoel vir die terrein om 'n lewensvatbare verteenwoordigende monster van hierdie soort ekosisteme en die geassosieerde biodiversiteit te verteenwoordig en in stand te hou. Verbeter die bestaande vloeiverspreiding en retensiepatrone in die sisteem om van die verlore ekologiese en hidrologiese funksionaliteit van die sisteem en plantgroeistruktuur en –samestelling te herstel. Laterale vloei-ingange tot die vleiland moet beskerm word deur aanwending van hidrologiese buffers te bepaal deur hidro-pedologiese assesserings te onderneem as deel van Omgewingsimpakassessering- (OIA) en/of Watergebruiklisensie- (WGL) aansoeke en streng lisensiëringstoestande, insluitend monitering van die sisteme, moet van toepassing wees. Monitor afstroming afkomstig vanaf die stroomop stedelike gebiede wat bekend daarvoor staan om gedurig rioolwateroorloop, asook afloop van die soliede verspillingterrein, te veroorsaak. Identifiseer en prioritiseer vleilandrehabilitasievereistes om geïmplimenteer te word deur die reeds doenige Werk vir Vleilande-program.
UC1	C81B	Murphy's Rust	Ongekanaliseerde en gekanaliseerde valleibodem	C	Baie hoog	B	B/C	Implimenteer maatreëls om die ekologiese toestand van die sisteem te verbeter of ten minste in stand te hou vir die langtermyn beskerming van belangrike biodiversiteit en as 'n belangrike landskapkenmerk. Maak seker dat die terrein en die opvanggebied bydra tot die Kritiese Biodiversiteitgebiede 1- en Ekologiese Ondersteuingsgebiede 2-landskapvlakdoel vir die terrein om 'n lewensvatbare monster van hierdie soort ekosisteme en die geassosieerde biodiversiteit te verteenwoordig en in stand te hou. Hou die bestaande vloeiverdeling en retensiepatrone in die sisteem in stand. Hou bestaande plantgroeistrukture en -samestelling asook lae steuringsvlakke in stand vir aanhoudende ondersteuning van bedreigde biodiversiteit. Huidige ongekanaliseerde vleilande moet soos ongekanaliseerde sisteme in stand gehou word. Vloei-ingange tot die vleiland moet beskerm word deur aanwending van hidrologiese buffers bepaal deur hidro-pedologiese assesserings onderneem as deel van OIA- en/of WGL-aansoeke en streng lisensiëringstoestande, insluitend monitering van die sisteme, moet van toepassing wees. Pas die veiligheidsbeginsel vir steuring van onbekende impak toe. Enige aansoek vir ontwikkeling wat waarskynlik 'n impak op hierdie sisteem sal hê, derhalwe om deur die normale lisensiëringsprosesse te gaan, moet ook as 'n minimum 'n Intermediêrevlak Vleiland Reserwe insluit wat vloei

[1] Die sisteem is in 'n HES-kategorie van E (ernstig veranderd), maar het 'n baie hoë BS aangesien dit 'n Ramsar-terrein is (aangewys as 'n Vleiland van Internasionale Belang in terme van die Ramsar-konvensie). 'n HES-kategorie van E is nie voldoenbaar nie so die TEC word aanbeveel om dieselfde as AEK te wees en is een kategorie hoër as die HES gestel. Rehabilitasie-ingryping sal benodig word om die HES te verbeter. Om verbetering in die HES van hierdie sisteem te bereik moet dit dus geprioritiseer word.

IUA	Kwartêr Opvanggebied	Naam van vleiland	Soort vleiland	HES	BS	AEK	TEK	Ekologiese Spesifikasies Beskermings-, Handhawing- en Bestuursvereistes
								modelering (oppervlak en grondwater insluitend intervloei) van scenarios insluit om die potensiële impak vas te stel om die AEK te bereik.
UC1	C81A	Bedford-vleilandkompleks	Ongekanaliseerde valleibodem	C	Baie hoog	B	B/C	Hou die natuurlike voorgewende watervrylating van die Bedford Dam in stand om onveranderde hidrologiese regime te verseker. Diffuse waterverspreiding word vereis om hidrologiese en biodiversiteitsondersteuningsfunksies te optimiseer. Hou die naby-natuurlike ekologiese toestand in stand vir die langtermyn beskerming van belangrike biodiversiteit en as 'n belangrike landskapkenmerk. Maak seker dat die terrein en die opvanggebied bydra tot die Kritiese Biodiversiteitgebied- (CBA1) en EOG2-landskapvlakdoel vir die terrein om 'n lewensvatbare verteenwoordigende monster van hierdie soort ekosisteme en die geassosieerde biodiversiteit te verteenwoordig en in stand te hou. Hou die bestaande vloeiverdeling en retensiepatrone in die sisteem in stand. Hou bestaande plantegroeistruktuur en –samestelling asook lae steuringsvlakke in stand vir aanhoudende ondersteuning van bedreigde biodiversiteit. Huidige ongekanaliseerde vleilande moet soos ongekanaliseerde sisteme in stand gehou word. Geen erosie-aflope (geen insnyding van kanale of hoofsnee nie) kan toegelaat word om binne die vleiland te ontwikkel nie. Dit is 'n ongekanaliseerde vleiland en is baie sensitief vir erosie en insnyding. Vloei-vrylatings van die Bedford Dam moet die natuurlike hidrologiese regime simuleer wat 'n vereiste is om die vleiland in sy bestaande toestand in stand te hou. Die goedgekeurde Reserwe vir die vleiland beveel beide basisvloei en vloei-vrylatings vir die vleiland aan. Die basisvloei word benodig om die vlak inundasie van die valleivloer te verseker, veral in daardie gedeeltes van die valleivloer wat gemengde watergrasmoeras ondersteun. Dit word vereis nie net om potensiële toepaslike habitat vir die kritiese bedreigde Witvlerk-vleikuiken en anteelhabitat vir Lelkrane te verskaf nie, maar om versadiging van die veen in die sisteem te verseker. Dit sal ook gunstige toestande vir die funksionering van die vleiland en die voorsiening van ekosisteemdienste skep deur kontak tussen die waterkolom en die vleilandsedimente te maksimaliseer. Die funksie van hierdie hoër vloei help om 'n vlak van vleilandhabitat-instandhouding te bereik (vir die kleiner inundasiegebeurtenisse) en om toe te laat vir spoeling van die swak ontwikkelde kanale (in die geval van die groter, meer seldsame deurspoeling-gebeurtenisse). Monitering moet gemik word op die bepaling of die aanbevole basisvloei en vloei-vrylatings die gewenste mikpunte vir die vleiland en die AEK bereik of nie. Dit moet ook vir die bespeuring van verandering wees, veral veranderinge verwant aan die hidrologiese regime om toekomstige watervrylatings in te lig. Toekomstige potensiële impak van ontwikkelingsaansoeke moet bepaal word as deel van OIA- en/of WGL-aansoeke en streng lisensiëringstoestande, insluitend monitering van die sisteme, moet van toepassing wees. Pas die veiligheidsbeginsel vir steuring van onbekende impak toe. Monitering van bestaande vleilandrehabilitasiestrukture word vereis om die voortdurende uitvoering van die struktuur te verseker.
UC1	C81A	Boonste Wilge	Vloedvlakte	B	Hoog	A/B	B	Vloede word benodig om die vloedvlakte te inundeer en verskaf daardeur die benatting regime wat vereis word om die vloedvlakteplantegroei te ondersteun wat afhanklik is van onderwatersetting vir hulle lewensiklusse.

IUA	Kwartêr Opvanggebied	Naam van vleiland	Soort vleiland	HES	BS	AEK	TEK	Ekologiese Spesifikasies Beskermings-, Handhawing- en Bestuursvereistes
								In 'n natuurlike of naby-natuurlike ekologiese toestand in stand te hou vir die langtermyn beskerming van belangrike biodiversiteit en as 'n belangrike landskapkenmerk. Maak seker dat die terrein en die opvanggebied bydra tot die CBA1- en EOG2-landskapvlakdoel vir die terrein om 'n lewensvatbare verteenwoordigende monster van hierdie soort ekosisteme en die geassosieerde biodiversiteit te verteenwoordig en in stand te hou. Hou die bestaande vloeiverdeling en retensiepatrone in die sisteem in stand om die bestaande plantegroeistrukture en –samestelling in stand te hou. Laterale vloei-ingange tot die vleiland moet beskerm word deur die aanwending van hidrologiese buffers bepaal deur hidro-pedologiese assesserings te onderneem as deel van OIA- en/of WGL-aansoeke en streng lisensiëringstoestande, insluitend monitering van die sisteme, moet van toepassing wees.
UC1	C81L	Meul	Vloedvlakte	B	Hoog	A/B	B	Vloede word benodig om die vloedvlakte te inundeer en verskaf daardeur die benatting regime wat vereis word om die vloedvlakteplantegroei te ondersteun wat afhanklik is van onderwatersetting vir hulle lewensiklusse. Om 'n natuurlike of naby-natuurlike ekologiese toestand in stand te hou vir die langtermyn beskerming van belangrike biodiversiteit en as 'n belangrike landskapkenmerk. Maak seker dat die terrein en die opvanggebied bydra tot die EOG1- en EOG2-landskapvlakdoel vir die terrein om 'n lewensvatbare verteenwoordigende monster van hierdie soort ekosisteme en die geassosieerde biodiversiteit te verteenwoordig en in stand te hou. Hou die bestaande vloeiverdeling en retensiepatrone in die sisteem in stand om die bestaande plantegroeistrukture en –samestelling in stand te hou. Laterale vloei-ingange tot die vleiland moet beskerm word deur die aanwending van hidrologiese buffers te bepaal deur hidro-pedologiese assesserings te onderneem as deel van OIA- en/of WGL-aansoeke en streng lisensiëringstoestande, insluitend monitering van die sisteme, moet van toepassing wees.
UI	C21E	Blesbokspruit[2]	Oorstroomde valleibodem (kunsmatig ondersteun)	D	Hoog	C/D	D	Om die toestand van die vleiland te verbeter, moet die volgende [illegible] word: • Bestuursintervensies om sekere soorte habitatte wat vir sekere voëlspesies nodig is, weer vas te stel; • Verbeterde behandeling van mynwater, afloopwater en uitloop afvoere per bron voordat dit in vleilandgebiede vrygestel word; • Inginieurswese van sommige gedeeltes van die vleiland om oksidasiesone te skep om verbeterde watergehalte te implimenteer. Dit sal ook sommige van die oopwaterhabitatte herskep wat met hoë watervloeigetalle in die 1970's en 1980's geassosieer is; • Vooropstelling en beskerming van die paar bolope waar die spesies ryk, seisoenale nat grasveld nogsteeds voorkom; en • Monitering om te verseker dat die gespesifiseerde watergehaltestandaarde in terme van afvoer nagekom en uitgevoer is. Hierdie voorafgaande studies het dus verdere werk aanbeveel om die effekte van die verandering van die

[2] Die sisteem is 'n Ramsar-terrein (aangewys as 'n Vleiland van Internasionale Belang in terme van die Ramsar-konvensie) en word belangrik geag vanaf beide 'n voëllewe en hidro-funksionele perspektief

IUA	Kwartêr Opvanggebied	Naam van vleiland	Soort vleiland	HES	BS	AEK	TEK	Ekologiese Spesifikasies Beskermings-, Handhawing- en Bestuursvereistes
								vloei deur die stelsel te verstaan. Daar is besorgdheid gewees dat die inleiding van variabiliteit in vloei tot die sisteem tot gevolg kon hê dat sommige van die afsettings chemiese veranderinge kon ondergaan wat die mobilisering van sekere swaar metale en uraan wat gesondheidrisiko's skep, tot gevolg kon hê. Meer duidelikheid oor hierdie kwessie sal vereis word voordat enige aanbeveling verwant aan die verandering van die vloei deur die sisteem met enige vertroue gemaak kon word dat dit nie in gesondheidrisiko's sal ontaard nie. Skakel met geïnteresseerde en geaffekteerde partye om 'n samewerkende bestuurs-, rehabilitasie- en moniteringsplan vir die vleiland te ontwikkel.
UI	C22D	Kliprivier-vleiland	Ongekanaliseerde en gekanaliseerde valleibodem	D/E	Matig	D	D	Histories, is die vloei in hierdie sisteem baie laer as hedendaags, maar weens die veranderde kanaalgeometrie – die insnyding van die kanaal tot in die vleiland – word groter vloei nou vereis om die vloedvlakte te inundeer as wat nodig sou gewees het onder die Verwysingskanaal-toestand. Selfs dan, is die hedendaagse vloei baie hoër as die geraamde ekologiese watervereistes vir die boloop. Die hedendaagse natseisoen-basisvloei oorskry selfs die geraamde jaarlikse vloeivereiste vir die D AEK. As die TEK verbeter moet word van die huidige D/E na 'n D of hoër, dan moet basisvloei verminder word. As die vloei nie verminder kan word nie, dan is dit hoogs onwaarskynlik dat die verbeterde D-toestand van die vleilandboloop bereik sal word. As die vloei verminder word, sal dit dan geleenthede oopmaak vir rehabilitasie-aksies, soos klein damme wat gebruik kan word om plaaslike basisvlakke terug te plaas om die impakte van die gegrifte kanale op te weeg. Hierdie soorte strukture in die hoof stam sal die water kan verhoog en die valleibodem en geassosieerde veen substrate. Rehabilitasie-aksies in die Kliprivier-opvanggebied moet fokus op: • Verskraling van stedelike stormwaterpieke (in die kleiner byriviere); • Stabilisering van hoofsnee in die hoof stam en groter byriviere; en • Verhoging van die watertabel en herbenatting van die valleibodem-vene van die hoof byriviere. Skakel met geïnteresseerde en geaffekteerde partye om 'n samewerkende bestuurs-, rehabilitasie- en moniteringsplan vir die vleiland te ontwikkel en te implimenteer.
UI	C22B	Natalspruit	Ongekanaliseerde en gekanaliseerde valleibodem	D	Hoog	C/D	D	Diffuse waterverspreiding word vereis om die watergehalte vebeteringsfunksies te optimiseer. Dit is dus belangrik om die bestaande vloeiverspreiding en retensiepatrone in die sisteem in stand te hou en, indien moontlik, te verbeter. Ongekanaliseerde gedeeltes van die vleiland moet as ongekanaliseerde in stand gehou word en bestaande plantegroeistruktuur en -samestelling moet ten minste teruggehou of verbeter word. Laterale vloei-ingange tot die vleiland moet beskerm word deur die aanwending van hidrologiese buffers te bepaal deur hidro-pedologiese assesserings te onderneem as deel van OIA- en/of WGL-aansoeke en streng lisensiëringstoestande, insluitend monitering van die sisteme, moet van toepassing wees. Die vleiland moet geassesseer word om potensiële rehabilitasiemaatreëls te identifiseer wat die huidige toestand en die funksies wat dit uitvoer, sal verbeter. Skakel met geïnteresseerde en geaffekteerde partye om 'n samewerkende bestuurs-, rehabilitasie- en

IUA	Kwartêr Opvanggebied	Naam van vleiland	Soort vleiland	HES	BS	AEK	TEK	Ekologiese Spesifikasies Beskermings-, Handhawing- en Bestuursvereistes
								moniteringsplan vir die vleiland te ontwikkel.
UK	C23B	Kromelmboog-spruit	Vloedvlakte en gekanaliseerde valleibodem	C	Hoog	B/C	C	In 'n natuurlike of naby-natuurlike ekologiese toestand in stand te hou vir die langtermyn beskerming van belangrike biodiversiteit en as 'n belangrike landskapkenmerk. Verseker dat die terrein en die opvanggebied bydra tot die EOG1- en EOG2-landskapvlakdoel vir die terrein om 'n lewensvatbare verteenwoordigende monster van hierdie soort ekosisteem en die geassosieerde biodiversiteit te verteenwoordig en in stand te hou. Hou in stand en verhoog die bestaande vloeiverdeling en retensiepatrone in die sisteem. Huidige ongekanaliseerde vleilande moet soos ongekanaliseerde sisteme in stand gehou word. Hou bestaande plantegroeistruktuur en –samestelling in stand. Laterale vloei-ingange tot die vleiland moet beskerm word deur die aanwending van hidrologiese buffers te bepaal deur hidro-pedologiese assesserings te onderneem as deel van OIA- en/of WGL-aansoeke en streng lisensiëringstoestande, insluitend monitering van die sisteme, moet van toepassing wees. Die vleiland moet geassesseer word om potensiële rehabilitasiemaatreëls te identifiseer wat die huidige toestand sal verbeter.
UL	C23F	Boovenste Oog	Veenvleiland (dolomitiese oog)	B/C	Hoog	B	B	Instandhouding van die altydgroeiende aard van die sisteem en 'n diffuse waterverspreidingspatroon regoor die sisteem is sleutel kenmerke wat die ekologiese asook funksionele belang bepaal. In 'n natuurlike of naby-natuurlike ekologiese toestand in stand te hou vir die langtermyn beskerming van belangrike biodiversiteit, vloeiregulasie-funksie, en as 'n belangrike en unieke landskapkenmerk. Hoiu goeie watergehalte gewoonlik geassossieer met dolomitiese waterdraers en geassosieerde oë/waterbronne in stand. Voorkom oorabstraksie van die geassosieerde dolomitiese waterdraer. Hou die natuurlike vis en makro-ongewerwelde diversiteit van die sisteem in stand en voorkom die inleiding van eksotiese taksa. 'n Bestuursplan moet vir die sisteem ontwikkel en geïmplimenteer word. Dit is voorheen al voorgestel dat die herwinning van perifere vlak oopwaterhabitatte met voldoende rietgange gelaat tussen die oopwater-gebiede die biodiversiteit van die sisteem sal verbeter. Daar is ook voorgestel dat om sommige van die opgegrawe kanale in die sisteem in te vul, 'n verbetering in die HES sal toelaat. Wanneer die bestuursplan ontwikkel word, moet hierdie voorstelle verder ondersoek word. Bepaal 'n Preliminêre Vleiland en Grondwater Reserwe vir die sisteem asook beskermings- en bestuursvereistes vir die grondwater om die geassosieerde dolomiet waterdraer en vloei in die sisteem te beskerm.
UL	C23F	Mooi	Ongekanaliseerde valleibodem	D	Hoog	C/D	C/D	Diffuse waterverspreiding word vereis om hidrologiese en biodiversiteitsondersteuningsfunksies te optimiseer. Hou in stand en waar moontlik verbeter die ekologiese toestand vir die langtermyn beskerming van hidrologiese

66

IUA	Kwartêr Opvanggebied	Naam van vleiland	Soort vleiland	HES	BS	AEK	TEK	Ekologiese Spesifikasies Beskermings-, Handhawing- en Bestuursvereistes
								funksies, biodiversiteit en as ’n belangrike landskapkenmerk. Hou ’n lewensvatbare verteenwoordigende monster van hierdie soort ekosisteme in stand om die geassosieerde biodiversiteit te verteenwoordig en in stand te hou. Implementeer maatreëls om die bestaande vloeiverspreiding en retensiepatrone in die sisteem te verbeter en om die bestaande plantegroeistruktuur en –samestelling in stand te hou.
UL	C23G	Gerhard Minnebron	Veenvleiland	C	Hoog	B/C	C	Instandhouding van die altydgroeiende aard van die sisteem en ’n diffuse waterverspreidingspatroon regoor die sisteem is sleutel kenmerke wat die ekologiese asook funksionele belang bepaal. Hou die huidige ekologiese toestande in stand vir die langtermyn beskerming van die oorblywende veen, belangrike biodiversiteit, vloeiregulering en watergehalte verbeteringsfunksies, en as ’n belangrike en unieke landskapkenmerk. Hou in stand en waar moontlik verbeter die natuurlike vloeiverdeling en retensiepatrone in die sisteem. Hou goeie watergehalte gewoonlik geassosieer met huishoudelike waterdraers en geassosieerde veenvleilande in stand. Aangesien veenlande lae energievloei met permanente versadiging en anaërobiese toestande vereis, vir veen om te kan vermenigvuldig of ten minste nie vergaan nie, is dit belangrik dat hierdie toestande aan voldoen moet word om die sisteem in stand te hou. Die ergste wat kan gebeur is om die sisteem in stand te hou gebaseer op ’n TEK of K wat sou beteken het dat dit belangrik sou wees om ’n daaglikse vloei in stand te hou soos voorgestel in die Preliminêre Reserwe om die veen voortdurend aan te vul en dit versadig te hou en op dié manier enige kans te verhoed dat dit uitdroog, oksideer en verrot of brand. Aan die ander kant, deur die stelsel te verbeter gebaseer op ’n AEK of B/C sou beteken dat dit belangrik sou wees om die daaglikse vloei en die veenland te verhoog, soos aangedui in die Preliminêre Reserwe. Dit sal inundasie van die sisteem toelaat en op dié manier die vermeerdering of akkumulasie van veen deur die skepping van anaërobiese toestande binne die rhisomatus sone fasiliteer en dus toestande skep gunstige vir akkumulasie van organiese matter afkomstig van die seisoenale afsterwe van onderstokke. Dit sou ontaard in ’n verbetering in die stelsel deur die herbenatting van laterale habitatte, die inundasie van huidig blootgestelde veen, en die hervestiging van die natuurlike veen akkumulasieproses, veral in daardie gebiede waar veen voorheen al gemyn is. Voorkom oorabstraksie van die geassosieerde dolomitiese waterdraer. Verseker volbrenging van die rehabilitasiemaatreëls voorgestel vir die veen mynwese wat in die sisteem plaasgevind het. ’n Bestuurs- en rehabilitasieplan moet vir die sisteem ontwikkel en geïmplimenteer word. Werk die bestaande Preliminêre Vleiland Reserwe by en bepaal ’n Preliminêre Grondwater Reserwe vir die sisteem asook beskermings- en bestuursvereistes vir die grondwater om die geassosieerde dolomiet waterdraer en vloei in die sisteem te beskerm.
UL	C23E	Abe Bailey-natuurreservaat	Ongekanaliseerde en gekanaliseerde	D[3]	Hoog	C	C	Implementeer maatreëls om die ekologiese toestand te verbeter vir die langtermyn beskerming van belangrike biodiversiteit en as ‘n belangrike landskapkenmerk.

[3] Aangesien hierdie sisteem met ’n natuurreservaat geassosieer word, word die TEK aanbeveel om dieselfde as die AEK te wees en word een kategorie hoer as die HES gestel

67

IUA	Kwartêr Opvanggebied	Naam van vleiland	Soort vleiland	HES	BS	AEK	TEK	Ekologiese Spesifikasies Beskermings-, Handhawing- en Bestuursvereistes
		vleilande	valleibodem					Verseker dat die terrein en die opvanggebied bydra tot die CBA- en EOG-landskapvlakdoel vir die terrein om 'n lewensvatbare verteenwoordigende monster van hierdie soort ekosisteme en die geassosieerde biodiversiteit te verteenwoordig en in stand te hou. Hou in stand en waar moontlik verbeter die bestaande vloeiverdeling en retensiepatrone in die sisteem. Oortollige voedingsinsette moet geïdentifiseer en aangespreek word.
UL	C23H en C23L	O.P.M. Prozesky-voëlpark	Vloedvlakte	E[4]	Hoog	D	D	Implementeer maatreëls om die huidige ekologiese toestand te verbeter vir die langtermyn beskerming van belangrike biodiversiteit en as 'n belangrike landskapkenmerk. Verseker dat die terrein en die opvanggebied bydra tot die CBA- landskapvlakdoel vir die terrein om 'n lewensvatbare verteenwoordigende monster van hierdie soort ekosisteme en die geassosieerde biodiversiteit te verteenwoordig en in stand te hou. Hou in stand en vermeerder die bestaande vloeiverspreiding en retensiepatrone in die sisteem. Oortollige voedingsinsette moet geïdentifiseer en aangespreek word.
MA	C70K	Witpan	Pan	F[5]	Hoog	D	D	Implementeer maatreëls om die huidige toestand te verbeter (ekologiese toestand) van die sisteem vir dit om bestaande dienste te verskaf. Oortollige voedingsinsette moet geïdentifiseer en aangespreek word.
MC	C24C	Pan- en vleilandkompleks - Leliefontein	Pan, Sepe en ongekanaliseerde valleibodem	C	Hoog	B/C	C	Om die huidige ekologiese toestand in stand te hou vir die langtermyn beskerming van die biodiversiteit en as 'n belangrike landskapkenmerk. Hou in stand of verbeter bestaande ekologiese diversiteit en onderlinge verbinding van die pan en geassosieerde vleilandsisteem. Watergehalte en –kwaliteit impakte moet bestuur word sodat dit nie die ekologiese waarde van die pan en die geassosieerde vleiland ondermyn nie.
MC	C24C	Vetpan	Pan	C	Hoog	B/C	C	Om die huidige ekologiese toestand in stand te hou vir die langtermyn beskerming van die biodiversiteit en as 'n belangrike landskapkenmerk. Hou in stand of verbeter bestaande ekologiese diversiteit en onderlinge verbinding van die pan en geassosieerde dreineringsisteem en omliggende natuurlike habitatte. Watergehalte en –kwaliteit impakte moet bestuur word sodat dit nie die ekologiese waarde van die pan en die geassosieerde vleiland ondermyn nie.

4 Die sisteem is in 'n HES-kategorie van E (Ernstig Veranderd), maar het 'n hoë BS aangesien dit as 'n belangrike voëlpark beskou word. 'n HES-kategorie van E is nie volhoubaar nie so die TEK word aanbeveel om dieselfde as die AEK te wees en word twee kategorieë hoër as die HES gestel

5 Die sisteem is in 'n HES-kategorie van F (Krities Veranderd), maar het 'n hoë BS aangesien dit as 'n belangrike voëlpark beskou word. 'n HES-kategorie van F is nie volhoubaar nie so die TEK word aanbeveel om dieselfde as die AEK te wees en word twee kategorieë hoër as die HES gestel

IUA	Kwartêr Opvanggebied	Naam van vleiland	Soort vleiland	HES	BS	AEK	TEK	Ekologiese Spesifikasies Beskermings-, Handhawing- en Bestuursvereistes
MC	C24C	Klippan en vleilandsisteem geassosieer met Klippan	Pan en ongekanaliseerde valleibodem	C	Hoog	B/C	C	Om die huidige ekologiese toestand in stand te hou vir die langtermyn beskerming van belangrike biodiversiteit en as ’n belangrike landskapkenmerk. Maak seker dat die terrein en die opvanggebied bydra tot die CBA- en EOG-landskapvlakdoel vir die terrein om ’n lewensvatbare verteenwoordigende monster van hierdie soort ekosisteem en die geassosieerde biodiversiteit te verteenwoordig en in stand te hou. Watergehalte en –kwaliteit impakte moet bestuur word sodat dit nie die ekologiese waarde van die pan en die geassosieerde vleiland ondermyn nie. Hou in stand en vermeerder die bestaande vloeiverdeling en retensiepatrone in die sisteem. Huidige ongekanaliseerde vleilande moet soos ongekanaliseerde sisteme in stand gehou word. Hou bestaande plantegroeistruktuur en –samestelling in stand. Die vleiland moet geassesseer word om potensiële rehabilitasiemaatreëls te identifiseer wat die huidige toestand sal verbeter.
MC	C24C	Boonste gedeelte van die Schoonspruit-veenland en die Schoonspruit-oog	Veenvleiland en dolomitiese oog	B	Baie hoog	A	B	Instandhouding van die altydgroeiende aard van die sisteem en ’n diffuse waterverspreidingpatroon regoor die sisteem is sleutelkenmerke wat die ekologiese asook funksionele belang bepaal. In ’n natuurlike of naby-natuurlike ekologiese toestand in stand te hou vir die langtermyn beskerming van belangrike biodiversiteit, veen, vloeiregulasiefunksie, en as ‘n belangrike en unieke landskapkenmerk. Hou die natuurlike vloeiverspreiding en retensiepatrone in die sisteem in stand. Hou goeie watergehalte in stand wat gewoonlik geassosieer word met dolomitiese waterdraers en geassosieerde oë/waterbronne. Voorkom oorabstraksie van die geassosieerde dolomitiese waterdraer. Hou die natuurlike vis en makro-ongewerwelde diversiteit van die sisteem in stand en voorkom die inleiding van eksotiese taksa. ’n Bestuursplan moet vir die sisteem ontwikkel en geïmplimenteer word in oorleg met geïnteresseerde en geaffekteerde partye. Bepaal ’n Preliminêre Vleiland en Grondwater Reserwe vir die sisteem asook beskermings- en bestuursvereistes vir die grondwater om die geassosieerde dolomiet waterdraer en vloei in die sisteem te beskerm.
MC	C24F	Vloedvlakte en laer gedeelte van die Taaibosspruit	Vloedvlakte en ongekanaliseerde valleibodem	C	Hoog	B/C	C	Vloede word benodig om die vloedvlakte te inundeer en verskaf daardeur die benatting regime wat vereis word om die vloedvlakteplantegroei te ondersteun wat afhanklik is van onderwatersetting vir hulle lewensiklusse. Die laer gedeelte van die vleiland is ongekanaliseer en moet so bly aangesien dit heel moontlik watergehalte verbeteringsfunksies en habitat verskaf wat anders as die res van die sisteem is. Dit verbeter die biodiversiteit van die vleiland. Hou die huidige ekologiese toestand in stand en waar moontlik verbeter die toestand van die sisteem vir die langtermyn beskerming van belangrike biodiversiteit en as ’n belangrike landskapkenmerk.

IUA	Kwartêr Opvanggebied	Naam van vleiland	Soort vleiland	HES	BS	AEK	TEK	Ekologiese Spesifikasies Beskermings-, Handhawing- en Bestuursvereistes
								Hou die bestaande vloeiverdeling en retensiepatrone in die sisteem in stand om die bestaande plantegroeistrukture en –samestelling in stand te hou. Ongekanaliseerde gedeeltes van die vleiland moet as ongekanaliseerd in stand gehou word en bestaande plantegroeistruktuur en –samesteling moet ten minste teruggehou of verbeter word. Laterale vloei-ingange tot die vleiland moet beskerm word deur die aanwending van hidrologiese buffers te bepaal deur hidro-pedologiese assesserings te onderneem as deel van OIA- en/of WGL-aansoeke en streng lisensiëringstoestande, insluitend monitering van die sisteme, moet van toepassing wees. Die vleiland moet geassesseer word om potensiële rehabilitasiemaatreëls te identifiseer wat die huidige toestand en die funksies wat dit uitvoer, sal verbeter.
MC	C24G	Vloedvlakte van die Schoonspruit insluitend Mahemsvlei	Vloedvlakte	C	Hoog	B/C	C	Vloede word benodig om die vloedvlakte te inundeer en verskaf daardeur die benatting regime wat vereis word om die vloedvlakteplantegroei te ondersteun wat afhanklik is van onderwatersetting vir hulle lewensiklusse. Om die huidige ekologiese toestand in stand te hou en waar moontlik die toestand van die sisteem vir die langtermyn beskerming van belangrike biodiversiteit en as ’n belangrike landskapkenmerk te verbeter. Hou die bestaande vloeiverdeling en retensiepatrone in die sisteem in stand om die bestaande plantegroeistrukture en –samestelling in stand te hou. Laterale vloei-ingange tot die vleiland moet beskerm word deur die aanwending van hidrologiese buffers te bepaal deur hidro-pedologiese assesserings te onderneem as deel van OIA- en/of WGL-aansoeke en streng lisensiëringstoestande, insluitend monitering van die sisteme moet van toepassing wees. Die vleiland moet geassesseer word om potensiële rehabilitasiemaatreëls te identifiseer wat die huidige toestand en die funksies wat dit uitvoer, sal verbeter.
MC	C24C en C24E	Laer gedeelte van die Schoonspruit-vaanland	Veenvleiland	D	Baie hoog	C	C	Instandhouding van die altydgroeiende aard van die sisteem en ’n diffuse waterverspreidingspatroon regoor die sisteem is sleutel kenmerke wat die ekologiese asook funksionele belang bepaal. Verbeter die ekologiese toestand van die sisteem vir die langtermyn beskerming van belangrike biodiversiteit, veen, vloeiregulasiefunksie, en as ‘n belangrike en unieke landskapkenmerk. Hou die natuurlike vloeiverspreiding en retensiepatrone in die sisteem in stand. Hou goeie watergehalte gewoonlik geassosieer met dolomitiese waterdraers en geassosieerde oë/waterbronne in stand. Voorkom oorabstraksie van die geassosieerde dolomitiese waterdraer. Voorkom en bestuur oorabstraksie/afleiding van vloei/water vanaf die veenland. Hou die natuurlike vis en makro-ongewerwelde diversiteit van die sisteem in stand en voorkom die inleiding van

IUA	Kwartêr Opvanggebied	Naam van vleiland	Soort vleiland	HES	BS	AEK	TEK	Ekologiese Spesifikasies Beskermings-, Handhawing- en Bestuursvereistes
								eksotiese taksa. 'n Bestuursplan moet vir die sisteem ontwikkel en geïmplimenteer word in oorleg met geïnteresseerde en geaffekteerde partye. Bepaal 'n Preliminêre Vleiland en Grondwater Reserwe vir die sisteem asook beskermings- en bestuursvereistes vir die grondwater om die geassosieerde dolomiet waterdraer en vloei in die sisteem te beskerm.
MA	C70G	Grootvlei in 'n byrivier van die Heuningspruit en op die Heuningspruit	Ongekanaliseerde en gekanaliseerde valleibodem	D	Hoog	C/D	D	Hou in stand en waar moontlik verbeter die huidige ekologiese toestand vir die langtermyn beskerming van belangrike biodiversiteit en as 'n belangrike landskapkenmerk. Verseker dat die terrein en die opvanggebied bydra tot die CBA1-, EOG1- en EOG2-landskapvlakdoel vir die terrein om 'n lewensvatbare verteenwoordigende monster van hierdie soort ekosisteme en die geassosieerde biodiversiteit te verteenwoordig en in stand te hou. Hou in stand en verhoog die bestaande vloeiverspreiding en retensiepatrone in die sisteem. Huidige ongekanaliseerde vleilande moet soos ongekanaliseerde sisteme in stand gehou word. Hou bestaande plantegroeistruktuur en –samestelling in stand. Laterale vloei-ingange tot die vleiland moet beskerm word deur die aanwending van hidrologiese buffers te bepaal deur hidro-pedologiese assesserings onderneem as deel van OIA- en/of WGL-aansoeke en streng lisensiëringstoestande, insluitend monitering van die sisteme, moet van toepassing wees. Die vleiland moet geassesseer word om potensiële rehabilitasiemaatreëls te identifiseer wat die huidige toestand sal verbeter.
MA	C70K	Vleilandsisteem aangrensend Viljoenskroon	Ongekanaliseerde en gekanaliseerde valleibodem	E[6]	Hoog	D	D	Hou in stand en vermeerder die bestaande vloeiverdeling en retensiepatrone in die sisteem. Druk vanaf riooluitloopwater, fisiese obstruksie, informele nedersettings en ander in stroomopgebiede moet aandag geniet. Huidige ongekanaliseerde vleilande moet soos ongekanaliserende sisteme in stand gehou word. Hou in stand of verbeter bestaande plantegroeistruktuur en -samestelling. Die vleiland moet geassesseer word om potensiële rehabilitasie maatreëls te identifiseer wat die huidige toestand en vermoë om watergehalte te verbeter, sal verbeter.
MA	C70K	Groot Rietpan	Pan	D	Hoog	C/D	C/D	Implementeer maatreëls om die huidige ekologiese toestand te verbeter vir die langtermyn beskerming van belangrike biodiversiteit en as 'n belangrike landskapkenmerk. Verseker dat die terrein en die opvanggebied bydra tot die CBA2-landskapvlakdoel vir die terrein om 'n lewensvatbare verteenwoordigende monster van hierdie soort ekosisteme en die geassosieerde biodiversiteit te verteenwoordig en in stand te hou. Hou in stand en vermeerder die bestaande vloeiverdeling en retensiepatrone in die sisteem. Monitor voedings- en sedimentingange van onmiddelike opvanggebiede.

[6] Die sisteem is in 'n HES-kategorie van E (Ernstig Veranderd), maar het 'n hoë BS weens die hidro-funksionele belang. 'n HES-kategorie van E is nie volhoubaar nie so die TEK word aanbeveel om dieselfde as die AEK te wees en word een kategorie hoër as die HES gestel

IUA	Kwartêr Opvanggebied	Naam van vleiland	Soort vleiland	HES	BS	AEK	TEK	Ekologiese Spesifikasies Beskermings-, Handhawing- en Bestuursvereistes
								Die vleiland moet geassesseer word om potensiële rehabilitasiemaatreëls te identifiseer om die hidrologie na ’n meer natuurlike toestand te herstel.
MF	C25B	Boonste bolope van die Sandspruit (onmiddelik noord van Kutloanong)	Ongekanaliseerde en gekanaliseerde valleibodem	D	Hoog	C/D	D	Hou in stand en waar moontlik verbeter die huidige ekologiese toestand vir die langtermyn beskerming van belangrike biodiversiteit en as ‘n belangrike landskapkenmerk. Maak seker dat die terrein en sy opvanggebied bydra tot die CBA1- en EOG1- landskapvlakdoel vir die terrein om ’n lewensvatbare verteenwoordigende monster van hierdie soort ekosisteme en die geassosieerde biodiversiteit te verteenwoordig en in stand te hou. Hou in stand en waar moonltik vermeerder die bestaande vloeiverspreiding en retensiepatrone in die sisteem. Druk vanaf riooluitloopwater, fisiese obstruksie, informele nedersettings en ander in stroomopgebiede moet aandag geniet. Huidige ongekanaliseerde vleilande moet soos ongekanaliseerde sisteme in stand gehou word. Hou in stand of verbeter bestaande plantegroeistruktuur en -samestelling. Laterale vloei-ingange tot die vleiland moet beskerm word deur die aanwending van hidrologiese buffers te bepaal deur hidro-pedologiese assesserings te onderneem as deel van OIA- en/of WGL-aansoeke en streng lisensiëringstoestande, insluitend monitering van die sisteme, moet van toepassing wees. Die vleiland moet geassesseer word om potensiële rehabilitasiemaatreëls te identifiseer wat die vermoë sal verbeter om watergehalte te verbeter.
MF en MD2	C25B, C25F en C43B	Groepie panne rondom Wesselbron insluitend Volstruispan na die noorde	Groepie panne	C	Hoog	B/C	B/C	Hou die naby-natuurlike ekologiese toestand in stand vir die langtermyn beskerming van belangrike biodiversiteit en as ’n belangrike landskapkenmerk. Maak seker dat die terrein en die opvanggebied bydra tot die EOG1- en EOG2-landskapvlakdoel vir die terrein om ’n lewensvatbare verteenwoordigende monster van hierdie soort ekosisteme en die geassosieerde biodiversiteit te verteenwoordig en in stand te hou. Beskerm die watergehalte en ekologiese karaktereienskappe van die verskillende panne geassossieer met die groepie om te verseker dat hullle aanhou om die biodiversiteitondersteuningsfunkies tipies geassossieer met die verskillende pansoorte wat teenwoordig is, te verskaf. Hou in stand of verbeter bestaande ekologiese diversiteit en onderlinge verbinding van individuele verlaagde vleilande (panne).
MD2	C43B	Flamingo Pan	Pan	F[7]	Hoog	D	D	Implementeer maatreëls om die huidige toestand van die pan te verbeter vir dit om voort te gaan om bestaande dienste te verskaf.

[7] Die sisteem is in ’n HES-kategorie van F (Krities Veranderd), maar het ’n hoë BS aangesien dit ’n belangrike voëlpark beskou word. ’n HES-kategorie van F is nie volhoubaar nie so die TEK word aanbeveel om dieselfde as die AEK te wees en word twee kategorieë hoër as die HES gestel

IUA	Kwartêr Opvanggebied	Naam van vleiland	Soort vleiland	HES	BS	AEK	TEK	Ekologiese Spesifikasies Beskermings-, Handhawing- en Bestuursvereistes
								Oortollige voedings- en besoedelingsinsette moet geïdentifiseer en aangespreek word. Stel voor en implimenteer fisiese en bestuursintervensies wat vereis word.
ME2	C43A	Bultfontein Pan	Pan	D	Hoog	C/D	C/D	In oorleg met geïnteresseerde en geaffekteerde partye verken en waar doenlik implimenteer maatreëls om die hidrologiese regime tot 'n meer natuurlike toestand te verbeter. Verhoed riooluitloopwater om in die vleilandsisteem in te vloei. Assesseer en monitor die impak van soutwerke en ander aktiwiteite op die hidrologie en die biodiversiteitondersteuningsfunkisie van die vleiland. Stel voor en implimenteer fisiese en bestuursintervensies wat vereis word.
MD2	C43B	Toronto Pan	Pan	F[8]	Hoog	D	D	Implementeer maatreëls om die huidige toestand van die pan te verbeter vir dit om voort te gaan om bestaande dienste te verskaf. Oortollige voedings- en besoedelingsinsette moet geïdentifiseer en aangespreek word. Stel voor en implimenteer fisiese en bestuursintervensies wat vereis word.
LA1	C31D	Barberspan[9]	Pan	C	Baie hoog	B	B/C	Hou in stand en indien moontlik verbeter die huidige ekologiese toestand vir die langtermyn beskerming van belangrike biodiversiteit en as 'n belangrike vleiland en landskapkenmerk. Oortollige voedings- en sedimentingange moet geïdentifiseer en aangespreek word. Skakel met geïnteresseerde en geaffekteerde partye om 'n samewerkende bestuurs- en moniteringsplan saam met dié vir Leeupan te ontwikkel.
LA1	C31D	Leeupan	Pan	C[10]	Hoog	B/C	B/C	Implementeer maatreëls om die huidige ekologiese toestand van die vleiland te verbeter vir die langtermyn beskerming van belangrike biodiversiteit en as 'n belangrike landskapkenmerk. Oortollige voedings- en/of sedimentingange moet geïdentifiseer en aangespreek word. Skakel met geïnteresseerde en geaffekteerde partye om 'n samewerkende bestuurs- en moniteringsplan saam met dié vir Barberspan te ontwikkel.
LA2	C31E	Harts River-vloedvlakte	Vloedvlakte	C	Hoog	B/C	B/C	Erosie en kanaalinsnyding dreig om die vloeddempfunksies van die vleiland te ondermyn. Dit is ook belangrik om die beskerming en handhawing van die vloedvlaktehabitatte wat biodiversiteit ondersteun, te verseker. Implementeer maatreëls om die huidige toestand van die vleiland te verbeter vir die langtermyn beskerming van

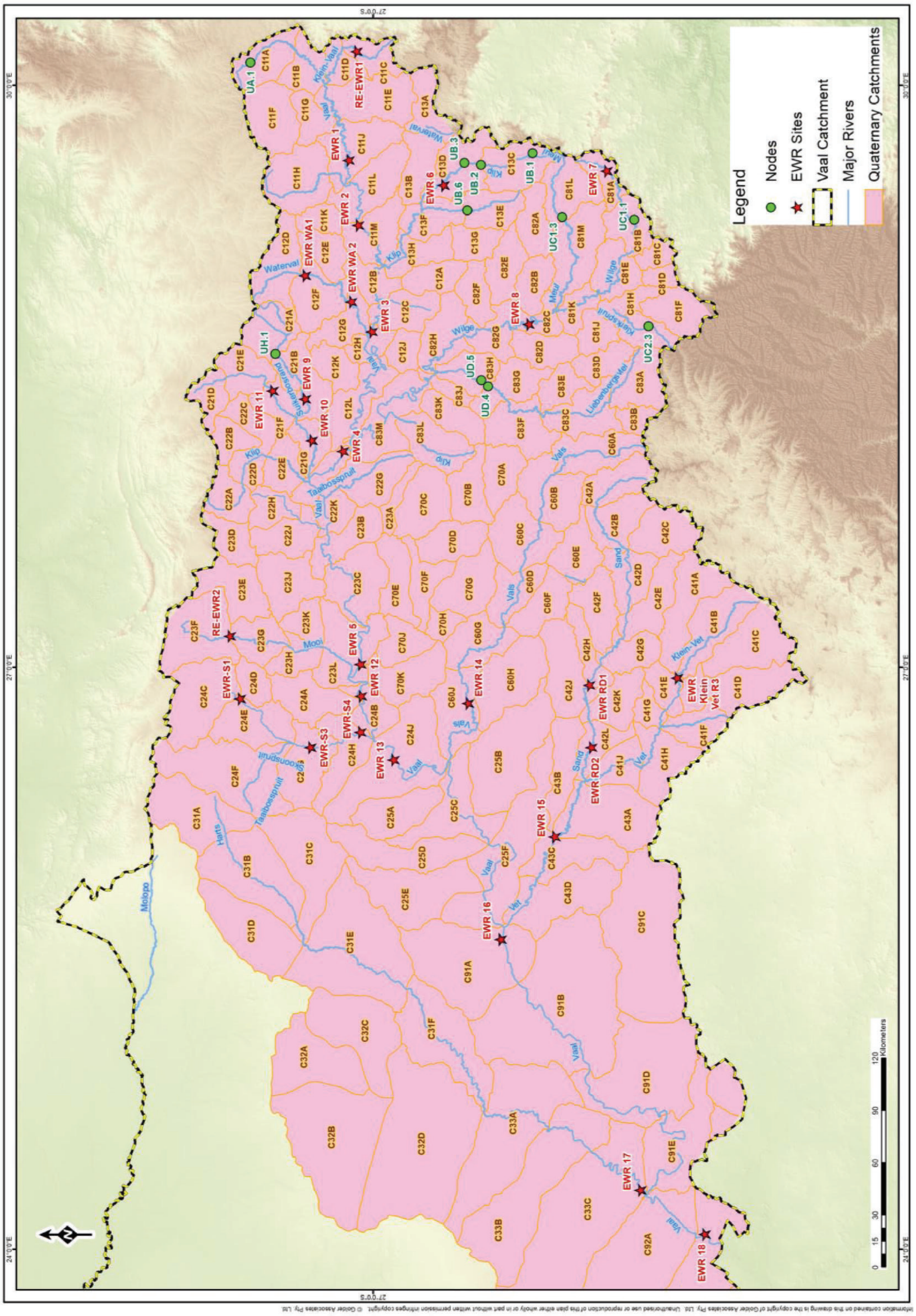
[8] Die sisteem is in 'n HES-kategorie van F (Krities Veranderd), maar het 'n hoë BS aangesien dit 'n belangrike voëlpark beskou word. 'n HES-kategorie van F is nie volhoubaar nie so die TEK word aanbeveel om dieselfde as die AEK te wees en word twee kategorieë hoër as die HES gestel

[9] Die sisteem is 'n Ramsar-terrein (aangewys as 'n Vleiland van Internasionale Belang in terme van die Ramsar-konvensie)

[10] Aangesien hierdie sisteem geassosieer word met die Barberspan Ramsar-terrein, word die TEK aanbeveel om dieselfde te wees as die AEK en word dit 'n halwe kategorie hoër as die HES gestel

IUA	Kwartêr Opvanggebied	Naam van vleiland	Soort vleiland	HES	BS	AEK	TEK	Ekologiese Spesifikasies Beskermings-, Handhawing- en Bestuursvereistes
								belangrike biodiversiteit en as 'n belangrike landskapkenmerk. Hou 'n lewensvatbare verteenwoordigende monster van hierdie soort ekosisteme en die geassosieerde biodiversiteit in stand. Hou in stand en vermeerder die bestaande vloeiverdeling en retensiepatrone in die sisteem en hou die hidrologiese en ekologiese skakel na Barberspan. Hou die bestaande plantegroeistruktuur en –samestelling in stand.
LB	C91E	Kamferpan[11]	Pan	C	Baie hoog	B	B/C	Hou in stand en waar moontlik verbeter die toestand van die pan vir dit om voort te gaan om bestaande hidrologiese en biodiversiteit-ondersteuningsdienste te verskaf. Oortollige voedings- en besoedelingsinsette moet geïdentifiseer en aangespreek word. Voortsetting van bestaande pogings om riool ingang te verhoed en watervlakke te bestuur om onderwatersetting van aanteelgebiede te verhoed. Monitor dreigemente soos eutrofisering en rietinbreukmaking. Skakel met geïnteresseerde en geaffekteerde partye om 'n samewerkende bestuurs- en moniteringsplan vir die pan te ontwikkel.
LB	C91B	Gannapan	Pan	C	Hoog	B/C	B/C	Hou in stand en waar moontlik verbeter die huidige ekologiese toestand vir die langtermyn beskerming van belangrike biodiversiteit en as 'n belangrike landskapkenmerk. Verseker dat die terrein en die opvanggebied bydra tot die CBA1-, CBA2- en EOG1-landskapvlakdoel vir die terrein om 'n lewensvatbare verteenwoordigende monster van hierdie soort ekosisteme en die geassosieerde biodiversiteit te verteenwoordig en in stand te hou.
LB	C92A	Silverstreams-pan (Die Groot Pan) en geassosieerde vleilandkompleks	Panne, ongekanaliseerde valleibodem en waterbronne	B	Hoog	A/B	B	Hou bestaande hidrologiese regime in stand en ekologiese prosesse om die panne, waterbronne en geassosieerde vleilandhabitatte in die huidige ekologiese toestand te beskerm. Hou die natuurlike vloeiverdeling en retensiepatrone in die sisteem in stand. Hou goeie watergehalte wat gewoonlik geassosieer word met dolomiet waterdraers en geassosieerde oë/waterbronne in stand. Voorkom oorabstraksie van die geassosieerde dolomitiese waterdraer. 'n Bestuursplan moet vir die sisteem ontwikkel en geïmplimenteer word in oorleg met geïnteresseerde en geaffekteerde partye. Bepaal 'n Preliminêre Vleiland en Grondwater Reserwe vir die sisteem asook beskermings- en bestuursvereistes vir die grondwater om die geassosieerde dolomiet waterdraer, geassosieerde waterbronne en vloei in die sisteem te beskerm.

[11] Alhoewel dit meerendeels kunsmatig in stand gehou is, is hierdie sisteem 'n kritiese aanteelterrein vir Kleinflamink en streng beskermingsvereistes moet toegepas word om te verseker dat dit vir hierdie spesie 'n suksesvolle aanteelterrein bly



Figuur 1: Kaart van die Vaal-waterbestuursarea wat die kwartêr opvanggebiede, EWV en nodusterreine illustreer

75

MOLAO WA BOTSETŠHABA WA METSI WA 1998
(MOLAO WA NO. YA 36 WA 1998)

TLHOMAMISO YA RASEFE YA METSWEDI YA METSI YA LEFELO LA TAOLO YA METSI A VAAL

Nna, Lindiwe Sisulu, Tona ya Manno a Batho, Metsi le Kgeleloleswe, go ya ka karolo ya 16 (1) ya Molao wa Bosetšhaba wa Metsi wa 1998 (Molao wa No. ya 36 wa 1998), jaanong ke phasalatsa Tshomarelo ya Rasefe e e tlhomamisitsweng ya metswedi ya metsi a Lefelo ya Taolo ya Metsi la Vaal, jaaka simolola loêtô mo ka Mametlelelo.

L N SISULU (MP)
TONA YA MANNO A BATHO, METSI LE KGELELOLESWE
LETLHA: 05/03/2020

MAMETLELELO

1. TLHALOSO YA MOTSWEDI WA METSI

1.1 Rasefe e tlhomamisiwa ka motswedi otlhe wa metsi kgotsa karolo nngwe le nngwe e e botlhokwa mo Lefelong la Taolo la Metsi la Vaal jaaka go tlhalositswe fa tlase:

Lefelo la Taolo la Metsi: Vaal

Dikgaolo tsa Meselo: C Kgaolo ya Moselomogolo:
C11, C12, C13, C21, C22, C23, C81, C82, C83, C24, C25, C41, C42, C43, C60, C70, C31, C32, C33, C91, C92, C41, C42
(go sa akarediwa Bodutiso jwa Modder Riet, C51 le C52, gape go sa akarediwa modutelo wa Molopo, D41 le D42 le Lefelo ya Taolo ya Metsi a Vaal)

Dinoka: Vaal, Wilge, Klip, Klein Vaal, Waterval, Suikerbosrand, Blesbokspruit, Mooi, Vals, Schoonspruit, Sand, Vet, Harts

2. TLHALOSO YA DIAKERONIMI

2.1 Diakeronimi

BAS	Puso e e Fitlhelesegang Sentle
BHN	Ditlhoko tsa Motheo tsa Batho
CAWC	Palo e e gokagantswehng ya Dinonyane tsa Metsi
CBA	Mafelo a a Botlhokwa a a Mefutafuta
EC	Setlhopha sa Ekholoji
EcoSpecs	Dithulaganyo tsa Ekholoji
EIA	Tlhatlhobo ya Kutlwalo ya Tikogolo
EIS	Botlhokwa le bosisi jwa Ekholoji
ESA	Mafelo a Tshegetso a Ekholoji
EWR	Tlhokego ya Metsi ya Ekholoji
GRAII	Ditekanyetso tse di Laetsweng tsa Motswedi wa Metsi a a ka fa Tlase ga Lefatshe
GRDM	Ditekanyetso tse di Laetsweng tsa Motswedi wa Metsi a a ka fa Tlase ga Lefatshe
GRUs	Diyuniti tsa Motswedi wa Metsi a a ka fa tlase ga Lefatshe
IS	Botlhokwa le Bosisi
MAR	Kelelo e Nnye ya Ngwaga
MCM	Dikubimitara di le milione
nMAR	Kelelo e Nnye ya Tlhago ya Ngwaga
PES	Maemo a Gajaana a Ekholoji
REC	Setlhopha se se Atlanegisitsweng sa Ekholoji
TEC	Setlhopha se se Totilweng sa Ekholoji
TPCs	Direpodi tsa Kgonagalo ya Matshwenyego
WUL	Laesense ya Tiriso ya Metsi

2.2 Ditlhaloso

Kelelo ya kwa tlase e e tswelediwang ke kelelo ya mo dinokeng ka nako ya maemo a bosa a a omileng le a a siameng, fela a sa abelwa otlhe ke metsi a a kwa tlase ga lefatshe, go akaretsa kabelo go tswa mo kelelong ya ka fa gare e e diegileng le go tswa ga metsi a a ka fa tlase ga lefatshe.

Setlhopha sa Motswedi wa Metsi: Ditaelo tsa Setlhopha ke setlhopha sa dimelo tse di elediwang tsa tiriso le maemo a ekholoji a metswedi e e botlhokwa ya metsi mo bodutisong jo bo rileng (yuniti e e tshwaraganeng ya tshekatsheko) Setlhopha se tshwanetse go tlhalosa bogolo jwa tiriso ya metswedi ya metsi: Rasefe; maitlhomo a boleng jwa motswedi le tlhomamiso ya karolo e e abiwang ya motswedi wa metsi o o dirisiwang. Motswedi wa metsi o tshwanetse go farologanngwa ka e le nngwe ya ditlhopha di le tharo, Setlhopha I motswedi wa metsi le Setlhopha II motswedi wa metsi le Setlhopha III motswedi wa metsi.

Botlhokwa le Bosisi jwa Ekholoji (EIS): Dibotshidigolo mo tlhophelong ya ekholoji ya metswedi ya metsi. Botlhokwa jwa Ekholoji bo amana le go nna teng, go emelwa le mefutafuta ya ditshedi tsa mo lefelong le le rileng le bonno. Bosisi jwa ekholoji bo amana le ketsaetsego ya bonno le ditshedi mo lefelong le le rileng mo diphetogong tse di ka diragalang mo dikelelong, maemo a metsi le maemo a lefatshe a a nang le dikhemikale.

Ditlhokego tsa Metsi tsa Ekholoji (EWR): Mekgwa ya Kelelo (Bogolo, nako le lobaka) le metsi a a boleng a a tlhokegang go tshola tikologo ya dinoka mo maemong a a rileng. Lereo le le dirisiwa go kaya dikarolo tsa bokanakang le boleng ka bobedi.

Dibaka tsa Tlhogelo ya Metsi ya Ekholoji (EWR): Dintlha tse di totobetseng tsa noka jaaka go tlhomamisitswe ka tsweletso ya tlhopho ya sebaka. Sebaka sa EWR se na le boleele jwa noka e e ka nnang le mefuta ya dikarolo tse di farologaneng ka maikemisetso a metsi le ekholoji. Dibaka tse di tlamela dibontshi tse di lekaneng go tlhatlhoba dikelelo tsa tikogolo le go tlhatlhoba maemo a dikarolo tsa saense ya tiriso ya melao ya fisika mo baelojing (thutatshelong) (ditlhotlheletsi tse di jaaka haeteroloji, jeomofoloji, le dikhemikale tsa fisika) le ditsibogo tsa baeoloji) (viz. ditlhapi, ditshedi tse di senang mokwatla, le dimela tse di mo lotshitshing).

Maemo a Gajaana a Ekholoji (PES): Setlhopha se se bontshang boitekanelo jwa gajaana ja mefuta ya boleng jwa baeoloji jwa motswedi wa metsi, fa go bapisiwa le maemo a tlhago kgotsa a a tshwanang le kaelo ya tlhago. Dipholo tsa tsweletso di tlamelwa jaaka Ditlhopha tsa Ekholoji (ECs) tse di simololang go A (gaufi le tlhago) go fitlha go F (tse di fetotsweng gotlhelele) mo PES.

Go tlatsa ke koketso ya metsi mo lefelong le le kolobileng, nwelelo ya kwa tlase ya pula kgotsa metsi a a mo boalong le/kgotsa go elela ga metsi a a ka fa tlase ga lefatshe a a gaufi le matlapa a a monang metsi.

Setlhopha se se Atlanegisitsweng sa Ekholoji (REC): Setlhopha sa ekholoji se se bontshang taolo e e totilweng ya motswedi wa metsi e e ka ga tlhophelo ya ona ya ekholoji e e tshwanetseng go fitlhelelwa. Ditlhopha di tloga ka Setlhopha A (se se sa fetolwang, tlhago) go fitlha go Setlhopha D (se se fetotsweng thata).

Mo noka e kopanang le enngwe teng (kopano ya baeofisikale): Tse ke dintlha tsa sekao tse di emetseng kelelo godimo kgotsa lefelo la metsi la thulaganyotikologo (dinoka, meraga, kgwelo le metsi a a ka fa tlase ga lefatshe) mo setlhopha sa dikamano se dirang teng.

Bodutiso jwa seka-kwatenari: Karolwana e nngwe ya bodutiso jwa kwatenari (mafelo a bodutiso a medutela ya dinoka kwa bodutisong jwa kwatenari).

Setlhopha se se Totilweng la Ekholoji (TEC): Se kaya maemo a a dirisitsweng a ekholoji a motswedi oo wa metsi go ya ka phapogo ya dikarolo tsa yona tsa baeyofisikale go tswa mo maemong a kaelo a tlhago. Setotwa sa bofelo sa go fitlhelela thulaganyo e e tswelelang ya ekholoji le ikomoni go tsewa tsia PES le REC.

3. TLHOMAMISO YA RASEFE

3.1 Rasefe e e akaretsang Ditlhokego tsa Metsi a Ekholoji (EWRs) le Rasefe ya Ditlhoko tsa Motheo tsa Batho (BHN) mo Dinokeng kwa dibakeng tsa EWR le dipumpunyego tsa biofisikale tse di tlhophilweng kwa Lefelong la Taolo ya Metsi a Vaal e tlhalositswe mo **karolong ya 4.** Lefelo la Taolo ya Metsi a Vaal le dibaka tsa EWR di supilwe mo **Popegong ya 1.**

3.2 Karolo ya boleng jwa metsi ya Rasefe ya Dinoka kwa dibakeng tsa EWR kwa bodutisong jwa Vaal e tlhagisitswe mo **karolong ya 5.**

3.3 Rasefe ya Metsi a a ka fa tlase ga Lefatshe ya Bokalo le Boleng jwa Metsi a Vaal e tlhagisitswe mo **karolong ya 6.**

3.4 Ditlhokego tsa ekholoji tsa Moraga wa Lefelo la Taolo ya Metsi a Vaal di tlhagisitswe mo **karolo 7.**

4. TLHOMAMISO YA RASEFE YA DINOKA

Tlhomamiso ya Rasefe le tlhophiso ya ekholoji go ya ka karolo ya 16(1) ya dinoka tsa lefelo la bodutiso la Vaal, kwa Resefe e tlhalositsweng e le phesente ya kelelo e nnye ya tlhago (NMAR) mo bodutisong (koketsego):

Lenaneo 4.1: Rasefe ya Dinoka kwa dibakeng tsa EWR e e akaretsa diEWR go sireletsa tikologo ya metsi le ditlhokego tsa BHN

Bodutiso jwa Kwatenari	Motswedi wa Metse	Setlhopha sa Motswedi wa Metsi	PES	EIS	TEC[5]	MAR (MCM)[1]	Rasefe[2] (%MAR)	Rasefe ya Ekholoji3 (%MAR)	Ditlhoko tsa Motheo tsa Batho (BHN) Rasefe4 (%MAR)
C11J	Noka ya Vaal – EWR 1	II	B/C	Kwa godimo	B/C	332.3*	39.411	39.41	0.001
C11M	Noka ya Vaal – EWR 2	II	C	Mo bogareng	C	457.7#	13.610	13.61	0.00022
C12F	Waterval – EWR WA1	III	D	Kwa tlase	D	76.71#	3.501	3.5	0.0007
C12G	Waterval – EWR WA2	III	D	Kwa tlase	D	147.43#	6.4003	6.4	0.00027
C12H	Noka ya Vaal – EWR 3	II	C	Mo bogareng	C	858.1#	14.300	14.3	0.00004
C22F	Noka ya Vaal – EWR 4	III	C	Kwa godimo	B/C	1977.3•	21.550	21.55	0.00015
C23L	Noka ya Vaal – EWR 5	III	C/D	Kwa godimo	C	2288•	34.100	34.1	0.00004
C13D	Noka ya Klip – EWR 6	II	B/C	Mo bogareng	B/C	95.3#	26.542	26.54	0.0021
C81A	Noka ya Wilge – EWR 7	II	A/B	Kwa godimo	A/B	23.5#	45.893	45.88	0.0128
C82C	Noka ya Wilge – EWR 8	II	C	Mo bogareng	C	474.3#	11.770	11.77	0.00006
C21C	Suikerbosrand – EWR 9	II	C	Kwa godimo	B/C	31.3#	41.893	41.89	0.0032
C21G	Suikerbosrand – EWR 10	III	C/D	Mo bogareng	C/D	149.27*	34.391	34.39	0.0007
C21F	Blesbokspruit – EWR 11	III	D	Kwa tlase	D	100.69*	18.145	18.14	0.0050
C11C	Noka ya Vaal e Nnye – RE-EWR 1	II	C	Mo bogareng	C	26.09#	24.725	24.71	0.0153
C23G	Noka ya Mooi – RE-EWR 2	III	D	Kwa tlase	D	37.7#	19.061	19.05	0.0106
C24B	Noka ya Vaal – EWR 12	III	D	Mo bogareng	D	1574.64*	28.280	28.28	0.00009
C24J	Noka ya Vaal – EWR 13	III	C/D	Mo bogareng	C/D	1638.37•	35.800	35.8	0.00009
C60J	Noka ya Vals – EWR 14	III	C/D	Mo bogareng	C/D	145.79#	17.050	17.05	0.00034
C43A	Noka ya Vet – EWR 15	III	C/D	Mo bogareng	C/D	253.15*	18.200	18.2	0.00028
C41E	Klein Vet – RE – EWR 3	II	C	Mo bogareng	C	49.56#	19.540	19.54	0.00028
C42J	Sand – EWR RD1	III	C/D	Mo bogareng	B/C	140.76#	23.820	23.82	0.00007
C42L	Sand – EWR RD2	III	C	Mo bogareng	B/C	180.692#	23.490	23.49	0.00011
C24E	Schoonspruit – EWR S1	III	C	Kwa tlase	C	59.38#	35.805	35.8	0.0049
C24G	Schoonspruit – EWR S3	III	C/D	Kwa tlase	C/D	89.96#	30.902	30.9	0.0018
C24H	Schoonspruit – EWR S4	III	C/D	Kwa tlase	C/D	102.09#	31.203	31.2	0.0034
C91A	Vaal – EWR 16	III	D	Mo bogareng	D	3242.51*	13.020	13.02	0.00007
C33C	Harts – EWR 17	II	D	Mo bogareng	D	147.85*	51.6034	51.60	0.0034
C92B	Vaal – EWR 18	III	C	Mo bogareng	C	1177.28*	21.871	21.87	0.00060

1) MAR ke Palogare ya Kelelo ya Metsi ka Ngwaga (# E e ka ga kelelo ya tlhago kwa sebakeng sa EWR; * E ka ga kelelo ya gajaana kwa sebakeng sa EWR; ● E ka ga kelelo e e etsweng tlhoko kwa sebakeng sa EWR).
2) Rasefe ke palogotlhe ya tlhokego e e ikarabelang mo Rasefeng ya Ekholoji le Ditlhoko tsa Motheo tsa Batho ka bobedi (BHN).
3) Tlhokego ya Rasefe ya Ekholoji e emetse palogare ya kelelo ya pakatelele ya MAR. Fa MAR e fetoga, bogolo le bona bo a fetoga.
4) E emela tlhokego ya BHN e le phesente ya MAR. Ditlhoko tsa motheo tsa batho di akaretsa baagi ba ba ikaegileng mo dinokeng, melapo kgotsa thebolo ya motswedi wa metsi (e tswa mo tshedimosetsong ya Palobatho ya 2011)
5) Setlhopha se se Totilweng sa Ekholoji (TEC): Setotwa sa bofelo sa go fitlhelela thulaganyo e e tswelelang ya ekholoji le ikonomi ka bobedi go tsewa tsia PES le REC.

TSHEDIMOSETSO YA SEBAKA SA DITLHOKEGO TSA EKHOLOJI TSA METSI

Sebaka sa EWR	Leina la sebaka sa EWR	Noka	Tshimologo ya noka ya seka-kwatenari	Dikgokaganyo		Bodutelo jwa Kwatenari
				Latitšhutu	Lonkitšhutu	
EWR1	Uitkoms	Vaal	C11J-01838	S26.872800	E29.613840	C11J
EWR2	Grootdraai	Vaal	C11M-01894	S26.92110	E29.27929	C11M
EWR WA1	Waterval_1	Waterval	C12F-01722	S26.64608	E29.01857	C12F
EWR WA2	Waterval_2	Waterval	C12G-01896	S26.88543	E28.88357	C12G
EWR3	Gladdedrift	Vaal	C12C-01997	S26.99087	E28.72971	C12H
EWR4	De Neys	Vaal	C22F-01737	S26.84262	E28.11230	C22F
EWR5	Skandinavia	Vaal	C22L-01792	S26.93243	E27.01367	C23L
EWR6	Klip	Klip	C13D-02226	S27.36166	E29.48503	C13D
EWR7	Wilge e e kwa Godimo	Wilge	C81A-02790	S28.20185	E29.55827	C81A
EWR8	Bavaria	Wilge	C82C-2505	S27.80017	E28.76778	C82C
EWR9	Kelelogodimo ya Suikerbos	Suikerbosrand	C21C-01675	S26.64670	E28.38197	C21C
EWR10	Kelelotlase yaSuikerbos	Suikerbosrand	C21G-01627	S26.68137	E28.16798	C21G
EWR11	Blesbokspruit	Blesbokspruit	C21F-01447	S26.47892	E28.42488	C21F
RE-EWR1	Vaal e Nnye	Vaal e Nnye	C11C-01846	S26.912750	E30.174970	C11C
RE-EWR2	Noka ya Mooi	Mooi	C23G-01250	S26.258670	E27.159730	C23G
EWR12	Noka ya Vaal: Vermaasdrift	Vaal	C24B-01817	S26.93615	E26.85025	C24B
EWR13	Noka ya Vaal: Moratho wa Regina	Vaal	C24J-02016	S27.10413	E26.52185	C24J
EWR14	Noka ya Vals: Proklameersdrift	Vals	C60J-02262	S27.48685	E26.81320	C60J
EWR15	Noka ya Vet: Fisantkraal	Vet	C43A-02561	S27.93482	E26.12569	C43A
RE-EWR 3	Klein-Vet, kelelotlase ya Winburg	Vet e Nnye	C41E-03132	S28.564708	E26.943946	C41E
EWR RD1	Kwa Meloding	Sand	C42J-02716	S28.1131994	E26.9080556	C42J
EWR RD2	Kwa Steel Bridge	Sand	C42L-02635	S28.1228333	E26.5855555	C42L
EWR S1	EWR S1	Schoonspruit	C24E-01164	S26.31172	E26.31172	C24E
EWR S3	EWR S3	Schoonspruit	C24G-01661	S26.67500	E26.586108	C24G
EWR S4	EWR S4	Schoonspruit	C24H-01860	S26.93333	E26.66528	C24H
EWR16	Kelelotlase ya letamo la Bloemhof	Vaal	C91A-02391	S27.65541	E25.59564	C91A
EWR17	Lebotakganelo la Lloyds kwa Nokeng ya Harts	Harts	C33C-02836	S28.37694	E24.30305	C33C
EWR18	Schmidtsdrift	Vaal	C92B-02903	S28.70758	E24.07578	C92B

Lenaneo 4.2: Rasefe ya Dinoka kwa dipumpunyegong tsa baeofikale ka botlhokwa jo bo kwa Godimo tsa Ekholoji

Bodutelo jwa kwatenari	Mo dinoka di kopanang teng	Noka	Tshimologo ya noka ya seka-kwatenari	PES	Botlhokwa jwa Ekholoji	REC	Rasefe ya Ekholoji (%NMAR)	Rasefe ya BNH (%NMAR)	Palogotlhe ya Rasefe (%NMAR)	NMAR (MCM/a)
C11A	UA.1	Vaal	C11A-01460	B/C	Kwa godimo	B/C	44.09	0.053	44.143	13.27
C13C	UB.1	Klip	C13C-02550	B	Kwa godimo	B	63.86	0.018	63.878	5.67
C13D	UB.2	Klip	C13D-02416	B/C	Kwa godimo	B/C	38.86	0.004	38.864	54
C13D	UB.3	Klip	C13D-02284	B/C	Kwa godimo	B	44.26	0.003	44.263	68.04
C13E	UB.6	Kommandospruit	C13E-02228	B/C	Kwa godimo	B	50.66	0.006	50.666	33.6
C81A	UC1.1	Wilge	C81A-02790	B	Kwa godimo	B	45.69	0.004	45.694	69.03
C81L	UC1.3	Meul	C81L-02594	B	Kwa godimo	B	57.25	0.008	57.258	26.49
C81G	UC2.3	Klerkspruit	C81G-02882	B	Kwa godimo	B	69.45	0.017	69.467	5.85
C83G	UD.4	Liebenbergsvlei	C83G-02364	B/C	Kwa godimo	B/C	62.48	0.006	62.486	4.74
C83H	UD.5	Liebenbergsvlei	C83H-02395	B/C	Kwa godimo	B	64.50	0.015	64.515	2.66
C12A	UH.1	Suikerbosrant	C12A-01567	B/C	Kwa godimo	B	47.17	0.002	47.172	28.65

5. KAROLO YA BOLENG JWA METSI YA RASEFE YA EKHOLOJI YA DINOKA

Ditlhokego tsa ekholoji tsa boleng jwa metsi a tlamelo ya setlhopha se se totilweng sa Rasefe ya ekholoji kwa sebakeng sengwe le sengwe di tlhalositswe mo Mananeong a 5.1 go fitlha go Lenaneo la 5.18. Tse ke diparameta tsa mesola ya boleng jwa metsi (serepodi sa botlalo) tse di sa tshwanelang go fetiwa gore go fitlhelelwe boleng jwa metsi jwa TEC.

Lenaneo 5.1: EWR1: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Vaal		EWR 1: kwa Uitkoms	Sebaka/selekanyo ya tebelelo ya boleng jwa metsi:C1H007/ VS4 GDDC11
Matswai a a sa Boleng	$MgSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 28 mg/L	
	Na_2SO_4	Phensentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 38 mg/L	
	$MgCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 36 mg/L	
	$CaCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 69 mg/L	
	NaCl	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 243 mg/L	
	$CaSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 351 mg/L	
Dipharologantsho tsa lefelo	Phetiso ya Motlakase	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 70 mS/m	
	pH	Phensentile ya 5 ya tshedimosetso e tshwanetse go nna 6.5 to 8.0, le phensentile ya 95 8.0 to 8.8	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥ 7.0 mg/L	
Dikotlo	Palogotlhe ya Naeterojene e e sa boleng (TIN)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.7 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.020 mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna < 20 µg/L	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna < 21 mg/m2	
Botlhole	Amonia	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.044 mg/L	
	Aterasine	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.064 mg/l	
	Foloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 2.5 mg/L	
	Endosulfan	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.13 µg/l	

Lenaneo 5.2: EWR2: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Vaal		EWR 2: Kelelotlase ya Grootdraai	Sebaka/selekanyo sa tebelelo ya boleng jwa metsi: C1H019
Matswai a a sa Boleng	$MgSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 23 mg/L	
	Na_2SO_4	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 33 mg/L	
	$MgCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 30 mg/L	
	$CaCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 57 mg/L	
	NaCl	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 191 mg/L	
	$CaSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 351 mg/L	
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 30 mS/m	
	pH	Phensentile ya 5 ya tshedimosetso e tshwanetse go nna 6.5 to 8.0, le phensentile ya 95 8.0 to 8.8	
	Thempereitšha	Phapogo e nnye go tswa mo kelong ya tlhago ya thempereitšha	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥7.5mg/L	
Dikotlo	Palogotlhe ya Naeterojene e e sa boleng (TIN)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.25 mg/L	
	PO_4-P	Phesentile ya 50th ya tshedimosetso e tshwanetse go nna ≤0.025mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna <18 µg/L	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 16 mg/m2	
Botlhole	Amonia	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.044 mg/L	
	Foloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 1.5 mg/L	

Lenaneo 5.3: EWR3: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Vaal		**EWR 3: kwa Gladdedrift**	**Sebaka/selekanyo sa tebelelo ya boleng jwa metsi: C1H012**
Matswai a a sa Boleng	$MgSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 37 mg/L	
	Na_2SO_4	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 33 mg/L	
	$MgCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 30 mg/L	
	$CaCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 57 mg/L	
	NaCl	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 191 mg/L	
	$CaSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 351 mg/L	
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 55 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna 6.5 to 8.0 le phesentile ya 95 ya 8.0 to 8.8	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥ 7.5 mg/L	
Dikotlo	Palogotlhe ya Naeterojene e e sa boleng (TIN)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.25 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.125 mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna < 20 µg/L	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 21 mg/m2	
Botlhole	Amonia	Phesentile 95 ya tshedimosetso e tshwanetse go nna ≤ 0.1 mg/L	
	Foloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 1.5 mg/L	

Lenaneo 5.4: EWR4: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Vaal		**EWR 4: kwa De Neys**	**Sebaka/selekanyo sa tebelelo ya boleng jwa metsi: C1H012**
Matswai a a sa Boleng	$MgSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 37 mg/L	
	Na_2SO_4	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 33 mg/L	
	$MgCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 30 mg/L	
	$CaCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 57 mg/L	
	NaCl	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 191 mg/L	
	$CaSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 351 mg/L	
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 30 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna 6.5 to 8.0 le phesentile ya 95 ya 8.0 to 8.8	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥ 7 mg/L	
Dikotlo	Palogotlhe ya Naeterojene e e sa boleng (TIN)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.7 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.125 mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna <10 µg/L	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 1.7 mg/m2	
Botlhole	Amonia	Phesentile 95 ya tshedimosetso e tshwanetse go nna ≤ 0.1 mg/L	
	Foloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 1.5 mg/L	

Lenaneo 5.5: EWR5: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Vaal		**EWR 5: Skandinavia**	**Sebaka/selekanyo sa tebelelo ya boleng jwa metsi: C2H122**
Matswai a a sa Boleng	$MgSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 37 mg/L	
	Na_2SO_4	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 51 mg/L	
	$MgCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 36 mg/L	
	$CaCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 105 mg/L	
	NaCl	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 191 mg/L	
	$CaSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 351 mg/L	
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 85 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna 6.5 to 8.0 le phesentile ya 95 ya 8.8 to 9.2	
	Thempereitšha	Dithempereitšha di tshwanetse go nna gaufi le kelo ya tlhago	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥ 6 mg/L	
Dikotlo	Palogotlhe ya Naeterojene e e sa boleng (TIN)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 1.0 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.025 mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 20 µg/L	
Botlhole	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 21 mg/m2	
	Amonia	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.073 mg/L	
	Foloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 1.5 mg/L	
Diione tse di sa boleng	Salafate	Phesentole ya 95 ya tshedimosetso e tshwanetse go nna ≤ 200 mg/L	

Lenaneo 5.6: EWR6: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Klip		**EWR 6:** Klip	**Sebaka/Selekanyo sa tebelelo ya boleng jwa metsi: C1H002 (Sebaka sa kelelotlase kwa C13F)**
Matswai a a sa Boleng	$MgSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 28 mg/L	
	Na_2SO_4	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 20 mg/L	
	$MgCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 15 mg/L	
	$CaCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 21 mg/L	
	NaCl	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 45 mg/L	
	$CaSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 351 mg/L	
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 55 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna 6.5 to 8.0 le phesentile ya 95 ya 8.0 to 8.8	
	Thempereitšha	Dithempereitšha di tshwanetse go nna gaufi le kelo ya tlhago	
	Okosijene e e tlhaolotsweng	E tshwanetse go nna gareng ga 7 le 8 mg/L	
	kgoberego	Farologane ka bokanakang jo bonnye go tswa mo kelong ya tlhago ya kgoberego, kamogelo ya mmukgogodi ya bonno jwa ka fa gare ga metsi	
Dikotlo	Palogotlhe ya Naeterojene e e sa boleng (TIN)	Phesentile ya 50th ya tshedimosetso e tshwanetse go nna ≤ 0.75 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.020 mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50th ya tshedimosetso e tshwanetse go nna < 15 µg/L	
	Chl-a periphyton	Phesentile ya 50th ya tshedimosetso e tshwanetse go nna < 12 mg/m2	
Botlhole	Amonia	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.044 mg/L	
	Foloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 1.5 mg/L	

Lenaneo 5.7: EWR7: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Wilge		**EWR 7: Wilge e e kwa godimo**	**Sebaka/selekanyo tsa tebelelo ya boleng jwa metsi: Ga go lebotakganelo/sebaka sa WQ mo tikologong ya sebaka sa EWR**
Matswai a a sa Boleng	$MgSO_4$	Phesente ya 95th ya tshedimosetso e tshwanetse go nna < 23 mg/L	
	Na_2SO_4	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 33 mg/L	
	$MgCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 30 mg/L	
	$CaCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 57 mg/L	
	NaCl	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 191 mg/L	
	$CaSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 351 mg/L	
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 55 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna 6.5 go fitlha go 8.0, phesentile ya 95th ya 8.8 to 9.2	
	Thempereitšha	Phapogo e nnye go tswa mo kelong ya tlhago ya thempereitšha	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥ 8 mg/L	
	kgoberego	Farologane ka bokanakang jo bonnye go tswa mo kelong ya tlhago ya kgoberego, kamogelo ya mmukgogodi ya bonno jwa ka fa gare ga metsi	
Dikotlo	Palogotlhe ya Naeterojene e e sa boleng (TIN)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna gareng ga < 0.7 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna < 0.025 mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 15 μgL	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 12 mg/m2	
Botlhole	Amonia	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.044 mg/L	
	Foloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 1.5 mg/L	

Lenaneo 5.8: EWR8: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Wilge		**EWR 8: Bavaria**	**Sebaka/selekanyo tsa tebelelo ya boleng jwa metsi: C8H028**
Matswai a a sa Boleng	$MgSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 16 mg/L	
	Na_2SO_4	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 20 mg/L	
	$MgCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 15 mg/L	
	$CaCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 21 mg/L	
	NaCl	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 45 mg/L	
	$CaSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 351 mg/L	
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna <55 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna 6.5 to 8.0 le phesentile ya 95 ya 8.0 to 8.8	
	Thempereitšha	Phapogo e nnye go tswa mo kelong ya tlhago ya thempereitšha	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥ 8 mg/L	
	kgoberego	Farologane ka bokanakang jo bonnye go tswa mo kelong ya tlhago ya kgoberego, kamogelo ya mmukgogodi ya bonno jwa ka fa gare ga metsi	
Dikotlo	Palogotlhe ya Naeterojene e e sa boleng (TIN)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna gareng ga <0.7 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna < 0.025 mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna < 20 ug/L	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna < 21 mg/m2	
Botlhole	Amonia	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.073 mg/L	
	Foloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 1.5 mg/L	

Lenaneo 5.9: EWR9: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Suikerbosrand		EWR 9: Kelelogodimo	Sebaka.selekanyo sa tebelelo ya boleng jwa metsi: C2H131
Matswai a a sa Boleng	$MgSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 37 mg/L	
	Na_2SO_4	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 51 mg/L	
	$MgCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 30 mg/L	
	$CaCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 57 mg/L	
	NaCl	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 45 mg/L	
	$CaSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 351 mg/L	
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 55 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna 6.5 – 8.0 le phesentile ya 95 ya 8.0 - 8.8	
	Thempereitšha	Phapogo e nnye go tswa mo kelong ya tlhago ya thempereitšha	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥ 8 mg/L	
	kgoberego	Farologane ka bokanakang jo bonnye go tswa mo kelong ya tlhago ya kgoberego, kamogelo ya mmukgogodi ya bonno jwa ka fa gare ga metsi	
Dikotlo	Palogotlhe ya Naeterojene e e sa boleng (TIN)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna < 0.7 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna < 0.020 mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna < 20 µg/L	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna < 21 mg/m2	
Botlhole	Amonia	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.073 mg/L	
	Foloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 1.5 mg/L	

Lenaneo 5.10 EWR10: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Suikerbosrand		EWR 10: Kelelotlase	Sebaka/selekanyo sa tebelelo ya boleng jwa metsi: C2H070
Matswai a a sa Boleng	$MgSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 37 mg/L	
	Na_2SO_4	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 51 mg/L	
	$MgCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna <51 mg/L	
	$CaCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna <105 mg/L	
	NaCl	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 191 mg/L	
	$CaSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 351 mg/L	
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 85 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna gareng ga 6.5 – 8.0 le phesentile ya 95 ya 8.0 - 8.8	
	Thempereitšha	Phapogo e nnye go tswa mo kelong ya tlhago ya thempereitšha	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥ 7 mg/L	
Dikotlo	Palogotlhe ya Naeterojene e e sa boleng (TIN)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna < 0.7 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna < 0.125 mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna < 30 µg/L	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna < 21 mg/m2	
Botlhole	Amonia	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.100 mg/L	
	Foloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 1.5 mg/L	

Lenaneo 5.11: EWR11: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Blesbokspruit		**EWR 11: Blesbokspruit**	**Sebaka/selekanyo sa tebelelo ya boleng jwa metsi: C2H185**
Matswai a a sa Boleng	$MgSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 37 mg/L	
	Na_2SO_4	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 51 mg/L	
	$MgCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 36 mg/L	
	$CaCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna <105 mg/L	
	NaCl	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 389 mg/L	
	$CaSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 351 mg/L	
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna < 85 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna 6.5 – 8.0 le phesentile ya 95 ya 8.0 - 8.8	
	Thempereitšha	Phetogo e e mo bogareng go tswa mo tekanyong ya thempereitšha	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥ 6.0 mg/L	
	kgoberego	Tshimololo ya tebelelo ya pharologano kwa tlase	
Dikotlo	Palogotlhe ya Naeterojene e e sa boleng (TIN)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.70 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.125 mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna < 20 µg/L	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 21 mg/m2	
Botlhole	Amonia	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.100 mg/L	
	Aterasine	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 100 ug/L	
	Foloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 3.0 mg/L)	
	Endosulfan	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.200 µg/L	

Lenaneo 5.12: EWR12: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Vaal		**EWR 12: kwa Vermaasdrift**	**Sebaka/selekanyo sa tebelelo ya boleng jwa metsi: C2H007**
Matswai a a sa Boleng	$MgSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 37 mg/L	
	Na_2SO_4	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 51 mg/L	
	$MgCl_2$	Phesentile ya 5th le 95 ya tshedimosetso e tshwanetse go nna ≤ 51 mg/L	
	$CaCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 105 mg/L	
	NaCl	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 191 mg/L	
	$CaSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 351 mg/L	
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 70 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna 7.5 go fitlha go 8.0 le phesentile ya 95 ya 8.8 to 9.2	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥ 7.5 mg/L	
	kgoberego	Farologana ka bokanakang jo bonnye go tswa mo tekanyong ya kgoberego ya tlholego	
	TDS	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤560mg/L	
Dikotlo	Palogotlhe ya Naeterojene e e sa boleng (TIN)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 1.0 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.125 mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 30 µg/L	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 84 mg/m2	
Botlhole	Amonia	Phesentile 95 ya tshedimosetso e tshwanetse go nna ≤ 0.1 mg/L	
	Foloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 1.5 mg/L	
	Cyanide	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.05 mg/L	
	Aluminiamo	Phensetile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.1 mg/L	
	Yureniamo	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.030 mg/L	

Diione tse di sa boleng	Salafate	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 160 mg/L
	Magenesiamo	Phensentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 33 mg/L

Lenaneo 5.13: EWR13: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Vaal		**EWR 13: Kwa Morathong wa Regina**	**Sebaka/selekanyo sa tebelelo ya boleng jwa metsi: C2H022**
Matswai a a sa Boleng	$MgSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 37 mg/L	
	Na_2SO_4	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 51 mg/L	
	$MgCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 51 mg/L	
	NaCl	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 191mg/L	
	$CaCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 105 mg/L	
	$CaSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 351 mg/L	
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 70 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna 7.5 go fitlha go 8.0, le phesentile ya 95 ya 8.0 to 8.8	
	Thempereitšha	Phapogo e nnye go tswa mo kelong ya tlhago ya thempereitšha	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥ 6 mg/L	
	kgoberego	Farologana ka bokanakang jo bonnye go tswa mo tekanyong ya kgoberego ya tlholego	
	TDS	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 560 mg/L	
Dikotlo	Palogotlhe ya Naeterojene e e sa boleng (TIN)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 4.0 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.125 mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 30 µg/L	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 84 mg/m2	
Botlhole	Amonia	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.0438 mg/L	
	Foloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 1.5 mg/L	
	Aluminiamo	Phensetile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.1 mg/L	
	Cyanide	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.05 mg/L	
	Yureniamo	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.030 mg/L	
Diione tse di sa boleng	Magenesiamo	Phensentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 33 mg/L	
	Salafate	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 160 mg/L	

Lenaneo 5.14: EWR14: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Vals		**EWR 14: Proklameersdrift**	**Sebaka/selekanyo sa tebelelo ya boleng jwa metsi: C6H007**
Matswai a a sa Boleng	$MgSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 37 mg/L	
	Na_2SO_4	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 51 mg/L	
	$MgCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 51 mg/L	
	$CaCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 191mg/L	
	NaCl	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 105 mg/L	
	$CaSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 351 mg/L	
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 85 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna 5.5 go fitlha go 6.0 le phesentile 95 ya 8.8 go fitlha go 9.2	
	Thempereitšha	Phapogo e nnye go tswa mo kelong ya tlhago ya thempereitšha	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥ 8 mg/L	
	kgoberego	Farologana ka 10% go tloga mo tekanyong ya kgoberego ya tlhago	
Dikotlo	Palogotlhe ya Naeterojene e e sa boleng (TIN)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.7 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.125mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 30ug/L	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 84 mg/m2	
Botlhole	Amonia	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.073 mg/L	
	Foloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 1.5 mg/L	

Lenaneo 5.15: EWR15: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Vet		**EWR 15: kwa Fisantkraal**	**Sebaka/selekanyo sa tebelelo ya boleng jwa metsi: C4H004**
Matswai a a sa Boleng	$MgSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 37 mg/L	
	Na_2SO_4	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 51 mg/L	
	$MgCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 36 mg/L	
	$CaCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 69 mg/L	
	NaCl	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 191 mg/L	
	$CaSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 351 mg/L	
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 80 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna 6.5 – 8.0, le phesentile ya 95 ya 8.0 – 8.8	
	Thempereitšha	Phapogo e nnye go tswa mo kelong ya tlhago ya thempereitšha	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥ 6.0 mg/L	
	kgoberego	Farologana ka bokanakang jo bonnye go tswa mo tekanyong ya kgoberego ya tlholego	
Dikotlo	Palogotlhe ya Naeterojene e e sa boleng (TIN)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.7 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.058 mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50th ya tshedimosetso e tshwanetse go nna ≤ 25 µg/L	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 84 mg/m2	
Botlhole	Amonia	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.072 mg/L	
	Foloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 1.5 mg/L	
Diione tse di sa boleng	Salafate	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 120 mg/L	
	Tleloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 100 mg/L	

Lenaneo 5.16: EWR16: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Vaal		**EWR 16: Kelelotlase ya Letamo la Bloemhof**	**Sebaka/selekanyo sa tebelelo ya boleng jwa metsi: C9H021**
Matswai a a sa Boleng	$MgSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 28 mg/L	
	Na_2SO_4	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 51 mg/L	
	$MgCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 30 mg/L	
	$CaCl_2$	- Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 69 mg/L	
	NaCl	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 191mg/L	
	$CaSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 351 mg/L	
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 55 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna gareng ga 6.5 go fitlha go 8.0, le phesentile ya 95 gareng ga 8.0 go fitlha go 8.8	
	Thempereitšha	Phapogo e nnye go tswa mo kelong ya tlhago ya thempereitšha	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥ 6 mg/L	
	kgoberego	Farologana ka bokanakang jo bonnye go tswa mo tekanyong ya kgoberego ya tlholego	
Dikotlo	Palogotlhe ya Naeterojene e e sa boleng (TIN)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.25 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.025 mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 30 µg/L	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 84 mg/m2	
Botlhole	Amonia jaaka Naeterojene	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.073 mg/L	
	Foloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 3.0 mg/L	
	Aterasine	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.100 mg/L	
	Endosulfan	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.2 µg/L	

Lenaneo 5.17: EWR17: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Harts		**EWR 17: Lebotakganelo la Lloyds**	**Sebaka/selekanyo sa tebelelo ya boleng jwa metsi: C3H016**
Matswai a a sa Boleng	$MgSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 37 mg/L	
	Na_2SO_4	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 51 mg/L	
	$MgCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 51 mg/L	
	$CaCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 105 mg/L	
	NaCl	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 389 mg/L	
	$CaSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 351 mg/L	
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 111 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna 6.5 to 8.0 le phesentile ya 95 ya 8.0 to 8.8	
	Thempereitšha	Phapogo e nnye go tswa mo kelong ya tlhago ya thempereitšha	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥ 6.0 mg/L	
	kgoberego	Farologana ka bokanakang jo bonnye go tswa mo tekanyong ya kgoberego ya tlholego	
Dikotlo	Palogotlhe ya Naeterojene e e sa boleng (TIN)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 1.0 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.025 mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 30ug/L	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 84 mg/m2	
Botlhole	Amonia jaaka Naeterojene	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.073 mg/L	
	Foloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 1.5 mg/L	

Lenaneo 5.18: EWR18: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Vaal		**EWR 18: kwa Schmidtsdrift**	**Sebaka/selekanyo sa tebelelo ya boleng jwa metsi: C9H024**
Matswai a a sa Boleng	$MgSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 28 mg/L	
	Na_2SO_4	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 51 mg/L	
	$MgCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 30 mg/L	
	$CaCl_2$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 105 mg/L	
	NaCl	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 191 mg/L	
	$CaSO_4$	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 351 mg/L	
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 85 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna 6.5 to 8.0 le phesentile ya 95 ya 8.0 to 8.8	
	Okosijene e e tlhaolotsweng	Phesentile ya 5th ya tshedimosetso e tshwanetse go nna ≥ 4 mg/L	
	kgoberego	Farologana ka bokanakang jo bonnye go tswa mo tekanyong ya kgoberego ya tlholego	
Dikotlo	Palogotlhe ya Naeterojene e e sa boleng (TIN)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.7 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.125 mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 30 µg/L	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 84 mg/m2	
Botlhole	Amonia jaaka Naeterojene	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.073 mg/L	
	Foloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 1.5 mg/L	

Lenaneo 5.19: EWR WA1: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Waterval		**EWR WA1: Waterval_1**	**Sebaka/selekanyo sa tebelelo ya boleng jwa metsi: C1H036**
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 85 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna 5.0 go fitlha go 5.6 le phesentile ya 95 ya 9.2 go fitlha go 10.0	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥ 6.5 mg/L	
Dikotlo	Naetereiti (NO3) + Niteriete (NO2)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 4.0 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.125 mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 30 µg/L	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 84 mg/m2	
Botlhole	Amonia jaaka Naeterojene	Phesentile 95 ya tshedimosetso e tshwanetse go nna ≤ 0.1 mg/L	
	Foloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 3.0 mg/L	
	Aterasine	Phensetile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.1 mg/L	
	Endosulfan	Phensentile 95 ya tshedimosetso e tshwanetse go nna ≤ 0.20 µg/L	
	Cadmium (popota)	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.005 mg/L	
	Keromiamo (VI)	Phesentile 95 ya tshedimosetso ya e tshwanetse go nna ≤ 0.2 mg/L	
	Koporo (popota)	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.008 mg/L	
	Mankanese	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 1.3 mg/L	
	Lloto (popota)	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.013 mg/L	
	Mekhuri	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.0017 mg/L	
	Seleniamo	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.030 mg/L	
	Senke	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.036 mg/L	

Lenaneo 5.20: EWR WA2: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Waterval		EWR WA2: Waterval_2	Sebaka/selekanyo sa tebelelo ya boleng jwa metsi: C1H030
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 85 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna 5.0 go fitlha go 5.6 le phesentile ya 95 ya 9.2 go fitlha go 10.0	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥ 6.5 mg/L	
Dikotlo	Naetereiti (NO3) + Niteriete (NO2)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 4.0 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.125mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 30 µg/L	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤84 mg/m2	
Botlhole	Amonia jaaka Naeterojene	Phesentile 95 ya tshedimosetso e tshwanetse go nna ≤ 0.1 mg/L	
	Foloraete	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 3.0 mg/L	
	Aterasine	Phensetile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.1 mg/L	
	Endosulfan	Phensentile 95 ya tshedimosetso e tshwanetse go nna ≤ 0.20 µg/L	
	Cadmium (popota)	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.005 mg/L	
	Keromiamo (VI)	Phesentile 95 ya tshedimosetso ya e tshwanetse go nna ≤ 0.2 mg/L	
	Koporo (popota)	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.008 mg/L	
	Mankanese	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 1.3 mg/L	
	Lloto (popota)	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.013 mg/L	
	Mekhuri	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.0017 mg/L	
	Seleniamo	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.030 mg/L	
	Senke	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.036 mg/L	

Lenaneo 5.21: EWR S1: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Schoonspruit		EWR S1: Kelelotlase ya Leitlho la Schoonspruit	Sebaka/selekanyo sa tebeleloo ya boleng jwa metsi: Ga go sebaka mo tikogolong
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 55 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna 5.6 go fitlha 6.0 le phesentile ya 95 ya 8.0 go fitlha go 8.5	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥ 7.0 mg/L	
Dikotlo	Naetereiti (NO3) + Niteriete (NO2)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 2.5 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.02 mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 10 µg/L	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 12 mg/m2	

Lenaneo 5.22: EWR S3: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Schoonspruit		EWR S3: kelelotlase dikgatlho tsa Taaibosspruit le Rietspruit	Sebaka/selekanyo sa tebelelo ya boleng jwa metsi: Ga go sebaka se se dirang
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 70 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna 5.2 go fitlha go 5.4 le phesentile ya 95 ya 9.3 go fitlha go 9.6	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥ 6.5 mg/L	
Dikotlo	Naetereiti (NO3) + Niteriete (NO2)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 2.5 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.125 mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 20 µg/L	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 21 mg/m2	

Lenaneo 5.23: EWR S4: Ditlhokego tsa Ekholoji tsa Boleng jwa Metsi

Noka: Schoonspruit		**EWR S4: Kelelotlase ya Letamo la Johan Neser**	**Sebaka/selekanyo sa tebelelo ya boleng jwa metsi: C2H073**
Dipharologantsho tsa lefelo	EC	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 85 mS/m	
	pH	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna 5.2 go fitlha go 5.4 le phesentile ya 95 ya 9.3 go fitlha go 9.6	
	Okosijene e e tlhaolotsweng	Phesentile ya 5 ya tshedimosetso e tshwanetse go nna ≥ 6.5 mg/L	
Dikotlo	Naetereiti (NO3) + Niteriete (NO2)	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 2.5 mg/L	
	PO_4-P	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 0.125 mg/L	
Dipharologantsho tsa tsibogo	Chl-a phytoplankton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 20 μg/L	
	Chl-a periphyton	Phesentile ya 50 ya tshedimosetso e tshwanetse go nna ≤ 21 mg/m2	
Diione tse di sa boleng	Salafate	Phesentole ya 95 ya tshedimosetso e tshwanetse go nna ≤ 200 mg/L	
Botlhole	Amonia jaaka Naeterojene	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.073 mg/L	
	Aluminiamo	Phesentile 95 ya tshedimosetso e tshwanetse go nna ≤ 0.1 mg/L	
	Mankanese	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤0.250 mg/L	
	Yureniamo	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤0.03 mg/L	
	Tshipi	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤0.25 mg/L	
	Keromiamo (VI)	Phesentile 95 ya tshedimosetso ya e tshwanetse go nna ≤ 0.2 mg/L	
	Koporo (popota)	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.008 mg/L	
	Cyanide (ga e teng)	Phesentile ya 95 ya tshedimosetso e tshwanetse go nna ≤ 0.050 mg/L	

6. RASEFE YA METSI A A KA FA TLASE GA LEFATSHE

Lenaneo 6.1 fa tlase le tlhagisa Rasefe ya Metsi a a ka fa Tlase ga Lefatshe a Lefelo la Bodutiso la Vaal a a tswang mo go diriseng mokgwa wa Ditekanyatsego tse di Laetsweng tsa Metswedi ya Metsi a a ka fa Tlase ga Lefatshe (GRDM).

Alegoritheme e e beilweng ya GRDM e ne ya dirisiwa mme bolumo ya "metsi a a ka abiwang a metsi a a ka fa tlase ga lefatshe" (MCM/ka ngwaga) e ne ya balelwa mo (kholomong ya K ya Lenaneo 6.1). Alegoritheme go ya ka diporotokolo tsa GRDM, e supa karolo ya ngwaga ya go tlatsa gape go go leng teng morago ga Ditlhoko tsa Motheo tsa Batho, ditlhokego tsa kelelotlase le tiriso ya gajaana ya metsi e ntshiwa mo go tlatsa gape ga metsi a a ka fa tlase ga lefatshe go baletsweng ka teng.

Boleng jwa metsi a ka fa tlase ga lefatshe mo kwatenaring nngwe le nngwe ya bodutiso, a ne a le teng mo palong ya tshedimosetso ya >9, e ne ya diriwa le kelo ya boleng jwa metsi a ka fa tlase ga lefatshe go ya ka thulaganyo ya tlhophelo jaaka go tlhalositswe mo kaelong: Boleng jwa Dithebolo tsa Metsi a fa Gae Bolumo ya 1: Kaedi ya Tlhatlhobo". 1998. Khomišene ya Patlisiso ya Metsi, Lefapha la Merero ya metsi le Jalo ya Dikgwa & Lefapha la Boitekanelo. Pegelo No. TT 101/98.

TLHOKOMELA: Thulaganyo ya Tlhophelo ya Boleng jwa Metsi a Dithebolo tsa Metsi a fa Gae go ya ka diphetho tse di oketsegang

Setlhopha sa 0: Boleng jo bo siameng jwa metsi, a siametse go dirisiwa botshelo jotlhe, kwa ntle ga diphetho go modirisi.

Setlhopha sa I: Metsi a a mo setlhopheng se a bolokesegile go dirisiwa nako e telele fela ga a fitlhelele boleng jo bo siameng jwa metsi gonne go ka nna le mo a ka nnang le diphetho tse di kotsi mo boitekanelong, fela ka gale di nna bori, mme diphetho tse di bonalang tsa boitekanelo ga di bontshe matshwaobolwetsi mme go nna boima go a bontsha. Metsi a a mo Setlhopha I ga a tlhole diphetho tsa boitekanelo mo maemong a a tlwaelegileng. Fela, diphetho tse dintle di ka bonala.

Setlhopha sa II: Metsi a a mo setlhopheng se a tlhalosiwa e le a mo diphetho tsa boitekanelo tse di kotsi di sa tlwaelegang mo tirisong e e lekanyeditsweng ya pakakhutshwane. Diphetho tse di kotsi tsa boitekanelo di ka nna teng bogolo mo tirisong e e telele mo dingwageng di le dintsi, kgotsa mo tirisong ya nako e e telele. Setlhopha se emela metsi a a siametseng tiriso ya phakakhutshwane kgotsa tiriso ya tshoganyetso fela, fela a sa siamela tiriso e e tswelelang ya nako e e telele.

Setlhopha sa III: Metsi a a na le dikarolo mo mofuteng o o kokoantsweng mo diphetho tse di masisi tsa boitekanelo di ka solofelwang teng, bogolo mo maseeng kgotsa mo batsofeng ka tiriso ya pakakhutshwane, mme le go feta fao ka tiriso ya pakatelele. Metsi a a mo setlhopheng se ga a siamela go dirisiwa e le metsi a a nowang kwa ntle ga go phepafatso e e maleba.

Lenaneo 6.1: GRDM a Lefelo la Taolo la Metsi a Noka ya Vaal

A	B	C	D	E	F	G	H	I	J	K
Kwatenari Bodutelo	Lefelo (km2)	Dipula tse di Bokoa ka Ngwaga (mm)	Go tlatsa (Mm3/a)	% Ya Dipula tse di Bokoa ka Ngwaga	Bontsi (maemo a palotlase)	Ditlhoko tsa Motheo tsa Batho (Mm^3/a)	Karolo ya Kelelotlase ya Metsi a a ka fa Tlase ga Lefatshe (Mm^3/a)	Palogotlhe ya Rasefe (Mm3/a)	Tiriso ya Metsi a a ka fa Tlase ga Lefatshe (Mm^3/a)	Metsi a a ka abiwang a a ka fa Tlase ga Lefatshe Palogotlhe (Mm^3/a)
BODUTISO JO BO KWA GODIMO JWA VAAL										
C11A	719	743	38.93	7.3	1955	0.02	6.46	6.48	0.00	32.45
C11B	535	705	26.49	7.0	2142	0.02	4.60	4.62	0.09	21.78
C11C	449	765	22.16	6.5	1277	0.01	4.39	4.40	0.14	17.62
C11D	372	702	17.05	6.5	965	0.01	3.17	3.18	0.17	13.70
C11E	1155	697	46.63	5.8	23889	0.22	9.74	9.96	1.26	35.41
C11F	929	705	39.67	6.1	31634	0.29	7.56	7.85	0.39	31.43
C11G	432	659	17.01	6.0	1460	0.01	3.00	3.01	0.22	13.78
C11H	1103	664	40.16	5.5	33924	0.31	6.76	7.07	1.38	31.71
C11J	1001	658	36.15	5.5	3106	0.03	6.76	6.79	0.48	28.88
C11K	340	633	11.47	5.3	2970	0.03	1.82	1.85	0.31	9.31
C11L	947	675	32.74	5.1	6416	0.06	6.77	6.83	0.49	25.42
C11M	795	637	23.38	4.6	38506	0.35	4.69	5.04	0.43	17.91
C12A	484	614	12.10	4.1	758	0.01	3.26	3.27	0.00	8.83
C12B	478	631	14.40	4.8	2461	0.02	3.18	3.20	0.13	11.07
C12C	666	605	18.66	4.6	4257	0.04	4.19	4.23	0.17	14.26
C12D	898	667	32.75	5.5	53555	0.49	5.27	5.76	3.78	23.21
C12E	497	641	16.87	5.3	1960	0.02	2.80	2.82	0.26	13.79
C12F	834	635	29.46	5.6	3241	0.03	4.43	4.46	0.36	24.64
C12G	570	640	21.20	5.8	6797	0.06	3.17	3.23	0.20	17.77
C12H	355	618	11.26	5.1	16104	0.15	1.54	1.69	0.08	9.49
C12J	344	615	9.67	4.6	627	0.01	1.49	1.50	0.17	8.00
C12K	479	657	19.93	6.3	2739	0.02	2.36	2.38	0.09	17.46
C12L	887	648	31.99	5.6	2116	0.02	4.12	4.14	3.77	24.08
C13A	594	779	27.18	5.9	2807	0.03	6.54	6.57	0.21	20.40
C13B	615	683	21.93	5.2	2395	0.02	5.42	5.44	0.27	16.22
C13C	836	724	35.96	5.9	5970	0.05	8.14	8.19	0.04	27.73
C13D	895	698	32.67	5.2	1742	0.02	8.23	8.25	0.11	24.31
C13E	602	699	21.94	5.2	1130	0.01	5.55	5.56	0.01	16.37
C13F	611	692	19.25	4.6	1525	0.01	5.16	5.17	0.03	14.05
C13G	434	674	14.14	4.8	15885	0.14	3.57	3.71	0.01	10.42
C13H	588	628	15.36	4.2	1688	0.02	3.99	4.01	0.02	11.33
C21A	707	674	26.89	5.6	4853	0.04	4.78	4.82	0.06	22.01
C21B	431	697	9.70	3.2	19019	0.17	4.16	4.33	0.23	5.14
C21C	438	674	9.85	3.3	8820	0.08	3.97	4.05	0.13	5.67
C21D	446	698	8.56	2.8	180660	1.65	4.20	5.85	0.84	1.87
C21E	628	691	9.21	2.1	40363	0.37	5.82	6.19	0.22	2.80
C21F	427	704	9.49	3.2	71170	0.65	4.04	4.69	0.59	4.21
C21G	462	667	9.38	3.0	2339	0.02	4.03	4.05	0.03	5.30
C22A	548	695	19.56	5.4	517617	4.73	5.37	11.77	1.41	6.38
C22B	391	691	11.22	4.7	237009	2.16	3.75	5.27	1.47	4.48
C22C	465	684	14.72	4.5	96073	0.88	4.38	11.05	0.03	3.64
C22D	345	701	12.24	9.2	30823	0.28	3.27	7.83	2.34	2.07
C22E	532	669	12.13	3.4	13549	0.12	4.81	4.93	0.91	6.29

A	B	C	D	E	F	G	H	I	J	K
Kwatenari Bodutelo	Lefelo (km2)	Dipula tse di Bokoa ka Ngwaga (mm)	Go tlatsa (Mm3/a)	% Ya Dipula tse di Bokoa ka Ngwaga	Bontsi (maemo a palotlase)	Ditlhoko tsa Motheo tsa Batho (Mm^3/a)	Karolo ya Kelelotlase ya Metsi a a ka fa Tlase ga Lefatshe (Mm^3/a)	Palogotlhe ya Rasefe (Mm3/a)	Tiriso ya Metsi a a ka fa Tlase ga Lefatshe (Mm^3/a)	Metsi a a ka abiwang a a ka fa Tlase ga Lefatshe Palogotlhe (Mm^3/a)
C22F	440	655	7.01	2.4	109440	1.00	4.01	5.01	0.05	1.95
C22G	830	613	25.77	5.1	2596	0.02	6.93	6.95	0.47	18.35
C22H	454	639	9.35	3.2	282162	2.57	3.89	6.46	0.07	2.82
C22J	669	633	15.25	3.6	14856	0.14	5.62	5.76	0.24	9.25
C22K	434	644	18.27	6.5	58152	0.53	3.91	4.44	0.34	13.49
C23A	258	612	7.39	4.7	1028	0.01	1.64	1.65	0.12	5.62
C23B	701	619	27.63	6.4	2152	0.02	4.54	4.56	0.40	22.67
C23C	1069	609	23.13	3.6	42653	0.39	6.27	6.66	0.60	15.87
C23D	510	664	25.79	7.6	99677	0.91	10.49	11.40	4.93	9.46
C23E	850	631	35.84	6.7	64933	0.59	15.97	11.93	34.23	0.00
C23F	1324	605	47.38	5.9	2373	0.01	22.97	15.89	0.28	31.21
C23G	613	597	27.18	7.4	1605	0.01	10.44	10.45	2.32	14.41
C23H	451	604	12.43	4.6	8385	0.08	7.69	7.77	0.27	4.39
C23J	890	620	19.05	3.5	25528	0.23	4.65	4.88	0.63	13.54
C23K	396	607	10.76	4.5	1605	0.01	1.97	1.98	0.26	8.52
C23L	1211	612	24.44	3.3	40749	0.37	6.10	17.07	0.73	6.64
C81A	382	882	22.72	6.7	323	0.00	3.52	3.52	0.05	19.15
C81B	576	763	26.44	6.0	1374	0.01	4.51	4.52	0.08	21.84
C81C	250	730	9.88	5.4	230	0.00	1.96	1.96	0.03	7.89
C81D	195	735	8.31	5.8	216	0.00	1.53	1.53	0.03	6.75
C81E	642	658	22.34	5.3	21029	0.19	4.61	4.80	0.10	17.44
C81F	688	892	46.15	7.5	236987	2.16	8.17	10.33	0.35	35.47
C81G	435	722	19.86	6.3	3855	0.04	4.25	4.29	0.09	15.48
C81H	358	638	12.37	5.4	1227	0.01	2.52	2.53	0.04	9.80
C81J	392	612	12.88	5.4	1496	0.01	2.51	2.52	0.06	10.30
C81K	359	623	12.34	5.5	793	0.01	2.34	2.35	0.05	9.94
C81L	793	740	35.97	6.1	689	0.01	6.18	6.19	0.11	29.67
C81M	1092	662	38.82	5.4	2936	0.03	7.82	7.85	0.16	30.81
C82A	582	670	21.75	5.6	1303	0.01	4.18	4.19	0.08	17.48
C82B	493	660	16.88	5.2	4736	0.04	3.48	3.52	0.07	13.29
C82C	353	646	12.39	5.4	978	0.01	2.42	2.43	0.07	9.89
C82D	572	623	19.50	5.5	1849	0.02	3.78	3.80	0.16	15.54
C82E	622	666	20.73	5.0	1725	0.02	4.37	4.39	0.04	16.30
C82F	483	639	14.02	4.5	827	0.01	3.25	3.26	0.01	10.75
C82G	580	655	18.14	4.8	1086	0.01	3.99	4.00	0.09	14.05
C82H	782	614	20.70	4.3	1537	0.01	4.89	4.90	0.19	15.61
C83A	746	692	31.27	6.1	3635	0.03	7.04	7.07	0.07	24.13
C83B	251	668	9.95	5.9	2141	0.02	2.27	2.29	0.03	7.63
C83C	828	663	30.60	5.6	39056	0.36	7.16	7.52	0.10	22.98
C83D	465	650	17.05	5.6	1761	0.02	4.04	4.06	0.05	12.94
C83E	426	654	15.46	5.6	1918	0.02	3.61	3.63	0.11	11.72
C83F	875	637	32.35	5.8	2266	0.02	5.72	5.74	11.23	15.38
C83G	695	647	24.23	5.4	14040	0.13	4.69	4.82	0.21	19.20
C83H	547	646	16.23	4.6	4173	0.04	3.50	3.54	0.24	12.45
C83J	222	641	6.68	4.7	18257	0.17	1.38	1.55	0.11	5.02
C83K	548	635	16.63	4.8	943	0.01	2.66	2.67	0.24	13.72
C83L	825	641	23.21	4.4	2014	0.02	3.96	3.98	0.05	19.18

A	B	C	D	E	F	G	H	I	J	K
Kwatenari Bodutelo	Lefelo (km2)	Dipula tse di Bokoa ka Ngwaga (mm)	Go tlatsa (Mm3/a)	% Ya Dipula tse di Bokoa ka Ngwaga	Bontsi (maemo a palotlase)	Ditlhoko tsa Motheo tsa Batho (Mm^3/a)	Karolo ya Kelelotlase ya Metsi a a ka fa Tlase ga Lefatshe (Mm^3/a)	Palogotlhe ya Rasefe (Mm3/a)	Tiriso ya Metsi a a ka fa Tlase ga Lefatshe (Mm^3/a)	Metsi a a ka abiwang a a ka fa Tlase ga Lefatshe Palogotlhe (Mm^3/a)
C83M	1100	639	31.72	4.5	9691	0.09	5.14	5.23	0.39	26.10
BODUTISO JO BO MO BOGARENG JWA VAAL										
C24A	839	582.6	18.6	4.18	5 017	0.1	3.94	4.04	0.3	14.26
C24B	530	561.0	16.31	5.49	31 256	0.29	2.28	2.57	5.1	8.64
C24C	1350	586.9	96.98	12.24	25 663	0.23	21.55	21.8	14.9	60.30
C24D	364	584.3	3.99	1.88	3 079	0.03	1.70	1.73	0.2	2.06
C24E	925	560.0	21.87	6.23	51389	0.47	3.75	4.22	7.51	10.14
C24F	2020	577.5	55.91	5.52	29827	0.27	8.86	9.13	1.30	45.48
C24G	985	581.6	11.75	2.05	20 852	0.19	4.42	4.61	0.3	6.84
C24H	840	574.9	10.81	2.24	5 225	0.05	0.74	0.79	1.4	8.62
C24J	2109	550.9	22.31	1.88	17403	0.16	1.62	1.78	0.80	19.73
C25A	863	542.8	12.49	2.67	2 998	0.03	0.67	0.70	0.5	11.29
C25B	1888	510.0	18.16	1.89	63 942	0.58	1.19	1.77	0.6	15.79
C25C	1210	523.0	7.02	1.84	5004	0.09	0.83	0.92	0.80	5.30
C25D	1202	526.1	8.74	1.21	60167	0.67	0.85	1.52	0.60	6.62
C25E	1536	510.7	8.3	1.01	10597	0.11	0.98	1.09	1.90	5.34
C25F	2218	481.9	10.48	0.96	3706	0.06	1.14	1.20	0.60	8.68
C41A	1078	598.2	9.04	1.41	54136	0.74	5.24	5.98	1.10	1.96
C41B	1005	598.2	9.51	1.58	20033	0.27	4.89	5.16	0.40	3.95
C41C	1095	594.7	10.09	1.55	21 292	0.19	5.28	5.47	0.3	4.32
C41D	1155	549.5	4.94	0.78	29 024	0.26	4.87	5.13	0.3	0.00
C41E	391	519.0	0.62	0.30	2 629	0.02	1.28	1.30	0.1	0.00
C41F	556	494.9	0.56	0.20	8 630	0.08	1.54	1.62	0.2	0.00
C41G	272	516.8	0.29	0.21	130.00	0.00	0.64	0.64	0.1	0.00
C41H	887	499.2	2.32	0.52	8 669	0.08	2.24	2.32	0.2	0.00
C41J	556	494.6	2.16	0.79	11 390	0.10	1.38	1.48	0.1	0.58
C42A	695	632.0	8.77	2.00	5 110	0.05	6.08	6.13	0.3	2.34
C42B	727	581.0	5.10	1.21	1 903	0.02	5.21	5.23	0.3	0.00
C42C	793	625.6	6.27	1.26	8 731	0.08	6.75	6.83	0.3	0.00
C42D	663	555.5	1.71	0.46	21 992	0.20	4.20	4.40	0.3	0.00
C42E	750	564.0	2.93	0.69	6 150	0.06	4.99	5.05	0.3	0.00
C42F	734	568.2	1.42	0.34	39 809	0.36	4.91	5.27	0.2	0.00
C42G	555	550.4	0.82	0.27	6 876	0.06	3.43	3.49	0.2	0.00
C42H	445	541.1	0.53	0.22	41 319	0.38	2.62	3.00	1.1	0.00
C42J	1014	530.8	1.99	0.37	12 391	0.11	5.69	5.80	0.4	0.00
C42K	668	522.1	0.67	0.19	587.00	0.01	3.59	3.60	0.9	0.00
C42L	511	505.2	0.96	0.37	1 182	0.01	2.33	2.34	0.1	0.00
C43A	1491	482.2	3.37	0.47	26 707	0.24	0.37	0.61	0.3	2.46
C43B	723	494.0	1.26	0.35	1 854	0.02	0.20	0.22	0.2	0.84
C43C	913	469.0	3.17	0.74	9 364	0.09	0.20	0.29	0.3	2.58
C43D	1475	464.0	3.95	0.58	24 645	0.22	0.31	0.53	0.4	3.02
C60A	859	632.8	10.01	1.84	2 340	0.02	5.74	5.76	0.2	4.05
C60B	1022	617.8	10.11	1.60	10 790	0.10	6.52	6.62	0.5	2.99
C60C	1047	578.4	5.51	0.91	8 469	0.08	5.69	5.77	0.4	0.00
C60D	645	552.7	2.53	0.71	2 567	0.02	3.05	3.07	0.2	0.00
C60E	664	563.9	2.76	0.74	7 788	0.07	3.50	3.57	0.6	0.00
C60F	659	558.2	1.94	0.53	96 217	0.88	3.23	4.11	0.2	0.00

A	B	C	D	E	F	G	H	I	J	K
Kwatenari Bodutelo	Lefelo (km2)	Dipula tse di Bokoa ka Ngwaga (mm)	Go tlatsa (Mm3/a)	% Ya Dipula tse di Bokoa ka Ngwaga	Bontsi (maemo a palotlase)	Ditlhoko tsa Motheo tsa Batho (Mm^3/a)	Karolo ya Kelelotlase ya Metsi a a ka fa Tlase ga Lefatshe (Mm^3/a)	Palogotlhe ya Rasefe (Mm3/a)	Tiriso ya Metsi a a ka fa Tlase ga Lefatshe (Mm^3/a)	Metsi a a ka abiwang a a ka fa Tlase ga Lefatshe Palogotlhe (Mm^3/a)
C60G	782	539.2	2.28	0.54	1 300	0.01	3.45	3.46	2.1	0.00
C60H	1232	514.8	2.69	0.42	6 274	0.06	0.26	0.32	0.3	2.07
C60J	959	550.6	10.02	1.90	6 169	0.06	0.28	0.34	0.8	8.88
C70A	613	628.1	7.02	1.82	2 218	0.02	4.71	4.73	0.5	1.79
C70B	660	612.6	4.74	1.17	6 715	0.06	4.70	4.76	0.4	0.00
C70C	887	616.0	5.92	1.08	4 114	0.04	6.28	6.32	0.4	0.00
C70D	675	586.6	3.82	0.96	2 012	0.02	4.20	4.22	0.6	0.00
C70E	693	580.4	7.67	1.91	13 034	0.12	4.16	4.28	0.2	3.19
C70F	564	576.4	4.95	1.52	2 141	0.02	3.34	3.36	0.2	1.39
C70G	901	579.1	7.15	1.37	2 745	0.03	5.34	5.37	0.3	1.48
C70H	251	570.4	1.92	1.34	3 081	0.03	1.43	1.46	0.1	0.36
C70J	521	577.3	6.45	2.14	3 602	0.03	3.05	3.08	0.2	3.17
C70K	891	567.4	9.39	1.86	3 050	0.03	4.92	4.95	0.7	3.74
BODUTISO JO BO KWA TLASE JWA VAAL										
C31A	1402	330.00	32.68	7.00	28400	0.71	5.55	6.26	0.77	25.65
C31B	1743	230.00	20.59	5.00	4400	0.11	11.07	11.18	1.15	8.26
C31C	1635	280.00	21.79	5.00	800	0.02	9.33	9.35	1.45	10.99
C31D	1493	300.00	22.95	5.00	30400	0.76	5.55	6.31	0.57	16.07
C31E	2958	270.00	37.91	5.00	65600	1.64	20.31	21.95	2.33	13.64
C31F	1787	205.00	12.92	3.00	63600	1.59	9.92	11.51	1.41	0.00
C32A	1403	165.00	8.62	3.50	25200	0.63	6.91	7.54	1.08	0.00
C32B	2997	225.00	31.22	5.00	123200	3.08	25.63	28.71	2.52	0.00
C32C	1657	245.00	15.24	3.50	<1000	0.00	9.69	9.69	0.79	4.76
C32D	4134	240.00	60.26	6.00	40000	1.00	16.63	17.63	3.26	39.37
C33A	2855	245.00	35.29	5.00	57600	1.44	10.69	12.13	1.06	22.10
C33B	2830	230.00	36.55	5.00	17600	0.44	6.58	7.02	0.83	28.70
C33C	4141	190.00	35.06	4.50	2400	0.06	11.44	11.50	0.97	22.59
C91A	2545	170.00	16.81	3.50	11200	0.28	7.86	8.14	0.77	7.90
C91B	4675	270.00	59.66	4.50	2800	0.07	21.89	21.96	1.11	36.59
C91C	3133	240.00	33.55	4.00	10400	0.26	7.18	7.44	0.18	25.93
C91D	2694	265.00	27.83	4.00	22000	0.55	3.55	4.10	0.46	23.27
C91E	1506	190.00	9.32	3.00	36400	0.91	3.16	4.07	0.42	4.83
C92A	3913	180.00	27.50	4.00	24000	0.60	9.80	10.40	0.88	16.22
C92B (68%)[1]	1341	190.00	9.00	3.50	<1000	0.00	5.63	5.63	0.32	3.15
C92C (67%)[1]	1332	185.00	10.00	4.00	6600	0.17	5.38	5.55	0.65	3.90
D-Bodutiso	Maitlhomo a Tlhophelo ya Boleng jwa Motswedi wa Metsi a a ka fa Tlase ga Lefatshe									

Gw = Metsi a a ka fa Tlase ga Lefatshe.
1 Ke fela dikarolo tse di kwa godimo (tse di bontshitsweng e le diphesente tsa palogotlhe ya lefelo la bodutelo la kwatenari) tse di welang mo Lefelong la Taolo ya Metsi a a kwa tlase a Vaal.

Mela e e kwebu e e lebeletsweng: Bodutelo jwa Kwaterani jo bo nang le bobotlana 25% ya Mafelo a Metsi a a nang le Dolomaete (ke gore, dithulaganyo tse di botlhokwa tsa matlapa a a kwa tlase ga lefatshe a a tshotseng metsi).

RASEFE YA METSI A A FA TLASE GA LEFATSHE - KAROLO YA BOLENG JWA METSI

Boleng jwa metsi a a ka fa tlase ga lefatshe a bodutiso jwa kwatenari a tshedimosetso e e teng ya haeterokhemisi a ne a tlhatlhobiwa kgatlhanong le ditotwa tsa metsi a fa gae le mefuta ya boleng jwa metsi jaaka go bontshitswe mo Lenaneong 6.2 le Lenaneo 6.3 Khutshwafatso ya dipholo tsa boleng tlhophelo ya boleng jwa metsi a a ka fa tlase ga lefatshe kwa boemong jwa kwatenari go ya ka tlhokego ya ditlhoko tsa motheo tsa batho e akareditswe mo mananeong a a latelang (Mananeo 6.4 - 6.72).

Lenaneo 6.2: Boleng jwa metsi a Dikhemikale

Diparameta tsa Dikhemikale	Mefuta ya Boleng jwa Metsi1				
	Diyuniti	Setlhopha sa 0	Setlhopha sa I	Setlhopha sa II	Setlhopha sa III
Khalesiamo ke Ca	mg/l	0 - 80	80 - 150	150 - 300	> 300
Makenesiamo ke Mg	mg/l	0 - 30	30 - 70	70 - 100	> 100
Potasiome ke K	mg/l	0 - 25	25 - 50	50 - 100	> 100
Sodiamo ke Na	mg/l	0 - 100	100 - 200	200 - 400	> 400
Tleloraete ke Cl	mg/l	0 - 100	100 - 200	200 - 600	> 600
Salafate ke SO4	mg/l	0 - 200	200 - 400	400 - 600	> 600
Naetereiti jaaka NOx- N	mg/l	0 - 6	6 - 10	10 - 20	> 20
Folaraete ke F	mg/l	< 0.7	0.7 - 1.0	1.0 - 1.5	> 1.5
Palogotlhe ya bopopota jaaka CaCO3*	mg/l	0 - 200	200 - 300	300 - 600	> 600

1) Kaelo: Thulaganyo ya Tlhophelo goya ka - Khomišene ya Patlisiso ya Metsi: Dithebolo tsa Boleng jwa Metsi a fa Gae - Bolumo ya 1. Pegelo No. TT 101/98, Kgatiso ya Bobedi, 1998.

2) * Mo bodutisong fa haeterokhemisi ya paramita ya dikhemikale e le popota gotlhe fela, e bontsha dikokoanyo tse di kwa godimo ka ntlha ya maemo a tlhago, boleng jwa metsi bo ne bo a tlhophiwa e le mofuta wa setlhopha sa nngwe se se kwa godimo ka go ne go se na dikutlwalo mo boitekanolong jwa batho tse di diragetseng tse di itsiweng. Dikutlwalo tse di teng di amana le go lekanya didirisiwa tsa fa gae.

Lenaneo 6.3: Boleng jwa Metsi a a Teng

Paramita e e Teng	Mefuta ya Boleng jwa Metsi2				
	Diyuniti	Setlhopha sa 0	Setlhopha sa I	Setlhopha sa II	Setlhopha sa III
pH (Diyuniti tsa pH)		6 - 9	5 - 6 & 9 - 9.5	4.5 – 5 & 9.5 - 10	< 4 or > 10
Palogotlhe ya Dikomota tse di Tlhaolotsweng	mg/l	0 - 450	450 - 1000	1000 - 2400	> 2400
Phetiso ya Motlakase	mS/m	0 - 70	70 - 150	150 - 370	> 370

3) Kaelo: Thulaganyo ya Tlhophelo goya ka - Khomišene ya Patlisiso ya Metsi: Dithebolo tsa Boleng jwa Metsi a fa Gae - Bolumo ya 1. Pegelo No. TT 101/98, Kgatiso ya Bobedi, 1998.

Boleng jwa metsi jwa bodutelo jo bo latelang jwa kwatenari ga bo a tlhatlhobiwa ka ntlha ya tshedimosetso e e sa lekanang (tlhaelo ya tshedimosetso e e emetseng boleng jwa metsi a a ka fa tlase ga lefatshe):

- C11A; C11B; C11C; C11D; C11E; C11F; C11G; C11J; C11K; C11L; C11M
- C12A; C12B; C12C; C12E; C12F; C12G; C12H; C12J; C12K; C12L
- C13A; C13B; C13C; C13D; C13E; C13F; C13G
- C21A; C21B
- C22G, C22K
- C23A; C23C
- C25D
- C41B; C41C; C41E; C41F; C41G; C41H; C41J
- C42A; C42B; C42C; C42D; C42E; C42F; C42G; C42H; C42J; C42K; C42L
- C43C; C43D
- C60A; C60B; C60C; C60D; C60F; C60G; C60H; C60J
- C70A; C70B; C70C; C70E; C70F; C70G; C70H; C70J; C70K
- C81A; C81B; C81C; C81D; C81E; C81G; C81H; C81J; C81K; C81L; C81M
- C82A; C82C; C82D; C82E; C82F; C82G
- C83A; C83C; C83D; C83E; C83F; C83G; C83H; C83JC83K; C83L; C83M

Lenaneo 6.4: Rasefe ya Boleng jwa Metsi a a ka fa tlase ga Lefatshe- Bodutiso jwa Kwatenari C11H

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: *C11H			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		37	8.20	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	37	79.70	<150	88
Khalesiamo ke Ca	mg/l	37	78.65	<150	87
Makenesiamo ke Mg	mg/l	37	36.28	<70	39
Sodiamo ke Na	mg/l	37	48.76	<200	54
Potasiome ke K	mg/l	37	4.24	<50	4.7
Palogotlhe ya Bopopota ke CaCO3	mg/l	37	345.8	<300	380
Tleloraete ke Cl	mg/l	37	32.32	<200	36
Salafate ke SO4	mg/l	37	61.58	<400	68
Naetereite ke NOx-N	mg/l	37	4.75	<10	5.2
Folaraete ke F	mg/l	37	0.35	<1.0	0.39
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

* Supa gore ke fela morago ga 1995 gore tshedimosetso ya haeterokhimise ya bodutiso jwa kwatenari e neng ya dirisiwa.

Lenaneo 6.5: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe - Bodutiso jwa kwatenari C12D

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: *C12D			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		34	8.13	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	34	89.25	<150	98
Khalesiamo ke Ca	mg/l	34	84.75	<150	93
Makenesiamo ke Mg	mg/l	34	48.91	<70	54
Sodiamo ke Na	mg/l	34	29.33	<200	32
Potasiome ke K	mg/l	34	8.34	<50	9
Palogotlhe ya Bopopota ke CaCO3	mg/l	34	413	<300	454
Tleloraete ke Cl	mg/l	34	44.61	<200	49
Salafate ke SO4	mg/l	34	96.36	<400	106
Naetereite ke NOx-N	mg/l	34	3.63	<10	4
Folaraete ke F	mg/l	34	0.28	<1.0	0.3
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

* Supa gore ke fela morago ga 1995 gore tshedimosetso ya haeterokhimise ya bodutiso jwa kwatenari e neng ya dirisiwa

Lenaneo 6.6: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C21C

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C21C			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		67	7.65	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	67	57.20	<150	63
Khalesiamo ke Ca	mg/l	67	40.10	<150	44
Makenesiamo ke Mg	mg/l	67	19.40	<70	21
Sodiamo ke Na	mg/l	67	39.10	<200	43
Potasiome ke K	mg/l	67	4.98	<50	5
Palogotlhe ya Bopopota ke CaCO3	mg/l	67	180	<300	198
Tleloraete ke Cl	mg/l	67	43.40	<200	48
Salafate ke SO4	mg/l	67	31.60	<400	35
Naetereite ke NOx-N	mg/l	67	0.10	<10	0.11
Folaraete ke F	mg/l	67	0.71	<1.0	0.78
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo 6.7: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe: – Bodutiso jwa kwatenari C21D

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C21D♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		17	7.37	9.5 – 5.0 ($\pm$0.05)	9.5 – 5.0 ($\pm$0.05)
Phetiso ya Motlakase	mS/m	17	27.50	<150	30
Khalesiamo ke Ca	mg/l	17	19.10	<150	21
Makenesiamo ke Mg	mg/l	17	11	<70	12
Sodiamo ke Na	mg/l	17	13.40	<200	15
Potasiome ke K	mg/l	17	2.20	<50	2.4
Palogotlhe ya Bopopota ke CaCO3	mg/l	17	101.60	<300	112
Tleloraete ke Cl	mg/l	17	8.50	<200	9
Salafate ke SO4	mg/l	17	6.10	<400	7
Naetereite ke NOx-N	mg/l	17	0.23	<10	0.25
Folaraete ke F	mg/l	17	0.12	<1.0	0.13
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).
♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 6.8 Rasefe ya Boleng jwa Metsi a a ka fa tlase ga Lefatshe – Bodutiso jwa kwatenari C21E

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C21E♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		11	7.52	9.5 – 5.0 ($\pm$0.05)	9.5 – 5.0 ($\pm$0.05)
Phetiso ya Motlakase	mS/m	11	51.90	<150	57
Khalesiamo ke Ca	mg/l	11	39.70	<150	44
Makenesiamo ke Mg	mg/l	11	20.90	<70	23
Sodiamo ke Na	mg/l	11	26.00	<200	29
Potasiome ke K	mg/l	11	10.43	<50	11
Palogotlhe ya Bopopota ke CaCO3	mg/l	11	185.2	<300	203
Tleloraete ke Cl	mg/l	11	29.50	<200	32
Salafate ke SO4	mg/l	11	32.30	<400	36
Naetereite ke NOx-N	mg/l	11	1.73	<10	1.9
Folaraete ke F	mg/l	11	0.17	<1.0	0.19
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).
♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 6.9 Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C21F

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: *C21F			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		31	7.92	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	31	41.80	<150	46
Khalesiamo ke Ca	mg/l	31	39.34	<150	43
Makenesiamo ke Mg	mg/l	31	19.71	<70	22
Sodiamo ke Na	mg/l	31	10.72	<200	12
Potasiome ke K	mg/l	31	0.50	<50	1
Palogotlhe ya Bopopota ke CaCO3	mg/l	31	179.5	<300	198
Tleloraete ke Cl	mg/l	31	25.60	<200	28
Salafate ke SO4	mg/l	31	12.87	<400	14
Naetereite ke NOx-N	mg/l	31	2.88	<10	3.21
Folaraete ke F	mg/l	31	0.13	<1.0	0.15
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

* Supa gore ke fela morago ga 1995 gore tshedimosetso ya haeterokhimise ya bodutiso jwa kwatenari e neng ya dirisiwa

Lenaneo 6.10 Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C21G

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C21G♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		15	7.58	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	15	48.30	<150	53
Khalesiamo ke Ca	mg/l	15	32	<150	35
Makenesiamo ke Mg	mg/l	15	20.80	<70	23
Sodiamo ke Na	mg/l	15	23.80	<200	26
Potasiome ke K	mg/l	15	3.23	<50	4
Palogotlhe ya Bopopota ke CaCO3	mg/l	15	165.6	<300	182
Tleloraete ke Cl	mg/l	15	12.409	<200	14
Salafate ke SO4	mg/l	15	12.40	<400	14
Naetereite ke NOx-N	mg/l	15	1.52	<10	2
Folaraete ke F	mg/l	15	0.21	<1.0	0.23
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhimisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 6.11: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C22A

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C22A			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		45	8.00	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	45	46.5	<150	51
Khalesiamo ke Ca	mg/l	45	38.6	<150	43
Makenesiamo ke Mg	mg/l	45	29.0	<70	32
Sodiamo ke Na	mg/l	45	8.00	<200	8.8
Potasiome ke K	mg/l	45	0.96	<50	1.1
Palogotlhe ya Bopopota ke CaCO3	mg/l	45	215.8	<300	237
Tleloraete ke Cl	mg/l	45	5.8	<200	6.4
Salafate ke SO4	mg/l	45	90.0	<400	99
Naetereite ke NOx-N	mg/l	45	4.07	<10	4.5
Folaraete ke F	mg/l	45	0.10	<1.0	0.11
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo 6.12: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga lefatshe – Bodutiso jwa kwatenari C22B

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C22B♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		53	7.70	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	53	134.10	<150	148
Khalesiamo ke Ca	mg/l	53	106.45	<150	117
Makenesiamo ke Mg	mg/l	53	58.70	<70	65
Sodiamo ke Na	mg/l	53	46.25	<200	51
Potasiome ke K	mg/l	53	3.75	<50	4
Palogotlhe ya Bopopota ke CaCO3	mg/l	53	507.5	<300	558
Tleloraete ke Cl	mg/l	53	55.10	<200	61
Salafate ke SO4	mg/l	53	308.70	<400	340
Naetereite ke NOx-N	mg/l	53	2.40	<10	2.6
Folaraete ke F	mg/l	53	0.15	<1.0	0.17
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 6.13: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C22C

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C22C			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		123	7.79	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	123	57	<150	63
Khalesiamo ke Ca	mg/l	123	44.0	<150	50
Makenesiamo ke Mg	mg/l	123	32.0	<70	35
Sodiamo ke Na	mg/l	123	14.8	<200	16
Potasiome ke K	mg/l	123	1.84	<50	2
Palogotlhe ya Bopopota ke CaCO3	mg/l	123	241.6	<300	266
Tleloraete ke Cl	mg/l	123	16.8	<200	19
Salafate ke SO4	mg/l	123	23.2	<400	26
Naetereite ke NOx-N	mg/l	123	2.38	<10	2.6
Folaraete ke F	mg/l	123	0.10	<1.0	0.11
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo 6.14: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C22D

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C22D♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		182	7.60	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	182	38.15	<150	42
Khalesiamo ke Ca	mg/l	182	35.90	<150	39
Makenesiamo ke Mg	mg/l	182	22.85	<70	25
Sodiamo ke Na	mg/l	182	6.30	<200	7
Potasiome ke K	mg/l	182	0.84	<50	1
Palogotlhe ya Bopopota ke CaCO3	mg/l	182	182	<300	200
Tleloraete ke Cl	mg/l	182	6.25	<200	7
Salafate ke SO4	mg/l	182	9	<400	10
Naetereite ke NOx-N	mg/l	182	1.20	<10	1.3
Folaraete ke F	mg/l	182	0.10	<1.0	0.11
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).
♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka

Lenaneo 6.15: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C22E

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C22E♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		181	7.68	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	181	38.70	<150	43
Khalesiamo ke Ca	mg/l	181	33.80	<150	37
Makenesiamo ke Mg	mg/l	181	22.90	<70	25
Sodiamo ke Na	mg/l	181	10.10	<200	11
Potasiome ke K	mg/l	181	0.94	<50	1
Palogotlhe ya Bopopota ke CaCO3	mg/l	181	178.70	<300	197
Tleloraete ke Cl	mg/l	181	7.10	<200	8
Salafate ke SO4	mg/l	181	9.70	<400	11
Naetereite ke NOx-N	mg/l	181	1.05	<10	1.2
Folaraete ke F	mg/l	181	0.13	<1.0	0.14
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka

Lenaneo 616: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C22F

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C22F♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		39	7.60	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	39	48.30	<150	53
Khalesiamo ke Ca	mg/l	39	42.70	<150	47
Makenesiamo ke Mg	mg/l	39	22.30	<70	25
Sodiamo ke Na	mg/l	39	18	<200	20
Potasiome ke K	mg/l	39	1.61	<50	2
Palogotlhe ya Bopopota ke CaCO3	mg/l	39	198.5	<300	218
Tleloraete ke Cl	mg/l	39	14.40	<200	16
Salafate ke SO4	mg/l	39	10.30	<400	11
Naetereite ke NOx-N	mg/l	39	0.50	<10	0.55
Folaraete ke F	mg/l	39	0.20	<1.0	0.22
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka

Lenaneo 6.17: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C22H

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C22H♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		30	7.21	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	30	18.30	<150	20
Khalesiamo ke Ca	mg/l	30	14.50	<150	16
Makenesiamo ke Mg	mg/l	30	6	<70	7
Sodiamo ke Na	mg/l	30	7.05	<200	8
Potasiome ke K	mg/l	30	0.91	<50	1
Palogotlhe ya Bopopota ke CaCO3	mg/l	30	60.9	<300	67
Tleloraete ke Cl	mg/l	30	4.45	<200	5
Salafate ke SO4	mg/l	30	4.70	<400	5
Naetereite ke NOx-N	mg/l	30	0.11	<10	0.12
Folaraete ke F	mg/l	30	0.14	<1.0	0.15
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka

Lenaneo 6.18: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C22J

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C22J♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		30	7.40	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	30	56.10	<150	62
Khalesiamo ke Ca	mg/l	30	47.70	<150	52
Makenesiamo ke Mg	mg/l	30	27.65	<70	30
Sodiamo ke Na	mg/l	30	23.75	<200	26
Potasiome ke K	mg/l	30	1.17	<50	1.3
Palogotlhe ya Bopopota ke CaCO3	mg/l	30	233.0	<300	256
Tleloraete ke Cl	mg/l	30	17.35	<200	19
Salafate ke SO4	mg/l	30	21.85	<400	24
Naetereite ke NOx-N	mg/l	30	4.29	<10	5
Folaraete ke F	mg/l	30	0.21	<1.0	0.23
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka

Lenaneo 6.19: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C23B

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C23B♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		16	7.64	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	16	43.10	<150	47
Khalesiamo ke Ca	mg/l	16	31.05	<150	34
Makenesiamo ke Mg	mg/l	16	20.45	<70	23
Sodiamo ke Na	mg/l	16	15.95	<200	18
Potasiome ke K	mg/l	16	2.37	<50	3
Palogotlhe ya Bopopota ke CaCO3	mg/l	16	161.7	>300	178
Tleloraete ke Cl	mg/l	16	13.30	<200	15
Salafate ke SO4	mg/l	16	10.25	<400	11
Naetereite ke NOx-N	mg/l	16	2.44	<10	3
Folaraete ke F	mg/l	16	0.23	<1.0	0.25
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka

Lenaneo 6.20: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C23C

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: *C23C			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		35	7.92	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	35	64.80	<150	71
Khalesiamo ke Ca	mg/l	35	42.45	<150	47
Makenesiamo ke Mg	mg/l	35	27.76	<70	31
Sodiamo ke Na	mg/l	35	53.10	<200	58
Potasiome ke K	mg/l	35	4.61	<50	5
Palogotlhe ya Bopopota ke CaCO3	mg/l	35	220.3	<300	242
Tleloraete ke Cl	mg/l	35	24.50	<200	26
Salafate ke SO4	mg/l	35	19.40	<400	21
Naetereite ke NOx-N	mg/l	35	4.07	<10	5
Folaraete ke F	mg/l	35	0.42	<1.0	0.46
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

* Supa gore ke fela morago ga 1995 gore tshedimosetso ya haeterokhimise ya bodutiso jwa kwatenari e neng ya dirisiwa.

Lenaneo 6.21: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C23D

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C23D♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		74	7.08	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	74	20.40	<150	22
Khalesiamo ke Ca	mg/l	74	16	<150	18
Makenesiamo ke Mg	mg/l	74	10.70	<70	12
Sodiamo ke Na	mg/l	74	3.80	<200	4
Potasiome ke K	mg/l	74	0.78	<50	1
Palogotlhe ya Bopopota ke CaCO3	mg/l	74	84.0	<300	92
Tleloraete ke Cl	mg/l	74	2.25	<200	2.5
Salafate ke SO4	mg/l	74	12.90	<400	14
Naetereite ke NOx-N	mg/l	74	0.53	<10	1
Folaraete ke F	mg/l	74	0.05	<1.0	0.06
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).
♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka

Lenaneo 6.22: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C23E

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C23E♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		34	7.56	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	34	50.4	<150	55
Khalesiamo ke Ca	mg/l	34	51.1	<150	56
Makenesiamo ke Mg	mg/l	34	33.7	<70	37
Sodiamo ke Na	mg/l	34	9.9	<200	11
Potasiome ke K	mg/l	34	1.29	<50	1.4
Palogotlhe ya Bopopota ke CaCO3	mg/l	34	266.4	<300	293
Tleloraete ke Cl	mg/l	34	5.15	<200	6
Salafate ke SO4	mg/l	34	24.6	<400	27
Naetereite ke NOx-N	mg/l	34	1.96	<10	2
Folaraete ke F	mg/l	34	0.05	<1.0	0.06
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).
♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka

Lenaneo 6.23: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C23F

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C23F♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		14	7.72	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	14	31.20	<150	34
Khalesiamo ke Ca	mg/l	14	30.90	<150	34
Makenesiamo ke Mg	mg/l	14	16.75	<70	18
Sodiamo ke Na	mg/l	14	3.40	<200	4
Potasiome ke K	mg/l	14	0.90	<50	1
Palogotlhe ya Bopopota ke CaCO3	mg/l	14	146.1	<300	161
Tleloraete ke Cl	mg/l	14	3.35	<200	3.7
Salafate ke SO4	mg/l	14	2	<400	2.2
Naetereite ke NOx-N	mg/l	14	1	<10	1.1
Folaraete ke F	mg/l	14	0.12	<1.0	0.13
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka

Lenaneo 6.24: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C23G

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C23G♣			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		196	7.78	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	196	88.95	<150	98
Khalesiamo ke Ca	mg/l	196	79.95	<150	88
Makenesiamo ke Mg	mg/l	196	44.55	<70	49
Sodiamo ke Na	mg/l	196	44.35	<200	48
Potasiome ke K	mg/l	196	1.88	<50	2
Palogotlhe ya Bopopota ke CaCO3	mg/l	196	383.1	<300	421
Tleloraete ke Cl	mg/l	196	45.40	<200	50
Salafate ke SO4	mg/l	196	228.05	<400	251
Naetereite ke NOx-N	mg/l	196	2.11	<10	2.3
Folaraete ke F	mg/l	196	0.11	<1.0	0.12
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♣ E ka ga tshedimosetso ya pakatelele ya haeterokhemisi go tswa mo sebakeng se le sengwe fela (motswedi/leitlho) sa tebelelo kwa bodutisong jwa kwatenari

Lenaneo 6.25: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C23H

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C23H			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		19	7.91	9.5 – 5.0 ($\pm$0.05)	9.5 – 5.0 ($\pm$0.05)
Phetiso ya Motlakase	mS/m	19	43.70	<150	48
Khalesiamo ke Ca	mg/l	19	44	<150	48
Makenesiamo ke Mg	mg/l	19	24.60	<70	27
Sodiamo ke Na	mg/l	19	11.40	<200	13
Potasiome ke K	mg/l	19	1.14	<50	1.25
Palogotlhe ya Bopopota ke CaCO3	mg/l	19	211.3	<300	232
Tleloraete ke Cl	mg/l	19	7.20	<200	8
Salafate ke SO4	mg/l	19	5.20	<400	6
Naetereite ke NOx-N	mg/l	19	3.11	<10	3.4
Folaraete ke F	mg/l	19	0.13	<1.0	0.14
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo 6.26: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C23J

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C23J♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		20	7.73	9.5 – 5.0 ($\pm$0.05)	9.5 – 5.0 ($\pm$0.05)
Phetiso ya Motlakase	mS/m	20	44.2	<150	49
Khalesiamo ke Ca	mg/l	20	28.3	<150	31
Makenesiamo ke Mg	mg/l	20	31.0	<70	34
Sodiamo ke Na	mg/l	20	14.3	<200	16
Potasiome ke K	mg/l	20	1.50	<50	1.65
Palogotlhe ya Bopopota ke CaCO3	mg/l	20	198.3	<300	218
Tleloraete ke Cl	mg/l	20	8.40	<200	9.0
Salafate ke SO4	mg/l	20	7.45	<400	8.20
Naetereite ke NOx-N	mg/l	20	0.79	<10	0.87
Folaraete ke F	mg/l	20	0.22	<1.0	0.24
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 6.27: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C23K

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C23K♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		9	7.76	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	9	39.50	<150	43
Khalesiamo ke Ca	mg/l	9	44.50	<150	49
Makenesiamo ke Mg	mg/l	9	19.20	<70	21
Sodiamo ke Na	mg/l	9	15.70	<200	17
Potasiome ke K	mg/l	9	1.07	<50	1.1
Palogotlhe ya Bopopota ke CaCO3	mg/l	9	190.2	<300	209
Tleloraete ke Cl	mg/l	9	6.10	<200	7
Salafate ke SO4	mg/l	9	4	<400	4.5
Naetereite ke NOx-N	mg/l	9	2.32	<10	3
Folaraete ke F	mg/l	9	0.18	<1.0	0.2
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka

Lenaneo la 6.28: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C23L

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C23L♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		26	7.20	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	26	34.70	<150	38
Khalesiamo ke Ca	mg/l	26	33.55	<150	37
Makenesiamo ke Mg	mg/l	26	16.80	<70	18
Sodiamo ke Na	mg/l	26	10.25	<200	11
Potasiome ke K	mg/l	26	1.47	<50	2
Palogotlhe ya Bopopota ke CaCO3	mg/l	26	153	<300	168
Tleloraete ke Cl	mg/l	26	5.90	<200	6
Salafate ke SO4	mg/l	26	2	<400	2.2
Naetereite ke NOx-N	mg/l	26	0.87	<10	1
Folaraete ke F	mg/l	26	0.13	<1.0	0.14
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka

Lenaneo 6.29: Rasefe ya Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C24A

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C24A			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		112	7.40	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	112	108.05	<150	119
Khalesiamo ke Ca	mg/l	112	89.95	<150	99
Makenesiamo ke Mg	mg/l	112	74.30	<70	82
Sodiamo ke Na	mg/l	112	70.35	<200	77
Potasiome ke K	mg/l	112	7.74	<50	9
Palogotlhe ya Bopopota ke CaCO3	mg/l	112	529.3	<300	582
Tleloraete ke Cl	mg/l	112	67.05	<200	74
Salafate ke SO4	mg/l	112	323.45	<400	356
Naetereite ke NOx-N	mg/l	112	1.99	<10	2
Folaraete ke F	mg/l	112	0.16	<1.0	0.18
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 2

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo la 6.30: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C24B

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C24B♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		13	7.17	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	13	361.20	<150	397
Khalesiamo ke Ca	mg/l	13	458.60	<150	504
Makenesiamo ke Mg	mg/l	13	225.40	<70	248
Sodiamo ke Na	mg/l	13	118.90	<200	131
Potasiome ke K	mg/l	13	20.14	<50	22
Palogotlhe ya Bopopota ke CaCO3	mg/l	13	2073.3	<300	2281
Tleloraete ke Cl	mg/l	13	143.40	<200	158
Salafate ke SO4	mg/l	13	2109.90	<400	2321
Naetereite ke NOx-N	mg/l	13	4.82	<10	5.3
Folaraete ke F	mg/l	13	0.22	<1.0	0.24
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 3

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka

Lenaneo 6.31: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C24C

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C24C			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		161	7.95	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	161	40.70	<150	45
Khalesiamo ke Ca	mg/l	161	34	<150	37
Makenesiamo ke Mg	mg/l	161	29.20	<70	32
Sodiamo ke Na	mg/l	161	4.60	<200	5
Potasiome ke K	mg/l	161	1.43	<50	2
Palogotlhe ya Bopopota ke CaCO3	mg/l	161	205.1	<300	226
Tleloraete ke Cl	mg/l	161	5.70	<200	6
Salafate ke SO4	mg/l	161	2	<400	2.2
Naetereite ke NOx-N	mg/l	161	1.97	<10	2.2
Folaraete ke F	mg/l	161	0.05	<1.0	0.06
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo 6.32: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C24D

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C24D			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		10	7.70	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	10	24.30	<150	27
Khalesiamo ke Ca	mg/l	10	16.95	<150	19
Makenesiamo ke Mg	mg/l	10	10.10	<70	11
Sodiamo ke Na	mg/l	10	13.90	<200	15
Potasiome ke K	mg/l	10	3.03	<50	3.3
Palogotlhe ya Bopopota ke CaCO3	mg/l	10	83.9	<300	92
Tleloraete ke Cl	mg/l	10	5.05	<200	6
Salafate ke SO4	mg/l	10	7.05	<400	8
Naetereite ke NOx-N	mg/l	10	3.46	<10	3.8
Folaraete ke F	mg/l	10	0.13	<1.0	0.15
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo 6.33: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C24E

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C24E			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		48	7.89	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	48	48.80	<150	54
Khalesiamo ke Ca	mg/l	48	35.45	<150	39
Makenesiamo ke Mg	mg/l	48	35.75	<70	39
Sodiamo ke Na	mg/l	48	7.20	<200	8
Potasiome ke K	mg/l	48	1.37	<50	2
Palogotlhe ya Bopopota ke CaCO3	mg/l	48	235.7	<300	259
Tleloraete ke Cl	mg/l	48	12.15	<200	13
Salafate ke SO4	mg/l	48	2	<400	2.2
Naetereite ke NOx-N	mg/l	48	5.21	<10	6
Folaraete ke F	mg/l	48	0.13	<1.0	0.14
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo 6.34: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C24F

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C24F			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		175	7.84	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	175	46.30	<150	51
Khalesiamo ke Ca	mg/l	175	40	<150	44
Makenesiamo ke Mg	mg/l	175	26.90	<70	30
Sodiamo ke Na	mg/l	175	7.70	<200	8
Potasiome ke K	mg/l	175	1.80	<50	2
Palogotlhe ya Bopopota ke CaCO3	mg/l	175	211	<300	232
Tleloraete ke Cl	mg/l	175	30.50	<200	34
Salafate ke SO4	mg/l	175	2	<400	2.2
Naetereite ke NOx-N	mg/l	175	6.62	<10	7
Folaraete ke F	mg/l	175	0.05	<1.0	0.06
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo 6.35: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C24G

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C24G			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		23	7.80	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	23	38	<150	42
Khalesiamo ke Ca	mg/l	23	33.70	<150	37
Makenesiamo ke Mg	mg/l	23	15.70	<70	17
Sodiamo ke Na	mg/l	23	14.70	<200	16
Potasiome ke K	mg/l	23	1.99	<50	2.2
Palogotlhe ya Bopopota ke CaCO3	mg/l	23	148.8	<300	164
Tleloraete ke Cl	mg/l	23	7.60	<200	8.4
Salafate ke SO4	mg/l	23	11.80	<400	13
Naetereite ke NOx-N	mg/l	23	3.21	<10	3.5
Folaraete ke F	mg/l	23	0.31	<1.0	0.34
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo 6.36: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C24H

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C24H♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		42	7.80	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	42	51.40	<150	57
Khalesiamo ke Ca	mg/l	42	46.10	<150	51
Makenesiamo ke Mg	mg/l	42	25.80	<70	28
Sodiamo ke Na	mg/l	42	14.85	<200	16
Potasiome ke K	mg/l	42	1.59	<50	1.75
Palogotlhe ya Bopopota ke CaCO3	mg/l	42	221.4	<300	244
Tleloraete ke Cl	mg/l	42	15.40	<200	17
Salafate ke SO4	mg/l	42	11.55	<400	13
Naetereite ke NOx-N	mg/l	42	3.67	<10	4.0
Folaraete ke F	mg/l	42	0.27	<1.0	0.29
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).
♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 6.37: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C24J

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C24J			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		22	7.64	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	22	42.60	<150	43
Khalesiamo ke Ca	mg/l	22	36.30	<150	37
Makenesiamo ke Mg	mg/l	22	16.30	<70	17
Sodiamo ke Na	mg/l	22	24.85	<200	26
Potasiome ke K	mg/l	22	1.06	<50	2
Palogotlhe ya Bopopota ke CaCO3	mg/l	22	157.3	<300	173.5
Tleloraete ke Cl	mg/l	22	10.45	<200	11
Salafate ke SO4	mg/l	22	7.55	<400	8
Naetereite ke NOx-N	mg/l	22	1.62	<10	2
Folaraete ke F	mg/l	22	0.22	<1.0	0.24
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo 6.38: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C25A

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C25A♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		9	7.84	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	9	53.60	<150	59
Khalesiamo ke Ca	mg/l	9	30	<150	33
Makenesiamo ke Mg	mg/l	9	24.90	<70	27
Sodiamo ke Na	mg/l	9	33.40	<200	37
Potasiome ke K	mg/l	9	1.37	<50	2
Palogotlhe ya Bopopota ke CaCO3	mg/l	9	177.4	<300	195
Tleloraete ke Cl	mg/l	9	17	<200	19
Salafate ke SO4	mg/l	9	14.20	<400	16
Naetereite ke NOx-N	mg/l	9	3.10	<10	3.4
Folaraete ke F	mg/l	9	0.82	<1.0	0.9
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 6.39: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari QC C25B

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: *C25B			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		16	8.29	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	16	136.95	<150	151
Khalesiamo ke Ca	mg/l	16	27.32	<150	30
Makenesiamo ke Mg	mg/l	16	15.25	<70	17
Sodiamo ke Na	mg/l	16	267.18	<200	294
Potasiome ke K	mg/l	16	5.03	<50	6.0
Palogotlhe ya Bopopota ke CaCO3	mg/l	16	131.0	<300	144
Tleloraete ke Cl	mg/l	16	117.83	<200	130
Salafate ke SO4	mg/l	16	33.93	<400	37
Naetereite ke NOx-N	mg/l	16	0.35	<10	0.4
Folaraete ke F	mg/l	16	2.38	<1.0	2.62
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 3

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).
* Supa gore ke fela morago ga 1995 gore tshedimosetso ya haeterokhimise ya bodutiso jwa kwatenari e neng ya dirisiwa.

Lenaneo 6.40: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutelo jwa kwatenari C25C

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C25C			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		28	8.13	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	28	50.45	<150	56
Khalesiamo ke Ca	mg/l	28	46.63	<150	51
Makenesiamo ke Mg	mg/l	28	27.52	<70	30
Sodiamo ke Na	mg/l	28	14.95	<200	16
Potasiome ke K	mg/l	28	1.93	<50	2
Palogotlhe ya Bopopota ke CaCO3	mg/l	28	229.8	<300	253
Tleloraete ke Cl	mg/l	28	8.77	<200	10
Salafate ke SO4	mg/l	28	4.32	<400	5
Naetereite ke NOx-N	mg/l	28	9.57	<10	11
Folaraete ke F	mg/l	28	0.13	<1.0	0.15
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo 6.41: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C25E

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C25E			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		11	7.99	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	11	67.70	<150	74
Khalesiamo ke Ca	mg/l	11	48.30	<150	53
Makenesiamo ke Mg	mg/l	11	20.70	<70	23
Sodiamo ke Na	mg/l	11	19.80	<200	22
Potasiome ke K	mg/l	11	2.75	<50	3
Palogotlhe ya Bopopota ke CaCO3	mg/l	11	205.8	<300	226
Tleloraete ke Cl	mg/l	11	17.80	<200	20
Salafate ke SO4	mg/l	11	8.90	<400	10
Naetereite ke NOx-N	mg/l	11	13.07	<10	14
Folaraete ke F	mg/l	11	0.18	<1.0	0.2
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo 6.42: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe - Bodutiso jwa kwatenari C25F

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C25F♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		22	7.75	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	22	27.20	<150	30
Khalesiamo ke Ca	mg/l	22	20.92	<150	23
Makenesiamo ke Mg	mg/l	22	12.30	<70	14
Sodiamo ke Na	mg/l	22	4.10	<200	5
Potasiome ke K	mg/l	22	1	<50	1.1
Palogotlhe ya Bopopota ke CaCO3	mg/l	22	102.9	<300	113
Tleloraete ke Cl	mg/l	22	1.50	<200	2
Salafate ke SO4	mg/l	22	11.45	<400	13
Naetereite ke NOx-N	mg/l	22	0.84	<10	1.0
Folaraete ke F	mg/l	22	0.05	<1.0	0.06
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).
♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 6.43: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari QC C31A

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C31A			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		187	7.82	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	187	60.90	<150	67
Khalesiamo ke Ca	mg/l	187	59	<150	65
Makenesiamo ke Mg	mg/l	187	34.30	<70	38
Sodiamo ke Na	mg/l	187	13.10	<200	14
Potasiome ke K	mg/l	187	2.19	<50	2.4
Palogotlhe ya Bopopota ke CaCO3	mg/l	187	288.6	<300	317
Tleloraete ke Cl	mg/l	187	27	<200	30
Salafate ke SO4	mg/l	187	2	<400	2.2
Naetereite ke NOx-N	mg/l	187	4.96	<10	5.5
Folaraete ke F	mg/l	187	0.12	<1.0	0.13
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo 6.44: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C31B

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C31B♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		69	7.87	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	69	74.80	<150	82
Khalesiamo ke Ca	mg/l	69	80.80	<150	89
Makenesiamo ke Mg	mg/l	69	36.90	<70	41
Sodiamo ke Na	mg/l	69	23.30	<200	26
Potasiome ke K	mg/l	69	3.10	<50	3.3
Palogotlhe ya Bopopota ke CaCO3	mg/l	69	353.7	<300	389
Tleloraete ke Cl	mg/l	69	35.70	<200	39
Salafate ke SO4	mg/l	69	11.30	<400	12
Naetereite ke NOx-N	mg/l	69	14.05	<10	15
Folaraete ke F	mg/l	69	0.23	<1.0	0.25
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo la 6.45: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C31C

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C31C♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		41	7.61	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	41	42.90	<150	47
Khalesiamo ke Ca	mg/l	41	30.1	<150	33.1
Makenesiamo ke Mg	mg/l	41	18.10	<70	20
Sodiamo ke Na	mg/l	41	24.80	<200	27
Potasiome ke K	mg/l	41	2.73	<50	3
Palogotlhe ya Bopopota ke CaCO3	mg/l	41	154.2	<300	169
Tleloraete ke Cl	mg/l	41	11.60	<200	13
Salafate ke SO4	mg/l	41	10.10	<400	11
Naetereite ke NOx-N	mg/l	41	9.76	<10	11
Folaraete ke F	mg/l	41	0.25	<1.0	0.28
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).
♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 6.46: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C31D

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C31D♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		23	8.05	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	23	83	<150	91
Khalesiamo ke Ca	mg/l	23	83.20	<150	92
Makenesiamo ke Mg	mg/l	23	41.30	<70	45
Sodiamo ke Na	mg/l	23	49.60	<200	55
Potasiome ke K	mg/l	23	4.43	<50	5
Palogotlhe ya Bopopota ke CaCO3	mg/l	23	377.8	<300	416
Tleloraete ke Cl	mg/l	23	56.20	<200	62
Salafate ke SO4	mg/l	23	19	<400	21
Naetereite ke NOx-N	mg/l	23	10.56	<10	12
Folaraete ke F	mg/l	23	0.42	<1.0	0.46
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).
♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 6.47: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C31E

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C31E♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		82	7.88	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	82	74.85	<150	82
Khalesiamo ke Ca	mg/l	82	70.85	<150	78
Makenesiamo ke Mg	mg/l	82	30.50	<70	34
Sodiamo ke Na	mg/l	82	44.50	<200	49
Potasiome ke K	mg/l	82	3.57	<50	4
Palogotlhe ya Bopopota ke CaCO3	mg/l	82	302.5	<300	333
Tleloraete ke Cl	mg/l	82	42.95	<200	47
Salafate ke SO4	mg/l	82	18.95	<400	21
Naetereite ke NOx-N	mg/l	82	14.37	<10	16
Folaraete ke F	mg/l	82	0.34	<1.0	0.37
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).
♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 4.48: Rasefe ya Boleng jwa Metsi a a ka Fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C31F

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C31F♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		35	7.28	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	35	57.20	<150	63
Khalesiamo ke Ca	mg/l	35	43.30	<150	48
Makenesiamo ke Mg	mg/l	35	21.90	<70	24
Sodiamo ke Na	mg/l	35	43.20	<200	48
Potasiome ke K	mg/l	35	2.97	<50	3.3
Palogotlhe ya Bopopota ke CaCO3	mg/l	35	198.3	<300	218
Tleloraete ke Cl	mg/l	35	26.90	<200	30
Salafate ke SO4	mg/l	35	23.60	<400	26
Naetereite ke NOx-N	mg/l	35	13.28	<10	15
Folaraete ke F	mg/l	35	0.35	<1.0	0.39
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).
♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 4.49: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C32A

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C32A♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		135	7.92	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	135	88.30	<150	97
Khalesiamo ke Ca	mg/l	135	69.90	<150	77
Makenesiamo ke Mg	mg/l	135	34.60	<70	38
Sodiamo ke Na	mg/l	135	71.70	<200	79
Potasiome ke K	mg/l	135	3.10	<50	3.4
Palogotlhe ya Bopopota ke CaCO3	mg/l	135	316.00	<300	349
Tleloraete ke Cl	mg/l	135	45.20	<200	50
Salafate ke SO4	mg/l	135	18.80	<400	21
Naetereite ke NOx-N	mg/l	135	15.87	<10	17
Folaraete ke F	mg/l	135	0.55	<1.0	0.61
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 4.50: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C32B

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C32B			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		896	7.91	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	896	80.95	<150	89
Khalesiamo ke Ca	mg/l	896	56	<150	62
Makenesiamo ke Mg	mg/l	896	44.60	<70	49
Sodiamo ke Na	mg/l	896	39.70	<200	44
Potasiome ke K	mg/l	896	3.18	<50	3.5
Palogotlhe ya Bopopota ke CaCO3	mg/l	896	323.5	<300	356
Tleloraete ke Cl	mg/l	896	43.90	<200	48
Salafate ke SO4	mg/l	896	18.40	<400	20
Naetereite ke NOx-N	mg/l	896	7.05	<10	7.8
Folaraete ke F	mg/l	896	0.40	<1.0	0.44
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo 6.51: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C32C

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C32C			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		98	7.94	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	98	71.80	<150	79
Khalesiamo ke Ca	mg/l	98	58	<150	64
Makenesiamo ke Mg	mg/l	98	43.35	<70	48
Sodiamo ke Na	mg/l	98	37.35	<200	41
Potasiome ke K	mg/l	98	2.70	<50	3.0
Palogotlhe ya Bopopota ke CaCO3	mg/l	98	323.3	<300	356
Tleloraete ke Cl	mg/l	98	29.30	<200	32
Salafate ke SO4	mg/l	98	22.70	<400	25
Naetereite ke NOx-N	mg/l	98	5.90	<10	6.5
Folaraete ke F	mg/l	98	0.40	<1.0	0.44
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo 6.52: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C32D

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C32D			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		148	8.14	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	148	85.65	<150	94
Khalesiamo ke Ca	mg/l	148	76.09	<150	84
Makenesiamo ke Mg	mg/l	148	64.0	<70	70
Sodiamo ke Na	mg/l	148	13.30	<200	15
Potasiome ke K	mg/l	148	0.67	<50	0.74
Palogotlhe ya Bopopota ke CaCO3	mg/l	148	455.4	<300	501
Tleloraete ke Cl	mg/l	148	33.08	<200	36
Salafate ke SO4	mg/l	148	44.35	<400	49
Naetereite ke NOx-N	mg/l	148	7.51	<10	8.3
Folaraete ke F	mg/l	148	0.29	<1.0	0.32
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo 6.53: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C33A

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C33A♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		264	8	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	264	85.95	<150	95
Khalesiamo ke Ca	mg/l	264	69.05	<150	76
Makenesiamo ke Mg	mg/l	264	69.20	<70	76
Sodiamo ke Na	mg/l	264	13.40	<200	15
Potasiome ke K	mg/l	264	0.95	<50	1.1
Palogotlhe ya Bopopota ke CaCO3	mg/l	264	457.4	<300	503
Tleloraete ke Cl	mg/l	264	36	<200	40
Salafate ke SO4	mg/l	264	31.30	<400	34
Naetereite ke NOx-N	mg/l	264	5.80	<10	6.4
Folaraete ke F	mg/l	264	0.33	<1.0	0.36
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).
♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 6.54: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C33B

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C33B♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		388	7.97	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	388	80.15	<150	88
Khalesiamo ke Ca	mg/l	388	59.60	<150	66
Makenesiamo ke Mg	mg/l	388	62.45	<70	69
Sodiamo ke Na	mg/l	388	14.40	<200	16
Potasiome ke K	mg/l	388	1.21	<50	1.3
Palogotlhe ya Bopopota ke CaCO3	mg/l	388	406.0	<300	447
Tleloraete ke Cl	mg/l	388	31.40	<200	35
Salafate ke SO4	mg/l	388	21.30	<400	23
Naetereite ke NOx-N	mg/l	388	5.67	<10	6.2
Folaraete ke F	mg/l	388	0.24	<1.0	0.26
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).
♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 4.55: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C33C

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C33C♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		290	7.99	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	290	71.80	<150	79
Khalesiamo ke Ca	mg/l	290	65.10	<150	72
Makenesiamo ke Mg	mg/l	290	44.30	<70	49
Sodiamo ke Na	mg/l	290	13	<200	14
Potasiome ke K	mg/l	290	2.07	<50	2.3
Palogotlhe ya Bopopota ke CaCO3	mg/l	290	345.0	<300	380
Tleloraete ke Cl	mg/l	290	30.65	<200	34
Salafate ke SO4	mg/l	290	16.35	<400	18
Naetereite ke NOx-N	mg/l	290	3.99	<10	4.4
Folaraete ke F	mg/l	290	0.21	<1.0	0.23
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).
♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 6.56: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C41A

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C41A			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		17	7.97	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	17	71.50	<150	79
Khalesiamo ke Ca	mg/l	17	74.90	<150	82
Makenesiamo ke Mg	mg/l	17	29.20	<70	32
Sodiamo ke Na	mg/l	17	56.10	<200	62
Potasiome ke K	mg/l	17	2.62	<50	2.9
Palogotlhe ya Bopopota ke CaCO3	mg/l	17	307.3	<300	338
Tleloraete ke Cl	mg/l	17	11.80	<200	13
Salafate ke SO4	mg/l	17	25.18	<400	28
Naetereite ke NOx-N	mg/l	17	2.51	<10	2.8
Folaraete ke F	mg/l	17	0.28	<1.0	0.31
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo 6.57: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C41D

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C41D♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		14	8.18	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	14	82.35	<150	91
Khalesiamo ke Ca	mg/l	14	65	<150	72
Makenesiamo ke Mg	mg/l	14	26.50	<70	29
Sodiamo ke Na	mg/l	14	65.15	<200	72
Potasiome ke K	mg/l	14	2.30	<50	2.5
Palogotlhe ya Bopopota ke CaCO3	mg/l	14	271.4	<300	299
Tleloraete ke Cl	mg/l	14	30.05	<200	33
Salafate ke SO4	mg/l	14	21.40	<400	24
Naetereite ke NOx-N	mg/l	14	4.50	<10	5.0
Folaraete ke F	mg/l	14	0.40	<1.0	0.43
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 6.58: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C43B

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C43B♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		15	7.60	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	15	70	<150	77
Khalesiamo ke Ca	mg/l	15	69.30	<150	76
Makenesiamo ke Mg	mg/l	15	39.90	<70	44
Sodiamo ke Na	mg/l	15	22.70	<200	25
Potasiome ke K	mg/l	15	2.32	<50	2.6
Palogotlhe ya Bopopota ke CaCO3	mg/l	15	337.4	<300	371
Tleloraete ke Cl	mg/l	15	25.50	<200	28
Salafate ke SO4	mg/l	15	41.90	<400	46
Naetereite ke NOx-N	mg/l	15	0.07	<10	0.08
Folaraete ke F	mg/l	15	0.20	<1.0	0.22
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 6.59: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutelo jwa kwatenari C60E

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C60E			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		12	7.90	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	12	64.30	<150	71
Khalesiamo ke Ca	mg/l	12	43.90	<150	48
Makenesiamo ke Mg	mg/l	12	15.80	<70	17
Sodiamo ke Na	mg/l	12	42.30	<200	47
Potasiome ke K	mg/l	12	1.01	<50	1.1
Palogotlhe ya Bopopota ke CaCO3	mg/l	12	174.7	<300	192
Tleloraete ke Cl	mg/l	12	20.50	<200	23
Salafate ke SO4	mg/l	12	12	<400	13.2
Naetereite ke NOx-N	mg/l	12	1.91	<10	2.10
Folaraete ke F	mg/l	12	0.24	<1.0	0.26
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo 6.60: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C70D

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: * C70D			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		21	8.11	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	21	77.50	<150	85
Khalesiamo ke Ca	mg/l	21	62.72	<150	69
Makenesiamo ke Mg	mg/l	21	23.75	<70	26
Sodiamo ke Na	mg/l	21	70.50	<200	78
Potasiome ke K	mg/l	21	4.93	<50	5
Palogotlhe ya Bopopota ke CaCO3	mg/l	21	254.4	<300	280
Tleloraete ke Cl	mg/l	21	29.17	<200	32
Salafate ke SO4	mg/l	21	68.34	<400	75
Naetereite ke NOx-N	mg/l	21	1.76	<10	1.9
Folaraete ke F	mg/l	21	0.60	<1.0	0.66
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).
* Supa gore ke fela morago ga 1995 gore tshedimosetso ya haeterokhimise ya bodutiso jwa kwatenari e neng ya dirisiwa.

Lenaneo 6.61: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C81F

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C81F♣			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		18	7.25	9.5 – 5.0 ($\pm$0.05)	9.5 – 5.0 ($\pm$0.05)
Phetiso ya Motlakase	mS/m	18	28.90	<150	32
Khalesiamo ke Ca	mg/l	18	24.75	<150	27
Makenesiamo ke Mg	mg/l	18	6.30	<70	6.9
Sodiamo ke Na	mg/l	18	20	<200	22
Potasiome ke K	mg/l	18	1.30	<50	1.4
Palogotlhe ya Bopopota ke CaCO3	mg/l	18	87.7	<300	97
Tleloraete ke Cl	mg/l	18	1.50	<200	1.7
Salafate ke SO4	mg/l	18	2	<400	2.2
Naetereite ke NOx-N	mg/l	18	0.31	<10	0.34
Folaraete ke F	mg/l	18	0.21	<1.0	0.23
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).
♣ Disampole tse di tswang fela mo tebelelong e e dirilweng ka 1976.

Lenaneo 6.62: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C82B

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: *C82B			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		29	8.21	9.5 – 5.0 ($\pm$0.05)	9.5 – 5.0 ($\pm$0.05)
Phetiso ya Motlakase	mS/m	29	39.90	<150	44
Khalesiamo ke Ca	mg/l	29	32.23	<150	35
Makenesiamo ke Mg	mg/l	29	13.98	<70	15
Sodiamo ke Na	mg/l	29	27.60	<200	30
Potasiome ke K	mg/l	29	3.39	<50	3.7
Palogotlhe ya Bopopota ke CaCO3	mg/l	29	138.0	<300	152
Tleloraete ke Cl	mg/l	29	25.24	<200	28
Salafate ke SO4	mg/l	29	22.16	<400	24
Naetereite ke NOx-N	mg/l	29	0.17	<10	0.19
Folaraete ke F	mg/l	29	0.32	<1.0	0.35
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 0

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).
* Supa gore ke fela morago ga 1995 gore tshedimosetso ya haeterokhimise ya bodutiso jwa kwatenari e neng ya dirisiwa.

Lenaneo 6.63: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C82H

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C82H			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		18	8.07	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	18	85.15	<150	94
Khalesiamo ke Ca	mg/l	18	65.77	<150	72
Makenesiamo ke Mg	mg/l	18	27.34	<100	30
Sodiamo ke Na	mg/l	18	89.79	<200	99
Potasiome ke K	mg/l	18	1.08	<50	1.2
Palogotlhe ya Bopopota ke CaCO3	mg/l	18	276.8	<300	305
Tleloraete ke Cl	mg/l	18	20.71	<200	23
Salafate ke SO4	mg/l	18	22.56	<400	25
Naetereite ke NOx-N	mg/l	18	0.38	<10	0.41
Folaraete ke F	mg/l	18	0.78	<1.0	0.85
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo 6.64: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C83B

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: *C83B			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		33	7.98	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	33	60	<150	66
Khalesiamo ke Ca	mg/l	33	52.12	<150	57
Makenesiamo ke Mg	mg/l	33	27.20	<70	30
Sodiamo ke Na	mg/l	33	33.50	<200	37
Potasiome ke K	mg/l	33	0.85	<50	0.9
Palogotlhe ya Bopopota ke CaCO3	mg/l	33	242.82	<300	267
Tleloraete ke Cl	mg/l	33	28.89	<200	32
Salafate ke SO4	mg/l	33	35.06	<400	39
Naetereite ke NOx-N	mg/l	33	0.79	<10	0.9
Folaraete ke F	mg/l	33	0.29	<1.0	0.32
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).
* Supa gore ke fela morago ga 1995 gore tshedimosetso ya haeterokhimise ya bodutiso jwa kwatenari e neng ya dirisiwa.

Lenaneo 6.65: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C91A

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C91A♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		14	8.41	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	14	70.10	<150	77
Khalesiamo ke Ca	mg/l	14	27.45	<150	30
Makenesiamo ke Mg	mg/l	14	36.85	<70	41
Sodiamo ke Na	mg/l	14	59.70	<200	66
Potasiome ke K	mg/l	14	4.02	<50	4.4
Palogotlhe ya Bopopota ke CaCO3	mg/l	14	220.3	<300	242
Tleloraete ke Cl	mg/l	14	44.40	<200	49
Salafate ke SO4	mg/l	14	60.20	<400	66
Naetereite ke NOx-N	mg/l	14	3.05	<10	3.4
Folaraete ke F	mg/l	14	0.28	<1.0	0.30
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 6.66: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C91B

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C91B♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		41	7.90	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	41	96.00	<150	106
Khalesiamo ke Ca	mg/l	41	50.50	<150	56
Makenesiamo ke Mg	mg/l	41	46.40	<70	51
Sodiamo ke Na	mg/l	41	70.40	<200	77
Potasiome ke K	mg/l	41	2.30	<50	2.5
Palogotlhe ya Bopopota ke CaCO3	mg/l	41	317.2	<300	349
Tleloraete ke Cl	mg/l	41	68.50	<200	75
Salafate ke SO4	mg/l	41	60.20	<400	66
Naetereite ke NOx-N	mg/l	41	7.02	<10	7.7
Folaraete ke F	mg/l	41	0.56	<1.0	0.62
				Setlhopha sa Boleng jwa Metsi	Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 6.67: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C91C

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C91C			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		33	8.12	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	33	98.90	<150	109
Khalesiamo ke Ca	mg/l	33	82.90	<150	91
Makenesiamo ke Mg	mg/l	33	62.57	<70	69
Sodiamo ke Na	mg/l	33	25.81	<200	28
Potasiome ke K	mg/l	33	3.33	<50	3.7
Palogotlhe ya Bopopota ke CaCO3	mg/l	33	464.7	<300	511
Tleloraete ke Cl	mg/l	33	92.36	<200	102
Salafate ke SO4	mg/l	33	54.36	<400	60
Naetereite ke NOx-N	mg/l	33	14.42	<10	16
Folaraete ke F	mg/l	33	0.41	<1.0	0.45
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

Lenaneo 6.68: Rasefe ya Boleng jwa Metsi a a fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C91D

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C91D♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		15	7.90	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	15	71.30	<150	78
Khalesiamo ke Ca	mg/l	15	49.60	<150	55
Makenesiamo ke Mg	mg/l	15	38.80	<70	43
Sodiamo ke Na	mg/l	15	30.30	<200	33
Potasiome ke K	mg/l	15	2.91	<50	3.2
Palogotlhe ya Bopopota ke CaCO3	mg/l	15	283.6	<300	312
Tleloraete ke Cl	mg/l	15	35.00	<200	39
Salafate ke SO4	mg/l	15	36.50	<400	40
Naetereite ke NOx-N	mg/l	15	2.55	<10	2.8
Folaraete ke F	mg/l	15	0.64	<1.0	0.7
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);
2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le
3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).
♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 6.69: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C91E

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C91E♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		29	8.00	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	29	113.20	<150	125
Khalesiamo ke Ca	mg/l	29	78.20	<150	86
Makenesiamo ke Mg	mg/l	29	61.10	<70	67
Sodiamo ke Na	mg/l	29	53.90	<200	59
Potasiome ke K	mg/l	29	1.80	<50	2.0
Palogotlhe ya Bopopota ke CaCO3	mg/l	29	446.9	<300	492
Tleloraete ke Cl	mg/l	29	69.50	<200	76
Salafate ke SO4	mg/l	29	116.80	<400	128
Naetereite ke NOx-N	mg/l	29	7.45	<10	8.2
Folaraete ke F	mg/l	29	0.58	<1.0	0.64
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 6.70: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C92A

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C92A♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		298	8.09	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	298	49.10	<150	54
Khalesiamo ke Ca	mg/l	298	51.35	<150	56
Makenesiamo ke Mg	mg/l	298	19.20	<70	21
Sodiamo ke Na	mg/l	298	10.58	<200	12
Potasiome ke K	mg/l	298	2.29	<50	2.5
Palogotlhe ya Bopopota ke CaCO3	mg/l	298	207.3	<300	228
Tleloraete ke Cl	mg/l	298	20.35	<200	22
Salafate ke SO4	mg/l	298	20.45	<400	23
Naetereite ke NOx-N	mg/l	298	2.31	<10	2.5
Folaraete ke F	mg/l	298	0.17	<1.0	0.19
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 6.71: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C92B

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C92B♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		46	8.22	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	46	100.20	<150	110
Khalesiamo ke Ca	mg/l	46	82.85	<150	91
Makenesiamo ke Mg	mg/l	46	73.40	<70	81
Sodiamo ke Na	mg/l	46	29.05	<200	32
Potasiome ke K	mg/l	46	3.28	<50	3.6
Palogotlhe ya Bopopota ke CaCO3	mg/l	46	509.1	<300	560
Tleloraete ke Cl	mg/l	46	55.55	<200	61
Salafate ke SO4	mg/l	46	42.25	<400	46
Naetereite ke NOx-N	mg/l	46	6.14	<10	6.8
Folaraete ke F	mg/l	46	0.31	<1.0	0.34
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

Lenaneo 6.72: Rasefe ya Boleng jwa Metsi a a ka fa Tlase ga Lefatshe – Bodutiso jwa kwatenari C92C

Diparameta tsa Dikhemikale	Yuniti	Vaal WMA – Bodutiso jwa kwatenari: C92C♦			
		[A]	[B]	[C]	[D]
		No. ya Disampole	Boleng jwa GW (boleng jo bo mo magareng)1	Tekanyetso ya BHNt2	Rasefe ya Boleng jwa Metsi a a ka fa tlase ga lefatshe3
pH		100	8.27	9.5 – 5.0 (±0.05)	9.5 – 5.0 (±0.05)
Phetiso ya Motlakase	mS/m	100	87.60	<150	96
Khalesiamo ke Ca	mg/l	100	83.55	<150	92
Makenesiamo ke Mg	mg/l	100	56.10	<70	62
Sodiamo ke Na	mg/l	100	20.95	<200	23
Potasiome ke K	mg/l	100	4.13	<50	4.5
Palogotlhe ya Bopopota ke CaCO3	mg/l	100	439.6	<300	484
Tleloraete ke Cl	mg/l	100	50.85	<200	56
Salafate ke SO4	mg/l	100	32.30	<400	36
Naetereite ke NOx-N	mg/l	100	4.29	<10	4.7
Folaraete ke F	mg/l	100	0.33	<1.0	0.36
Setlhopha sa Boleng jwa Metsi					Setlhopha sa 1

1 Se ka ga tshedimosetso ya pakatelele ya boleng jwa metsi a a ka fa tlase ga lefatshe (Thulaganyo ya Taolo ya Metsi ya DWS). Palotlase ya palo ya ditshekatsheko tse di dirisitsweng mo tlhatlhobong ya dipalopalo ke robongwe (9);

2 Tekanyetso e e kwa godimo ya Setlhopha sa I sa boleng jwa metsi [a a nowang] (WRC et al. Kgatiso ya 2nd , 1998, Bolumo ya 1: Tlhatlhobo (Kaedi); le

3 Boleng jo bo mogareng le 10% (kwa ntle ga pH).

♦ E ka ga tshedimosetso ya pele ga 1995 ya haeterokhemisi (e e emetseng thata tshedimosetso ya sebaka)

7. DITLHOKEGO TSA TSHIRELETSO LE TAOLO YA MERAGA YA DITLAPELE

Meraga ya ditlapele kwa bodutisong jwa Noka ya Vaal e akaretsa meraga eo e e bontshang bosisi jwa ekholoji jwa Kwa Godimo kgotsa Kwa Godimo Thata. Meraga ya tlaleletso ya ditlapele e ne ya supiwa go tsewa tsia gareng ga tse dingwe, dipopego tse di tshwanang di le dingwe, ditshedi tsa tshedimosetso e khibidu le meraga ya motshotelo. Ditlhopha tse di atlanegisitsweng tsa ekholoji (REC) le ditlhokego tsa ekholoji tsa moraga wa setlapele mo Lefelong la Taolo la Metsi a Vaal se tlhagisiwa mo Lenaneo 7.1 Maemo a Gajaana a Ekholoji (PES), Botlhokwa le Bosisi (IS) tse di supilweng e le meraga ya ditlapele le tsona di a tlhagisiwa.

Tlhokomela:
Diakeronimi tse di kailweng mo Lenaneong 7-1:

- CBA: Lefelo le le Botlhokwa la Mefutafuta ya Ditshedi
- ESA: Mafelo a Tshegetso ya Ekholoji
- EIA: Tlhatlhobo ya Kutlwalo ya Tikologo
- REC: Setlhopha se se Atlanegisitsweng sa Ekholoji
- TEC: Setlhopha se se Totilweng sa Ekholoji
- WUL: Laesense ya Tiriso ya Metsi

Thulaganyo 7.1: Ditlhokego tsa meraga ya ditlapele kwa Lefelong la Taolo ya Metsi la Vaal

IUA	Bodutiso jwa Kwatenari	Leina la Moraga	Mofuta wa Moraga	PES	IS	REC	TEC	Dithulaganyo tsa Ekholoji Ditlhokego tsa Tshireletso, Tlamelo le Taolo
UA	C11H	Moela o o elelang mo motsweding wa noka wa Blesbokspruit (Vaal e e kwa Godimo)	Metsi a a sa eleleng a a kwa tlase ga Mogorogoro	C	Kwa godimo	B/C	C	Kamaniso ya phatlalatso ya metsi e a tlhokega go tokafatsa ditiro tsa koketso ya boleng jwa metsi. Dikarolo tse metsi a sa eleleng mo go tsona tsa moraga di tshwanetse go tlamelwa. Tlamelo ya thulaganyo ya dimela tse di teng le tlhamo. Ditsenngwa tsa kelelo ya mo matlhakoreng a meraga di tshwanetse go sirelediwa ka tiriso ya dithibedi tsa haeteroloji tse di tlhomamisitsweng ka ditlhatlhobo tsa petagokigale ya metsi tse di dirilweng e le karolo ya Tshekatsheko ya Kutlwalo ya Tikologo (EIA) le/kgotsa Dikopo tsa Laesense ya Tiriso ya Metsi (WUL), le maemo a a gagametseng a tetlelelo a a akaretsang tebelelo ya dithulaganyo a tshwanetse go dira. Kopo nngwe le nngwe ya tlhabololo go akaretsa le meepo e e ka amang thulaganyo e, kwa ntle ga go dira ditsweletso tse di tlwaelegileng tsa tetlelelo, e tshwanetse go akaretsa gape e le palotlase ya Rasefe ya Nakwana ya Maemo a meraga e e akaretsang mekgwa ya kelelo (metsi a a fa godimo ga lefatshe le a a ka fa tlase ga lefatshe go akaretsa le kelelo e e kopantsweng mo moeleng o le mongwe) tsa ditiragalo tse di tlhagisang dikutlwalo tse di ka nnang teng go fitlhelela REC.
UB	C13C	Vanger	Metsi a a sa eleleng a a kwa tlase ga Mogorogoro	A	Kwa Godimo thata	A	A	Kanamiso ya phatlalatso ya metsi e tlhokega go tokafatsa ditiro tsa tshegetso tsa haeteroloji le mefutafuta ya ditshedi. Tshola maemo a ekholoji a tlhago kgots a a gaufi le tlhago ka maikemisetso a tshireletso ya pakatelele ya mefutafuta ya ditshedi e e botlhokwa le popego e e botlhokwa ya boalo. Netefatsa gore sebaka le bodutiso jwa sona bo abelana mo Mafelong a a Botlhokwa a Mefutafuta ya Ditshedi 1 le Mafelo a Tshegetso a Ekholoji 2 maikemisetso a maemo a boalo a sebaka go emela le go tshola sampole e e tswelelang ya kemedi ya mefuta ya thulaganyotikologo le mefutafuta ya ditshedi e e amanang le yona. Tshola phatlalatso e e teng ya kelelo le mekgwa ya tsholo mo thulaganyong go tshola thulaganyo e e teng ya dimela le tlhamo. Ditsenngwa tsa kelelo ya mo matlhakoreng di tshwanetse go sirelediwa ka tiriso ya dithibedi tsa haeteroloji tse di tlhoamamisitsweng ka ditlhatlhobo tsa petakokikale ya haeteroloji tse di dirilweng e le karolo ya ditshekatsheko tsa EIA le/kgotsa dikopo tsa WUL, le maemo a a gagametseng a tetlelelo go akaretsa tebelelo ya dithulaganyo di tshwanetse go dira.

IUA	Bodutiso jwa Kwatenari	Leina la Moraga	Mofuta wa Moraga	PES	IS	REC	TEC	Dithulaganyo tsa Ekholoji Ditlhokego tsa Tshireletso, Tlamelo le Taolo
UB	C13C	Seekoeivlei	Mogorogoro	E[1]	Kwa Godimo thata	D	D	Kanamiso ya phatlalatso ya metsi e tlhokega go tokafatsa ditiro tsa tshegetso tsa haeteroloji le mefutafuta ya ditshedi. Dirisa ditekaynetso tse di tofatsang maemo a meraga gore e nne mo maemong a tlhago a ekholoji le go laola go ya ka maitlhomo a thulaganyo ya taolo ya mafelo a a sireleditsweng. Sireletsa moraga le bodutiso jwa ona ka maikemisetso a tshireletso ya pakatelele ya mefutafuta ya ditshedi e e botlhokwa le le popego e e botlhokwa ya boalo. Netefatsa gore sebaka le bodutiso jwa sona bo abelana mo Mafelo a a Botlhokwa a Mefutafuta ya Ditshedi 1 le 2 Mafelo a Tshegetso a Ekholoji 1 le 2 maikemisetso a maemo a boalo a sebaka go emela le go tshola sampole e e tswelelang ya kemedi ya mofuta wa thulaganyotikologo le mefutafuta ya ditshedi e e amanang le yona. Tokafatsa phatlalatso e e teng ya kelelo le mekgwa ya tsholo mo thulaganyong go busetsa dingwe tsa go dira go go latlhegileng tsa ekholoji le haeteroloji tsa thulaganyo le tokafatso ya popego ya dimela le tlhamo. Ditsenngwa tsa kelelo ya mo matlhakoreng di tshwanetse go sirelediwa ka tiriso ya dithibedi tsa haeteroloji tse di tlhoamamisitsweng ka ditlhatlhobo tsa petakokikale ya haeteroloji tse di dirilweng e le karolo ya ditshekatsheko tsa EIA le/kgotsa dikopo tsa WUL, le maemo a a gagametseng a tetlelelo go akaretsa tebelelo ya dithulaganyo di tshwanetse go dira. Lebelela kelelo e e tswang kwa moeleng o o kwa godimo kwa mafelong a ditoropo a a itsegeng ka go tlhola tshologelo ya mantle gangwe le gape, gammogo le kgogolego go tswa mo sebakeng sa mantle. Supa le go dira ditlhokego tsa tsosoloso ya meraga setlapele e e tla diriwang ka manane a a setseng a Dira a Meraga.
UC1	C81B	Murphy's Rust	Metsi a a Elelelang le a a sa Eleleng kwa Tlase ga Mogorogoro	C	Kwa Godimo thata	B	B/C	Dirisa ditekanyetso go tokafatsa kgotsa bobotlana go tshola maemo a ekholoji a thulaganyo ya maikemisetso a tshireletso ya pakatelele ya mefutafuta e e botlhokwa ya ditshedi le popego e e botlhokwa ya boalo. Netefatsa gore sebaka le bodutiso jwa sona bo abelana mo Mafelong a a Botlhokwa a Mefutafuta ya Ditshedi 1 le Mafelo a Tshegetso a Ekholoji 2 maikemisetso a maemo a boalo a sebaka go emela le go tshola sampole e e tswelelang ya kemedi ya mefuta ya thulaganyotikologo le mefutafuta ya ditshedi e e amanang le yona. Tshola phatlatso e e teng ya kelelo le mekgwa ya tsholo mo thulaganyong. Tshola thulaganyo e e teng ya dimela le tlhamo le maemo a a kwa tlase a kgoreletso go tswelela go tshegetsa mefutafuta ya ditshedi e e nyelelang. Meraga ya gajaana e e sa eleleng e tshwanetse go tlamelwa e le dithulaganyo tse di sa eleleng. ditsenngwa tsa kelelo kwa merageng di tshwanetse go sirelediwa ka tiriso ya dithibedi tsa haeteroloji tse di tlhomamisitsweng ka ditlhatlhobo tsa petakokikale ya haeteroloji tse di dirilweng e le karolo ya dikopo tsa EAI le/kgotsa WUL, le maemo a a gagametseng a tetlelelo go akaretsa tebelelo ya dithulaganyo di tshwanetse go dira. Dirisa theo ya tlhokomelo mo kgoreletsong ya kutlwalo e e sa itsiweng. Kopo nngwe le nngwe ya tlhabololo e e ka ratang go ama thulaganyo e, kwa ntle ga go dira ditsweletso tse di tlwaelegileng tsa tetlelelo, e tshwanetse gape go akaretsa palotlase ya Maemo a Nakwana a Rasefe ya Moraga e e

[1] Thulaganyo e mo setlhopheng sa PES (Fetotswe Thata) fela se na le IS e e kwa Godimo Thata ka e le Sebaka sa Ramsar (se se theilweng e le Moraga o o Botlhokwa Boditšhaba go ya ka Kgolagano ya Ramsar). Setlhopha sa PES sa E ga tswelele ka jalo TEC e atlanegisiwa go tshwana le REC mme ke setlhoha sa nngwee se se kwa godimo ga PES. Tsenogare ya tsosoloso e tla tlhokega go tokafatsa PES. Go fitlhelela tokafalo mo PES ya thulaganyo e ka jalo go tshwanetse go diriwa setlapele.

IUA	Bodutiso jwa Kwatenari	Leina la Moraga	Mofuta wa Moraga	PES	IS	REC	TEC	Dithulaganyo tsa Ekholoji Ditlhokego tsa Tshireletso, Tlamelo le Taolo
								akaretsang mekgwa ya kelelo (metsi a a fa godimo ga le fatshe le a a ka fa tlase ga lefatshe go akaretsa kelelo e e kopantsweng mo moeleng o le mongwe) tsa ditiragalo tse di tlhagisang dikutlwalo tse di ka nnang teng go fitlhelela REC.
UC1	C81A	Bedford wetland complex	Metsi a a sa eleleng a a kwa tlase ga Mogorogoro	C	Kwa Godimo thata	B	B/C	Tshola kgololo e e itiretsweng ya metsi a tlhago go tswwa mo Letamong la Bedford go netefatsa taolo e e sa fetolwang ya haeteroloji. Kanamiso ya phatlalatso ya metsi e tlhokega go tokafatsa ditiro tsa tshegetso tsa haeteroloji le mefutafuta ya ditshedi. Tshola maemo a a batlileng go nna a tlhago ka maikemisetso a tshireletso ya pakatelele ya mefutafuta ya ditshedi e e botlhokwa le jaaka popego e e botlhokwa ya boalo. Netefatsa gore sebaka le bodutiso jwa sona mo Lefelong le le Botlhokwa la Mefutafuta ya Ditsheedi (CBA1) le ESA2 maikemisetso a maemo a boalo mo sebakeng go emela le go tshola sampole e e tswelelang ya kemedi ya mefuta e ya thulaganyotikologo le mefutafuta ya ditshedi e e amanang le yona. Tshola phatlatso e e teng ya kelelo le mekgwa ya tsholo mo thulaganyong. Tshola thulaganyo e e teng ya dimela le tlhamo le maemo a a kwa tlase a kgoreletso go tswelela go tshegetsa mefutafuta ya ditshedi e e nyelelang. Meraga ya gajaana e e sa eleleng e tshwanetse go tlamelwa e le dithulaganyo tse di sa eleleng. Ga go mesele ya kgogolego (Ga go dikanala tse di epiwang kgotsa mogorogoro) e e ka dumelelwang go tlhagisiwa mo merageng. Se ke moraga o o sa eleleng mme o ka kgogolega thata le go epega. Dikgololo tsa kelelo mo letamong la Bedford di tshwanetse go etsa mokgwa wa tlhago wa haeteroloji o o tlhokegang go tshola moraga go nna mo maemong a go nna teng. Rasefe e e rebotsweng ya moraga e atlanegisa kelelo ya kwa tlase le dikgololo tsa morwalela ka bobedi mo morageng. Dikelelo tsa kwa tlase di tlhokega go netefatsa kokotlelo e e seng boteng ya boalo jwa mogorogoro mo dikarolong tse tsa boalo jwa mogorogoro tse di tshegetsang tlhakanyo tsa dimela tsa moraga. Se se tlhokega e seng fela go tlamela bonno jo bo ka siamelang Dimela tse di Tshweu tsa flufftail tse di ka nyelelang, le bonno jwa thuthuso ya megolodi, fela le go netefatsa kolobo ya borubu mo thulaganyong. Se se tla tlhola maemo a a siameng a go dira ga meraga le tlamelo ya ditirelo tsa thulaganyotikologo ka go oketsa kamano gareng ga kholumo ya metsi le loretse lwa meraga. Tiro ya dikelelo tse di kwa godimo di thusa go fitlhelela maemo a tlamelo ya bonno jwa moraga (ya ditiralago tse dinnye tse di bonwang) le go letlelela phepafatso ya dikanala tse di sa tlhagisiwang sentle (mo ntlheng e ditiragalo tse dikgolo tse di sa diragaleng gangwe le gape tsa go tsholola). Tebelelo e tshwanetse go totisiwa mo tlhomamiseng gore a kelelo ya kwa tlase le dikgololo tsa merwalela di fitlhelela maitlhomo a a eleditsweng a meraga le REC kgotsa nnyaa. E tshwanetse gape go nna ka go lemoga phetogo, bogolo diphetogo tse di amanang le mekgwa ya haeteroloji go itsise dikgololo tsa isago tsa metsi. kutlwalo e e ka nnang teng ya isago ya dikopo tsa tlhabololo e tshwanetse go tlhomamisiwa e le karolo ya EIA le/kgotsa dikopo tsa WUL, le maemo a a gagametseng a tetlelelo go akaretsa tebelelo ya dithulaganyo e tshwanetse go dira. Dirisa theo ya tlhokomelo mo kgoreletsong ya kutlwalo e e sa itsiweng. Tebelelo ya tsosoloso e e teng ya dithulaganyo tsa meraga e e tlhokegang go netefatsa tiragatso e e tswelelang ya

IUA	Bodutiso jwa Kwatenari	Leina la Moraga	Mofuta wa Moraga	PES	IS	REC	TEC	Dithulaganyo tsa Ekholoji Ditlhokego tsa Tshireletso, Tlamelo le Taolo
								dithulaganyo.
UC1	C81A	Wilge e e kwa Godimo	Mogorogoro	B	Kwa godimo	A/B	B	Merwalela e a tlhokega go tlasa megorogoro ka jalo e tlamela kolobetso e e tlhokegany ya tshegetso ya dimela tsa megorogoro tse di ikaegileng ka merwalela mo matshelong a tsona. Tshola maemo a ekholoji a tlhago kgots a a gaufi le tlhago ka maikemisetso a tshireletso ya pakatelele ya mefutafuta ya ditshedi e e botlhokwa le popego e e botlhokwa ya boalo. Netefatsa gore sebaka le bodutiso jwa sona di abelana mo CBA1 le ESA2 mo maikemisetsong a boalo mo sebakeng go emela le go tshola sampole e e tswelelang ya kemedi ya mefuta e ya thulaganyotikologo le mefutafuta ya ditshedi e e amanang le yona. Tshola phatlalatso e e teng ya kelelo le mekgwa ya tsholo mo thulaganyong go tshola thulaganyo e e teng ya dimela le tlhamo. Ditsenngwa tsa kelelo ya mo matlhakoreng di tshwanetse go sirelediwa ka tiriso ya dithibedi tsa haeteroloji tse di tlhoamamisitsweng ka ditlhatlhobo tsa petakokikale ya haeteroloji tse di dirilweng e le karolo ya ditshekatsheko tsa EIA le/kgotsa dikopo tsa WUL, le maemo a a gagametseng a tetlelelo go akaretsa tebelelo ya dithulaganyo di tshwanetse go dira.
UC1	C81L	Meul	Mogorogoro	B	Kwa godimo	A/B	B	Merwalela e a tlhokega go tlasa megorogoro ka jalo e tlamela kolobetso e e tlhokegany ya tshegetso ya dimela tsa megorogoro tse di ikaegileng ka merwalela mo matshelong a tsona. Tshola maemo a ekholoji a tlhago kgots a a gaufi le tlhago ka maikemisetso a tshireletso ya pakatelele ya mefutafuta ya ditshedi e e botlhokwa le popego e e botlhokwa ya boalo. Netefatsa gore sebaka le bodutiso jwa sona di abelana mo CBA1 le ESA2 mo maikemisetsong a boalo mo sebakeng go emela le go tshola sampole e e tswelelang ya kemedi ya mefuta e ya thulaganyotikologo le mefutafuta ya ditshedi e e amanang le yona. Tshola phatlalatso e e teng ya kelelo le mekgwa ya tsholo mo thulaganyong go tshola thulaganyo e e teng ya dimela le tlhamo. Ditsenngwa tsa kelelo ya mo matlhakoreng di tshwanetse go sirelediwa ka tiriso ya dithibedi tsa haeteroloji tse di tlhoamamisitsweng ka ditlhatlhobo tsa petakokikale ya haeteroloji tse di dirilweng e le karolo ya ditshekatsheko tsa EIA le/kgotsa dikopo tsa WUL, le maemo a a gagametseng a tetlelelo go akaretsa tebelelo ya dithulaganyo di tshwanetse go dira.
UI	C21E	Blesbokspruit[2]	Metsi a a sa eleleng kwa tlase ga mogorogoro (a a tshegediwang ka go itirela)	D	Kwa godimo	C/D	D	Go tokafatsa seemo sa meraga, tse di latelang di tshwanetse go tsewa tsia: • Ditsenogare tsa tsamaiso go tlhoma gape mefuta e e rileng ya bonno e e tlhokegang mo dinonyaneng tse di rileng; • Phepatso e e tokafaditsweng ya metsi a meepo, metsi a a leswe le ditsholololo tsa kelelo kwa motsweng pele ga go ntshetswa mo mafelong a meraga;

2 Thulaganyo ke Sebaka sa Ramsar (se se Theilweng e le Moraga o o Botlhokwa Boditšhaba go ya ka Kgolagano ya Ramsar) mme e tsewa e le botlhokwa mo matshelong a dinonyane le mo tirisong ya metsi.

IUA	Bodutiso jwa Kwatenari	Leina la Moraga	Mofuta wa Moraga	PES	IS	REC	TEC	Dithulaganyo tsa Ekholoji Ditlhokego tsa Tshireletso, Tlamelo le Taolo
								• Kago ya dingwe tsa dikarolo tsa meraga go tlhola dikgaolo mo dikhemikale di fetogang ka ntlha ya gore go na le okosijine go simolola boleng jo bo tokafetseng jwa metsi. Se se tla tlhola gape dingwe tsa mafelo a mangwe a metsi a a bulegileng a a neng a amanngwa le dipalo tse di kwa godimo tsa dipidipidi kwa dingwaga tsa bo 1970 le 1980; • Thulaganyo le tshireletso ya mafelo mo ditshedi di humileng teng, naga ya majang e e metsi ka dipaka e santse e le teng; le • Tebelelo go netefatsa gore maemo a a totobaditsweng a boleng jwa metsi go ya ka go ntsha e a obamelwa le go diragadiwa. Gape dipatlisiso tse tsa maloba di ne di a atlanegisa tiro e nngwe go tlhaloganya ditlamorago tsa phetogo ya kelelo mo thulaganyong. Go nnile le matshwenyego a gore go tlisa pharologano mo kelelong ya thulaganyo go tla dira gore dingwe tsa disedimente di fetolwe dikhemikale tse di tla dirang kokoanyo ya dimetale tse dingwe tse di bokete le yuraniamo, ka go dira jalo go tlhola dikotsi tsa boitekanelo. Tshedimosetso e nngwe ka ga ntlha e tla tlhokega pele ga katlanegiso nngwe le nngwe e e amanang le go fetola kelelo ka thulaganyo e ka diriwa ka go tshepa gore ga e kitla e dira gore go nne le dikotsi tsa boitekanelo. Golagana le batho ba ba nang le kgatlhego le ba ba amegang go tlhagisa le go dirisa taolo e e tshwaraganeng, Thulaganyo ya Tsosoloso le Tebelelo ya meraga
UI	C22D	Moraga wa Noka ya Klip	Metsi a a elelang le a a sa eleleng kwa tlase ga mogorogoro	D/E	Mo bogareng	D	D	Mo malobeng dikelelo mo thulaganyong e di ne di le kwa tlase thata gore feta gompieno, fela ka ntlha ya phetolo ya jeometeri ya kelelo- pulego ya kelelo mo morageng- dikelelo tse dikgolo ditlhokega go jaanong go tlatsa megorogoro go na le go tlhokege mo Kaelong ya maemo a kelelo. Le fa go le jalo, dikelelo tsa gompieno di kwa godimo thata go feta le ditlhokego tse di lekanyeditsweng tsa metsi a ekholoji a dintlha. Dikelo tsa gompieno ka setlha se se metsi di feta tlhokego e e lekanyeditsweng ya ngwaga ya morwalela ya D REC. Fa TEC e ka tofadiwa mo D/E ya gajaana go ya go D kgotsa kwa godimo, dikelelo tsa kwa tlase di tla tlhoka go fokodiwa. Fa dikelelo di sa kgone go fokodiwa go ka se diragale gore maemo a a tokafaditswe a D ya ntlha ya moraga a ka se fitlhelelwe. Fa dikelelo di ka fokodiwa se se tla bula ditšhono tsa ditiro tsa dingwe tsa ditsosoloso, tse di jaaka mabotakganelo a mannye a a ka dirisiwang go busetsa maemo a a kwa tlase a selegae go samagana le dikutlwalo tsa dikelelo tse di bulegileng. Mefuta e ya dithulaganyo mo moelamogolong di tla kgona go tlhatlosa metsi le go kolobetsa gape bokwatlase jwa mogorogoro le motshotelo wa disabosetereiti. Ditiro tsa tsosoloso kwa bodutisong jwa Noka ya Klip di tshwanetse go tsepa: • Fokotsa bogolo jwa metsi a difefo mo ditoropo (medutelo e mennye); • Nitamisa ntlha e e kwa godimo ya moelamogolo le medutelo e megolo; le • Tlhatlosa boalo jo bo kwa godimo jwa metsi a a ka fa tlase ga lefatshe le go kolobetsa motshotelo o o kwa tlase wa mogorogoro wa medutelomegolo. Golagana le batho ba ba nang le kgatlhego le ba ba amegang go tlhagisa le go dirisa taolo e e tshwaraganeng, Thulaganyo ya Tsosoloso le Tebelelo ya meraga.

IUA	Bodutiso jwa Kwatenari	Leina la Moraga	Mofuta wa Moraga	PES	IS	REC	TEC	Dithulaganyo tsa Ekholoji Ditlhokego tsa Tshireletso, Tlamelo le Taolo
UI	C22B	Natalspruit	Metsi a a Elelelang le a a sa Eleleng kwa Tlase ga Mogorogoro	D	Kwa godimo	C/D	D	Kamaniso ya phatlalatso ya metsi e a tlhokega go tokafatsa ditiro tsa koketso ya boleng jwa metsi. Ka jalo go botlhokwa go tshola mme fa go kgonegang teng go oketsa phatlalatso e e teng ya kelelo le mekgwa ya tsholo mo thulaganyong. Dikarolo tse di sa eleleng tsa meraga di tshwanetse go tsholwa e le thulaganyo ya dimela e e teng e e sa eleleng le tlhamo e tshwanetse go tshola kgotsa go tokafadiwa. Ditsenngwa tsa kelelo ya mo matlhakoreng di tshwanetse go sirelediwa ka tiriso ya dithibedi tsa haeteroloji tse di tlhoamamisitsweng ka ditlhatlhobo tsa petakokikale ya haeteroloji tse di dirilweng e le karolo ya ditshekatsheko tsa EIA le/kgotsa dikopo tsa WUL, le maemo a a gagametseng a tetlelelo go akaretsa tebelelo ya dithulaganyo di tshwanetse go dira. Moraga o tshwanetse go tlhatlhobiwa go supa ditekanyetso tse di kgonegang tsa tsosoloso tse di tla tokafatsang maemo a ona a gajaana le ditiro tse o di dirang. Golagana le batho ba ba nang le kgatlhego le ba ba amegang go tlhagisa le go dirisa taolo e e tshwaraganeng, Thulaganyo ya Tsosoloso le Tebelelo ya meraga.
UK	C23B	Kromelmboog-spruit	Mogorogoro le Bokwatlase jo bo Eleleng jwa Mogorogoro	C	Kwa godimo	B/C	C	Tshola maemo a ekholoji a tlhago kgots a a gaufi le tlhago ka maikemisetso a tshireletso ya pakatelele ya mefutafuta ya ditshedi e e botlhokwa le popego e e botlhokwa ya boalo. Netefatsa gore sebaka le bodutiso jwa sona di abelana mo CBA1 le ESA2 mo maikemisetsong a boalo mo sebakeng go emela le go tshola sampole e e tswelelang ya kemedi ya mefuta e ya thulaganyotikologo le mefutafuta ya ditshedi e e amanang le yona. Tshola le go oketsa phatlalatso ya kelelo e e teng le mekgwa ya tsholo mo thulaganyong. Meraga ya gajaana e e sa eleleng e tshwanetse go tlamelwa e le dithulaganyo tse di sa eleleng. Tlamelo ya thulaganyo ya dimela tse di teng le tlhamo. Ditsenngwa tsa kelelo ya mo matlhakoreng di tshwanetse go sirelediwa ka tiriso ya dithibedi tsa haeteroloji tse di tlhoamamisitsweng ka ditlhatlhobo tsa petakokikale ya haeteroloji tse di dirilweng e le karolo ya ditshekatsheko tsa EIA le/kgotsa dikopo tsa WUL, le maemo a a gagametseng a tetlelelo go akaretsa tebelelo ya dithulaganyo di tshwanetse go dira. Moraga o tshwanetse go tlhatlhobiwa go supa ditekanyetso tse di kgonegang tsa tsosoloso tse di tla tokafatsang maemo a ona a gajaana.
UL	C23F	Boovenste Oog	Moraga wa Motshotelo (leitlho la dolomitiki)	B/C	Kwa godimo	B	B	Tshola mokgwa wa kelelo ya ruri ya thulaganyo le go amanisa mokgwa wa phatlalatso ya metsi go ralala thulaganyo ke dintlhakgolo tse di tlhomamisang ekholoji ya yona le botlhokwa jwa yona jwa go dira. Tshola maemo a tlhago kgotsa a a gaufi le tlhago ka maikemisetso a tshireletso ya pakatelele ya botlhokwa jwa mefutafuta ya ditshedi, tiro ya taolo ya kelelo, le jaaka ntlha ya popego e e botlhokwa le e e tshwanang e le nngwe.

67

IUA	Bodutiso jwa Kwatenari	Leina la Moraga	Mofuta wa Moraga	PES	IS	REC	TEC	Dithulaganyo tsa Ekholoji Ditlhokego tsa Tshireletso, Tlamelo le Taolo
								Tshola boleng jo bo siameng jwa metsi jo ka gale bo tsamaelanang le matlapa a dolomitiki a a monang metsi le matlho/metswedi. Thibela go tlosa thata matlapa a dolomitiki a a tsamaelanang. Tshola ditlhapi tsa tlhago le mefutafuta ya ditshedi tse di senang mokwatla tsa thulaganyo le go thibela go tsena ga setlhopha sa ditshedi tse e seng tsa fa gae. Thulaganyo ya taolo e tshwanetse go tlhagisiwa le go dirisiwa mo thulaganyong. Mo malobeng go ne ga tshitshinngwa gore go bona gape bonno jo bonnye jwa metsi a a kwa tlase ka maparego a a lekaneng a matlhaka a a tlogetsweng mo gare ga mafelo a metsi a a bulegileng a tla oketsa mefutafuta ya ditshedi ya thulaganyo. Go ne go a tshitshinngwa gape gore go tlatsa dikanale tse di epilweng mo thulaganyong go tla letlelela tokafalo mo PES. Mo go thagiseng thulaganyo ya taolo, ditshitshinyo tse di tshwanetse go batlisisiwa go ya pele. Tlhomamisa Rasefe ya Tshimologo ya Meraga le Metsi a a ka fa tlase ga Lefatshe mo thulaganyong le tshireletso le ditlhokego tsa taolo tsa metsi a a ka fa tlase ga lefatshe go sireletsa matlapa a a monang metsi a dolomitiki a a tsamaelang le ona le dikelelo mo thulaganyong.
UL	C23F	Mooi	Metsi a a sa eleleng a a kwa tlase ga Mogorogoro	D	Kwa godimo	C/D	C/D	Kanamiso ya phatlalatso ya metsi e tlhokega go tokafatsa ditiro tsa tshegetso tsa haeteroloji le mefutafuta ya ditshedi. Tshola le go tokafatsa fa go kgonegang teng maemo a ekholoji ka maikemisetso a tshireletso ya pakatelele ya ditiro tsa haeteroloji, mefutafuta ya ditshedi le jaaka ntlha ya popego e e botlhokwa. Tshola sampole e e tswelelang ya kemedi ya mofuta wa thulaganyotikologo e le mefutafuta ya ditshedi e e amanang le yona. Dirisa ditekanyetso go tokafatsa phatlasatso e e tokafatseng ya kelelo le mekgwa ya tsholo mo thulaganyong go tshola popego ya dimela e e teng le tlhamo.
UL	C23G	Gerhard Minnebron	Moraga wa motshotelo	C	Kwa godimo	B/C	C	Tshola mokgwa wa kelelo ya ruri ya thulaganyo le go amanisa mokgwa wa phatlalatso ya metsi go ralala thulaganyo ke dintlhakgolo tse di tlhomamisang ekholoji ya yona le botlhokwa jwa yona jwa go dira. Tshola maemo a gajaana a ekholoji ka maikemisetso a tshireletso ya pakatelele ya motshotelo o o setseng, mefutafuta ya ditshedi e e botlhokwa, taolo ya kelelo le ditiro tsa koketso ya metsi a a boleng, le jaaka ntlha ya popego e e botlhokwa le e e tshwanang e le nngwe. Tshola le fa go kgonegang teng tokafatstsa phatlalatso ya kelelo ya tlhago le mekgwa ya tsholo mo thulaganyong. Tshola boleng jo bo siameng jwa metsi jo ka gale bo tsamaelanang le matlapa a dolomitiki a a monang metsi le metshotelo ya meraga e e amanang le yona. Fa mafatshe a motshotelo a tlhoka maatla a a kwa tlase a kelelo ka go tlala ga leruri le maemo a anerobiki a

IUA	Bodutiso jwa Kwatenari	Leina la Moraga	Mofuta wa Moraga	PES	IS	REC	TEC	Dithulaganyo tsa Ekholoji Ditlhokego tsa Tshireletso, Tlamelo le Taolo
								motshotelo go kgona go kokoanya kgotsa bobotlana go se bole, go botlhokwa gore maemo ao a fitlhelelwe go tshola thulaganyo. Mo go maswe, go tshola thulaganyo ka TEC ya C go tla kaya gore go tla nna botlhokwa go tshola kelelo ya letsatsi lengwe le lengwe jaaka go atlanegisitswe mo Rasefeng ya Tshimologo go ntshwafatsa go go tswelelang motshotelo le go o tlola go le metsi, ka jalo go thibela kgonagalo nngwe le nngwe ya go oma, go tsenwa ke dikhemikale ka ntlha ya okosijine kgotsa go swa. Ka fa letlhakoreng le lengwe, go tokafatsa thulaganyo ka REC ya B/C go tla kaya gore go tla nna botlhokwa go oketsa kelelo ya letsatsi lengwe le lengwe mo mafatsheng a motshotelo jaaka go supilwe mo Rasefeng ya Tshimogolo. Se se tla letlelela go tlala ga thulaganyo go tsamaisa ke kgolo kgotsa koketsego ya motshotelo ka go tlhola maemo a anarobiki mo lefelong la raesomatouso, go tlhola maemo a a siameng a kokoanyo ya dilo tse di bolang tse di tswang mo medithola e e suleng ya setlha. Se se tla dira tokafalo mo thulaganyong ka go kolobetsa manno, go tlatsa le go tlhagisa motshotelo wa gajaana, bogolo mo mafelong ao mo motshotelo o epolotsweng teng mo malobeng. Thibela go tlosa thata matlapa a dolomitiki a a tsamaelanang. Netefatsa tiragatso ya ditekanyetso tsa tsosoloso tse di atlanegitsweng tsa go epa motshotelo go go diragetseng mo thulaganyong. Thulaganyo ya taolo le tsosoloso e tshwanetse go tlhagisiwa le go dirisiwa mo thulaganyong. Tlhabolola Rasefe e e teng ya Tshimologo ya Moraga le go tlhomamisa Rasefe ya Tshimologo ya Metsi a a ka fa Tlase ga Lefatshe a thulaganyo le ditlhokego tsa tshireletso le taolo tsa metsi a a ka fa tlase ga lefatshe go sireletsa matlapa a dolomatiki a a amanang lle dikelelo mo thulaganyong.
UL	C23E	Rasefe ya Moraga wa Tlhago wa Abe Bailey	Metsi a a Elelelang le a a sa Eleleng kwa Tlase ga Mogorogoro	D[3]	Kwa godimo	C	C	Dirisa ditekanyetso go tokafatsa maemo a ekholoji ka maikemisetso a tshireletso ya pakatelel ya botlhokwa jwa mefutafuta ya ditshedi e e botlhokwa le jaaka popego e e botlhokwa ya boalo. Netefatsa gore sebala le bodutiso jwa sona di abelana mo boalong jwa CBA le ESA maemo a boalo ka maikemisetso a go emela le go tshola sampole ya kemedi e e tswelelang ya mefuta e ya thulaganyotikologo le mefutafuta ya ditshedi e e amanag le yona. Tshola le fa go kgonegang teng tokafatstsa phatlalatso ya kelelo ya tlhago le mekgwa ya tsholo mo thulaganyong. Ditsenngwa tse dintsi tsa kotlo di tshwanetse go supiwa le go rarabololwa.
UL	C23H and C23L	O.P.M. Prozesky Bird Sanctuary	Mogorogoro	E[4]	Kwa godimo	D	D	Dirisa ditekanyetso go tokafatsa maemo a ekholoji ka maikemisetso a tshireletso ya pakatelele ya botlhokwa jwa mefutafuta ya ditshedi e e botlhokwa le jaaka popego e e botlhokwa ya boalo.

3 Fa thulaganyo e e amanang le Rasefe ya Tlhago, TEC e atlanegisiwa go tshwana le REC mme ke setlhopha sa nngwe kwa godimo ga PES

4 Thulaganyo e mo setlhopheng sa PES sa E (Se se Fetotsweng Thata) fela se na le IS e e kwa Godimo ka se tsewa e le botshabelo jwa dinonyane. Setlhopha sa PES sa E ga se tsweledīwe ka jalo TEC e atlanegisiwa go tshwana le REC mme e bewa setlhoha se le sengwe kwa godimo ga PES

69

IUA	Bodutiso jwa Kwatenari	Leina la Moraga	Mofuta wa Moraga	PES	IS	REC	TEC	Dithulaganyo tsa Ekholoji Ditlhokego tsa Tshireletso, Tlamelo le Taolo
								Netefatsa gore sebaka le bodutiso jwa sona se abelana mo maemong a CBA a popego ka maikemisetso a gore sebaka se emele le go tshola sampole e e tswelelang ya kemedi ya mefuta e ya thulaganyotikologo le mefutafuta ya ditshedi e e amanang le yona. Tshola le go oketsa phatlalatso ya kelelo e e teng le mekgwa ya tsholo mo thulaganyong. Ditsenngwa tse dintsi tsa kotlo di tshwanetse go supiwa le go rarabololwa.
MA	C70K	Witpan	Pane	F[5]	Kwa godimo	D	D	Dirisa ditekanyetso go tokafatsa maemo a gajaana (maemo a ekholoji) a thulaganyo gore a tswelele go tlamela ditirelo tse di teng. Ditsenngwa tse dintsi tsa kotlo di tshwanetse go supiwa le go rarabololwa.
MC	C24C	Tharaano ya Pane le moraga - Leliefontein	Pane, Mo metsi a Dutlang teng le Bokwatlase jwa Metsi a a sa Eleleng a Mogorogoro	C	Kwa godimo	B/C	C	Tshola mo maemong a gajaana a ekholoji ka maikemisetso a tshireletso ya pakatelele ya mefutafuta ya ditshedi le jaaka ntlha e e botlhokwa ya boalo. Tshola kgotsa tokafatsa mefutafua ya ditshedi e e teng ya ekholoji le kopanyo ya pane le thulaganyo e e amanang le yona ya moraga. Dikutlwalo tsa Bokanakang le boleng jwa metsi di tshwanetse go laolwa gore di se ise kwa tlase boleng jwa ekholoji jwa pane le moraga o o amanang le ona.
MC	C24C	Vetpan	Pane	C	Kwa godimo	B/C	C	Tshola mo maemong a gajaana a ekholoji ka maikemisetso a tshireletso ya pakatelele ya mefutafuta ya ditshedi le jaaka ntlha e e botlhokwa ya boalo. Tshola kgotsa tokafatsa mefutafuta ya ditshedi e e teng ya ekholoji le kopanyo ya pane le thulaganyo ya meselo e e amanang le yona le manno a a mabapi a tlhago. Dikutlwalo tsa Bokanakang le boleng jwa metsi di tshwanetse go laolwa gore di se ise kwa tlase boleng jwa ekholoji jwa pane le moraga o o amanang le ona.
MC	C24C	Klippan le thulaganyo ya moraga e e amanang le Klippan	Pane le Kwatlase jo bo sa eleleng jwa Mogorogoro	C	Kwa godimo	B/C	C	Tshola maemo a gajaana a ekholoji ka maikemisetso a tshireletso ya pakatelele ya botlhokwa jwa mefutafuta ya ditshedi le jaaka ntlha e e botlhokwa ya boalo. Netefatsa gore sebala le bodutiso jwa sona di abelana mo boalong jwa CBA le ESA maemo a boalo ka maikemisetso a go emela le go tshola sampole ya kemedi e e tswelelang ya mefuta e ya thulaganyotikologo le mefutafuta ya ditshedi e e amanag le yona. Dikutlwalo tsa Bokanakang le boleng jwa metsi di tshwanetse go laolwa gore di se ise kwa tlase boleng jwa ekholoji jwa pane le moraga o o amanang le ona.

5 Thulaganyo e mo setlhopha sa PES sa F (Se se Fetotsweng Thata) fela se na le IS e e kwa Godimo ka e tsewa e le botshabelo jo bo botlhokwa jwa dinonyane. Setlhopha sa PES sa F ga se tsweledīwe ka jalo TEC e atlanegisa go tshwana le REC mme e bewa mo ditlhopheng di le pedi kwa godimo ga PES .

IUA	Bodutiso jwa Kwatenari	Leina la Moraga	Mofuta wa Moraga	PES	IS	REC	TEC	Dithulaganyo tsa Ekholoji Ditlhokego tsa Tshireletso, Tlamelo le Taolo
								Tshola le go oketsa phatlalatso ya kelelo e e teng le mekgwa ya tsholo mo thulaganyong. Meraga ya gajaana e e sa eleleng e tshwanetse go tlamelwa e le dithulaganyo tse di sa eleleng. Tlamelo ya thulaganyo ya dimela tse di teng le tlhamo. Moraga o tshwanetse go tlhatlhobiwa go supa ditekanyetso tse di kgonegang tsa tsosoloso tse di tla tokafatsang maemo a ona a gajaana.
MC	C24C	Karolo e e kwa godimo ya lefatshe la motshotelo la Schoonspruit le leitlho la Schoonspruit	Motshotelo wa Moraga le leitlho la dolomitiki	B	Kwa Godimo thata	A	B	Tshola mokgwa wa kelelo ya ruri ya thulaganyo le go amanisa mokgwa wa phatlalatso ya metsi go ralala thulaganyo ke dintlhakgolo tse di tlhomamisang ekholoji ya yona le botlhokwa jwa yona jwa go dira. Tshola maemo a tlhago kgotsa a a gaufi le tlhago ka maikemisetso a tshireletso ya pakatelele ya botlhokwa jwa mefutafuta ya ditshedi, tiro ya taolo ya kelelo, le jaaka ntlha ya popego e e botlhokwa le e e tshwanang e le nngwe. Tshola phatlalatso ya kelelo ya tlhago le mekgwa ya tsholo mo thulaganyong. Tshola boleng jo bo siameng jwa metsi jo ka gale bo tsamaelanang le matlapa a dolomitiki a a monang metsi le matlho/metswedi. Thibela go tlosa thata matlapa a dolomitiki a a tsamaelanang. Tshola ditlhapi tsa tlhago le mefutafuta ya ditshedi tse di senang mokwatla tsa thulaganyo le go thibela go tsena ga setlhopha sa ditshedi tse e seng tsa fa gae. Thulaganyo ya taolo e tshwanetse go tlhagisiwa le go dirisiwa mo thulaganyong ka therisano le batho ba ba nang le kgatlhego le ba ba amegang. Tlhomamisa Rasefe ya Tshimologo ya Meraga le Metsi a a ka fa tlase ga Lefatshe mo thulaganyong le tshireletso le ditlhokego tsa taolo tsa metsi a a ka fa tlase ga lefatshe go sireletsa matlapa a a monang metsi a dolomitiki a a tsamaelang le ona le dikelelo mo thulaganyong.
MC	C24F	Mogorogoro le karolo e e kwa tlase ya Taaibosspruit	Mogorogoro le Bokwatlase jwa Metsi a a sa Eleleng a Mogorogoro	C	Kwa godimo	B/C	C	Merwalela e a tlhokega go tlasa megorogoro ka jalo e tlamela kolobetso e e tlhokegany ya tshegetso ya dimela tsa megorogoro tse di ikaegileng ka merwalela mo matshelong a tsona. Karolo e e kwa tlase ya moraga ya metsi a a sa eleleng e tshwanetse go nna e le jalo ka gore e ka rata go tlamela ditiro tse di okeditsweng tsa boleng jwa metsi le manno a a farologaneng mo thulaganyong yotlhe. Se se oketsa mefutafuta ya ditshedi ya moraga. Tshola mo maemong a gajaana a ekholoji e fa go kgonegang teng go tokafatsa maemo a thulaganyo ka maikemisetso a tshireletso ya pakatelele ya mefutafuta ya ditshedi e e botlhokwa jaaka ntlha e e botlhokwa ya boalo. Tshola phatlalatso e e teng ya kelelo le mekgwa ya tsholo mo thulaganyong go tshola thulaganyo e e teng ya dimela le tlhamo.

71

IUA	Bodutiso jwa Kwatenari	Leina la Moraga	Mofuta wa Moraga	PES	IS	REC	TEC	Dithulaganyo tsa Ekholoji Ditlhokego tsa Tshireletso, Tlamelo le Taolo
								Dikarolo tse di sa eleleng tsa meraga di tshwanetse go tsholwa e le thulaganyo ya dimela e e teng e e sa eleleng le tlhamo e tshwanetse go tshola kgotsa go tokafadiwa. Ditsenngwa tsa kelelo ya mo matlhakoreng di tshwanetse go sirelediwa ka tiriso ya dithibedi tsa haeteroloji tse di tlhoamamisitsweng ka ditlhatlhobo tsa petakokikale ya haeteroloji tse di dirilweng e le karolo ya ditshekatsheko tsa EIA le/kgotsa dikopo tsa WUL, le maemo a a gagametseng a tetlelelo go akaretsa tebelelo ya dithulaganyo di tshwanetse go dira. Moraga o tshwanetse go tlhatlhobiwa go supa ditekanyetso tse di kgonegang tsa tsosoloso tse di tla tokafatsang maemo a ona a gajaana le ditiro tse o di dirang.
MC	C24G	Mogorogoro wa Schoonspruit go akaretsa Mahemsvlei	Mogorogoro	C	Kwa godimo	B/C	C	Merwalela e a tlhokega go tlasa megorogoro ka jalo e tlamela kolobetso e e tlhokegany ya tshegetso ya dimela tsa megorogoro tse di ikaegileng ka merwalela mo matshelong a tsona. Tshola mo maemong a gajaana a ekholoji e fa go kgonegang teng go tokafatsa maemo a thulaganyo ka maikemisetso a tshireletso ya pakatelele ya mefutafuta ya ditshedi e e botlhokwa jaaka ntlha e e botlhokwa ya boalo. Tshola phatlalatso e e teng ya kelelo le mekgwa ya tsholo mo thulaganyong go tshola thulaganyo e e teng ya dimela le tlhamo. Ditsenngwa tsa kelelo ya mo matlhakoreng di tshwanetse go sirelediwa ka tiriso ya dithibedi tsa haeteroloji tse di tlhoamamisitsweng ka ditlhatlhobo tsa petakokikale ya haeteroloji tse di dirilweng e le karolo ya ditshekatsheko tsa EIA le/kgotsa dikopo tsa WUL, le maemo a a gagametseng a tetlelelo go akaretsa tebelelo ya dithulaganyo di tshwanetse go dira. Moraga o tshwanetse go tlhatlhobiwa go supa ditekanyetso tse di kgonegang tsa tsosoloso tse di tla tokafatsang maemo a ona a gajaana le ditiro tse o di dirang.
MC	C24C and C24E	Karolo e e kwa tlase ya lefatshe la motshotelo la Schoonspruit	Moraga wa motshotelo	D	Kwa Godimo thata	C	C	Tshola mokgwa wa kelelo ya ruri ya thulaganyo le go amanisa mokgwa wa phatlalatso ya metsi go ralala thulaganyo ke dintlhakgolo tse di tlhomamisang ekholoji ya yona le botlhokwa jwa yona jwa go dira. Tokafatsa maemo a ekholoji a thulaganyo ka maikemisetso a tshireletso ya pakatelele ya mefutafuta ya ditshedi e e botlhokwa, motshotelo, tiro ya taolo ya kelelo, le jaaka ntlha ya boalo e e botlhokwa e e tshwanang e le nngwe. Tshola phatlalatso ya kelelo ya tlhago le mekgwa ya tsholo mo thulaganyong. Tshola boleng jo bo siameng jwa metsi jo ka gale bo tsamaelanang le matlapa a dolomitiki a a monang metsi le matlho/metswedi. Thibela go tlosa thata matlapa a dolomitiki a a tsamaelanang.

IUA	Bodutiso jwa Kwatenari	Leina la Moraga	Mofuta wa Moraga	PES	IS	REC	TEC	Dithulaganyo tsa Ekholoji Ditlhokego tsa Tshireletso, Tlamelo le Taolo
								Thibela le go laola go tlosa thata/phaposo ya dikelelo/metsi mo lefatsheng la motshotelo. Tshola ditlhapi tsa tlhago le mefutafuta ya ditshedi tse di senang mokwatla tsa thulaganyo le go thibela go tsena ga setlhopha sa ditshedi tse e seng tsa fa gae. Thulaganyo ya taolo e tshwanetse go tlhagisiwa le go dirisiwa mo thulaganyong ka therisano le batho ba ba nang le kgatlhego le ba ba amegang. Tlhomamisa Rasefe ya Tshimologo ya Meraga le Metsi a a ka fa tlase ga Lefatshe mo thulaganyong le tshireletso le ditlhokego tsa taolo tsa metsi a a ka fa tlase ga lefatshe go sireletsa matlapa a a monang metsi a dolomitiki a a tsamaelang le ona le dikelelo mo thulaganyong.
MA	C70G	Modutela wa Grootvlei wa Heuningspruit le mo Heuningspruit	Metsi a a Elelelang le a a sa Eleleng kwa Tlase ga Mogorogoro	D	Kwa godimo	C/D	D	Tshola le go mo kgonegang teng tokafatsa maemo a gajaana a ekholoji ka maikemisetso a tshireletso ya pakatelele ya mefutafuta ya ditshedi e e botlhokwa jaaka ntlha e e botlhokwa ya boalo. Netefatsa gore sebaka le bodutiso jwa sona di abelana mo CBA1, ESA1 le ESA2 maemo a boalo a ka maikemisetso a seba go emela le go tshola sampole e e tswelelang ya kemedi ya mefuta e ya thulaganyotikologo le mefutafuta ya ditshedi e e amanang le yona. Tshola le go oketsa phatlalatso ya kelelo e e teng le mekgwa ya tsholo mo thulaganyong. Meraga ya gajaana e e sa eleleng e tshwanetse go tlamelwa e le dithulaganyo tse di sa eleleng. Tlamelo ya thulaganyo ya dimela tse di teng le tlhamo. Ditsenngwa tsa kelelo ya mo matlhakoreng di tshwanetse go sirelediwa ka tiriso ya dithibedi tsa haeteroloji tse di tlhoamamisitsweng ka ditlhatlhobo tsa petakokikale ya haeteroloji tse di dirilweng e le karolo ya ditshekatsheko tsa EIA le/kgotsa dikopo tsa WUL, le maemo a a gagametseng a tetlelelo go akaretsa tebelelo ya dithulaganyo di tshwanetse go dira. Moraga o tshwanetse go tlhatlhobiwa go supa ditekanyetso tse di kgonegang tsa tsosoloso tse di tla tokafatsang maemo a ona a gajaana.
MA	C70K	Thulaganyo ya moraga e e gaufi le Viljoenskroon	Metsi a a Elelelang le a a sa Eleleng kwa Tlase ga Mogorogoro	E[6]	Kwa godimo	D	D	Tshola le go oketsa phatlalatso ya kelelo e e teng le mekgwa ya tsholo mo thulaganyong. Kgatelelo mo meselong e e dutlang, kgoreletso ya mafelo, manno a a sa tlhomamang le lefelo le lengwe la kelelogodimo a tlhoka go lebelelwa. Meraga ya gajaana e e sa eleleng e tshwanetse go tlamelwa e le dithulaganyo tse di sa eleleng. Tshola kgotsa tokafatsa thulaganyo e e teng ya dimela le tlhamo. Moraga o tshwanetse go tlhatlhobiwa go supa ditekanyetso tse di kgonegang tsa tsosoloso tse di tla tokafatsang maemo a ona a gajaana le bokgoni jwa ona go tokafatsa boleng jwa metsi.

6 Thulaganyo e mo setlhopheng sa PES (Se se Fetotsweng Thata) fela se na le IS e e kwa Godimo ka ntlha ya botlhokwa jwa yona jwa tiro ya metsi. Setlhopha sa PES sa E ga se tsweledlwe ka jalo TEC e atlanegisiwa go tshwana le REC mme e bewa setlhoha se le sengwe kwa godimo ga PES

IUA	Bodutiso jwa Kwatenari	Leina la Moraga	Mofuta wa Moraga	PES	IS	REC	TEC	Dithulaganyo tsa Ekholoji Ditlhokego tsa Tshireletso, Tlamelo le Taolo
MA	C70K	Groot Rietpan	Pane	D	Kwa godimo	C/D	C/D	Dirisa ditekanyetso go tokafatsa maemo a ekholoji ka maikemisetso a tshireletso ya pakatelele ya botlhokwa jwa mefutafuta ya ditshedi e e botlhokwa le jaaka popego e e botlhokwa ya boalo. Netefatsa gore sebaka le bodutiso jwa sona di abelana mo maemong a boalo a CBA2 ka maikemisetso a sebaka go emela le go tshola sampole e e tswelelang ya kemedi ya mefuta e ya thulaganyotikologo le mefutafuta ya ditshedi e e amanang le yona. Tshola le go oketsa phatlalatso ya kelelo e e teng le mekgwa ya tsholo mo thulaganyong. Lebelela ditsenngwa tsa kotlo le sedimente mo lefelo le le gaufi la bodutiso. Moraga o tshwanetse go tlhatlhobiwa go supa ditekanyetso tse di kgonegang tsa tsosoloso go busetsa haeteroloji mo maemong a tlhago.
MF	C25B	Dintlha tse di kwa godimo tsa Sandspruiti (bokone jwa Kutloanong)	Metsi a a Elelelang le a a sa Eleleng kwa Tlase ga Mogorogoro	D	Kwa godimo	C/D	D	Tshola le go mo kgonegang teng tokafatsa maemo a gajaana a ekholoji ka maikemisetso a tshireletso ya pakatelele ya mefutafuta ya ditshedi e e botlhokwa jaaka ntlha e e botlhokwa ya boalo. Netefatsa gore sebaka le bodutiso jwa sona di abelana mo CBA1 le ESA2 mo maikemisetsong a boalo mo sebakeng go emela le go tshola sampole e e tswelelang ya kemedi ya mefuta e ya thulaganyotikologo le mefutafuta ya ditshedi e e amanang le yona. Tshola le fa go kgonegang teng tokafatstsa phatlalatso ya kelelo ya tlhago le mekgwa ya tsholo mo thulaganyong. Kgatelelo mo meselong e e dutlang, kgoreletso ya mafelo, manno a a sa tlhomamang le lefelo le lengwe la kelelogodimo a tlhoka go lebelelwa. Meraga ya gajaana e e sa eleleng e tshwanetse go tlamelwa e le dithulaganyo tse di sa eleleng. Tshola kgotsa tokafatsa thulaganyo e e teng ya dimela le tlhamo. Ditsenngwa tsa kelelo ya mo matlhakoreng di tshwanetse go sirelediwa ka tiriso ya dithibedi tsa haeteroloji tse di tlhoamamisitsweng ka ditlhatlhobo tsa petakokikale ya haeteroloji tse di dirilweng e le karolo ya ditshekatsheko tsa EIA le/kgotsa dikopo tsa WUL, le maemo a a gagametseng a tetlelelo go akaretsa tebelelo ya dithulaganyo di tshwanetse go dira. Moraga o thanetse go tlhatlhobiwa go supa ditekanyetso tse di kgonegang tsa tsosoloso tse di tla tokafatsang bokgoni jwa ona go oketsa boleng jwa metsi.
MF le MD2	C25B, C25F le C43B	Setlhopha sa dipane go dikadika Wesselsbron go akaretsa Volstruispan kwa bokone	Setlhopha sa dipane	C	Kwa godimo	B/C	B/C	Tshola maemo a a batlileng go nna a tlhago a ekholoji ka maikemisetso a tshireletso ya pakatelele ya mefutafuta ya ditshedi e e botlhokwa le jaaka ntlha e e botlhokwa ya boalo. Netefatsa gore sebaka le bodutiso jwa sona di abelana mo CBA1 le ESA2 mo maikemisetsong a boalo mo sebakeng go emela le go tshola sampole e e tswelelang ya kemedi ya mefuta e ya thulaganyotikologo le mefutafuta ya ditshedi e e amanang le yona. Sireletsa boleng jwa metsi le dimelo tsa ekholoji tsa dipane tse di farologaneng tse di amanang le setlhopha go

IUA	Bodutiso jwa Kwatenari	Leina la Moraga	Mofuta wa Moraga	PES	IS	REC	TEC	Dithulaganyo tsa Ekholoji Ditlhokego tsa Tshireletso, Tlamelo le Taolo
								netefatsa gore di tswelela go tlamela ditiro tsa tshegetso tsa mefutafuta ya ditshedi e e amanang le mefuta e e farologaneng ya dipane tse di teng. Tshola kgotsa go tokafatsa mefutafuta ya ditshedi ya ekholoji e e teng le kopanyo ya phokotsego ya meraga ka bongwe (dipane).
MD2	C43B	Pane ya Flamingo	Pane	F[7]	Kwa godimo	D	D	Dirisa ditekanyetso go tokafatsa maemo a gajaana a pane gore e tswelele go tlamela ditirelo tse di teng. Ditsenngwa tse dintsi tsa kotlo le kgotlelego di tshwanetse go supiwa le go rarabololwa. Tshitshinya le go dirisa ditsenogare tsa lefelo le taolo fa go tlhokegang teng.
ME2	C43A	Pane ya Bultfontein	Pane	D	Kwa godimo	C/D	C/D	Ka therisano le batho ba ba nang le kgatlhego le ba ba amegang go tlhotlhomisa le fa go kgonegang teng dirisa ditekanyetso go tokafatsa haeteroloji go ya kwa maemo a tlhago. Thibela kelelo ya kgeleloleswe mo tseneng mo thulaganyong ya moraga. Tlhatlhoba le go lebelela kutlwalo ya ditiro tsa letswai le ditiro tse dingwe mo haeterolojing le mo tirong ya tshegetso ya mefutafuta ya ditshedi ya moraga. Tshitshinya le go dirisa ditsenogare tsa lefelo le taolo fa go tlhokegang teng.
MD2	C43B	Pane ya Toronto	Pane	F[8]	Kwa godimo	D	D	Dirisa ditekanyetso go tokafatsa maemo a gajaana a pane gore e tswelele go tlamela ditirelo tse di teng. Ditsenngwa tse dintsi tsa kotlo le kgotlelego di tshwanetse go supiwa le go rarabololwa. Tshitshinya le go dirisa ditsenogare tsa lefelo le taolo fa go tlhokegang teng.
LA1	C31D	Barberspan[9]	Pane	C	Kwa Godimo thata	B	B/C	Tshola le fa go kgonegang teng go tokafatsa maemo a gajaana a ekholoji ka maikemisetso a tshireletso ya pakatelele ya botlhokwa jwa mefutafuta ya ditshedi le jaaka ntlha e e bothokwa ya moraga le boalo. Ditsenngwa tse dintsi tsa kotlo le sedimente di tshwanetse go supiwa le go rarabololwa. Golagana le batho ba ba nang le kgatlhego le ba ba amegang go tlhagisa thulaganyo ya tshwaragalo ya taolo le tebelelo gammogo le eo ya Leeupan.

7 Thulaganyo e mo setlhopha sa PES sa F (Se se Fetotsweng Thata) fela se na le IS e e kwa Godimo ka e tsewa e le botshabelo jo bo botlhokwa jwa dinonyane. Setlhopha sa PES sa F ga se tsweledíwe ka jalo TEC e atlanegisa go tshwana le REC mme e bewa mo ditlhopheng di le pedi kwa godimo ga PES .

8 Thulaganyo e mo setlhopha sa PES sa F (Se se Fetotsweng Thata) fela se na le IS e e kwa Godimo ka e tsewa e le botshabelo jo bo botlhokwa jwa dinonyane. Setlhopha sa PES sa F ga se tsweledíwe ka jalo TEC e atlanegisa go tshwana le REC mme e bewa mo ditlhopheng di le pedi kwa godimo ga PES .

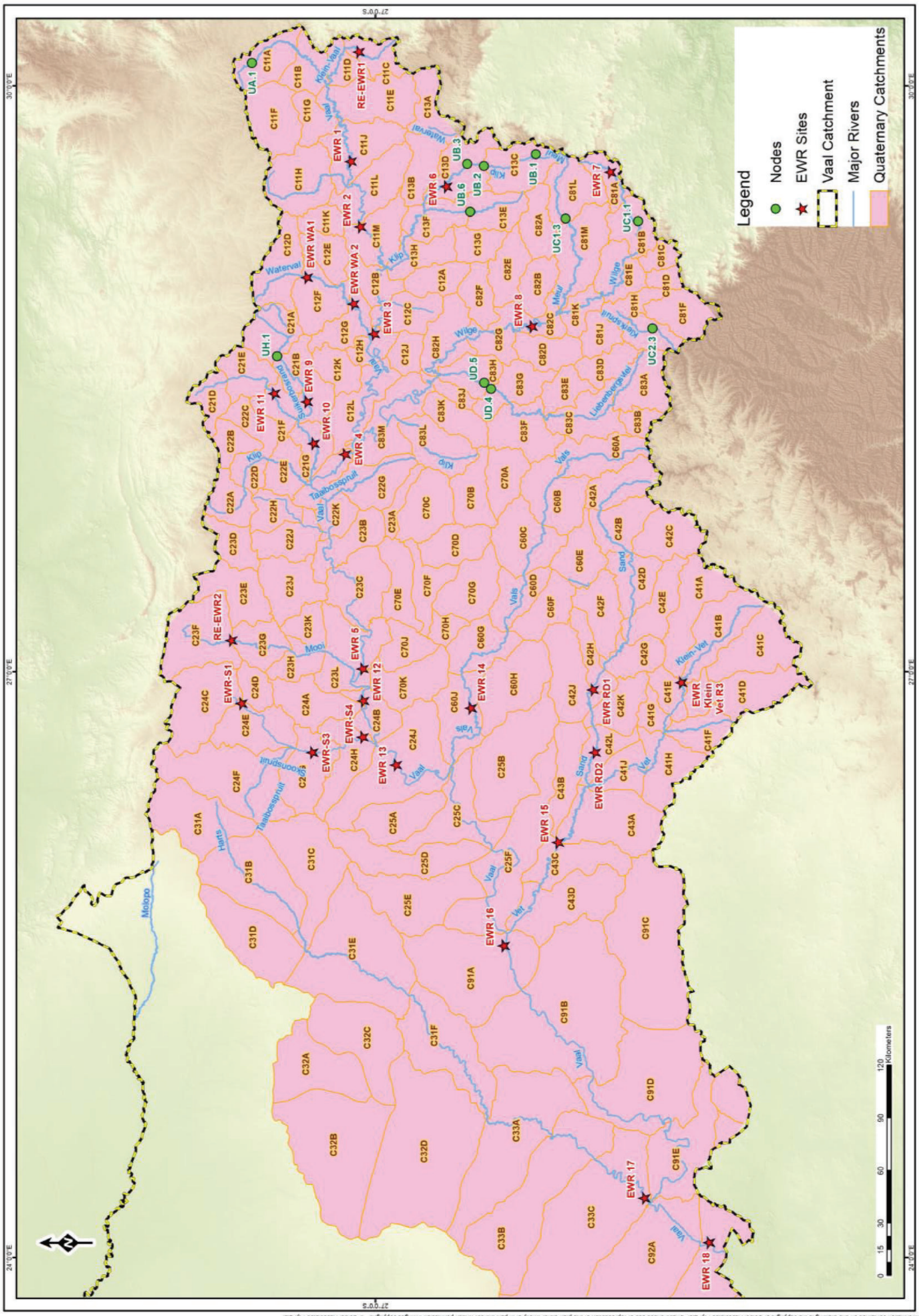
9 Thulganyo ke Sebaka sa Ramsar (Se se Theilweng e le Moraga wa Botlhokwa Boditšhaba go ya ka Kgolagano ya Ramsar)

IUA	Bodutiso jwa Kwatenari	Leina la Moraga	Mofuta wa Moraga	PES	IS	REC	TEC	Dithulaganyo tsa Ekholoji Ditlhokego tsa Tshireletso, Tlamelo le Taolo
LA1	C31D	Leeupan	Pane	C[10]	Kwa godimo	B/C	B/C	Dirisa ditekanyetso go tokafatsa maemo a ekholoji ka maikemisetso a tshireletso ya pakatelel ya botlhokwa jwa mefutafuta ya ditshedi e e botlhokwa le jaaka popego e e botlhokwa ya boalo. Ditsenngwa tse ditsi tsa kotlo le/kgotsa sedimente di tshwanetse go supiwa le go rarabololwa. Golagana le batho ba ba nang le kgatlhego le ba ba amegang go tlhagisa thulaganyo ya tshwaragalo ya taolo le tebelelo gammogo le eo ya Barberspan
LA2	C31E	Mogorogoro wa Noka ya Harts	Mogorogoro	C	Kwa godimo	B/C	B/C	Kgogolego le pulego ya kelelo ya metsi e tshosetsa le go tsela kwa tlase ditiro tsa phokotso ya morwalela tsa moraga. Go botlhokwa gape go netefatsa tshireletso le tlamelo ya bonno jwa megorogoro e e tshegetsang mefutafuta ya ditshedi. Dirisa ditekanyetso tsa go tokafatsa maemo a gajaana a moraga ka maikemisetso a tshireletso ya pakatelele ya botlhokwa jwa mefutafuta ya ditshedi le jaaka ntlha e e botlhokwa ya boalo. Tshola sampole e e tswelelang ya kemedi ya mefuta e ya thulaganyotikologo le mefutafuta ya ditshedi e e amanang le yona. Tshola le go oketsa phatlalatso e e teng ya kelelo le mekgwa ya tsholo mo thulaganyong le go tsholo kgolagano ya haeteroloji le ekholoji kwa Barberspan. Tlamelo ya thulaganyo ya dimela tse di teng le tlhamo.
LB	C91E	Kamferpan[11]	Pane	C	Kwa Godimo thata	B	B/C	Tshola le fa go kgonegang teng tokafatsa maemo a pane gore e tswelele go tlamela ditirelo tse di teng tsa tshegetso tsa haeteroloji le mefutafuta ya ditshedi. Ditsenngwa tse dintsi tsa kotlo le kgotlelego di tshwanetse go supiwa le go rarabololwa. Tswelelo ya maiteko a a teng a go thibela ditsenngwa tsa kgeleloleswe le go laola maemo a metsi go thibela go rwalela mo mafelo a bothuthusetso. Lebelela ditshosetso tse di jaaka eterofikaišene le go tsenenela ga matlhaka. Golagana le batho ba ba nang le kgatlhego le ba ba amegang go tlhagisa thulaganyo ya taolo e e tshwarageng le tebelelo tsa pane.
LB	C91B	Gannapan	Pane	C	Kwa godimo	B/C	B/C	Tshola le go mo kgonegang teng tokafatsa maemo a gajaana a ekholoji ka maikemisetso a tshireletso ya pakatelele ya mefutafuta ya ditshedi e e botlhokwa jaaka ntlha e e botlhokwa ya boalo. Netefatsa gore sebaka le bodutiso jwa sona di abelana mo CBA1 CBA2 le ESA1 mo maikemisetsong a boalo mo

10 Fa thulaganyo e e amana le Sebaka sa Ramsar sa Barberspan, TEC e atlanegisiwa go tshwana le REC mme e beilwe mo halofong ya setlhopha kwa godimo go feta PES

11 Le fa e tlamelwa thata ka dilo tsa maitirelo, thulaganyo e ke sebaka se se botlhokwa sa bothuthusetso sa Lesser Flamingo mme ditlhokego tsa tshireletso tse di gagametseng di tshwanetse go dirisiwa go netefatsa gore e nna sebaka se se atlegileng sa bothuthusetso sa ditshedi tse

IUA	Bodutiso jwa Kwatenari	Leina la Moraga	Mofuta wa Moraga	PES	IS	REC	TEC	Dithulaganyo tsa Ekholoji Ditlhokego tsa Tshireletso, Tlamelo le Taolo
								sebakeng go emela le go tshola sampole e e tswelelang ya kemedi ya mefuta e ya thulaganyotikologo le mefutafuta ya ditshedi e e amanang le yona.
LB	C92A	Pane ya (Pane e Kgolo) le Moraga wa Complex o o amanang le yona	Dipane, Metsi a a sa Eleleng jwa tlase ga Mogorogoro le Metswedi	B	Kwa godimo	A/B	B	Tshola haeteroloji e e teng le ditsweletso tsa ekholoji go sireletsa dipane le metswedi le manno a a amanang le meraga mo maemo a gajaana a ekholoji. Tshola phatlalatso ya kelelo ya tlhago le mekgwa ya tsholo mo thulaganyong. Tshola boleng jo bo siameng jwa metsi jo ka gale bo tsamaelanang le matlapa a dolomitiki a a monang metsi le matlho/metswedi. Thibela go tlosa thata matlapa a dolomitiki a a tsamaelanang. Thulaganyo ya taolo e tshwanetse go tlhagisiwa le go dirisiwa mo thulaganyong ka therisano le batho ba ba nang le kgatlhego le ba ba amegang. Tlhomamisa Rasefe ya Tshimologo ya Meraga le Metsi a a ka fa tlase ga Lefatshe mo thulaganyong le tshireletso le ditlhokego tsa taolo tsa metsi a a ka fa tlase ga lefatshe go sireletsa matlapa a a monang metsi a dolomitiki a a tsamaelang le ona le dikelelo mo thulaganyong.



78

Popego 1: Mmapa wa Lefelo la Taolo la Metsi a Vaal o o bontshang bodutiso jwa kwatenari le mafelo a EWR

CONTINUES ON PAGE 258 - PART 3

Government Gazette
Staatskoerant

REPUBLIC OF SOUTH AFRICA
REPUBLIEK VAN SUID AFRIKA

Vol. 663 | 25 September / September 2020 | No. 43734

PART 3 OF 3

ISSN 1682-5843
43734
9 771682 584003

GAZETTING OF THE RESERVE IN THE VAAL WATER MANAGEMENT AREA

Comments and Responses Report

April 2019

This Comments and Responses Report (CRR) captures the issues raised by stakeholders after the Draft Notice of the proposed Reserve was published for comment in **Government Gazette No. 42127, Gazette Notice No. 1419 of 21 December 2018 (Vol. 642)**. The purpose of this report is to ensure that the concerns and comments raised by stakeholders are noted and adequately and satisfactorily addressed. This study has been commissioned by the Department of Water and Sanitation (DWS). This report will be presented to the Minister with the proposed final Reserve. Once the Minister is duly satisfied with the process and the handling of comments, the final Reserve will be gazetted.

	COMMENTS, QUESTIONS AND CONCERNS	COMMENTATOR(S)	SOURCE(S)	RESPONSE(S)
1	What is the implication of the proposed Reserve on the annual demands and yield of the Vaal River System relative to the current (2018/2019) planning quantities?	Mr Kobie Maré, Rand Water	Email on 14 January 2019	The Ecological Water Requirements (EWRs) will not influence the Vaal Balance as these are already part of the current operating releases. The EWRs are included in the Water Resources Planning Model used for the annual operating analysis and planning of the developed Vaal River System.
2	It appears that the Rietspruit (which flows into the Vaal River via Loch Vaal about 10 km west of Vanderbijlpark), has not been included as part of the Reserve. In fact, ALL tributaries of the Vaal River should be included in this draft. Am I incorrect or what is the reason for this exclusion?	Ms Maureen Stewart, Save the Vaal Environment	Email on 14 January 2019	Unfortunately to cover all the tributaries at a high level of detail would not be cost effective, hence the Department looked at prioritization. During the initial stages of the study the Department looked at prioritization based on hotspot areas, areas of high impact and conservation areas.
3	There is mention of an Ingula Dam in the Gazette. Where exactly is this dam? You might know that Eskom has built the Ingula Pump Storage power plant in the Drakensberg. We were wondering if they were referring to this system?	Mr Anesh Surendra, Eskom	Email on 14 January 2019	It does refer to the Eskom Ingula Pump Storage scheme in the Drakensberg. The point of confusion is noted. The Gazette will be revised to reflect Bedford Dam (the top dam) which is located in quaternary catchment C81A and not Ingula Dam (Braamhoek) (which is the bottom dam). However, the system is linked so the dams would need to be operated together to manage the releases from the Bedford Dam into the Wilge River.
4	With the groundwater quality Reserve that was done, what would the implication be for an owner of a water use license, for whom a quality baseline was already published as such in their license? Which one of the two documents will have to be adhered to? Is the purpose of this document to inform decisions in terms of licensing for future projects following the promulgation of this document?	Ms Elrina Cilliers, Finsch Diamond Mine	Email on 16 January 2019	According to Section 17(2) of the National Water Act (NWA), the preliminary determination results will be superseded by the gazetted determination results. However, an owner of a water use license must continue to adhere to the specified water use license conditions until the license is reviewed and new conditions are set.

	COMMENTS, QUESTIONS AND CONCERNS	COMMENTATOR(S)	SOURCE(S)	RESPONSE(S)
				The Reserve is a component of the Resource Quality Objectives (RQOs). RQOs are a catchment management based approach and compliance to them is regulated for all users by the department.
5	The ‘Groundwater Contribution to Baseflow (GW_{bf})’ values used in the gazette document are abstracted from intermediate Reserve studies reports produced by the Council for Scientific and Industrial Research (CSIR) for the DWS. However, the reports are not clear as to how these values were determined and they seem not to be aligned with other values obtained using known methods (also provided in the reports), and thus their correctness is questionable. Can this be clarified or rectified?	Mr. Fanus Fourie, Department of Water and Sanitation	Email on 16 January 2019	Initially, these values were used because they are applied throughout the technical documents referred to, and they were presumably accepted as they were part of the approved preliminary Reserve. However, after careful consideration of these values in correlation with the other tabulated values from known methods; a wide consultation with various experts in the field was undertaken. The aim of the consultation process was to ascertain the origin of these values in order to qualify their application in this gazette. The attempts to get clarity from the study team were unsuccessful because all of them were no longer at the CSIR and the study leader, deceased. Due to uncertainty in their origin and thus their correctness, it was decided that the Sami values (reflected in the technical documents) are used instead (Upper Vaal: Appendix C; Column 11) (Middle Vaal: Appendix B; Column 10).
6	Sasol prepared a letter for the Department highlighting various concerns and recommendations as summarised below.	Mr Martin Ginster, Sasol	Letter *via* Email on 21 February 2019	
6.1	The collation of Eco-classification summary was conducted through desktop assessments.			Yes, the collation, assimilation and synthesis of results for the purposes of gazetting were conducted through desktop assessments but it is important to note that these were derived from technical studies that were done at a comprehensive level.

	COMMENTS, QUESTIONS AND CONCERNS	COMMENTATOR(S)	SOURCE(S)	RESPONSE(S)
6.2	Sasol expressed dissatisfaction that the proposed Reserve was gazetted late in the year when most offices were closed for the annual recess giving stakeholders very limited time to formulate comments on this important document.			The Department was compliant with Section 16 (3) (ii) of the NWA which prescribes a minimum period of 60 days and the Department advertised for a period of 60 days. Secondly the Promotion of Administrative Justice Act (PAJA) talks about reasonable time period of 30 days, in this instance the Department exceeded that. So, the Department is satisfied that the time period was adequate and that even though it coincided with the December period, there was still sufficient opportunity given the 60-day time period which ended on 22 February 2019. Furthermore, there was sufficient opportunity provided by the Department to participate in the entire Reserve, Classification and RQO studies in the Vaal catchment. These studies commenced as of 2009 and they comprised of numerous stakeholder engagement opportunities which included public, steering committee and technical meetings, at which representatives from Sasol were present.
6.3	Sasol recommends that the Department makes this information more accessible to a broader stakeholder base by simplifying the contents. A guidance document to accompany the Reserve values is recommended as well as awareness sessions and training to a broader stakeholder base on the application of the Reserve concept. In order to then ensure that all relevant parties fully appreciate the impact Sasol further recommends an additional phase for public consultation.			Yes, the Department acknowledges that the interpretation of some information is very difficult if one is not familiar with the processes. However, the doors of the department have always been open throughout the process and sufficient opportunity has been provided for all stakeholders to participate in numerous stakeholder engagements such as public, steering committee and technical meetings.

	COMMENTS, QUESTIONS AND CONCERNS	COMMENTATOR(S)	SOURCE(S)	RESPONSE(S)
				The technical documents also contain all the necessary steps undertaken to get to the results that are seen in the Gazette Notice. These documents are accessible from the link www.dwa.gov.za/rdm/
6.4	Sasol's submission is focussed on the proposed Reserve values for Rivers, water quality component of the proposed Ecological Reserve for rivers, the Groundwater Reserve and protection and monitoring measures for priority wetlands specifically in the Upper-Vaal Catchment as being applicable to our operational footprint and our water supply needs. Further, and as previously explained this submission is preliminary in nature given the challenges experienced in translating the implications of the proposed Reserve on users like Sasol. This is notwithstanding the fact that the Reserve is largely a tool to be applied by the DWS and specifically Catchment Management Agencies (CMAs) to manage the catchment to agreed objectives. There is however an invariable link between SDCs (like waste water discharge limits) and the Resource Directed Measures (RDMs) expressed in the Reserve. It was generally assumed that a scientific basis was followed in proposing the Reserve.			Noted and agreed.
6.5	The Notice proposes that the ecological category for EWR4 and EWR5 needs to be improved by half a category, while those for the EWR WA1 (Waterval) and EWR 2 (Grootdraai Dam) remains unchanged. Sasol is in support of measures to protect EWR4 (namely Vaal Dam water) as it supplies water to Sasolburg			The ecological importance of this site is related to endangered and rare fish species. The proposed measure includes the improvement of seasonality (decrease base flows during dry seasons and increased wet season flows above base flows).

	COMMENTS, QUESTIONS AND CONCERNS	COMMENTATOR(S)	SOURCE(S)	RESPONSE(S)
	Operations (SO) and is an alternative source of water to Sasol Secunda Operations (SSO) via the VRESAP transfer system. Considering that EWR4 is located downstream of Vaal Dam on the Vaal River system used to transfer water to downstream users (notably Midvaal Water, Sedibeng Water, Vaalharts irrigation scheme via Bloemhof Dam), i.e. it is significantly hydraulically altered, it is not clear what measures can be foreseen with which the ecological category of EWR4 can be improved. Recommendation: In order to provide a more meaningful response to this matter, Sasol would appreciate an explanation on the measures foreseen to improve EWR4.			
6.6	It is our understanding that the proposed Reserve will not negatively impact Sasol's bulk water allocation and assurance of supply from the Integrated Vaal River System (IVRS), for both raw and potable water allocations. The water allocation to high assurance users like Sasol is based on stored (Dam) water and inter-basin transfers which has already been accounted for in the planning and allocations from the IVRS. Further, this stored water allocated from the IVRS has no effect on the ecological characteristics of rivers unless a river is used to transfer such water. An example here is a section of the Heyshope Dam to Grootdraai Dam transfer which requires water to be transferred along the Little Vaal for which no alternative exists. Sasol's licensed allocation of supply is reliant on water supplied from both Grootdraai Dam and Vaal Dam.			Noted.

	COMMENTS, QUESTIONS AND CONCERNS	COMMENTATOR(S)	SOURCE(S)	RESPONSE(S)
	Position: On the basis of the assumptions made above the Target Ecological Category (TEC) for the sites listed in Table 1 is supported.			
6.7	It is our understanding that the proposed Reserve water quality conditions are intended to be aligned to the matching published RQOs. In reviewing the water quality variables, a significant challenge arises when many of the Reserve conditions are present as concentrations of salts ($MgSO_4$, Na_2SO_4, $MgCl_2$, etc.) and not element concentrations. Recommendation: While, from the perspective of undertaking aquatic ecology assessments, the application of salts may be preferred it is not practical to apply this approach in practice and it is recommended that element concentration values be provided from which the implication of water quality objectives can be practically assessed.			Yes, it is true that the Reserve and RQO's are aligned. For instance, in the Upper Vaal, the Reserve consists of defined/specified salts ($MgSO_4$; $NaSO_4$; $MgCl_2$, etc.) while for the RQO's salts are considered under River Water Quality Sub-component. The Reserve as detailed as it is, cannot be implemented on its own and can only be implemented through RQOs. The implementation of RQOs can be done by measuring concentrations of the chosen/selected numerical indicators. In the case of the Upper Vaal, Electrical Conductivity (EC) was chosen as the numerical indicator for salts and therefore EC can be used to assess concentrations of salts defined in the Reserve.
6.8	In comparing the Reserve values with the RQO's to sites linked to Sasol's Operations it was found that in most cases they were identical as to be expected. One notable discrepancy is that the Electrical Conductivity (EC) value for the Reserve specifications for EWR WA1 site differs from the published RQO value; namely an EC value ≤ 85 mS/m for the 95th percentile for the Reserve compared with EC ≤ 79.1 mS/m for the 95th percentile for the published RQO.			At EWR WA1 an EC specification of ≤ 85 mS/m for the Reserve has been set – as the PES is to be maintained. The EC ≤ 79.1 mS/m is the status quo value that has been included with the RQOs published. Users are not required to meet the requirements of the RQOs, but they are required to meet the requirements of the license conditions for their respective activities. The Department is required to ensure that the

	COMMENTS, QUESTIONS AND CONCERNS	COMMENTATOR(S)	SOURCE(S)	RESPONSE(S)
	Recommendation: It is recommended that the Reserve values as a minimum be aligned to the published RQOs.			necessary regulatory and source controls are in place for all users in the catchment in order to achieve the RQOs.
6.9	It is our view that the ammonia and phosphate values proposed for the Waterval (EWR WA1 and EWR WA2) are unachievable, especially during the dry months of the year when the return flow from sewage plants are contributing significantly to flow in the catchments. Even if sewage plants operate within the special limit for phosphate discharges this would still pose a significant challenge to achieve. Recommendation: A far greater understanding to the approach taken in setting these Reserve values is required before it is possible to take a view on this and an engagement with the DWS is requested to discuss the broader implication for the sub-catchment on this matter			The concern is noted, this will require a comprehensive compliance and enforcement of waste discharges in the entire catchment to ensure compliance with the discharge standards. A nutrient balance for the Waterval catchment is required. A submission is being compiled within DWS for approval to initiate a planning study that, if successful, will *inter alia* develop phosphate load balances and also set up a nutrient module in the Water Resource Planning Model for the Integrated Vaal River System (IVRS). This will assist with future improvement iterations of the Reserve. The Department is open to a meeting, however it must be noted that this process is now concluded and will be submitted for the Minister's consideration.
6.10	Of key interest to Sasol is to establish how future water quality expectations as defined by the Reserve, are likely to influence future water use license conditions. Two examples are highlighted: namely water quality considerations downstream of Sasol Secunda complex on Waterval (EWR – WA1) as compared to the RESM 1 Sasol Secunda surface water compliance point and water quality expectation for Vaal Barrage (closest site is the EWR5), which has a bearing on Sasolburg Operations.			RQOs are overall water resource goals that need to be achieved by all users in the catchment and therefore using them as water use license conditions is not appropriate. The department supports the WRC Joint catchment study which was initiated due to challenges identified in the approaches used for setting applicable water use license conditions and discharge quality specifications.

	COMMENTS, QUESTIONS AND CONCERNS	COMMENTATOR(S)	SOURCE(S)	RESPONSE(S)
	Recommendation: Sasol's recommendation is that load allocation assessments be undertaken to prevent RQO water quality limits being as default written into future water licenses. Sasol recommends that the DWS prioritise the WRC Joint catchment study recently kicked-off on the Vaal River in the region of the Leeu-Taaiboschspruit and Barrage Catchment which will provide the DWS and all other users a decision support tool for transparently setting scientifically defendable water use license conditions. Once developed these tools could be applied elsewhere in the catchment.			According to the Department's understanding this study will look at the linkages between Source Directed Controls (SDCs) and Resource Directed Measures (RDMs) and how they inform each other. This requires the availability of RQOs to establish the link between RQOs and water use license conditions, including discharge quality specifications. Therefore, if one needs to conduct a study to establish a link between SDCs and RDMs (RQOs and the Reserve forms part of RDM), then one needs to have the Reserve and RQOs determined. Thus waiting for the WRC Joint study to be completed before we gazette the Reserve is not necessary.
6.11	C12D which is proposed as a Class 2 defined as water suitable for short term or emergency use only and not for continuous use. The proposed ground water quality Reserve of the proposed ground water Reserve was compared to the values given in our Sasol Mining water use license conditions and found that there is no alignment with the stated values.			The Reserve and license conditions cannot be compared because they represent two different things. The Reserve is determined for the entire catchment and not for an individual water use license. When assessing the water use license application, the Reserve is just one of the components that are considered. Moreover, the Reserve is determined for the wellbeing of the resource (and in this case groundwater resource) and not as a license condition.
6.12	Greater clarity is required on how these conditions are included as Water Use License (WUL) conditions.			License conditions are established by using data supplied by the applicant in conjunction with baseline conditions and consideration of the Reserve. The Water Use Authorisation Directorate responsible for setting license conditions should incorporate the groundwater Reserve (present status of groundwater resources within a quaternary) and set conditions based on the two

	COMMENTS, QUESTIONS AND CONCERNS	COMMENTATOR(S)	SOURCE(S)	RESPONSE(S)
				types of data sets (groundwater Reserve and data supplied by the applicant). The Reserve is determined based on the historical data from the DWS' comprehensive water quality database for each quaternary catchment, and not on localised data.
6.13	It is unclear what measures the DWS will initiate to improve the class should the ground water for this quaternary catchment deteriorate and greater clarity is sought on this matter.			Any changes in the Reserve and RQOs specifications would likely be due to the non-compliance by users to their license conditions, unless proven otherwise. There are various measures in place within the DWS to address such non-compliances.
6.14	Setting the Reserve as a compliance requirement for a water user make it impossible for a water user to comply.			The Reserve is never set as a compliance requirement for a water user. The Reserve is set for a water resource to allow the Department to monitor the health of the resource. License conditions are set based on individual water user activities and other relevant information and not solely on the Reserve.
6.15	At what point does the water user need to meet these requirements. Will it be at the fence line or any point within the property of the water user?			The need to meet the requirements of the Reserve lies with the Department. A water user is obliged to meet the requirements of the water use license conditions which are attributed to a specific water use activity and at a given location.
6.16	The groundwater Reserve values are based on limited historic water quality results. The appropriate criteria should be basic human needs and ecological requirements and not historical water quality results.			This recommendation is not acceptable. Water quality limits for basic human needs were established for human health as a user requirement. However, the use of all available historic data for a water resource including recent data is also considered in setting of the Reserve limits, as this more appropriate and meaningful as it reflects status quo conditions that need to either be maintained or improved. Therefore, the Reserve limits

	COMMENTS, QUESTIONS AND CONCERNS	COMMENTATOR(S)	SOURCE(S)	RESPONSE(S)
				should be easily linked to current water resource conditions rather than just the basic human needs requirements. A similar concept applies when one considers ecological requirements. Therefore, if a Reserve was to be set based on basic human needs limits and ecological requirements, then there would be no need for an eco-status assessment, status quo monitoring and data generation, as the Department would just specify the basic human needs limits and ecological requirements limits as per the guidelines as the Reserve.
6.17	The groundwater quality Reserve in C12D catchment is indicated as a class II water. The only component that caused it to be in this category is total hardness. The numerical water quality values of the majority of components fall within the Class 0 range and the remaining ones in the Class I range. The scientific basis for the determination of these values are therefore questioned.			The reason for classifying groundwater resources in terms of water quality class is to assist in decision making regarding the management of groundwater quality, especially for human health protection. The Department uses a procedure for classifying water as per the guideline titled “Quality of Domestic Water Supplies, Volume 1: Assessment Guide, 2nd Ed.1998. Water Research Commission Report No: TT 101/98, Pretoria, South Africa”, as the guideline for basic human needs. This approach sets the Reserve water quality based on the status quo conditions as compared to the domestic water quality range classes. The specification for C12D has been based on the parameter with the worst quality, which was total hardness. The Class has been specified as a Class I. However, should the groundwater be a source for domestic use, the drinking water standards would have to be complied with.

	COMMENTS, QUESTIONS AND CONCERNS	COMMENTATOR(S)	SOURCE(S)	RESPONSE(S)
				The Resource Directed Measures are designed to protect the resource whilst allowing for socio-economic developments to take place where feasible.
6.18	C22K which is proposed as a Class 0 defined as ideal water quality suitable for lifetime use. According to SO's water use license ground water quality is not a Class 0. This is pristine water quality which is not possible for this area and is hence not supported.			Noted.
6.19	The number of water quality data sets for both C12D and C22K that were used to inform the classification is extremely limited, *i.e.* .9 data points. This data has been obtained from the DWS's Water Management Database. Using 9 data sets is not considered scientifically adequate to reflect the water quality variability that can be expected over time. Significantly more data (recent and geographical locations) is required to determine statistically acceptable water quality limits across catchments, specifically where any compliance is to be assessed against unjustified quality limits.			Noted. This was the number of verified water quality analyses for the quaternary catchments that were available. The Class of the water resource is determined in terms of the baseline background quality at a quaternary catchment scale. In this case, 9 were used as a minimum number of analyses used for statistical evaluations (as indicated in the document). Even though more datasets would be better than 9, this cannot be used as a reason by the DWS not to protect water resources whilst there is available minimum data to use. If possible in the future, with more data, the Reserve might be re-visited to ascertain its applicability at that time.
6.20	All role players are required to contribute to the data set including Sasol Mining, New Vaal, Eskom, agriculture etc. A significant shift in population densities were seen in the last 15 years. Deteriorating and absence of sewage infrastructure will negatively impact on groundwater. Informal waste disposal sites were started that can have a			All these aspects are considered during the resource Classification process, whereby rigorous stakeholder engagements take place and different scenarios are tested. Classification took place before the initiation of this Reserve gazetting process. Water resource Classes have been determined and RQOs set and gazetted based on, among other issues, such

	COMMENTS, QUESTIONS AND CONCERNS	COMMENTATOR(S)	SOURCE(S)	RESPONSE(S)
	negative impact on groundwater quality. Clarity is required to establish if this was considered.			information. Furthermore, high confidence Reserve studies were done for the Vaal and the results presented here are based on the outcomes of those studies. The Reserve is determined to ensure that a certain amount required for basic human needs and aquatic ecosystems is set aside before any allocation can take place in a specific catchment. Thus, any new developments in these catchments should consider the Reserve requirements, via the water use license application. It is accepted though that data from role players should find its way into the DWS' water quality system.
6.21	Clarity is also required on distinctions to be made between shallow and deep aquifers. Sasolburg has a low yielding, mostly confined, shallow aquifer which must be viewed differently when compared to deeper and more sustainable aquifers that have the ability to provide water for drinking, livestock, irrigation etc. A Class 0 Reserve on shallow, generally more impacted aquifers, would have vastly different implications than on the deep aquifer.			At present, the Reserve specifications by the DWS are not based on aquifer types, but based on quaternary catchments. Then water quality data obtained from geosites (e.g. boreholes which could be tapping shallow or deep aquifers, springs, eyes) found within a specified quaternary catchment is used to establish groundwater quality component of the Reserve irrespective of the aquifer type. However, the DWS is in the process of refining this approach/methodology (Groundwater Resource Directed Measures [GRDM] methodology).
6.22	For the groundwater Reserve a single value for pH is stated and we are of the view that a range should be provided.			Noted, a range has been specified.
6.23	It is recommended that the DWS obtain recent groundwater data. Most industries do have a WUL requirement to submit groundwater data to the DWS on an annual or bi-annual			It is accepted that data from role players should find its way into the DWS water quality system. Currently, that mechanism does not exist and the data supplied by the role-players for compliance purposes in report forms is

	COMMENTS, QUESTIONS AND CONCERNS	COMMENTATOR(S)	SOURCE(S)	RESPONSE(S)
	basis. SO's most recently submitted report to DWS is dated August 2018.			not compatible with the WMS format and thus at this stage mainly not captured into the WMS. That data should also be subjected to quality checks but compliance monitoring section of the DWS does not yet cover all role-players.
6.24	If sufficient recent data is not available, the class determination must be postponed to allow for sufficient data gathering.			That was done but not for the whole WMA. The catchments where no groundwater quality data is available, or even insufficient (less than 9 datasets), were left out and they are listed in the document at the beginning of the Groundwater Quality Component section. But this does not warrant the postponement of Reserve determination in the whole WMA because the Reserves are determined per quaternary catchment.
6.25	There is no scientific evidence presented that the use of groundwater in any specific catchment is reasonably likely to be the sole, and life-long, source of drinking water which could potentially be used as an argument that pristine water guidelines could apply, which assume sole source life-time exposure. Where the groundwater is not reasonably likely to be sole source, lifetime supply, the risk to human health is not as significant, and quality can be relaxed. It is inappropriate to assume pristine water supply quality is required where the catchment is not utilised in such a way. This is especially relevant in the case of land use zoning for industrial activities having been applied with no use of groundwater for human needs.			The current approach to determining the Reserve does not allow for the relaxation of certain aspects. What's good for the BHN might not be good for ecosystem and vice versa. Thus, the Reserve is not only for sole source supply but also for the aquatic ecosystems. These issues are considered during the water resource Classification and RQO process, where stakeholders are requested to bring all the information they have to the fore for consideration in the process. The set RQOs and the WUL conditions should be adhered to in order to maintain or improve the Reserve. The bottom line is that the user must not deteriorate the quality of the resource any further than they found it, either it's maintained or improved for groundwater resource protection purposes.

	COMMENTS, QUESTIONS AND CONCERNS	COMMENTATOR(S)	SOURCE(S)	RESPONSE(S)
				According to the NWA, water resources must be protected, no matter what they are currently used for. This is for the benefit of the current and future generations. The determination of groundwater quality component of the Reserve is not based on assumptions of use. It is based on historical water quality data for the resource. Water users and their impacts on the environment are considered during the water resource classification process. The water quality component of the Reserve is based on the groundwater quality data of a given catchment.
6.26	In terms of the groundwater Reserve it will thus also be critical to understand what distinctions will be made between shallow and deep aquifers as well as for land use zoning having been applied.			The Reserve studies are undertaken for quaternary catchment and not for aquifer types and land use zoning. However, the DWS is initiating a process of reviewing the GRDM methodology and these parameters will be looked at. In the meantime, the resource has to be protected using the best scientific approaches available**, i.e**. the GRDM of 2013.
6.27	A preliminary implementation plan should be included in the proposed Reserve detailing how the DWS will track compliance.			The Reserve is monitored through RQOs, therefore, it is most appropriate for an implementation plan to come with RQOs implementation process.
6.28	The protection of headwaters remains a nascent area of effort in South Africa and Sasol would be willing to work with the DWS and other stakeholders to identify opportunities for intervention to improve the ecological functioning of critical habitats (including wetlands) to the benefit of the water supply from the IVRS (both reliability and quality).			The Department supports the project initiative from Sasol.

General Notices • Algemene Kennisgewings

DEPARTMENT OF CO-OPERATIVE GOVERNANCE

NOTICE 515 OF 2020

WHITE PAPER ON FIRE SERVICES

I, Dr Nkosazana Dlamini Zuma, Minister of Cooperative Governance and Traditional Affairs, in accordance with Section 85 of the Constitution read with the Fire Brigade Services Act, 1987 (Act 99 of 1987), after approval by Cabinet on 27 May 2020, hereby publishes the White Paper on Fire Services.

Due to the large volume, copies of the White Paper on Fire Services will only be made available electronically. The electronic copy of the White Paper is obtainable from the websites of the Department of Cooperative Governance and Traditional Affairs at www.cogta.gov.za and the National Disaster Management Centre at www.ndmc.gov.za

NC Zuma

DR NKOSAZANA DLAMINI ZUMA, MP

MINISTER OF COOPERATIVE GOVERNANCE AND TRADITIONAL AFFAIRS

DATE: 13.08.2020

cooperative governance

Department:
Cooperative Governance
REPUBLIC OF SOUTH AFRICA

WHITE PAPER ON FIRE SERVICES

Prepared by:

National Department of Cooperative Governance

National Disaster Management Centre

Directorate: Fire Services

May 2020

WHITE PAPER ON FIRE SERVICES

"I have no ambition in this world but one, and that is to be a firefighter. The position may, in the eyes of some, appear to be a lowly one; but we who know the work that the firefighter has to do believe that his/hers is a noble calling. Our proudest moment is to save lives **(Croker, Chief of Department 1899-1911, New York City Fire Department)**

May 2020

TABLE OF CONTENTS

2.9 Adoption of relevant South African National Standards (SANS) to support effective delivery of fire services.

2.10 National Fire Code

3. GUIDING PRINCIPLES

4. DEVELOPING A NEW APPROACH

5. ROLE OF NATIONAL GOVERNMENT IN FIRE SERVICES

5.1 Contextualising the role of national government in the provision of fire services

5.2 Role of the National Disaster Management Centre in the provision of fire services

5.3 Mechanisms for monitoring implementation, evaluating the outcomes and modifying the implementation process where required

5.4 Professionalisation of fire services

5.5 National Fire Services Advisory Council

6. ROLE OF PROVINCIAL GOVERNMENT IN FIRE SERVICES

6.1 Contextualising the role of provincial government in the provision of fire services

6.2 Role of the Provincial Disaster Management Centre in the administration of the Fire Service legislation at a provincial level

7. ROLE OF LOCAL GOVERNMENT IN FIRE SERVICES

7.1 Establishment and maintenance of municipal fire services

7.2 Roles and responsibilities of the fire service

7.3 Division of powers and functions between the various categories of municipalities

7.4 Appointment of a Chief Fire Officer and a member of service

7.5 Powers of a Chief Fire Officer and a member of a service

14. PORTFOLIO OF STAKEHOLDERS CONSULTATION UNDERTAKEN AS PART OF THE REVIEW OF THE FIRE BRIGADE SERVICES LEGISLATION

MINISTER's PREFACE

Throughout history, fires have inflicted a heavy cost in human, infrastructure, and damage to the environment. In our own country, the number of lives lost and injuries sustained because of fires is alarming. Statistics South Africa in its analysis of the distribution of deaths due to other external causes of accidental injury attributes 2 246 deaths to smoke, fire and flames in 2012 alone. With regard to the cost of fires to the economy, the Fire Protection Association of Southern Africa (FPASA) noted that in 2016, the recorded financial losses incurred by the country because of fires exceeded R3.144 billion. Taking into account that this figure reflects fires attended to by fire services and reported to the FPASA while excluding to a large extent uninsured losses, and fires occurring in areas where no professional fire services exist, it becomes evident that the cost of fires to our country's economy are significant and pervasive.

While most of our fire services have made tremendous progress in delivering the various services that communities expect, the majority of our country's fire services are frankly not functioning properly and continue to grapple with serious challenges that over the years, have weakened their ability to deliver on their legal mandate. Our analysis of these challenges has revealed that at the heart of these problems lies inappropriate policy and legislative framework, ambiguous assignment of roles and responsibilities across the three spheres of government on the delivery of fire services, burdensome requirements and fragmented legislative frameworks. There is no doubt that in responding to the challenges confronting fire services, strong and robust legislative framework is essential to provide an enabling framework for all role players to execute their roles and responsibilities. It is with this in mind that we have prioritise the development of this White Paper on Fire Services which represents the first major step in the reform and overhaul of the legislative framework governing the provision of this critical service to our communities.

This reform is fundamental to better position the fire services to respond to the changing and growing needs of society as well as to contribute meaningfully in the achievement of the strategic objectives of the country's National Development Plan. In essence, this White Paper provides a framework for understanding the philosophy and approach espoused by our government in the delivery of fire services in the country. The fundamentals of this White Paper are derived from our Constitution and the relevant post 1994 local government legislation. In addition, and in line with international trends and practices, this White Paper seeks to establish fire safety and prevention as core elements of fire services functions in order to prevent fires and ensure that precautionary measures are put in place to reduce the likelihood of fires thereby reducing the loss of lives, injuries, damage to property and the environment as a result of fires. Equally important is that this White Paper recognises the critical importance of working with all social partners to deal with factors undermining the ability of fire service to deliver on their Constitutional mandate while improving their performance.

This White Paper is being developed at a time when our government has adopted the Back to Basics approach that is designed to ensure that all municipalities perform their basic responsibilities and functions without compromise. This programme is built on five pillars i.e. putting people and their concerns first; demonstrating good governance and administration; delivering municipal services; sound financial management and accounting as well as sound institutional and administrative capabilities. Inevitably, the development and implementation of legislation, policies, strategies and other related frameworks guiding the delivery of fire services must resonate with the pillars of the Back to Basics approach. In this regard, this White Paper amongst others, places an obligation on fire services to constantly engage with the communities they serve with a view to work together to reduce fire risks and ensure that adequate response strategies and systems are put in place to respond to fires and other related incidents rapidly and effectively. Furthermore, in line with the Back to Basics 's pillar on good governance and administration, this White Paper also outlines the various mechanisms must be utilised by fire services to engage with communities especially those whose assets, housing and livelihoods are vulnerable to the risks posed by fires.

While this White Paper is not intended as the ultimate panacea for all challenges confronting fire services, it demonstrate our commitment to reposition the fire services from response oriented fire services towards a fire risk reduction based approach. We are aware that if we want to succeed in reducing fire losses in terms of lives lost, cost to the economy, it is crucial that we work closely with all our partners and stakeholders including those in the private sector involved in the provision of fire services.

This document is the product of great joint efforts and support. While various acknowledgements need to be made, the crafting of it would not have been possible without the involvement of the entire spectrum of the fire services as well as our governmental and social partners. The challenge now is for society to own this White Paper. It must take on the proportions of a living document driven by a common desire to contribute towards the building of a nation where loss of lives, costs of fires to the economy and the environment are progressively reduced.

DR NKOSAZANA DLAMINI ZUMA, MP
MINISTER OF COOPERATIVE GOVERNANCE AND TRADITIONAL AFFAIRS
DATE:

PREAMBLE BY DEPUTY MINISTER

We have identified the Fire Brigade Services Act, 1987 (Act No. 99 of 1987) (FBSA) which was promulgated in 1987 as one of the old-order legislation that require a comprehensive review. This review aims to closely align and harmonise the FBSA with other applicable legislation. Initially, we attempted to achieve the objectives of reviewing the FBSA through amendments and accordingly commenced with the process. Whilst this process was underway, it became evident that this approach will not enable us to achieve the desired objectives due to the nature of aspects that must be introduced in the revised fire services legislation. In view of this, and consistent with government's approach to policy development, a Discussion Paper on the review of fire services legislation was published for public comments in March 2013. The Discussion Paper is followed by the White Paper that will culminate in a revised fire services legislation. This approach will ensure that prior to the promulgation of the revised fire services legislation, a clear policy framework for the function is in place for all role players to grasp the fundamental principles and policy direction underpinning the legislation.

This White Paper on Fire Services is therefore designed to outline key policy proposals that the proposed fire services legislation must address going forward. This White Paper also seeks to prioritise fire risk reduction as a core element of the proposed fire brigade services legislation. While fire-fighting services are provided at both local government level and by designated services, this White Paper also clearly outlines the roles and responsibilities that both national and provincial governments must execute in support of municipalities and other stakeholders involved in fire services across the country. The White Paper has been released for wider public consultation and comments through publication in the government gazette and inputs that were received were duly assessed and integrated accordingly.

MR PARKS TAU
DEPUTY MINISTER: DCOG
DATE:

SECTION 1: INTRODUCTION

"Fire Services are a vital public service. It is part of the fabric of all our communities. The service it provides is essential in preventing fires starting in the first place and in responding quickly and effectively to those incidents with which it has to deal. Increasingly, it is now developing a wider role. That role involves tackling new threats which we are now facing, including terrorism, and threats such as flooding and other environmental disasters" (Prescott, Deputy Prime Minister, United Kingdom, 2003).

1.1 The fire problem: a global perspective

Burns constitute a major public health problem, especially in low and middle-income countries (such as South Africa) where over 95% of all burn deaths occur. Globally, fire-related burns alone account for over **300 000 deaths per year**, with more deaths from scalds, electricity, chemical burns and other forms of burns. While high-income countries have achieved much in terms of reducing the burden of injury and mortality from burns through implementation of proven interventions, such as promoting use of smoke detectors, regulation of hot water heater temperature and flame retardant children's sleepwear to name but a few, such strategies have yet to be widely applied in low- and middle income countries, and consequently mortality rates remain relatively high, especially among the poorer members of society (WHO, 2008). Thus, the burden of burn injury is one that falls predominantly on the worlds poor. The vast majority (over 95%) of fire-related burns occur in low- and middle-income countries. Within this group of countries, not only are burn deaths and injuries more common in people of lower socioeconomic status but, among those who suffer severe burns, it is the most economically vulnerable that are the more likely to be thrown into further poverty as a consequence.

Fire-related mortality rates are especially high in South-East Asia (11.6 deaths per 100 000 population per year), the Eastern Mediterranean (6.4 deaths per 100 000 population per year) and Africa (6.1 deaths per 100 000 population per year). These compare with much lower rates of, on average, just 1.0 deaths per 100 000 population per year in high-income countries. This is one of the largest discrepancies for any injury mechanism (WHO, 2008). Among the various age groups, children under 5 years and the elderly (i.e. those aged over 70 years) have the highest fire-related burn death rates (Mock *et al*. 2008). Fire related burn injuries are a serious health threat to young children and are disproportionately concentrated in Africa with nearly 16,000 African children under 5 years of age dying because of fire-related injuries alone (Van Niekerk et al., 2006; World Health Organisation (WHO), 2012). The WHO indicates that the rate of child deaths from burns is currently over seven times higher in LMIC's than in High Income Countries (HIC's) resulting in one of the largest discrepancies for any international comparison on injury mechanism.

However, deaths are only part of the problem, for every person who dies because of their burns, many more are left with lifelong disabilities and disfigurements. For some this means living with the stigma and rejection that all too often comes with disability and disfigurement (World Health Organisation, (WHO), 2008). It is important to note that for every fire related fatality, there are many more that suffer from surviving the injury leading to prolonged hospitalization, disfigurement and disability, often with resulting stigma and rejection. In 2004 alone, nearly 11 million people worldwide were burned severely enough to require medical attention and burns are among the leading causes of disability in LMIC's (WHO, 2012). These consequences are even more serious in developing countries, as severely disfigured survivors are flung into unemployment, extreme poverty, social segregation and sometimes even abandonment by their family. As a result, victims may become emotionally overwhelmed and withdraw from society, typically worsening the chances of healing and recovery whilst continuing to suffer from post-traumatic stress, anxiety, depression and loss of motivation.

There have been many cases where burn survivors have been stigmatized, socially excluded and their future employment has been disadvantaged because of their visible scarring. Psychological healing and support is often inadequate or even absent resulting in the victim suffering for life with both the physical and psychological scars of the burns. The growing fire challenges has resulted in the emergence of an approach which places specific focus on fire prevention and safety as core components of the fire services across the globe. While some of the strategies that have been implemented successfully in high-income countries to prevent burn injuries such as the use of smoke detectors would effectively address the risk factors in some low and middle income countries, it is important to note that the epidemiologic pattern of, and risk factors for, burns differ markedly from those that characterise high income countries. This is due to some of these factors:

a. The use of cooking pots on ground level (pots on ground level are more readily knocked over, and can increase the risk of scald burns, for example, among toddlers and young children);
b. The use of open wood fires; and
c. The use of unsafe and non-compliant kerosene (paraffin) stoves and lamps (these can be easily knocked over and then ignite) (WHO, 2008).

It is clear – given that approximately two billion people worldwide cook on open fires or very basic traditional stoves – that in order to reduce the number of fire-related burn deaths worldwide, evidence-based strategies to address these particular risks are going to be needed. However, there have been some promising pilot projects addressing some of the above risk factors, such as efforts to promote safer paraffin stoves in South Africa and safer, more stable paraffin lamps in Sri Lanka. With regard to the economic impacts, the WHO has noted that in South Africa an estimated US$ 26 million (approximately R300 million) is spent annually for care of burns from kerosene (paraffin) cook stove incidents. Indirect costs such as lost wages, prolonged care for deformities and emotional trauma, and commitment of family resources, also contribute to the socioeconomic impact.

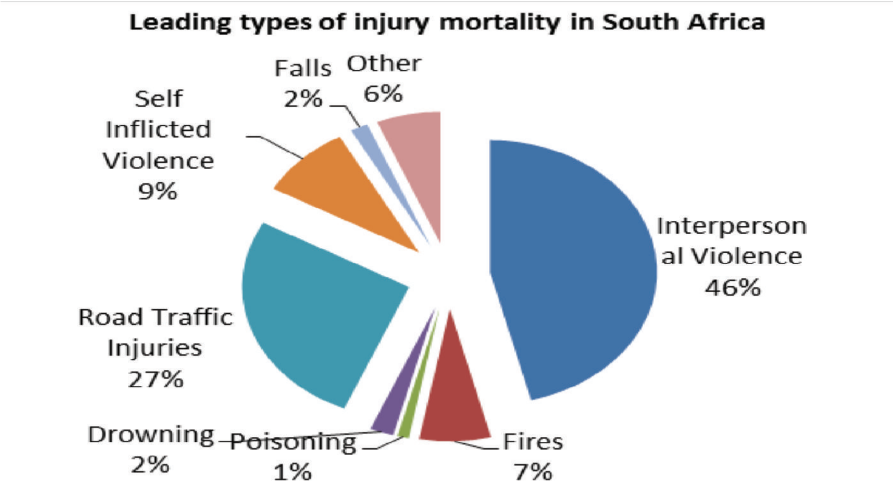
It is against this background that the International Association of Fire Chiefs (IAFC), 2009 postulates that a shift toward a greater emphasis on fire prevention is necessary if the fire service wishes to more effectively accomplish its mission to save lives and property. With regard to funding by governments to fire services, The World Fire Statistics Centre (WFSC) (whose main objective is to persuade governments to adopt strategies aimed at reducing the cost of fire) has noted that, although running at around one per cent of Gross Domestic Product (GDP) in most advanced countries, fire has generally received much less attention than the cost of crime or of road accidents. The WFSC further observed that wildfires (veldfires) are an increasingly prevalent natural hazard in many countries around the globe and, as the wildfire-urban interface becomes more extensive, more attention needs to be directed to their incidence, scope, and economic importance (WFSC, 2011). Most fire services legislation across the globe have also significantly moved towards prioritising fire risk assessment as a core component of fire services legislation. For example, the United Kingdom Fire and Rescue Act, 2004, introduces a new duty on all fire and rescue services authorities to promote fires safety which underpins the shift toward a more prevention-based and risk assessed approach, thereby helping to save more lives by reducing the number of fires occurring in the first place.

1.2 The fire problem in South Africa

The National Development Plan (NDP) observed that the proportion of South Africans living in rural areas has fallen by about 10 percentage points since 1994. Today, about 60 percent of the population lives in urban areas and slightly more than half of the poor lives in cities. By 2030, about 70 percent of people are likely to be living in urban areas. Gauteng and cities of eThekwini and Cape Town are the fastest growing city-regions, with implications for planning and delivery of basic services (South Africa, 2012). With regard to building safer communities, the NDP recognises that when people feel unsafe it makes it harder for them to develop their capabilities, pursue their personal goals and to take part in social and economic activity (South Africa, 2012). Fire services is one of the essential public service which plays a critical role in making communities safer place to live.

Fire kills. Preventing fires saves lives and reduces injuries. Currently too many fire services especially from resource poor municipalities are struggling to provide sustainable and cost-effective fire services. The number of lives lost and injuries sustained because of fires is alarming. A report by the FPASA on fire deaths by sector for the year 2015 revealed that 436 people lost their lives due to fires and that around 50% of the deaths (i.e. 219) are occurring in informal dwellings. South Africa has one of the highest levels of death and disability from injury in the world (Department of Health, 2012). As highlighted in **Figure 1** below, fires contribute seven percent to the injury mortality in the country:

Figure 1: Leading types of injury mortality in South Africa



(Department of Health, 2012)

According to the Integrated Strategic Framework for the Prevention of Injury and Violence in South Africa (Department of Health, 2012) the fire related burn death rate in South Africa **of 8,5 per 100 000** is greater than both the world average which is five per 100 000, and six for Africa respectively. With regard to financial losses, **Figure 2** provides a comparison between the financial losses incurred from fires in 2015 and 2016 per sector:

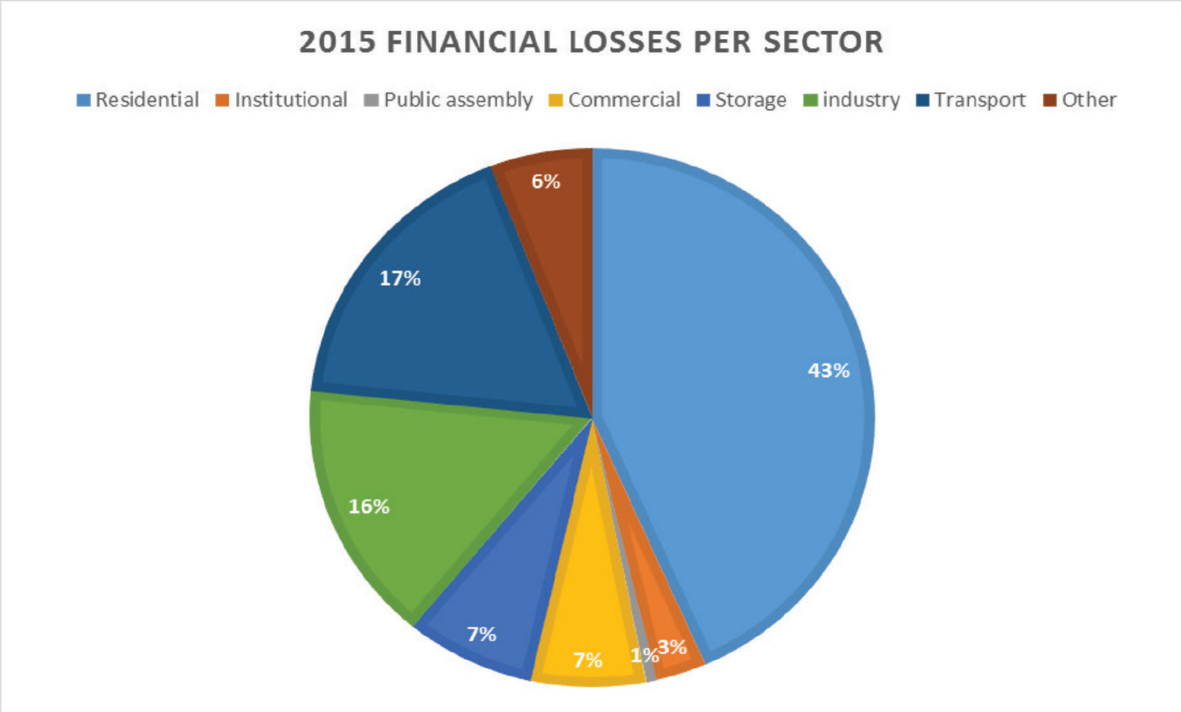
Figure 2: Compared financial losses 2015 and 2016

Financial Losses	**2015**	**2016**
Description	**Rand Sum of Damage**	**Rand sum of damage**
Residential	1 186 434 833	1 843 930 163
Institutional	80 038 500	160 576 600
Public Assembly	16 458 750	19 081 500
Commercial	179 437 310	393 481 500
Storage	202 994 800	25 487 861
Industry	428 018 082	228 402 209
Transport	478 601 719	425 611 214
Other	160 040 288	48 280 721
Total	2 732 024 282	3 144 280 721

(Fire Protection Association of Southern Africa, 2017)

Figure 3 below provides a further breakdown of these losses per sector.

Figure 3: Breakdown of 2015 financial losses per sector



(Fire Protection Association of Southern Africa, 2017)

These statistics essentially reflect the losses reported by local authorities to the FPASA. Fire losses under a certain value are usually not reported especially from fires in informal settlements and those assets that are not insured. The fire statistics of large industrial and other private services are also not included in the above figures especially since most large industrial agencies have in-house insurance facilities. **In other words, the losses could in all probability be much higher if all fire losses were captured during this period.**

As outlined in the NDP, to achieve sustainable and inclusive growth by 2030, South Africa needs to invest in a strong network of economic infrastructure designed to support the country's medium and long-term objectives (South Africa, 2012). Fire services play a critical role in the protection of this network of economic infrastructure. It is therefore important to continuously increase the capacity of fire services to deliver on its critical mandate as failure to do so may impact negatively on socio-economic development. This is critical as both social and economic infrastructure and rural development requires reliable and efficient fire services across the country with the capacity to provide adequate protection from fires and ability to manage them when they occur. While there are many viable and efficient fire services that are able to protect the critical economic infrastructure, a significant number of fire services across the country are not in a position to adequately protect strategic assets in their areas of jurisdiction.

The NDP further noted that poor road safety adds a huge cost to society. South Africa suffers from a high accident rate, with high incidence of death, injury and lost cargo. The fire services play a critical role in provide rescue capabilities required in accidents across the country's road network. The current reality is that some fire services do not have the requisite capacity and capability to provide rescue during accidents. While the effects of fires are most pronounced in live lost, injuries and damage to properties, the environmental effects of fires are also often huge and capable of undermining environmental conservation objectives of the country. The issues raised above clearly indicate that fire service is an essential and vital service that plays an integral part in the protection of communities, its infrastructure and livelihoods. In essence, fire services can be characterised as the key responder to all non-security related incidents in the community. The critical nature of this function necessitates the mobilisation of resources by all spheres of government to respond adequately to the systemic challenges besetting this critical community service and put it on a different trajectory going forward. The fundamental nature of changes required to place fire services on a different path requires a revised policy framework that reflects the changing scope and needs that fire services are confronted with on a day-to day basis.

1.3 The key drivers for change

Like other sectors, as the fire service enters the 21st century, it is subject to a number of key drivers for change and reform. The following provides a summary of the key drivers for change in the fire services sector:

a. **Legislative basis** – there is a need to review the FBSA to ensure that it is aligned, harmonised and consistent with the post 1994 legal framework/ dispensation in the country.

b. **Partnership** – robust and dynamic partnerships between all spheres of government, private sector, civil society organizations and communities is essential for the effective delivery of fire services.

c. **Standardisation of fire services** – standardisation of norms and standards is critical in fire services in the country and model by-laws and other similar mechanisms are required to accomplish this.

d. **Changing role of fire services** – traditional roles and responsibilities of fire services are changing across the globe. Some of these changes are fundamental and requires legislative overhaul to adequately reflect the changing role of the modern day fire service.

e. **Modernising agenda** – global technological advancement spawns new challenges to fire services that necessitate ongoing modernisation of fire services operations. Developments in building technologies impacts significantly on fire safety in buildings and necessitates a review in the manner in which fire safety services were provided in the past. In addition to this, fire services need to be committed to fundamental principles of accountability, transparency, continuous improvement, etc in the provision of services to communities.

f. **Changes in the built and natural environment** – this introduces new risks requiring different methodologies to manage effectively.

g. **Disaster management and fire services interface** – global warming, climate change, etc are expected to place different demands on the fire service.

The current fire services legislative framework does not adequately reflect most of the factors/ challenges outlined above and it is only through fundamental review of the legislative framework that the fire services can be repositioned to respond to this challenging and evolving agenda going forward.

1.4 Purpose of the White Paper

The fire service is in need of reform and the existing legislative framework i.e. the FBSA does not provide an adequate platform for such reform. This reform is fundamental to better position the fire service to respond to the changing and growing needs of society as well as to contribute meaningfully in the achievement of the strategic objectives of the NDP. This White Paper sets out the vision for the fire service of the future and outlines the strategy for achieving that vision going forward. It also set out key policy proposals and options that government wants to put in place in responding to the challenges facing the sector as outlined in preceding sections. In essence, this White Paper provides a framework for understanding the philosophy and approach in the delivery of fire services in the country going forward These proposals build on the good practice found in today's fire service across the country and globally.

1.5 Vision of fire service

A fire service that is proactive in preventing fires and other risks rather than simply reacting to fires through –

a. Acting in support of the wider developmental agenda as outlined in the NDP;

b. Establishing sound institutional and administrative capabilities that support its roles and purpose;

c. Demonstrating good governance and administration;

d. Adopting community based approaches;

e. Putting people and their concerns first; and

f. Professionalisation of the function.

1.6 Premises of the White Paper

The White Paper takes as its premise, the constitutional imperatives as laid down by the 1996 Constitution of the Republic of South Africa. In terms of the Constitution, fire-fighting services are a functional local government matter as outlined in paragraph B of Schedule 4 with national and provincial oversight. The White Paper further draws mandates from chapter three, six and seven of the country's Constitution, of 1996. This White Paper seeks to clearly define the role of all spheres of government in the sustainable delivery of fire services. It also contains high-level general policy principles that will provide a policy framework for the proposed legislation and subordinate legislation. Relevant international instruments to which South Africa has acceded to also forms the basis upon which this White Paper is premised.

1.7 Background to the White Paper Process

Former Minister (Mr. F.S Mufamadi) of the Department of Provincial and Local Government (now Department of Cooperative Governance (DCoG) granted approval to review the FBSA in April 2006. This review aims to closely align and harmonise the FBSA with other applicable legislation especially the local government legislation. The NDMC initially attempted to achieve the objectives of reviewing the FBSA through amendments and accordingly commenced with the process. Whilst this process was underway, it became clear that this approach would not enable the NDMC to achieve its objectives due to the nature of aspects that must be introduced in the revised fire services legislation.

In line with government approach to policy development, the National Disaster Management Centre (NDMC) published a Discussion Paper: Towards a Fire Services White Paper in March 2013. This document outlined relevant issues on which policy was required. Views and proposals espoused in the Discussion Paper were obtained from fire services stakeholders who were consulted by the NDMC from 2011/12 financial year through provincial workshops that were held in each province. The views of other government departments and other relevant stakeholders were obtained on identified policy issues, through an extensive and coordinated consultation process. This Discussion Paper was also released for wider public consultation and comments through publication in the government gazette in March 2013. A two-day national workshop was held in May 2013 involving all relevant stakeholders. This workshop also assessed written comments that were received from the public. Several workshops were organized in 2013 with key stakeholders to discuss various preliminary policy proposals. All this processes culminated in the production of this White Paper.

1.8 Key policy proposals

There are 20 key policy proposals set out in this White Paper: **These are**:

a. Reform legislation to reposition the fire services into the 21st century;
b. Clear definition of roles and responsibilities of all spheres of government;
c. Establishment of Fire Services Directorate at both provincial and national government spheres;
d. Introduction of a national fire services advisory structure;
e. Locating fire services within the broader development agenda of the country;
f. Development of a National Fire Services Framework;
g. Professionalisation of the fire services;
h. Alignment of applicable regulatory/legislative frameworks to provide a comprehensive and unified legislation for fire services;
i. Establishment of a national fire research & data centre;
j. Development of a uniform risk assessment model;
k. Development of various categories of designated services;
l. Development of a national education and training strategy;
m. Introduction of a risk-based approach in the provision of fire services;
n. Entrenching fire safety and prevention as core deliverables of the fire services;
o. Introduction of a funding strategy for fire services;
p. Make provision to adopt applicable South African National Standards (SANS) to provide benchmarks for the delivery of fire services;
q. Make it mandatory for all municipalities to develop and adopt fire services bylaws;
r. Introduction of a National Fire Code which will deal with fire safety elements which are not addressed adequately in the National Building Regulations;
s. Introduction of a national uniform Incident Management System (IMS) to improve response to fire incidents; and
t. The introduction and implementation of a new Fire Services Act.

1.9 Summary of Chapters

In addition to the introduction (Chapter 1), the White Paper comprises

Chapter 2: Setting the context - Outlines the development and social context for fire services in South Africa, as well as some international trends. The deficiencies of the current legislative framework also receive attention in this chapter together with the key impacts of that the post 1994 local government legislation has on fire services. This chapter will also reflect on the state of fire services, the costs of fires and the risk context within which fire services operates in the country.

Chapter 3: Key principles – Outlines key principles that will underpin and guide the delivery of fire service.

Chapter 4: Developing a new approach – outlines the new fire services operational philosophy

Chapter 5: Role of national government in fire services - Provides key roles and responsibilities of national government in fire services.

Chapter 6: Role of provincial government in fire services - Provides key roles and responsibilities of provincial government in fire services.

Chapter 7: Role of local government in fire services - Provides functions of a fire service including the key roles and responsibilities of fire safety and prevention. This section also outlines the role of volunteers in fire services, powers of a member of service, mechanisms for dealing with false alarms etc. This chapter contains the most important aspects of the proposed fire services policy.

Chapter 8: Fire prevention, safety and protection - Provides context on fire safety and fire prevention aspects of the policy. This section also outlines the paradigm shift from response-oriented operations towards fire safety and fire prevention.

Chapter 9: Designated services - This chapter outlines why government must work with other stakeholders in fire services, the provision of the current fire services legislation on the involvement of other stakeholders as well as the roles that such stakeholders can play in fire services.

Chapter 10: Training, research and capacity building - This section outlines the current fire services training context, impact of other key legislations on education and training of firefighters, use of research in fire services as well as proposals on the establishment of national or provincial academies that will provide specialised fire services training.

Chapter 11: Funding arrangements for the provision of a fire service – This section reflects on previous national funding initiatives dedicated to fire services by national government, current fire services financing arrangements, key challenges created by the current funding dispensation and the principles that must underpin future funding arrangements for fire services in the proposed legislation.

Chapter 12: Transboundary, Regional and International cooperation and liaison on fire services activities – This section deals with the mechanisms required for transboundary, regional and international cooperation on fire services matters.

Chapter 13: Definitions – Defines key concepts used in this White Paper.

CHAPTER 2: SETTING THE CONTEXT

2.1 Locating the delivery of fire services in the socio-economic development agenda of South Africa

The role of fire services has expanded over the years. In addition to fire calls, it rescues people trapped in vehicles and collapsed structures, responds to almost all non-security related incidents as well as other environmental disasters. The role of fire services must be seen in the context of the broader national development agenda of the country. The NDP‘s central goals are expanding employment and entrepreneurial opportunities on the back of a growing, more inclusive economy. The goal of the NDP is to almost treble the size of the economy by 2030, so that 11 million more work opportunities are created. Fire services plays a critical role in protecting strategic and productive assets that sustain the economy of the country. The desired economic growth targets espoused in the NDP necessitates the sustainable creation of capacity to protect strategic economic assets and infrastructure from the risk posed by fires and other related environmental disasters. **Pivotal development points (such as the Waterberg/ Lephalale region, Saldanha Industrial Development Zone, Coega and the strategic freight corridor from Gauteng to Durban) requires adequate protection from the risk posed by fires.**

Fire services play a pivotal role in reducing the vulnerability of these developments to anthropogenic hazards such as fires thereby contributing to building the resilience of the economy.

While there are several factors that heighten vulnerability to fires across the country, like most developing countries, South Africa is also grappling with an increasingly urbanising population. More than 60 % of South Africa’s population live in urban areas, which cover only 1.5% of South Africa’s surface area (South Africa, 2012). Experience has demonstrated that the majority of people migrating to urban centres are forced to settle in marginal land that is often highly vulnerable to environmental and industrial disasters. As outlined in the NDP, most job-seeking migrants moving to cities first live in informal settlements that are an affordable entry to the city and these present particular challenges. These informal settlements are vulnerable to floods and fires, exacerbated by their location in flood- or ponding-prone areas and on sand dunes; inferior building materials and inadequate road access for emergency vehicles (South Africa, 2012).

The new approach to the provision of fire services championed in this White Paper is premised on the recognition that communities at risk of fires must play a central role in reducing their vulnerability to fires. This will require the fire services to establish partnerships with all stakeholders including communities. These partnerships must clearly define the roles and responsibilities of all role players in the provision of fire services. In addition to this, fire services must develop programmes aimed at educating communities on actions that people can take to reduce vulnerability to fires. Going forward, these initiatives must be linked to existing community structures such as ward committees and mechanisms must be put in place to align these activities with the work done by traditional leaders where applicable.

It is clear that the costs of not developing a viable fire service are enormous to the community concerned both in terms of loss of lives, injuries, damage to property and infrastructure as well as the **opportunity cost** in instances where potential investors redirect their investments due to poor capacity of fire services.

2.2 Interface between climate change and fire services

Fire services also need to define its contribution to the vision 2030 of a transition to a low-carbon, resilient economy and just society espoused in the NDP. Consistent with South Africa's primary approach to adapting to the impact of climate change by strengthening the nation's resilience, the fire services must embrace climate adaptation by identifying and putting into effect appropriate policies, strategies and measures. While there are several interventions that the fire service can put in place to contribute to this vision, the following are some of the measures that can be put in place by the function:

a. Construction of green and environmentally friendly fire stations and facilities;
b. Better use of water for firefighting purposes as well as usage of alternate environmentally friendly extinguishing medium;
c. Utilisation of less harmful and environmentally friendly foam;
d. Reduction of emissions especially in prolonged fire incidents;
e. Factoring climate change impacts in land-use planning; including effects of urbanisation on flood characteristics and the urban island heat phenomena created by urban development.

As outlined in the National Climate Change Response White Paper, additional stresses to biodiversity resulting from climate change include wildfire frequency (which appears to already show climate change-related increases in the Fynbos Biome), and the prevalence of invasive alien species. The fire service must develop appropriate strategies to manage veldfire risks in view of the challenges brought about by climate change.

2.3 Current fire services delivery context

Fire services is a capital and resource intensive function. Currently fire services are mainly funded by revenue generated by municipalities. Frankly, this inevitably link the resource base of the fire service to municipal viability with those that are financially viable able to adequately and sustainably fund the function while those that are not viable struggles to finance fire activities in any meaningful way. This also exposes the delivery of fire services to revenue fluctuation dynamics that can affect a municipality. Furthermore, the low-revenue generating capacity of the function serves in most instances as a disincentive for decision makers to provide adequate funding for the function. In short, the competition for limited resources by all basic services such as electricity, sanitation, water, etc. often means that fire services (**which is not defined as a basic service**) is not able to receive priority. It is therefore critical that in addressing the challenges alluded to above, mechanisms are put in place to provide support to municipalities especially those in resource poor areas.

While fire service is regarded as an essential service in terms of the **Labour Relations Act 1995, it is not captured as a basic service in terms of Chapter one of the Municipal Systems Act, Act 32 of 2000.**

This current practice or omission contributes significantly in the allocation of resources to perform the function. The unclear roles and responsibilities of both provincial and national governments in the provision of fire services further hinders the effective provision of this critical function at the local level. This ambiguity also weakens the ability of these two spheres of government to provide adequate oversight and support to fire services at local government level and those operating outside the ambit of local government. In responding to these challenges, this White Paper advocates a paradigm shift from response and operations oriented approaches towards a fire risk management approach that prioritise fire prevention and safety. In essence, the policy advocates a move from reactive to a proactive approach.

2.4 What is the current state of fire services in the country?

In 1999, following a dramatic increase in the value of fire claims paid (R400 million in 1990 and R1.4 billion in 1998), the insurance industry tasked the South African Insurance Association (SAIA) with addressing government regarding these concerns. The former Department of Constitutional Development in response tasked SAIA to perform an assessment with the intention to establish and identify the root cause of service-delivery deficiencies. Since it was not possible to evaluate all the fire services, a cross section was selected. Several root causes of the problems within fire brigade were identified and this includes the lack of compulsory national standards, employment practices, inadequate accountability at some municipalities for the function, lack of effective management, poor maintenance of equipment, fire safety challenges and inadequate funding to mention but a few.

In 2007, in view of assessing which preparations were required for the 2010 FIFA World Cup the former Department of Provincial and Local Government (DPLG) tasked a group of experts, using the same methodology as the SAIA team, to determine the state of fire services with specific focus on services directly affected by this event. The team concluded that whilst there **were areas of excellence**, in essence, little changed in the delivery of fire services. In late 2009, an assessment of a cross section of the fire brigades of the 2010 FIFA World Cup host cities was completed by a group of experts comprising officials of the former DPLG and the Berlin fire brigade. The aim of the assessment was to determine the readiness of fire services to deliver a safe 2010 FIFA World Cup from a fire services point of view. The team concluded that whilst there were still minor areas of concern, in essence, huge strides were made in the delivery of fire services for the event. In fact, of the R 250 mil identified by the 2007 report needed for the upgrade of fire services equipment of the host cities, a total of R 235 mil was raised and spent on resourcing the various fire services involved in the FIFA World Cup. The findings of the SAIA report is not different from the defence report of 1975 that suggests that at the time little has changed in the delivery of fire brigade services.

This translated to significant equipment upgrades, training of personnel and the development of event specific operational plans still in use today. These capabilities will benefit the country going forward when similar sporting and other events are hosted in South Africa. The team also identified two key emerging issues that are affecting fire services that require consideration. The first relates to the different interpretation of Section 84(1) (j) of the Local Government: Municipal Structures Act, 1998 (in use since December 2000) which led to the complex and dissimilar division of fire functions between Districts and Local municipalities. These developments have in some areas led to a two-tiered fire service provided by both District and Local municipalities in the same jurisdiction often resulting in costly and wasteful duplication of efforts and resources.

The second issue relates to the relationship and jurisdictional contests between municipal fire services and other emerging government funded initiatives aimed at addressing fire challenges such as veldfire management. In some instances, these programs are presented as an alternative model for the provision of fire services that raises fundamental questions as **firefighting services are a municipal function as outlined in the Constitution of the Republic**. This places the Chief Fire Officer at the heart of sustainable delivery of fire services. The proposed fire service legislation should provide clarity on the jurisdiction of Chief Fire Officers on role players (government funded or private) who are involved in firefighting across the country. Although these studies were done many years ago, most of these challenges identified remains relevant today and require urgent and concerted efforts by all stakeholders led by government to address them effectively.

Notwithstanding the enormous challenges faced by fire services across the country, most services are implementing several positive initiatives across the country. Several services have established effective Public Information, Education and Relations (PIER) programs that are aimed at providing education and awareness about the measures that communities can put in place to reduce fires as well as measures generally aimed at building skills essential for life safety. These initiatives include amongst others the establishment of Community Emergency Response Teams (CERT) by fire services in most metropolitan areas and some local areas. These teams are comprised of identified community members who are equipped with basic firefighting and emergency mitigation skills required to respond to their community's immediate needs in the event and aftermath of a major emergency, whilst awaiting response from fire services and other agencies. By working together, they assist in saving lives and protecting property. The team’s responsibilities ranges from public education/awareness and information dissemination, to pro-active response to emergencies within the affected community until fire service services arrive.

The Mangaung Fire and Rescue Services established a Fire Brigade Museum that was aggressively marketed as a facility focussing on public fire safety awareness specifically targeting school learners. Since its establishment in 2003, the museum is visited by between four and six thousand people per annum who are exposed to public education which have significantly contributed to an elevated level of fire safety awareness in the Mangaung area. Furthermore, several areas have also benefited due to the expansion of fire services to areas that were previously without services whilst areas that had services have in most areas witnessed significant and sustained upgrading of capabilities. This expansion has been characterised in some areas by the intelligent utilisation of existing facilities such as in the Mangaung case where a vacant industrial building was used to establish a service to areas that were without access to a service with minimal capital investment. Various services have also implemented learnerships in partnership with the LGSETA aimed at building firefighting skills amongst young people using own funding and in some areas in partnership with other government agencies responsible for skills development.

2.5. Fire risk context in South Africa

The fire problem in South Africa is amongst the highest in the world and manifests through the loss of life, the injury (either permanent or temporary) to people, the loss of property and other direct and indirect financial losses. The Paraffin Safety Association of Southern Africa (PASASA) indicated that “more than 200 000 people per year are injured or lose their property from paraffin related fires” (Bradnum, 2007). The fire problem is further complicated by the living conditions in informal settlements characterised by narrow streets which are inaccessible to fire services vehicle as well as the lack of street names which complicates endeavours to reach people in need (Mabena, 2003).

In essence, the risk of fires in the country is influenced by a variety of socio-economic factors notably the rising levels of urbanization which often results in informal settlements comprised of shacks built by highly combustible materials (frequently wood and plastic) and in close proximity to each other which heighten the risk of fires in these areas. The case study of Imizamo Yethu outlined in Figure 4 below typifies the challenges posed by fires in informal settlements across the country:

Figure 4: Fires and fire risks in Imizamo Yethu, Hout Bay, South Africa

> A fire in February 2004 in Imizamo Yethu, an informal settlement in Hout Bay, destroyed 1,200 homes and left some 5,000 people homeless. The settlement was created in 1990 when forestry land was converted into an 18-hectare site for 429 housing plots with services. Imizamo Yethu means 'through our collective struggle'. It is a mix of brick houses and shacks. It has piped water, mostly through public taps – but the supply is irregular and at the time of this fire, there had been no water in the piped system for the previous 24 hours. The fire brigade was called but only half an hour after the fire started (many people did not know the phone number) and the fire engines could not access some areas because there were no roads or because people had put their possessions in the road.
>
> The settlement has had other serious fires – for instance, before the February 2004 fires, there had been fires that destroyed between 40 and 90 buildings in 1995, 1997, 2001 and 2003. In 2008, about 23 houses were burnt down in February, 60 in August, 200 in late November and 200 in early December. The initial causes of these fires are often not clear but the widespread use of candles for lighting and open fires or dangerous paraffin stoves for cooking and heating is clearly part of the reason. The close physical proximity of buildings and the many that are made of flammable materials help explain why fires spread from house to house – although many of the more severe fires here and in other informal settlements in Cape Town are also associated with high winds.

International Federation of Red Cross and Red Crescent Societies, World Disasters Report, 2010.

2.6. Current legislative framework for fire services in South Africa

Firefighting services is a local government function with concurrent provincial and national legislative competence in terms of Schedule 4 Part B, of the South African Constitution. The FBSA is the primary piece of legislation regulating fire services and seeks to provide for the establishment, maintenance, employment, co-ordination and standardization of fire brigade services. The FBSA replaced the Ordinances on Fire Brigade Services of the former provinces of Transvaal, Natal, Orange Free State and the Cape of Good Hope. The main reason for the initiation of the FBSA was the fact that the ordinances could not achieve national coordination and standardisation of fire brigade services. The FBSA provides for:

a. The establishment of a Fire Brigade Board (FBB) that performs functions assigned to it in terms of the FBSA or the Regulations. This Board is comprised of various key role players involved in the provision of fire services;
b. The establishment and maintenance of a service by a local authority in accordance with the prescribed requirements;
c. The establishment of Designated Services which are services that do not fall under the control of a local authority;
d. The appointment of a Chief Fire Officer who possesses the prescribed qualification and experience to be in charge of a service;
e. The appointment of any person who possesses the prescribed qualifications and experience by a controlling authority as a member of its service to perform such functions as may be assigned to him or her by the Chief Fire Officer. The powers of these members of a service are also outlined;
f. The appointment of a Category of Authorised Persons (CAPS) to perform prescribed functions in order to ensure that the objects of the FBSA are achieved;
g. The establishment of a fire brigade reserve force by a controlling authority for its area of jurisdiction;
h. The assignment of far reaching powers to a Chief Fire Officer and members of a service, with indemnity, to perform certain acts to achieve the objectives of a fire service by closing streets, entering or breaking and entering any premises, damage destroy or pull down any property, forcibly removing or cause the forcible removal of a person whom obstructs their actions during an incident and take any material or object to perform their functions provided that compensation is given at a later stage;
i. The salvaging of movable property which is in danger at a fee;
j. The introduction of fees for the rendering of a service;
k. The provision of grants-in-aid by provincial government in support of fire services based on certain conditions;
l. The conclusion of agreements with other fire services to render a more efficient fire service; and
m. The power of the Minister to make regulations as well as the powers of a controlling authority to make by-laws or regulations as the case may be which are not contrary to any law.

2.7. What are the main problems with our current legislation?

a. The FBSA does not make adequate arrangements or place explicit focus on fire safety and prevention particularly community fire safety education.
b. The FBSA does not clearly outline national norms and standards that can be utilised as benchmarks in the provision of a fire service. In addition to these, aspects related to research and development as well as mechanisms for dealing with quality assurance is currently not clarified in the FBSA.
c. The FBSA was promulgated in 1987 and the advent of the new democratic dispensation in 1994 resulted in a myriad of legislation that significantly impact on local government functions and institutional arrangements. This necessitate the review of the FBSA to harmonise it with other key legislation that impacts on the provision of fire services.
d. The FBSA established the FBB as a forum to be consulted on various matters relating to the oversight, regulation and administration of fire services. The FBB meet infrequently which makes its functioning ineffective and the administration of fire services weak. Political oversight is not achieved, as the platform to achieve this vital function is not functioning.
e. The FBSA assigns the administrative work arising from the activities of the FBB to a secretariat. The secretariat, established as a Directorate in the National Disaster Management Centre (NDMC) is under capacitated and under-funded to perform the assigned function.
f. A further weakness is that the current FBSA does not provide clear-cut provisions for the support, oversight, capacity-building roles of provinces and national government respectively as outlined in the country's Constitution, 1996, the White Paper on Local Government, 1998, and other applicable legislations.
g. The Municipal Structures Act, (MSA) 1998 provides for the division of powers between Category C (District Municipalities) and Category B (Local Municipalities) on fire services matters. Although this Act makes adequate provisions for the adjustment of such powers following a set procedure where appropriate, this has resulted in a two tiered fire services in some areas that often results in wasteful duplication of resources and efforts.

Prior to 1998, the legislative dispensation somewhat enabled structures created by the National Veld and Forest Fire Act (NVFFA), 1998 such as Fire Protection Associations to function optimally due to the absence of wall to wall municipalities and municipal boundaries were essentially covering the urban precinct where the risk of veldfires is usually low or insignificant. The advent of the MSA in 1998 and the introduction of wall-to-wall municipalities mean that there is no area in the country outside of municipal jurisdiction. This necessitates that future legislation on fire services should strongly reflect on how alignment and harmonisation can be achieved with the NVFFA to ensure an integrated legal framework for managing fire risk in the country. The future fire services legislation must eliminate confusion as well as clarify the roles and responsibilities of provincial and national governments. It must also outline clearly the framework within which other role players outside government can play a role in fire services with special emphasis on fire safety prevention and fire fighting in key installations. In short, the proposed legislation must elevate fire safety and prevention as a core component of the fire services that must be prioritised by all role players.

2.8 Other key legislation that impact on the provision of fire services

It is important to highlight that current and future fire brigade services legislation must be interpreted within the contextual framework of the Constitution and not in isolation. It is critical therefore to highlight that future fire brigade services legislation must be compatible and harmonised with the existing legal system. Although there are several legislation that impact on the provision of fire services especially due to concurrency and other related factors, the following Acts are some of those that have a direct bearing on the efficient provision of a service (list not exhaustive):

a. Criminal Procedure Act, 1977 (Act No. 51 of 1977);
b. National Building Regulations and Building Standards Act, 1977 (Act No 103 of 1977);
c. Occupational Health and Safety Act, 1993 (Act No. 181 of 1993);
d. National Water Act, 1998 (Act No. 36 of 1998);

e. National Environmental Management Act, 1998 (Act No. 107 of 1998);

f. Municipal Structures Act, 1998 (Act No. 117 of 1998);
g. National Veld and Forest Fire Act, 1998 (Act No. 101 of 1998);
h. Public Finance Management Act, 1999 (Act No. 1 of 1999);
i. Municipal Systems Act, 2000 (Act No. 32 of 2000);
j. Disaster Management Act, 2002 (Act No. 57 of 2002);
k. National Health Act, 2003 (Act No. 61 of 2003);
l. Municipal Finance Management Act, 2003 (Act No. 56 of 2003);
m. Major Hazardous Installation (MHI) Regulations;
n. Safety at Sports and Recreation Act, 2010 (Act No. 2 of 2010).

2.9. Adoption of relevant South African National Standards (SANS) to support effective delivery of fire services

South Africa is part of the global community and as such, we need to be aware of what is going on in other countries, especially if we trade with those countries. In order to reduce the barriers to trade, we often endeavour to align our standards and our work on standards as much internationally as possible. A standard is a document that has been developed by a group of the stakeholders that represent the interests of those parties that will be affected by the outcome of the standard. Standards contain requirements to which one can claim conformity and to which conformity can be tested. This makes it possible to refer to standards in regulations covering minimum safety or performance criteria (SABS).

Standards offer several advantages to the market place that include:

a. Providing a common terminology, symbols and units to allow for communication;

b. Standardising test methods, reporting units and acceptance criteria to facilitate comparisons and to make claims of conformity regarding the product in the market place, and

c. Providing the basis for acceptable safety levels and fitness for purpose performance criteria.

With regard to fire services, various standards have been developed and are being used widely in the sector. Thus, it is important for the revised fire services legislation to provide for the adoption of relevant standards that could enhance the delivery of fire services to communities as well as ensure that adequate indicators are in place to effectively monitor and evaluate performance of fire services on various fronts. It is also important for a standard to outline the minimum infrastructure, equipment and human resources required to effectively render a service taking into account the risks prevalent in the area of jurisdiction.

2.10 National Fire Code

While standards are important, there are a number of fire safety elements that are not comprehensively addressed in the National Building Regulations (NBR) since they are not directly relevant to the NBR. Although these aspects are currently dealt with through bylaws, a National Fire Code (NFC) must be developed in order to address these important issues adequately and comprehensively. Typical elements which will be addressed by the NFC include fire safety in existing buildings, informal settlements dwellings, home fire suppression and detection systems, day-care centres, crèches, schools and colleges, special risks such as transformer installations, turbine rooms, to name but a few. The NFC must be consistent with other applicable SANS and must contribute to the creation of a holistic, harmonised and comprehensive fire services legislative and policy framework in the country. Mechanisms must be put in place to ensure that detailed technical aspects of the NFC are integrated into Fire Services Regulations.

CHAPTER 3: GUIDING PRINCIPLES THAT MUST UNDERPIN DELIVERY OF FIRE SERVICES

The Batho Pele White Paper (1997) noted that public services are not a privilege in a civilised and democratic society but that they are a legitimate expectation. The eight Batho Pele Principles that aim to progressively raise standards of service, especially for those whose access to public services have been limited in the past and whose needs are greatest will form a premise upon which the provision of fire service will flow. These principles also resonate with the pillars of the Back to Basics approach adopted by government in 2014 that amongst others seek to put people at the heart of service delivery:

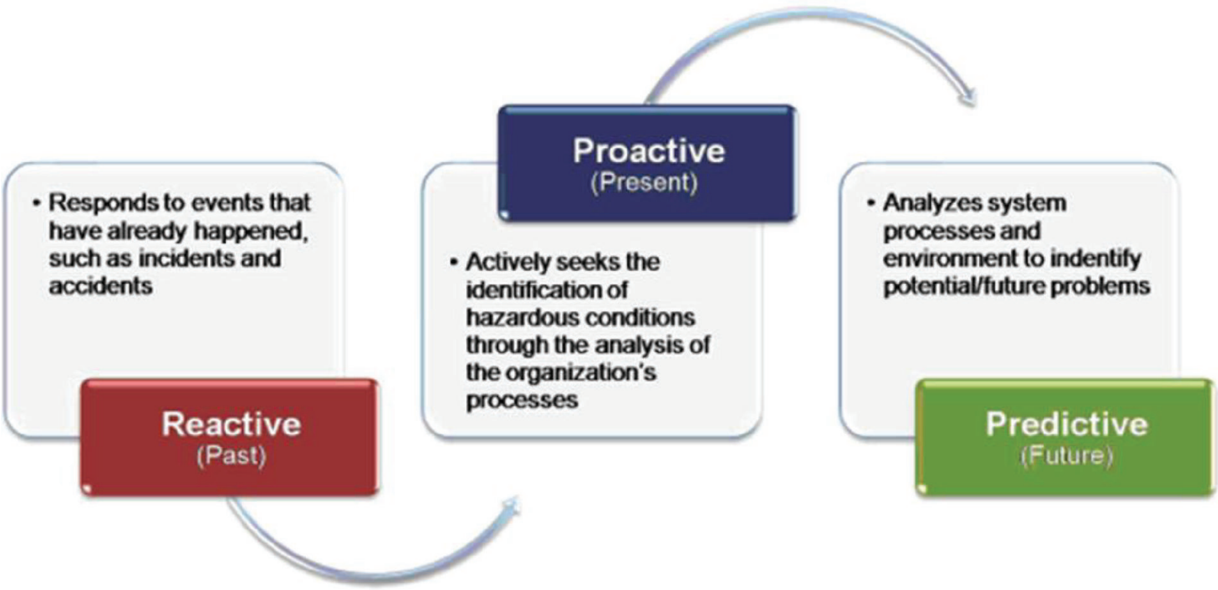
Figure 5: Key principles that must underpin delivery of fire services

It must take care of the most vulnerable first	The new Fire Services Act must make adequate provisions for providing fire services to those categories of society most vulnerable to fires.
It must inculcate a culture of fire prevention	Government will encourage both citizens and government structures to take adequate measures to prevent fires thereby protecting lives, properties, livelihoods and the environment from fires at all times.
It must integrate into development	Fire safety and prevention should be integral part of development initiatives.
It must have an integrated approach	Planning for the provision of fire services must be integrated with plans, initiatives, etc. of other agencies.
It must be based on consultation	Fire Services must regularly and systematically consult the users of their services about the services they provide. Consultation will provide essential information about where the priorities of a fire service should lie in improving services.
It must ensure community involvement	Community must know what fire services and fire safety and prevention in particular stand for, what their own responsibilities are, how they prevent fires, how they must handle fires and what they can do to support themselves during fires when necessary.
It must be driven at all spheres of government	All spheres of government have a role in the provision of fire services and must execute such roles and responsibilities effectively and efficiently.
It must be risk based	Fire risk is dynamic and context specific. Strategies to manage fire risk should be informed by the prevailing local risk conditions. Robust and scientific risk assessment should form the premise upon which fire service planning must be based.
It must have legitimacy	Structures tasked with the provision of fire services must be recognised by all key role players in the various government structures, as well as amongst the various community structures with whom liaison is necessary.
It must strive for excellence	In rendering service to communities, fire services must strive for excellence at all times.
It must be based on partnerships	Government cannot meet the development needs of South Africa on its own. Mutual and sustainable partnerships between government and other partners are critical for the effective and efficient delivery of fire services. Business and industry, Non-Governmental Organisations (NGOs), academic institutions and other bodies throughout the community should be encouraged to play a part in supporting fire services.
It must be effective and efficient	The provision of fire services should be outcome driven and cost effective.
It must be affordable and sustainable	Government must ensure that fire services are affordable and can be provided on a sustainable basis.
It must be needs oriented and prioritised	Fire services must be responsive to the needs of communities and must receive priority including in resource allocation.
It must ensure that the delivery of fire services are based on measurable standards	The delivery of fire services must be measured against clear, attainable, realistic and measurable standards. These standards must not be a 'one size fits all' and must be determined by the respective fire services. A differentiated approach based on risk and capacity of each fire service must form the backbone of these standards.

CHAPTER 4: DEVELOPING A NEW APPROACH

In light of the above, it is clear that traditional methods of providing fire services have not enabled the country to adequately manage the evolving fire risk faced by communities. Following extensive interactions between the NDMC and stakeholders involved in fire services, this White Paper seeks to entrench fire safety and prevention as core components of fire services. This requires a paradigm shift from response oriented methodologies of providing fire services towards an approach that primarily strives to reduce fire risk through fire safety and prevention initiatives. **Figure 6** indicates the transition from a reactive approach towards a more proactive and predictive approaches to the delivery of fire services that is espoused by this White Paper:

Figure 6: New fire services operational philosophy



Chapter 7 and 8 provide detailed discussion on this new approach to the provision of fire services.

CHAPTER 5: ROLE OF NATIONAL GOVERNMENT IN FIRE SERVICES

5.1 Contextualizing the role of national government in the provision of fire services.

Notwithstanding the fact that firefighting services are rendered by the local sphere of government, both provincial and national government also have specific roles and responsibilities in terms of the country's Constitution, 1996. Section 41 of the Constitution clearly stipulate the principles of co-operative government and inter-governmental relations and specifically requires the three spheres of government to co-operate with one another in mutual trust and good faith by among others, fostering friendly relations; assisting and supporting one another; informing one another of, and consulting one another on, matters of common interest. Section 154 of the Constitution, 1996 further calls upon national and provincial governments, by legislative and other measures, to support and strengthen the capacity of municipalities to manage their own affairs, to exercise their powers and to perform their functions. In addition, the White Paper on Local Government, 1998 also clearly defines the roles and responsibilities of both national and provincial governments in relation to local government.

In light of the above, it is therefore critical that in defining the role of national government in the provision of fire services, the high-level roles and responsibilities of national government as outlined in the White Paper on Local Government (1998:77-81). Amongst others, the roles and responsibilities of national government with respect to local government includes:

a. A strategic role – national government is responsible for setting the overall strategic framework for the economic and social development of the nation;
b. Providing a legislative framework for local government – national government must provide an overall legislative framework for local government within the general framework set out in the Constitution, and
c. Monitoring and oversight – to ensure the necessary levels of compatibility, uniformity and consistency, national government needs to develop an overall

framework for a system of monitoring and oversight within which other organs of state, particularly provincial governments, will perform these functions.

5.2 Role of the NDMC in the provision of fire services

The roles and responsibilities of the NDMC must be defined in terms of the framework set by the Constitution, 1996, the White Paper on Local Government, 1998 and other applicable legislative frameworks. In view of this, DCoG will be responsible for the following functions amongst others:

a. Establishment of a National Fire Services Advisory Council to advice the Minister on fire services and related matters;
b. Establishment of technical structures required to support the effective functioning of the national advisory structures;
c. Provision of monitoring and oversight on fire services issues;
d. Establishment of a national strategic agenda for fire services;
e. National coordination of fire services activities;
f. Development and implementation of a national fire services strategic framework which will set standards for the delivery of fire services;
g. Development and implementation of national norms and standards for the delivery of fire services;
h. Development and implementation of a national fire safety program;
i. Development of a national fire services education, training and research strategy;
j. Establishment of institutional arrangements for quality assurance in the provision of education and training for the fire services sector;
k. Establish mechanisms to protect national key strategic facilities from fires;
l. Development and implementation of a national strategy to professionalise the fire services;
m. Development of a career path for personnel in the fire services taking into account the importance of multi-level entry for practitioners;
n. Engagement with other national sector departments and industry stakeholders on fire services issues;

o. Preparation and submission of annual reports on the state of fire services to oversight structures including those established in terms of the Intergovernmental Relations Framework Act, 2005 (Act No. 13 of 2005) when required;
p. Coordinate the involvement of fire services in regional and international activities and initiatives;
q. Develop and maintain a directory of all municipal, designated and industrial fire services in the country;
r. Standardisation of norms and standards through model bylaws and other means;
s. Establishment of a national fire research & data centre;
t. Coordinate the establishment of a 112 Public Emergency Number in partnership with other first responders in terms of the provisions of the Electronic Communications Act, 2005 (Act 35 of 2005) (ECA), and
u. Establishment of a Fire Services Coordination unit to oversee the administration and implementation of the fire services legislation and the performance of duties alluded to above.

5.3 Mechanisms for monitoring implementation, evaluating the outcomes and modifying the implementation process where required

Monitoring and evaluating the implementation of this policy by all spheres of government is critically important for achieving the objects of the White Paper. While there are various mechanisms that will be utilised to monitor the implementation and evaluate the outcomes with a view to fine-tune the implementation process where required, the following are some of the key measures that will be deployed in this regard:

a. Promulgation of regulations that will deal among others with the submission of fire statistics, reports and other relevant information by all spheres of government involved in the implementation of this policy;
b. The establishment of national monitoring systems to assist the NDMC to monitor the implementation of the policy;

c. Utilisation of national advisory structures as proposed in Chapter five of the White Paper as a coordinating mechanism to monitor implementation by all role players;
d. Development of indicators (in line with the powers and duties of each sphere) that will be utilised to monitor implementation, evaluate the outcomes as well as forming a basis for modifying or fine-tuning the implementation process;
e. Annual reporting mechanisms which will enable each sphere of government to report to its executive and governance structures on –
   i. Its activities during the year;
   ii. Major fires that occurred during the year within each sphere of government ‘s jurisdiction;
   iii. Magnitude and severity of these major fires;
   iv. The effects they had;
   v. Particular problems that were experienced in dealing with these major fires and generally in implementing the White Paper.
f. Development of national norms and standards that will be used to monitor implementation of the policy as well as check compliance with the White Paper by all spheres of government.
g. The NDMC will, within available resources, provide support and assistance to all spheres of government in the implementation of the policy with particular bias towards those having/ facing challenges to implement as required, and
h. The NDMC will monitor the capacity of provinces and municipalities to implement this policy and where necessary, will provide assistance, based on the availability of resources at its disposal.

5.4. Professionalisation of fire services

While the fire services in South Africa has largely developed outside a formal and rigid professional framework due to a variety of historical reasons, there is consensus among practitioners that a clear professionalisation strategy must be developed and implemented in order to enhance the delivery of fire services and respond to some of the challenges facing the sector. Thus, in order to create a solid legal basis, the revised legislation must empower the Minister to appoint a Registration Regulating Authority that must be responsible for the development and implementation of a fire services professionalisation strategy in the country covering both municipal and industrial fire services.

5.5 National Fire Services Advisory Council

The Minister must establish a National Fire Services Advisory Council that will replace the Fire Brigade Board. The object of the Council is to advise the Minister on any matter related to fire services in the Republic. The Minister must consider and respond to the advice provided to him or her by the Council. The Advisory Council must include representatives of key national departments, representative of each province, organised local government, organised business involved in fire services, professional organisations, representatives of research and academic institutions involved in fire services, etc. The Advisory Council must have the authority to establish technical committees/ working groups that will assist it in discharging its duties effectively.

CHAPTER 6: ROLE OF PROVINCIAL GOVERNMENT IN FIRE SERVICES

6.1 Contextualising the role of provincial government in the provision of fire services

The White Paper on Local Government, 1998 defines the roles and responsibilities of provincial government as follows:

a. A strategic role – with respect to developing a vision and framework for integrated economic, social and community development in the province through the provincial growth and development strategy;
b. A development role – provincial governments should ensure that municipal integrated development plans combine to form a viable development framework across the province, and are vertically integrated with the provincial growth and development strategy;

c. An intergovernmental role – provincial government has an intergovernmental role to play with respect to local government. It should establish forums and processes for the purpose of including local government in decision-making processes which affect it;

d. Regulatory role – Section 155 (7) of the Constitution gives national and provincial government the legislative and executive authority to see to the effective performance by municipalities of their functions in respect of matters listed in Schedules 4 and 5, by regulating the exercise by municipalities of their executive authority with respect to the local government matters listed in Parts B of schedules 4 and 5, and any other matter assigned to local government by legislation.

6.2 Role of the Provincial Disaster Management Centre in the administration of the FBSA at a provincial level

Provinces play a critical role of supporting municipality in the optimal delivery of fire services to communities. While it is important (as outlined in the White Paper on Local Government, 1998) that provincial governments will need to tailor their approaches to supporting local government according to the specific conditions which prevail in each area, the following are some key roles and responsibilities of this sphere of government in the provision of fire services:

a. Ensure implementation of a national strategic agenda for fire services;

b. Establishment of provincial oversight mechanisms;

c. Ensuring adequate linkages and alignment with existing intergovernmental structures for purposes of advancing the objectives of the fire service;

d. Ensure provincial coordination of fire services activities in the province;

e. Establishment of institutional arrangements to support cooperation between fire services in the province;

f. Supports implementation of a national fire services strategic framework;

g. Supports the development and implementation of a national fire safety program;

h. Monitoring and evaluation of fire services in the province;

i. Establishment of intergovernmental and advisory committees to ensure stakeholder participation in fire services activities;

j. Ensure provision of education, training, research, and capacity building for fire services;

k. Ensure the provision of annual reports to oversight structures;

l. Provision of support to fire services stakeholders on urban search and Rescue;

m. Provide targeted support including resources to municipalities;

n. Act as a focal point for Urban Search and Rescue (USAR) within the province, and,

o. Establishment of a Fire Services Coordination **Directorate** to oversee the administration and implementation of the fire services legislation and the performance of duties alluded to above.

CHAPTER 7: ROLE OF LOCAL GOVERNMENT IN FIRE SERVICES

In recent years, the role of the fire service in many communities has expanded far beyond fire suppression. The name "fire department" does not begin to cover the many services that progressive organisations are providing to their communities. With this expansion, fire prevention and public education have appropriately begun receiving an increased emphasis as the proactive elements of a fire service delivery system. Citizens are dependent on the fire department to ensure their protection against dangers of fire, entrapment, explosion, dangerous goods incidents and any emergency event that may occur in the community (Paulsgrove, 2003).

7.1. Establishment and maintenance of municipal fire services

Consistent with global changes, the scope of responsibilities within the fire services in South Africa has evolved to include rescue, dangerous goods, as well as dealing with emerging threats which includes terrorism and responding to natural and anthropogenic disastrous incidents. Currently, the FBSA provides for local authorities to establish and maintain a fire brigade service for the following different purpose:

a. Preventing the outbreak or spread of a fire;
b. Fighting or extinguishing a fire;
c. The protection of life or property against a fire or other threatening danger;
d. The rescue of life or property from a fire or other danger;
e. Subject to the provisions of the Health Act, 1977 (Act No. 63 of 1977), the rendering of an ambulance service as an integral part of the fire brigade service; or
f. The performance of any other function connected with any of the matters referred to in paragraphs (a) to (e).

7.2 Roles and responsibilities of the fire service

It is clear in light of the above that going forward, the roles and responsibilities of a fire service must reflect the evolving nature of responsibilities and expectations that society have from their fire service. This White Paper expands the roles and responsibilities of fire service to the extent that a municipality is responsible for the provision of a fire service in its area of jurisdiction that must include the following:

a. integrated development planning towards uniform fire services;
b. coordination and regulation of local authority fire services, designated fire authorities and volunteer fire associations;
c. development of specialised fire services capacity to deal with specialised fire risks prevalent in the area such as veldfires, chemical, informal settlements fires, etc;
d. development of specialised dangerous goods incident response capacity to perform incident stabilization and perform oversight of cleaning operations;
e. development of specialised rescue services capacity focussing on the rescue disciplines prevalent in the area of jurisdiction as a priority;
f. coordination of the standardization of infrastructure, vehicles, equipment and operational procedures;

g. facilitation and coordination of the training and development of practitioners;

h. development and facilitation of the implementation of standardised municipal by-laws;

i. Coordinate planning for the provision of fire safety and prevention;

j. development, implementation and maintenance of mutual aid agreements amongst the local fire services, designated fire authorities, Fire Protection Associations and volunteer fire associations;

k. development, support and implementation of community based fire safety and prevention programs;

l. establishment and maintenance of a District Fire Service Coordination Forum;

m. preventing the outbreak and or spread of a fire, by making arrangements amongst others for: -

(i) the provision of information, publicity, training, education and encouragement in respect of the steps to be taken to prevent fires and death or injury by fire;

(ii) the giving of advice, on request, about –

- how to prevent fires and restrict their spread in buildings and other property;
- the means of escape from buildings and other property in case of fire;

(iii) conducting regular and random fire safety inspections at any premises where the Chief Fire Officer or his or her designate deems necessary;

(iv) providing advice on the means of escape from buildings and other property in case of fire;

n. fighting and extinguishing a fire; by making arrangements amongst others for: -

(i) having sufficient staff, equipment and vehicles at its disposal to deal with the fire risks in its area of jurisdiction – a risk based approach;

(ii) the development and implementation of standard operating procedures for use during firefighting operations; and

(iii) call taking and dispatching facilities training for dealing with incoming calls to report fires and summoning personnel amongst others;

o. control and stabilisation of dangerous goods incidents;

p. protection of life and or property against fire or other related danger;

q. rescue of life and or property from fire or another form of entrapment;

r. rendering of an emergency medical care.

s. performance of fire safety activities;

t. participation in special events planning;

u. provision of fire resilience training to fire practitioners and civil society at large;

v. maintenance of fire service equipment, infrastructure and or materials;

w. Conducting fire risk assessments;

x. Provision of training and to fire services practitioners;

y. Procurement of equipment, materials and other supplies required to perform the functions optimally;

z. Provision of support in the implementation of Disaster Management Act, 2002 (Act No. 57 of 2002), and

aa. Performance of any other function connected with any of the matters contemplated in paragraphs (m) to (v)

It is important to note that while fire service is a line function and disaster management a coordinating function, there must be closer working relations and cooperation between these two critical services. Furthermore, in discharging the duties alluded to above, especially those related to emergency response and other life-saving activities, a fire service may utilise emergency lights regulated in terms of the provision of the Road Traffic Management Act.

7.3 Division of powers and functions between various categories of municipalities

Fire fighting is listed as a local government function in Schedule 4 Part B of the Constitution. Section 156 (1) (a) in the Constitution does not differentiate between district and local municipalities. A core constitutional objective for local government is to ensure a safe and healthy environment for its communities. By not providing a service such as fire fighting, municipalities would be failing in their constitutional obligations. A discussion on powers and function for fire services must be located within the broader context of the two-tier local government system. The current service delivery model emanating from the two-tier system is beset with challenges such as:

a. Fragmentation in the delivery of services;
b. Duplication of efforts and resources;
c. Jurisdictional contest.

In view of the complexity involved in addressing this matter, the Department has identified the following fundamental principles as critical to the allocation of powers and functions:

a. Clear definition of roles and responsibilities is necessary to avoid duplication of efforts and resources which is costly and wasteful;
b. Recognition that District municipalities have an inherent responsibility to support local municipalities in its area of jurisdiction;
c. Recognising the importance of a differentiated approach as opposed to a one-size-fits-all approach that fails to appreciate the specific contextual variables of each municipality;
d. Appreciating that the function can be delivered as a shared service as long as roles and responsibilities are clearly defined;
e. Approach to division of powers must be underpinned by the principles of a risk-based approach to the provision of fire services;
f. The allocation of powers especially for local municipalities must recognise the role played by fire services in building plan approvals, land and township development initiatives amongst others;

g. Finally, municipalities must act in accordance with constitutional requirement of cooperative government.

It is also important to note that most local municipalities have fire services bylaws that are utilised to manage various aspects of the fire services including the organisation of the fire services, fire protection and fire fighting, management of dangerous goods, and other related matters. This is also linked to the role of municipal fire services in amongst others, building plan management processes, township development, etc.

In view of issues outlined in the preceding paragraph, it is clear that in the medium to long-term, the Department must ensure that applicable legislation are aligned and harmonised to create a unified legislative framework that provides clarity on the division of powers and functions between the various categories of municipalities. While a metropolitan municipality has the powers to render all functions outlined in 7.2 above, it is recognised that the MEC may adjust powers between a district and a local municipality in terms of the Municipal Structures Act, 1998. Where all powers to render the function resides with a district municipality, such a district municipality must perform fire services functions established by sub-section 7.2 (a) – (aa) for the area as a whole. Where an MEC has adjusted the firefighting function to be a function of the local municipality, or recognised a designated fire service, the district municipality must continue to perform the functions listed in sub-section 7.2 (a) – (l) whilst the local municipality or designated fire service, as the case may be, must perform the functions listed in sub-section 7.2 (m) – (aa). It is important to note that section 84 (1)(j) can be interpreted to mean that local municipalities retain firefighting functions and that this function has not been wholly allocated to district municipalities meaning that adjustment by the MEC is not necessary. **As outlined in section 88 of the Municipal Structures Act, 1998, municipalities must cooperate with one another in the provision of services.**

7.4 Appointment of a Chief Fire Officer and a member of the service

Currently, section 5 and 6 of the FBSA provides for the appointment of a Chief Fire Officer and Members of Service respectively by a controlling authority. Both the

Chief Fire Officer and the Member of Service must have the prescribed qualifications and experience to perform their respective functions. Although appointment of members of service remains a prerogative of the municipality or designated service, national government must ensure that the qualifications and experience required for such appointments are **prescribed appropriately**. This means that a regulation that sets out the inherent physical and medical requirements, minimum qualifications, experience and competencies that a person must comply with prior to appointment into the service must be developed.

National government must also develop a career path for fire services personnel. Such a career path must lay out positions within the hierarchy of the fire services, time in grade requirements as well as education and certifications (qualifications) needed for promotional consideration. It is critical that a career path recognises and creates a framework for multiple entry points into the service, allow for specialisation as a person progress in the service and the education curriculum must reflect such specialisation and be linked to the agenda to professionalise the fire services. Accordingly, generic skills must be provided at the initial career years while focused managerial and organisational education becomes critical as a person progress through the ranks.

7.5 Powers of a Chief Fire Officer and a member of the service

It is critical that fire services practitioners have adequate powers conferred upon them by legislation if they are to execute their work effectively. The following are some of the powers of a member of service:

a. Take command of other persons who may place their services at the disposal of the fire service;

b. Remove or order any member of the service to remove any person who by his presence or conduct interferes with or obstructs the operations of the service;

c. Enter a premises or a place, by force if necessary, without the consent of the owner or occupier of the premises or place when a there is a fire, smoke or to investigate if a fire, smoke or other aspect presents a life safety risk;

d. Move or break into a vehicle **without the consent of its owner for rescue**

purposes;

e. Close any highway, road or pathway in the process of managing an incident;

f. Restrict the access of persons to a premises or a place so long as there is a life safety risk.

g. Bring any apparatus or equipment onto premises to perform such functions as to achieve the objectives of a service;

h. Destroy (wholly or in part) or damage any premises or container in order to fight a fire, prevent its spread or reduce the life safety risk posed;

i. Shore up any building, or premises to protect it from fire or other life safety danger;

j. Shut off the supply of water from any main, pipe or other source to obtain greater pressure or supply or take water from any source whether natural or artificial to optimise the supply of water during an incident;

k. Cause to be shut off or disconnected the supply of gas, electricity or any other source of energy to any premises or area.

l. Generally, take any measure that may appear in the circumstances to be necessary for the protection of life and property in fulfilling the legal mandate of the function.

Fire kills, and preventing fires saves lives and reduce injuries and saves money. In view of this, it is therefore important that adequate mechanisms must be put in place to enable the Chief Fire Officer or a member of the service to make decisions without delay in pursuit of objectives of the service as set out in legislation. The fundamental difference between the work undertaken by operational staff and fire safety personnel also necessitates a clear division between the powers assigned to the two units i.e. Fire safety and firefighting operations. A Chief Fire Officer must be at a level (within an organisation) where he or she is able to influence decision making in order to effectively implement the legal mandate of the fire services.

7.6 Appointment of a fire service reservist

Reservist's firefighters play a critical role in most firefighting services across the globe. A reservist firefighter assists a fire service, typically on a part-time basis. Currently in South Africa, many fire services depend on reservists to provide services to their communities. **The proposed fire services legislation must make**

provision for the Chief Fire Officer to recruit and utilise reservists who meet the prescribe requirements in the fire services. Reservists have powers similar to those highlighted for a member of service. This White Paper makes provision for the recruitment and utilisation of reservists in fire services.

7.7 Call taking and dispatch

Call taking and dispatch play a critical role in fire services operations and service delivery. It is through a call taking and dispatch facility that a fire service receives a fire alarm, dispatch appropriate resources to the correct location and maintains contact with mobile units after dispatching them to an incident. During major emergencies, the call taking and dispatch facility is also responsible for liaison with other fire services that may be required for assistance. In order to function optimally, a call taking and dispatch facility must have infrastructure that will enable communication to and from operational resources as well as enable coordination of recourses. This infrastructure includes two-way radio communications networks, computer aided dispatch systems, Management Information Systems, and resource tracking systems. Naturally such infrastructure is expensive, complex and requires significant management input to such an extent that most municipal fire services have progressed little towards installing and using these systems. Going forward, the fire service legislation must provide adequate mechanisms for this critical component of the fire service.

7.8 Mutual aid agreements

Fire services must determine their level of capacity to discharge their legal mandate and to ensure that where necessary, and to strengthen this capacity; they enter into mutual aid agreements with neighbouring fire services, the private sector and any other agency involved in the provision of fire services.

7.9 False alarms

The FBSA in section 21 (d) states any person who summons a service while he or she knows that there is no reason to do so, shall be guilty of an offence, and on conviction liable to a fine not exceeding R10 000 or to imprisonment for a period not exceeding 12 months. The revised fire services legislation must provide for mechanisms for dealing with false alarms including tougher penalties provisions thereof to reduce this phenomenon. Municipal by-laws must put adequate mechanisms to deal with issues of false alarms decisively.

7.10 Dangerous goods management

While fire services play a fundamental role in the safe storage and transportation of dangerous goods, there are other role players involved in this process. The absence of a single and unified policy or legislative framework dealing with dangerous goods adds further complexities. Against this background, it is of paramount importance that the roles and responsibilities of fire services are clearly defined to minimise confusion, overlapping and duplication of efforts and resources that is costly and wasteful. Furthermore, it is critical that fire services must enter into partnerships with other role players involved in dangerous goods management. With regard to Major Hazard Installations (MHI), the MHI Regulations places a duty on the employer to draw up an on-site emergency plan to ensure the safety of the workers and the public. This plan must however be discussed with the relevant local government. Local government and fire services are responsible for all fire related off-site emergency plans to be followed outside the premises of the MHI. This means that fire services must build adequate capacity to discharge these functions and must in fact lead and coordinate response to fire related incidents. It is important to note that in doing this, fire services must work closely with other agencies such as Disaster Management, Emergency Medical Services, law enforcement agencies, etc.

7.11 Integrated veldfire management

Studies by Council for Scientific and Industrial Research (CSIR) have revealed that veldfires are a common feature of the South African landscape, and are the inevitable consequence of a combination of fire-prone vegetation and a warm, dry climate. The public often regard fires as universally bad, but both scientific facts and traditional knowledge contradict this view. Grasslands, fynbos and savanna all require fire as an integral part of their proper functioning. Collectively these fire-prone biomes cover almost half of South Africa. However, fires can and do kill people and animals, and destroy crops, grazing and houses, making their deliberate use in land management controversial (CSIR, 2006). South Africa's National Veld and Forest Fire Act, 1998 (NVFFA) recognises the need for, and is intended to support, integrated veldfire management. Integrated veldfire management encompasses a range of activities that together allow for the effective management of fires, both to enhance their positive benefits as well as to reduce their negative impacts. Activities such as prescribed burning, veldfire control, risk minimisation, training and awareness, resource management and co-ordination and ecosystem management all fall within the scope of integrated veldfire management.

Furthermore, the NVFFA provides for the formation of Fire Protection Associations (FPAs) which can be established by landowners for the purpose of predicting, preventing, managing and extinguishing veldfires. The NVFFA recognises the integrated nature of veldfire risk management and calls upon the Chief Fire Officer to be the Fire Protection Officer of an FPA and carry out duties to ensure that the FPA functions effectively. Thus, it is important for the FPA to work closely with the Chief Fire Officer in order to effectively manage veldfire risks in each area. This means that the Chief Fire Officer remains at the heart of sustainable management of fire risks including veldfires within a municipal area of jurisdiction.

7.12. Incident Management Systems

Experience and empirical studies have demonstrated that most response problems are often related to communication and management deficiencies rather than lack of resources or tactical failures. These shortfalls were mainly because of weak accountability, poor communication and inadequate planning processes as well as lack of knowledge with common terminology during an incident. It is therefore important that the fire services must adopt a uniform Incident Management System (IMS) in order to improve its response to large-scale fire and related incidents. While an IMS seeks to achieve various purpose such as the provision of overall safety of personnel and members of the public, ensure that the achievement of objectives are carried out efficiently and effectively, it must also –

a. Provides a uniform and standardised management tool for use on any type of incident or event irrespective of size;

b. Allows for a co-ordinated response amongst various agencies and across different jurisdictions;

c. Establishes common processes for planning and resource management, and

d. Ensure integration of resources within a common management structure.

A modular approach must be utilised in the development of a fire services IMS system in order to allow for overall integration of such a system in a broader National multi-hazard IMS system for use in multi-agency and jurisdictions response environments.

7.13 Physical fitness and mental health of firefighters

Experience and research have demonstrated that firefighting is one of the most stressful, physically demanding and hazardous occupation. This is exacerbated by the anxiety associated with unknown situations and unforeseen emergencies that firefighters respond to on a regular basis. There is no doubt that the nature of the job requires strength, discipline, and regular exercise in order to cope effectively with the occupational demands inherent to the job. It is important that firefighters meet the physical requirements upon entry in the service and must be subjected to regular physical fitness tests in order to ensure that they remain physical ready to respond to the demands of the profession. A national standard/ framework that outlines the physical requirements including a Candidate Physical Ability Test (CPAT) must be developed for use in the fire service. Such a framework must be informed by international good practice and applicable standards that have been utilised successfully in fire services environments.

Whilst many fire services have both physical fitness and physical health monitoring and support programmes, few, if any recognise the need for mental health services, especially in a preventative mental health approach. Fire services is an extremely demanding occupational environment to work in. The many situations that fire services personnel are confronted with often involve death, injuries, human suffering and loss that test the emotional resources of personnel. A significant percentage of staff in many fire services develop psychological disorders such as critical incident stress, post-traumatic stress disorder, depression, anxiety disorders, substance abuse often resulting in the break-up of intimate relationships (American Psychiatric Association, 2000). This is exacerbated by an entrenched culture of being tough and not needing help that pervades the fire services. It is therefore critical that going forward, mental health support programmes needs to be put in place and must focus on preventative psychosocial interventions aimed at empowering the personnel to deal with the stressors inherent in the working environment. In essence, this White Paper seeks to make it obligatory for fire services to implement and maintain employee wellness programmes that will address the mental health needs of fire services staff in a professional manner. Various strategies to give effect to this must be explored and benchmarking must be undertaken to understand how other related sectors deal with these challenges.

7.14 Annual reports

Accountability and oversight are important in the provision of government services including fire services. The submission of annual reports to administrative and political oversight structures will be mandatory to enhance accountability within the context of good governance as outlined in the Back to Basics approach. The responsibility to provide annual reports is not limited only to municipal fire services but includes reporting by designated services.

7.15 Possible disputes arising out of proposals contained in the policy

The NDMC anticipates possible labour disputes arising because of appointment of people without the prescribed skills, qualifications and experience to the service either as a member of the service or a Chief Fire Officer. These disputes will be managed in line with the provisions of the Labour Relations Act, 1995 (Act 66 of 1995 as amended) and other applicable legislation. With regard to disputes arising out of the performance of duties flowing from this policy, the NDMC has categorised these into pre-fire (Fire Safety and Prevention) and during (firefighting operations) as depicted in Figure 6 below:

Figure 7: Possible Fire Safety and firefighting operations dispute resolution mechanisms

Fire safety and prevention	**Dispute resolution mechanisms**	**Firefighting operations**	**Dispute resolution mechanisms**
Poor enforcement of fire safety standards and by-laws	Municipal bylaws and Standard Operating Procedures (SOPs)	Late arrival at an emergency incident where the fire service has been requested by a member of the community	To be dealt with as per section 7.14 below
Refusal to acknowledge and receive notice of non-compliance with fire safety standards and by-laws legally issued by a duly appointed Fire Safety Officer (FSO)	To be dealt with as per section 7.14 below	Arriving at an emergency incident with inadequate or inappropriate equipment, material and personnel to manage an emergency incident	The SOPs must outline the manning, material and equipment requirements that are required to deal with various incidents. Complains from the public will be dealt with as per section 7.14 below
Bribe solicitation (real or perceived) by a duly appointed FSO	To be dealt with as per section 7.14 below	Complains regarding undue or avoidable damage to property due to firefighting	To be dealt with as per section 7.14 below
Disputes related to a duly appointed FSO accessing a premise at unreasonable time to execute his or her work	Municipal bylaws and Standard Operating Procedures (SOPs)	Deployment of inappropriate tactical strategies to manage an incident	SOPs must outline this and complains from the public will be dealt with as per section 7.14 below
Obstructing a duly appointed FSO from executing a legal responsibility	Municipal bylaws and Standard Operating Procedures (SOPs)	Disputes related to safety concerns by a firefighter or a member of the service	SOPs and any complain to be dealt with as per section 7.14 below
Disputes related to issuing and management of veldfire burning permits or related issues that are used to manage firebreak permissions	Municipal bylaws and Standard Operating Procedures (SOPs)	Theft of goods by a firefighter during firefighting operations	To be dealt with as per section 7.14 below
		Road accidents involving unsafe conduct by a firefighter or a	SOPs and any complain to be

		member of service while driving to an incident	dealt with as per section 7.14 below
		Irregular treatment (real or perceived) of a patient during an incident	SOPs and any complain to be dealt with as per section 7.14 below

7.16 Mechanisms for resolving disputes

While the Department recognises that each city/ municipality may have mechanisms for resolving disputes, with regard to disputes arising because of the implementation of this policy, the following institutional arrangements/ pathways must be utilised:

a. Reporting of the complaint;
b. Acknowledgement of receipt in writing by the Chief Fire Officer within seven days;
c. Resolution by the Chief Fire Officer within seven days;
d. Escalation to the Municipal Manager on administrative matters if complaint remain unresolved;
e. Consideration of the matter by the Municipal Manager within seven days;
f. Escalation to relevant Member of Mayoral Committee for non-administrative matters;
g. Consideration of the matter by the Member of Mayoral Committee within seven days;
h. Inform Council through a report if the complaint is still unresolved;
i. Consideration of the matter by Council within 30 days;
j. Escalation to the Member of Executive Committee (MEC) if is still unresolved;
k. Consideration of the matter by the MEC within 30 days;
l. Escalation to the COGTA Minister if the complaint remains unresolved;
m. Consideration of the matter by the COGTA Minister with the assistance of appropriate structure/forum that is established to provide advice on fire services matters in order to make a determination. The decision of the COGTA Minister is final.

CHAPTER 8: FIRE PREVENTION, SAFETY AND PROTECTION

8.1 Contextualising fire safety and fire prevention

While there is acknowledgement that fire risk cannot be completely avoided or eliminated, there is consensus that fire safety and prevention play a central role in fire risk reduction. The emerging approach internationally places specific focus on fire prevention and safety as core components of the fire services. The proposed fire service legislation for South Africa should accordingly ensure that fire safety and prevention are important features of the fire service. The new fire services policy must prioritise fire safety and prevention. Over the years in South Africa, building regulations and standards have evolved to a point where the risk of fire in formal structures is significantly reduced except mainly for those fires caused by non-compliance with applicable fire safety measures. This is the case since fire safety of a building will essentially depend first on what is done to prevent a fire from starting in the building as well as what is done through design, construction and management to minimise the spread of fire when it happens. Generally, once a fire start, its spread will largely depend on the design of the building, the materials used in construction, building furnishings and contents, method of ventilation as well as fire suppression systems.

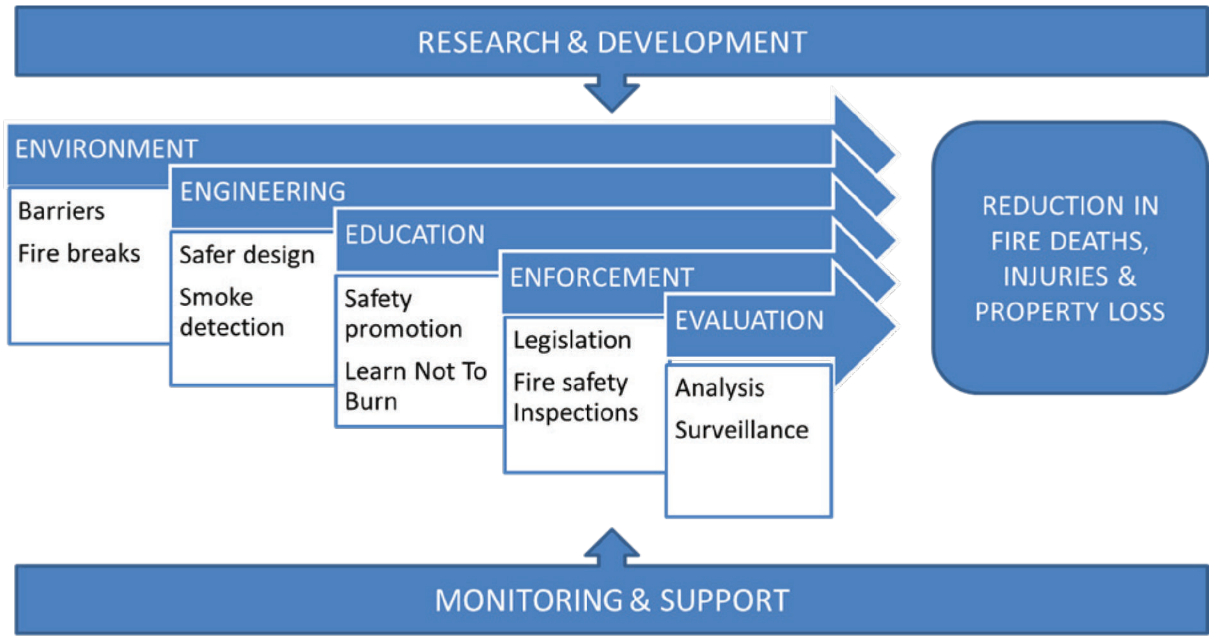
Fire safety teams in formal structures usually reflect on all of these aspects during decision-making processes. While formal structures have benefited from application of Building Regulations and standards, informal structures found mostly in rural areas and in informal settlements remain somewhat vulnerable as these codes are not enforced in their areas. This reality requires concerted and sustained efforts by all role players to improve application and compliance with applicable codes to reduce fire risks.

The fact that the average person suffers a minor burn or experiences a small fire once or twice in a lifetime, and for most people, this make the threat of a truly destructive fire seem improbable and remote. In most instances, these people find themselves unprepared, both physically and emotionally, when a large fire does occur. In too many cases this lack of preparation causes panic, death and destruction that might have been avoided had the victims taken seriously the threat of fire and thus know how to prepare themselves accordingly.

8.2 Integrated fire prevention and safety strategy

The integrated fire prevention strategy encompasses environmental modifications, engineering, education, enforcement (including legislation) and evaluation. Environmental modifications focus on modifying the physical environment, e.g. separating fire prone areas with barriers such as firebreaks. Engineering is directed at enhancing fire safety with equipment, e.g. sprinklers and smoke detectors. Education involves the provision of training and information to improve fire safety. Enforcement focuses on interventions that enforce fire safety legislation while evaluation provides information to determine fire related injury priorities and which fire prevention interventions works.

Figure 8: Integrated fire prevention and safety strategy



8.3 National fire safety goals and strategies

The development of national goals and strategies for fire safety is critical to improve fire safety. A report on a study on the prevention of fires and other incidents by the European Union (EU) conducted in 2000-2004 highlighted that national fire safety goals can be achieved through legislation, programmes and plans. It also emerged from the study that the process of setting goals for fire safety must involve all stakeholders and that such goals must be quantifiable. The following are some of the national goals and strategies for fire safety that South Africa can pursue to reduce fire risks and losses:

a. Prevention of loss of life, with a particular focus on preventing multi-fatality causalities in buildings to which the public have access;
b. Protection of state and national infrastructure (e.g. airport, hospital) from loss/damage or disruption of vital economic activity (e.g. tourist industry. IT plant) by fire.
c. To get fire safety advice to target audiences;
d. To ensure that design of new buildings takes proper account of fire safety;
e. To ensure that "persons in control" of different categories of premises are aware of their responsibilities, and how they can discharge these;
f. To undertake inspections of different types
g. **These may be as the three "E's of fire safety – Engineer the building, Educate the users and Enforce on those with responsibility;**
h. Significantly reduce number of fires and explosion in general and in connection with transport of dangerous goods where many fatalities in one single event may occur;
i. The average number of fatalities in fires in dwellings shall be reduced considerably compared to the average level for the period; and
j. Significantly reduce number of fires with loss of irreplaceable national cultural heritage;

In order to achieve the goals as outline above, it is critical to make civilians, private/ public organisations and local authorities more aware of their responsibilities to organise and maintain fire safety. South Africa must adopt national fire safety goals in its endeavour to reduce fire losses going forward. Mechanisms must also be put in place to measure the effect of the implementation of such goals on fire safety.

8.4 Fire Safety

Fire Safety refers to precautions that are taken to prevent or reduce the likelihood of a fire that may result in death, injury, or property damage, alert those in a structure to the presence of an uncontrolled fire in the event one occurs, better enable those threatened by a fire to survive, or to reduce the damage caused by a fire. The services provided by fire authorities to protect communities include a range of fire safety approaches including advisory, promotion, auditing, licensing, inspection and enforcement. Additionally, the fire service provides fire safety auditing services – including review of fire safety design and enforcement under the National Building Regulations, local building control by-laws as well as licensing the storage of Petroleum Substances and licensing of certain public events. The primary goal and role of fire services activity is to protect life and to prevent injury/loss from fire where this is possible. To this end, the available resources are targeted at preventing fires where possible, and ensuring that buildings are fitted with appropriate early warning systems and other facilities to alert and protect the occupants. This White Paper recommends the following as critical to the provision of fire safety:

a. To reduce the number of fire incidents occurring in their jurisdictional areas of responsibility,
b. To limit damage where fires do occur, by ensuring appropriate fire protection facilities (such as early detection and warning systems) are in place, and
c. To prevent escalation to point where single or multiple fatalities are likely to occur.

8.4.1 Fire Safety at events

There are a wide range of special events including music, sport and other events held regularly in many communities. Some of these events are licensed under the provisions of the Municipal by Laws and other relevant legislation. Fire services must consider crowd safety issues when considering fire safety clearance certificate applications relating, for instance, to the design of a new stadium. While the primary responsibility for ensuring public safety rests with the organiser, fire authorities contribute to event safety management through input at both licensed and unlicensed events. Each fire service must ensure that it creates the necessary capacity to give effect to its obligations in relation to event safety as contemplated in the Safety at Sports and Recreational Events (SASREA), 2010 (Act no 2 of 2010).

8.4.2 Residential Dwelling Fire Safety

More than 90% of fire deaths in South Africa occur in the domestic dwellings, both formal and informal. However, single residential dwellings do not normally fall within the ambit of the various legislation because the enforcement of legislation in relation to fire safety in individual dwellings could be seen as unwarranted interference into individual privacy. This by implication inevitably shifts the onus of protection to the individual. In this area, the themes and practices of what have come to be termed 'Community Risk Reduction' and fire safety promotion are the significant means by which people may be assisted in protecting their families from fire in their own homes. The design and construction aspects of domestic dwellings are regulated by the National Building Regulations, and there are currently no requirements in relation to the installation of domestic smoke detection and alarm systems in dwellings.

The main approach to protecting the public in their home is to reduce the number of dwelling fires that occur. The international literature identified a number of key factors that impact on the outcome of dwelling fires. In particular, where persons are under the influence of substances such as alcohol or drugs that impair their perception of danger, or are in close proximity to the origins of the fire, the probability of safe escape is greatly reduced. Going forward, the fire services legislation must provide adequate mechanisms to reduce the risk posed by fires to residential dwellings.

8.4.3 Smoke alarms

Research and empirical evidence have demonstrated that most fire deaths are not caused by burns, but by smoke inhalation. The rapidly spreading smoke and gas that often occurs while people are sleeping is highly toxic and are a leading cause of fire-related deaths. Researchers estimates that smoke inhalation injuries, including burns to the respiratory system cause 50% to 80% of fire deaths. Smoke often disorientates people or incapacitates them so quickly that they cannot escape. There are studies that also shows that smell of smoke does not waken people. Thus, if a potential fire can be detected during the smouldering stage, this reduces the risk of asphyxiation thereby providing time for people to evacuate safely. With this in mind, it is critical that the installation of smoke alarms in residential areas particularly in informal settlements and other fire-prone facilities must form an integral part of strategies to reduce fire-related injuries and deaths. Partnerships must be established between government and the private sector in order to mobilise resources to support the installation of smoke alarms in high-risk areas.

8.5 Fire prevention

Fire Prevention is a function of many fire services and is usually done by a Fire Prevention Officer. The goal of fire prevention is to educate the public to take precautions to prevent potentially harmful fires, and be educated about surviving them. It is a proactive method of reducing emergencies and the damage caused by them.

8.5.1 Current community education projects and programmes

The following community education projects and programmes have been implemented with some success in various areas throughout South Africa and serve as good practice examples for prevention interventions:

Figure 9: Current community education projects and programmes

Door to door campaigns / Home Visitation Programme (HVP)	The HVP programme can deliver targeted interventions at the household level that address the immediate social and physical environments to which high-risk groups are exposed and thus improve fire safety outcomes.
Learn Not To Burn (LNTB) Preschool Fire Prevention curriculum	International studies show that educational programmes, such as the LNTB Preschool Programme, can be effective in teaching children lifesaving fire safety behaviours and skills.
Promotion of Residential Smoke Alarms	Smoke alarms provide an early warning system alerting people and permitting them time to escape before the fire spreads. These low cost devices can easily be installed and maintained in any household environment.
Fire and burn prevention week	The goal of fire and burn prevention week is to co-ordinate efforts to educate the public to take precautions to prevent potentially harmful fires, and be educated about surviving them.

Reggie Rhino Fire Prevention Mascot:	Individual fire services must conduct their own campaigns targeting specific high-risk communities and groups using the Reggie Rhino mascot as a tool for retention.
Community Emergency Response Teams (CERT)	Providing community members with the skills and knowledge to respond to fires in the incipient stages whilst the fire and emergency services respond often reduce the level of destruction and injury significantly.
Basic Emergencies, Safety And Fire Education (BESAFE) Centres	The BESAFE Centre is a place where children and adults learn about the dangers of fire in their homes, methods of prevention and practice exit drills and other types of hazards. Teams of public safety educators deliver fire and life safety education information, tour the facility with the children, simulate a fire in the fire safety home, and practice safe evacuation and many other interactive safety activities.

8.5.2 Fire Protection

The fire service exists to protect people and their property from fires, and that remains the service's core mission. Protecting against fires has three components: defining and addressing the problem, improving fire prevention, and suppressing fires when they do break out.

8.6 Water reticulation systems, provisions for fire hydrants and other water sources

Successful firefighting largely depends on immediate access to adequate and reliable supplies of water. The access to, and proximity of, those water supplies directly affects the resources that fire and rescue authorities need to provide in protecting and mitigating their communities from the effects of fire. The provision of water for firefighting requires careful preplanning that not only establishes need but also goes on to identify the sources of water, whether drawn from public water mains or other sources, and then secures availability for use in case of fire. Essentially, three sources of piped water supply for firefighting can be identified as follows:

a. Public supply usually delivered by municipal infrastructure;
b. Private supply wherein National Building Regulations require building owners to install tanks and pumps;

c. Operational supply- this is where fire service responds with water tankers, use portable dams and other water supply resources.

It is important to highlight water supply requirements for firefighting can be objectively determined by the fire service conducting risk assessments and making determinations on the real risk at hand.

8.7 Fire risk assessment

The need to improve service delivery along with an increased focus on fire safety, all with limited resources and costs under scrutiny are challenges that have faced fire services internationally including South Africa. This has led to a shift from rigid standards of fire cover to a more flexible risk-based approach to ensure a more fit for purpose and cost effective service. In essence, fire service provision relies on a risk assessment approach to both emergency operations and fire safety functions. A fire risk assessment helps you identify all the fire hazards and risks in your area of jurisdiction. A risk assessment enables a fire service or any organisation to decide whether any risks identified are acceptable or whether you need to do something to reduce or control them. **A risk assessment should be carried out by a qualified and registered fire risk assessor.** A credible fire risk assessment must identify the most prevalent risks facing a community. While this White Paper entrenches the role of fire services in conducting risk assessments, it also recognises that individual property owners also have a responsibility to carry out fire risk assessment on their premises. **Key strategic facilities must also ensure that adequate fire protection measures are put in place to reduce fires.**

Within the South African context, risk assessment must take into account the provisions of the South African National Standard (SANS) 10090:2003- Community Protection Against Fire. This standard recognises the need for a risk-based approach by setting performance requirements that allows fire service some flexibility to apply a risk-based approach. The methodology uses a predominate risk approach where an area of jurisdiction is divided into categories based on predominant risk with the flexibility to list special risks which require a pre-determined attendance greater than that for the category assigned for the area. The fire-risk categories into which the area of jurisdiction could be divided as outlined in Figure 9 below:

Figure 10: Fire risk categories

CATEGORY	DESCRIPTION
A – High Risk	Central business districts and large commercial and industrial areas normally found in large towns and cities.
B - Moderate Risk	Limited central business districts and smaller commercial and industrial areas in small towns or decentralised areas of large towns and cities.
C	Residential areas of conventional construction.
D	Rural areas
E	Special Risks requiring an attendance over and above that of the predominant risk category above. (Shopping centres, informal settlements, petrochemical plants, etc.)

SANS 10090 also provides guidance and performance criteria for:

a. Call receipt and processing;
b. Vehicle/equipment availability and maintenance;
c. Incident management procedure;
d. Pre-fire planning and risk visits;
e. Training/personnel;
f. Water supplies;
g. Fire safety functions.

The standard includes an “assessment tool” against which fire services can be evaluated and classified depending on their level of performance and compliance. The development of a uniform fire risk assessment model/framework for South Africa must be informed by the issues raised above as well as SANS10090: Community Protection Against Fire. Other international well-recognised published standards that can provide input to a risk based approach include:

a. National Fire Protection Association (NFPA) 1201 Standard for Providing Fire and Emergency Serviced to the Public, and
b. NFPA 1710 Standard for the Organisation and Deployment of Fire Suppression Operations, Emergency Medical Operations and Special Operations to the Public by Career Fire Departments.

In simple terms, fire services needs to adopt a risk based approach to routine fire safety inspections to enable expectations to be met with limited capacity and resources. It is likely that the concept of inspecting all risks at least annually will be both impractical and not achievable when considered in relation to overall inspection responsibilities that include occupancy clearance, flammable liquid and gas installations and events. Grouping occupancies into high, moderate and low risks after considering life and property risks and then assigning a minimum inspection frequency may be worthwhile. The approach should be that high life/fire risks such as hospitals, old-age homes, schools and facilities for people with special needs, etc. must be inspected more regularly than moderate risks that will be inspected more regularly than low life/fire risks.

8.8 Partnership with society

The White Paper on Local Government recommends that municipalities look for innovative ways of providing and accelerating the delivery of municipal services. It is important that in carrying out duties outlined above and where necessary, partnerships must be established with other agencies involved in related work. The role of fire service has evolved as it now protects communities in a variety of ways that the existing legislation could not envisage. In view of this, fire service must also **establish viable partnerships with the communities they serve especially for purposes of enhancing community fire safety**. Such partnerships must also be entered into with private sector agencies especially those operating within the municipality's area of jurisdiction. Experience has demonstrated that the fire service can make the most impact in reducing vulnerability to fires by changing the behaviour of those at risk through sustained education and awareness programs.

8.9 The role of communities in fire services

While the fire services is generally classified as a first responder along with other agencies such as Emergency Medical Services, strictly speaking, communities are first responders to most fire incidents especially those that occur in residential areas.

This means that communities must be at the heart of strategies to prevent, mitigate, prepare and respond to fires. **This is consistent with the 'back to basics' approach adopted by the Presidential Local Government Summit held in September 2014 which in essence requires municipalities to:**

Put people and their concerns first and ensure constant contact with communities through effective public participation platforms.

In engaging with communities, it is important to recognise that different communities face different fire risks hence each fire service must develop strategies relevant to the unique circumstances, dynamics and fire risk profile prevalent in its area of jurisdiction. **In short, there is no one-size-fits-all approach that a fire service must utilise in its engagement with communities.** The fundamental principle at the heart of engagement between fire services and communities is that while fire services must strive within their means to reduce fire risks thereby lessening the losses in terms of lives, property and damage to environment because of fires, communities must take ownership for reducing the risks posed by fires.

It has already been highlighted in preceding sections that communities can be organised to participate in fire services activities through initiatives such as the Community Emergency Response Teams (CERTs) which function as a mechanism for communities to respond to fires while they await the fire services. While activities aimed at quick, rapid and effective response to fires remain important, community initiatives must also be designed to undertake fire risk reduction. Fire services also have a responsibility to support community initiatives aimed at reducing fire risk within its area of jurisdiction. Consequently, fire services together with communities must agitate for the inclusion of programs and projects aimed at reducing fire risks in municipal Integrated Development Plans (IDP). Additionally, communities are also encouraged to participate in the development of fire services by-laws and other related regulatory instruments aimed at reducing fire risks thereby protecting their livelihoods. In this regard, it is important to note that fire services must work closely with ward councillors and ward committees in the process of reducing fire risks within the communities they serve. The fact that fire services must work closely with communities does not mean that such communities cannot demand accountability in the provision of fire services. in line with the 'back to basics' approach, communities must still hold fire services accountable for the efficient and sustainable delivery of fire services within the framework of good governance.

CHAPTER 9: DESIGNATED FIRE SERVICES

The main goal of this government is to promote the general welfare of society. In achieving this goal, government recognises the importance of working with all its partners. This requires reciprocal and friendly relations between government agencies on the one hand, individuals or non-governmental institutions and the private sector on the other hand. Although the Constitution gives government the responsibilities to provide services to citizens, government does not always have to provide these services itself. The legislative framework provides mechanisms for government under certain conditions to appoint “service providers” to render the service.

In terms of Section 4 of the FBSA, a service that does not fall under the control of a local authority may, in the prescribed manner, apply to the Minister to be recognised as a designated service. If the Minister after consultation with the Fire Brigade Board (FBB) is satisfied that the service referred to above complies with the prescribed requirements, he or she may recognise the service as a designated service subject to such conditions as he or she may determine. A designated service shall be employed inside the area or areas, whether adjacent or not, demarcated for it by the Minister after consultation with the FBB, unless the controlling authority concerned is requested, or is obliged in terms of an agreement contemplated in Section 12 of the FBSA to employ the service outside that area or areas, as the case may be. It is important to note that during October 1990, Regulations regarding the prescribed manner in which a service may apply to be recognised as a designated service and the **prescribed requirements for recognition** as a designated service were promulgated.

In terms of these Regulations, a service shall comply **with these minimum requirements before it may be recognised as a designated service**:

a. Such service shall be operative 24, hours per day;
b. A full-time Chief Fire Officer shall be appointed in charge of such service;

c. Such service shall consist of trained full-time or part-time members or members of a fire brigade reserve force or a combination thereof;
d. Such service shall have at its disposal the equipment to cope with the risk at hand; and
e. Such service shall apply fire prevention and firefighting methods that are sufficient to cope with the risk at hand.

9.1 Rationale for establishment of Designated Services

While there are several reasons why a designated service may be established, the following provides some rationale for their establishment –

a. They have the expertise in their field & specialised training required to handle incidents/fires in the specific products produced, stored, and used at their facilities;
b. Company expectation;
c. International obligations;
d. Insurance carrier expectation;
e. Employee expectation;
f. Means to meet regulatory requirements;
g. Lack of specially trained resources; and
h. Lack of timely response by municipal emergency services.

9.2 Key duties of designated services

The following are some key duties (list not exhaustive) that designated services provide towards their organisations:

a. Assessment of new projects and existing production facilities and activities to identify fire hazard areas and activities;
b. Emergency planning;
c. Risk assessments;

d. Provision of fire suppression and other related activities;
e. Carrying out fire safety inspections;
f. Pre-incident planning;
g. Provision of training to firefighters i.e. fire training, safety watcher training, fire watcher training, etc;
h. Emergency response to numerous scenario's (process fires, tank fire's, building fire's, flammable gas releases, toxic gas releases i.e. to onsite and associated facilities;
i. Rendering of Medical and Rescue (High angle and Confined space) response onsite and to associated facilities;
j. Fire Prevention;
k. Fire Engineering, and
l. Mutual Aid assistance to Municipal Fire Services in terms of related industrial/ Petrochemical Incidents, etc.

This White Paper recognise the strategic role played by designated fire services. Going forward, adequate provisions must be put in place to enable designated services to deliver fire services. Whilst there is agreement that government must work with all stakeholders involved in the provision of fire services to reduce the losses as a result of fires, robust and clear mechanisms for accountability must be put in place to ensure closer working relationships with municipal fire services. This should be accompanied by clear criteria for monitoring and evaluation where applicable. It is also important that government must provide leadership on initiatives that are part of partnerships. Thus, the Department must ensure that regulatory frameworks are in place that outline the process that a potential designated service must follow in order to obtain recognition. Such a framework must make the process of applying for recognition simple, flexible, compatible and harmonious with best practice jurisdictions internationally while providing a predictable and effective environment for the efficient regulation of designated services in the country.

CHAPTER 10: FIRE SERVICE EDUCATION, RESEARCH, TRAINING AND CAPACITY BUILDING

Education, training and innovation are central to South Africa's long-term development. They are core elements in eliminating poverty and reducing inequality, and the foundations of an equal society. Education empowers people to define their identity, take control of their lives, raise healthy families, take part confidently in developing a just society, and play an effective role in the politics and governance of their communities (NDP, 2011).

10.1 Current fire service training context

Currently, fire services training activities are not well coordinated. There is no comprehensive national fire services education and training strategy that guides the sector on education and training matters. While existing training interventions are able to provide adequate technical knowledge required by fire service personnel, training interventions geared towards officer development and the provision of management skills and competencies required to manage the services has been inadequate. Quality assurance mechanisms also need to be clearly defined and this is critical since fire service training is mostly publicly funded, hence government must be assured that public funds are being invested efficiently. The existing training dispensation does not enable or support multi-level entry into the fire services. Fire prevention and safety are also other areas that have not received prominence in the existing training dispensation.

10.2 National fire services education and training strategy

The NDMC must develop a national fire services education and training strategy that guides the provision of training in the fire service sector. While this strategy must guide fire prevention in the community, it must also guide the provision of high-quality education and training in the fire services sector. Thus, this strategy informs the development of appropriate community education projects as well as education and training programmes that build on existing initiatives. The broad strategy is based on two pillars i.e. the community and the human resource capability of the fire service. The community education strategy includes and is not limited to identifying and implementing appropriate mechanisms for community education, and prioritising community education about fire prevention and safety. With regard to the human resources capability of the fire service, the strategy must consider the following –

a. The education and training strategy for the fire services is informed by the community needs for fire services, protection and prevention;
b. **Quality assurance**
    i. Quality is defined as fit-for-purpose, i.e. must meet the needs of the fire service;
    ii. Ensuring linkages between fire services education and training with the requirements of the National Qualifications Framework Act, 2008 (Act No. 67 of 2008) and other applicable legislation;
    iii. Linking fire services training and education to the Quality Council for Trade and Occupations (QCTO) Framework;
    iv. Clarification on institutional arrangements for quality assurance, and
    v. Ensure an appropriate balance between knowledge and skill components of the education and training for the fire services.
c. **Institutional arrangements**
    i. Establishment of partnerships with institutions of higher learning for purposes of fire services education and training;
    ii. Outline the role of Further Education and Training colleges in the provision of fire services training and education, and
    iii. Explore mechanisms for providing specialist training to the sector.
d. **Professional and career development**
    i. Explore, define and support mechanisms for continuous professional development including the registration of (an) appropriate professional body (s) with the South African Qualifications Authority;
    ii. Develop a typical career path for fire service personnel that includes a qualification framework, provides for a specialist and generic skills and knowledge required for in the fire services and accommodates multi-level entry into the fire services;
    iii. Determine the minimum requirements for individuals wishing to join the fire service and the provisions for accommodating firefighters of long standing and who, for historical reasons, may not meet these requirements,

iv. Describe potential routes for the acquisition of generic / transversal skills and knowledge required for management and leadership in the fire services;

v. Ensure an appropriate balance between the knowledge and skill components of the education and training for the fire services, and

vi. Define mechanisms for continuous professional development.

Firefighters must master a complex mix of three core competencies being foundational knowledge, physical skill and work experience to be successful in their occupation. The nature of work carried out by firefighters requires not only adequate training when entering the profession but also ongoing professional development to ensure that firefighters stay abreast with the constant technological changes in their working environment. In determining the training requirements of firefighters to be "fit-for-purpose" in a new legislative environment and providing services that are more diverse to their communities, it is required to review and critically analyse the existing capacity building programs.

10.3 Impact of other key legislation on education and training of firefighters

The advent of democracy brought about wide ranging legislative reform that requires significantly impact on the provision of training in the country. In view of this, the provision of education and training in the fire service must be aligned to the following legislation amongst others:

a. Skills Development Amendment Act, 2008;
b. National Qualifications Framework Act, 2008;
c. South African Qualifications Authority Act of 1995;
d. Higher Education Act of 1997, and
e. The Skills Development Levies Act, 1999.

10.4 Use of research in fire service

Currently, research output on fire services in South Africa is quite low. This significantly low research output in the sector often leads to approaches and interventions that are not based on scientifically robust foundations. Research can play a key role in for example determining the adequacy of current methodologies utilised by fire services in the execution of its mandate. New ideas for the fire service must be based on empirical evidence. In this regard, it is important that the fire services must establish linkages with academia and other research institutions in South Africa and elsewhere. The NDMC through a process of consultation must develop a national fire services strategic research agenda that will guide research in the sector. The provision of education and training must contribute to the agenda of professionalising the function. Partnerships must be established with research entities and academic institutions in order to optimise the use of existing capabilities in the country. Through such partnerships, facilities must be put in place in order to ensure ongoing fire engineering and technology research, conducting of live fire tests, and other related research initiatives.

CHAPTER: 11 FUNDING MODEL FOR THE PROVISION OF FIRE SERVICES

11.1 Overview of current funding arrangements

a. Local government funding

Generally, local government shoulders the bulk financial responsibility for funding fire services. This funding model is however, strongly linked to municipal viability with municipalities that are financially viable able to adequately and sustainably fund the function while those that are not viable struggles to finance fire activities in any meaningful way. Fire services are not defined as a basic service and this largely often results in inadequate allocation of resources to the function.

b. Provincial government funding

Proclamation R 153 of 1994 placed provincial government at the centre of the administration of the FBSA. This inevitably places certain obligations on provincial governments to support municipalities in the provision of fire services. Some provincial governments have dedicated fire services grants that are provided to municipalities to finance fire services capital projects such as:

a. Building of fire stations;
b. Procurement of capital items such as fire fighting vehicles and equipment;
c. Public awareness programmes (especially material development);
d. Provision of aerial resources especially for fighting disastrous veldfires;
e. Special services such as Urban Search & Rescue (USAR), training, etc**.**

The focus of the support has generally been on operational activities of the fire service as well as establishing adequate institutional capacity for the provision of the service in areas that were historically unserviced. It is thus evident that there has not been adequate support provided to municipalities to support fire prevention and safety programmes and activities. The focus of support going forward must reflect the paradigm shift from operations-intensive to fire safety and prevention based approach as espoused in this White Paper.

c. National government funding

During the early 1990s, national government provided a dedicated grant to fund certain capital projects in the fire services. This grant was distributed by the provincial government to municipalities that were identified for support. This grant was, however, stopped in 1997 with the understanding that the Local Government equitable share will provide funding for fire services together with other basic services. The primary role of the local government equitable share is to distribute local government's share of nationally raised revenue, supplementing municipal own revenues, to assist municipalities in providing basic services to poor households. Fire services are not defined as a basic service and this largely often results in inadequate allocation of resources to the function.

The Municipal Infrastructure Grant (MIG) administered by the DCoG that has been designed to achieve amongst others access to basic services, decentralised service delivery, empowerment of municipalities, etc has also provided funding towards fire services infrastructure development. Emergency services such as fire stations forms part of the services that may be funded with MIG funds under the infrastructure category of public municipal services. At this point, the Directorate: Fire Services

Coordination does not have any funding to support local and provincial government in the provision of fire services.

11.2 Problems with current funding dispensation

The provision of funding for fire services must be located within the broader context of funding local government functions in the country. The fact that fire services is capital and resource intensive coupled with its low revenue generating capacity serves in most instances as a disincentive for decision makers to provide adequate funding for the function. In short, the competition for limited resources by all basic services such as electricity, sanitation, water, etc often means that fire services is not able to receive priority. Another fundamental problem as highlighted above is the linkage between funding for fire services and the financial viability of a municipality. Experience has demonstrated that while viable municipalities are able to fund the provision of fire services, this is not the case with those municipalities that are not financially viable. It is therefore important that future funding models must recognise this challenge and put measures in place to support resource poor municipalities to be able to provide the service sustainably. While financially viable municipalities have been able to allocate resources for the function, an analysis of their expenditure patterns indicates that the bulk of resources expended has been to support fire services operations (firefighting and procurement of equipments, etc). Very little investments have been made by fire services to support fire safety, prevention and protection activities especially community based fire risk reduction initiatives.

The current funding arrangements does not recognise that apart from implementing its primary legislation, the fire services also play a key role in the implementation of a host of other legislation. This additional work is usually assigned to fire services at local government level by national legislation without regard to the resources that are required to comply with such legislation. Although most fire services have adopted policies that enable them to charge users for the provision of fire services, several services do not charge for rendering this function.

11.3 Proposals for future funding model

Future funding arrangements must provide for the funding of fire services across the entire value chain of the function. This will require a combination of sources found at all levels of government to adequately fund the fire service. The strategy to fund the function must be directly linked to the powers and duties of each sphere of government in the provision of this critical community service. The funding of fire prevention, safety and protection activities especially community based fire risk reduction programs must receive priority going forward. While the introduction of the user pays principle (especially where these users have the ability and resources to pay) must underpin the provision of fire services going forward, the nature of work undertaken by fire service necessitates the adoption of policies to ensure that access is not denied to those requiring it and are unable to pay.

11.4 Potential sources of funding

Figure 11: Potential sources of funding

Funding needs	**Potential sources of funding and expertise**
Fire prevention, safety and protection especially community fire risk reduction	Local government, insurance agencies, NGOs, CBOs, donor agencies, private sector, etc
Education and training	All spheres of government, academic institutions, research organisations, SETAs, etc
Procurement of capital equipment	All spheres of government
Building of fire stations	All spheres of government
Firefighting operations	Local government, user pay principle (where user can pay)
Firefighting operations in insured buildings/ facilities	Insurance companies
Donor funding will be integrated with local funding strategies and managed in terms of national policies for the sector as a whole	

As highlighted in preceding paragraphs, the role of the fire service has evolved to a point where the fire service responds to thousands of non-fire incidents. While this expansion of the role of fire service is understandable owing to the fact that the function has acquired a wide and sophisticated range of equipment to enable it to respond to such incidents, the funding has not increased concomitantly. Amongst these non-fire incidents is the safe extraction/ rescue of road accident victims to which the fire service expends substantial resources. It is therefore important that in developing a funding model, all possible sources of funding from sectors that benefit from the work undertaken by fire service are considered. In the final analysis, the provision of funding for fire services must be located within the broader context of funding local government functions in the country.

11.5 Transversal procurement

Transversal procurement entails the procurement of similar goods (and services) by two or more government departments or entities using a transversal tender. The benefits of using transversal tenders include shortened lead-time for deliveries, maximising economies of scale, ensuring contract management, minimizing irregular expenditure, decentralized management of procurement, conformance to appropriate Supply Chain Management prescripts. This avenue can be utilised to optimise the process of procuring equipments for the fire services.

CHAPTER 12: TRANSBOUNDARY, REGIONAL AND INTERNATIONAL COOPERATION AND LIAISON ON FIRE SERVICES ACTIVITIES

12.1 Current institutional arrangements for transboundary, regional and international cooperation and liaison

Section 12 of the FBSA dealing with agreements makes provision that a controlling authority may, with the concurrence of the Premier and the Minister of International Relations and Cooperation conclude an agreement in terms of which-

a. The controlling authority undertakes to make available its service, on such conditions as may be agreed upon, to any person, institution or body in any other state;
b. A person, institution or body in any other state undertakes to make available a service, on such conditions as may be agreed upon, to the controlling authority.

The Disaster Management Act, 2002 in section 7 2 (c) also provides for the National Disaster Management Framework to facilitate South Africa's cooperation in international disaster management, regional cooperation in disaster management in southern Africa and the establishment of joint standards of practice.

12.2 Importance of transboundary, regional and international cooperation

"Natural and other threats are not constrained by national boundaries. Measures taken in South Africa can increase or reduce risks in neighbouring countries, just as potential dangers across our borders can directly affect South Africa" (White Paper on Disaster Management, South Africa 1999). South Africa recognises itself as an integral part of the African continent and therefore understands its national interest as being intrinsically linked to Africa's stability, unity and prosperity (White Paper on South Africa's Foreign Policy, 2011). South Africa shares borders with six southern African neighbours and this presents both natural and human-induced cross boundary risks that often requires fire services involvement. Thus, it is important for South Africa to enter into cooperation agreements (bilateral or multilateral) in order to improve the management of cross-border fires and other related incidents.

Transboundary, regional and international cooperation is important, as it will enable that South Africa's approach to fire services is informed by a global perspective. Transboundary and regional cooperation for example may enable fire services to develop joint strategies to deal with cross-border fire risks, the transportation of dangerous goods across borders, etc in a more coordinated manner. Through this cooperation, mechanism for the provision of assistance during cross-border emergencies can also be established to ensure a coordinated response to such eventualities. The Department of International Relations and Cooperation together with the NDMC must provide leadership on all international activities, partnerships, etc related to fire services.

13. DEFINITIONS OF TERMS USED IN THE WHITE PAPER

13.1 Fire service

A fire service (also known as a fire and rescue service or simply fire department) within the South African context, is a public or designated organisation that provides predominantly proactive and reactive firefighting and prevention, rescue, emergency medical response and related humanitarian services to a certain geographic area of functional jurisdiction which may typically be a local, district or metropolitan municipality or any other jurisdiction designated accordingly. A fire service usually contains one or more fire stations within its boundaries, and may be staffed by career firefighters, volunteer firefighters, or a combination thereof referred to as a combination department.

13.2 Fire protection

Fire protection is the study and practice of mitigating the unwanted effects of potentially destructive and harmful fires. It may involves the study of the behavior, confinement , suppression and investigation of fire and its related emergencies, as well as the research and development, production, testing and application of mitigating systems.

13.3 Fire prevention

Fire prevention is a function of many fire services. The goal of fire prevention is to educate the public to take precautions to prevent potentially harmful fires, and be educated about surviving them. It is a proactive method of reducing emergencies and the associated damage caused by them.

13.4 Fire safety

Fire safety refers to precautions that are taken to prevent or reduce the likelihood of a fire that may result in death, injury, or property damage, alert those in a structure to the presence of an uncontrolled fire in the event one occurs, better enable those threatened by fire to survive in and evacuate from affected areas, or to reduce the damage caused by a fire. Fire safety measures include those that are planned during the construction of a building or implemented in structures that are already standing, and those that are taught to occupants of the building.

13.5 Property

Property within the context of the white paper refers to any movable of fixed asset "owned" in terms of common law meaning.

13.6 Fire service capacity

Fire service capacity refers to the ability of the fire service to adequately mitigate all credible fire risks within its functional and geographic areas of responsibility. This capacity will be measured against the current National Code of Practice for Fire Services. Capacity, in this case also includes to the ability to render proactive, reactive and predictive services.

13.7 Designated fire service

Designated fire service refers to the fire service of any non-municipal organization or entity, which is designated in terms of legislation to address and protect any specialized fire risk within a geographic, functional or legal area of responsibility.

Portfolio of Stakeholder consultation undertaken as part of the review of fire services legislation

Date	Area	Stakeholders
22-23 August 2011	Gauteng	Municipal fire services, designated services, Provincial & Municipal Disaster Management Centre, Fire Protection Associations, other relevant sector departments, state owned entities, civil society organisations.
25-26 August 2011	North West	Municipal fire services, designated services, Provincial Disaster Management Centre, Fire Protection Associations, other relevant sector departments, state owned entities.
19-20 September 2011	Limpopo	Municipal fire services, designated services, Provincial Disaster Management Centre, Fire Protection Associations, other relevant sector departments, state owned entities.

22-23 September 2011	Mpumalanga	Municipal fire services, designated services, Provincial Disaster Management Centre, Fire Protection Associations, other relevant sector departments, state owned entities.
27-28 September 2011	Western Cape	Municipal fire services, designated services, Provincial Disaster Management Centre, Fire Protection Associations, other relevant sector departments, state owned entities.
13-14 October 2011	Eastern Cape	Municipal fire services, designated services, Provincial Disaster Management Centre, Fire Protection Associations, other relevant sector departments, state owned entities.
17-18 October 2011	Free State	Municipal fire services, designated services, Provincial Disaster Management Centre, Fire Protection Associations, other relevant sector departments, state owned entities.
27-28 October 2011	KwaZulu Natal	Municipal fire services, designated services, Provincial Disaster Management Centre, Fire Protection Associations, other relevant sector departments, state owned entities.
29-30 November 2011	Northern Cape	Municipal fire services, designated services, Provincial Disaster Management Centre, Fire Protection Associations, other relevant sector departments, state owned entities.
26-30 March 2012	Pretoria [national workshop to draft the Fire Services Framework]	Identified key stakeholders drawn from various sectors across the country.
17 May 2012	KwaZulu Natal Provincial disaster management workshop	Key stakeholders from across the province, Mayors and Executive Mayors, Municipal Managers, Traditional Leaders, etc.
01 October 2012	Institute of Fire Engineers Annual General Meeting	Delegates from various sectors
16 May 2013	Southern African Emergency	Conference delegates representing various sectors within the fire service industry.

	Services Institute [SAESI]	
25 July 2013	Gauteng Fire Chiefs Committee	Fire Chiefs from across Gauteng province
29-30 May 2013	Gauteng [national workshop]	Key stakeholders identified by the Department for consultation during the review process. These stakeholders are part of the National Fire Services Advisory Committee (NAFSAC).
28 August 2013	Gauteng [bilateral engagement with Department of Agriculture, Forestry & Fisheries]	Officials responsible for the implementation of the National Veld and Forest Fire Act, 1998 [Fire Advisors]
19 September 2013	National Workshop: Functionality of District IGR Forums	Stakeholders including, Mayors, Municipal Managers, Councillors, Officials of various national and provincial sector departments.
23 – 25 October 2013	National fire safety and prevention workshop	Key stakeholders involved in fire safety, Disaster Managers, Fire Chiefs from government and the private sector, etc.
7 November 2013	Bilateral engagements with the Petro-Chemical Fire Chiefs Committee	Fire chiefs and representatives from the petrochemical industry.
20 November 2013	Workshop to discuss training proposals that must be integrated into the White Paper.	Fire services training coordinators and other fire services personnel including fire chiefs.
20 February 2014	Institute of Fire Engineers Annual	Delegates from various sectors

	General Meeting	
November 2015 and November 2017	Southern African Emergency Services Institute (SAESI) International Conference	Various delegates from the fire services sector and other related sectors.
06 May 2015	Sarah Baartman District Municipality	Delegates from the district municipality including Councillors, Chief Fire Officers, City Managers and other senior officers of municipalities.
May 2015, May 2016 and May 2017	InFIRE seminar	Delegates from the insurance sector
List is not exhaustive but covers only the major engagements held with stakeholders. It also does not contain details of extensive engagements held by the NDMC with stakeholders since the decision to review the fire service legislation was granted in April 2006.		

KEY STAKEHOLDERS WHO SUPPORTED THE PROCESS

The review of the FBSA started several years ago. Throughout this process, the NDMC was supported by various stakeholders (governmental, private and civil society). The robust and frank engagements held with these role players resulted in the development of this White Paper on Fire Services. While it is difficult to acknowledge all these stakeholders, professional associations such as the Southern African Emergency Services Institute (SAESI) and the Institute for Fire Engineers (IFE) have fully supported and actively participated in this process. They have also created platforms for the NDMC to present and engage with fire services stakeholders through the various international conferences that they hosted over the time during which this White Paper was under development.

The Fire Protection Association of Southern Africa (FPASA) has also significantly contributed into this process by providing data to support the various issues championed in this White Paper. All provinces have also fully participated in this process by organising workshops for the NDMC to present this White Paper, forming part of the national task team that developed this document, providing written inputs on various aspects covered by this policy document. All other stakeholders including chief fire officers and other fire services personnel both within municipal and designated/ private services who supported the process are also acknowledged.

DEPARTMENT OF MINERAL RESOURCES AND ENERGY

NOTICE 516 OF 2020

NATIONAL NUCLEAR REGULATOR ACT, 1999 (ACT NO 47 OF 1999)

Notice in terms of section 28 of the National Nuclear Regulator Act, 1999 (Act No 47 of 1999), on fees for Nuclear Authorisations.

I Mr. Gwede Mantashe, Minister of Minerals and Energy acting under section 28 of the National Nuclear Regulator Act, 1999 (Act No. 47 of 1999), on the recommendation of the NNR Board and in consultation with the Minister of Finance and by notice in the Government Gazette hereby determine the fees contained in the attached schedule payable to the Regulator in respect of —

(a) any application for the granting of a nuclear authorisation;

(b) an annual nuclear authorisation fee for the financial year (2020-21)

The fees shall be payable to the National Nuclear Regulator of South Africa, for the period of 01 April 2020 to 31 March 2021 by the licensed holders concerned.

MR. GWEDE MANTASHE, MP
MINISTER OF MINERALS RESOUCES AND ENERGY
DATE: 04/09/2020

The proposed fees payable by new applicants to the Nuclear Regulator for its regulatory services would increase from an hourly rate of R2, 029 for 2019-20 financial year to an hourly rate of R2, 181 for the 2020-21 financial year.

Facilities	**Type of Facility**	**Number of authorisation holders per category**	**Authorisation fees for the 2019/20 financial year per licenced holder.**	**Authorisation fees for the 2020/21 financial year per licenced holder.**	**Total fees for the 2020/21 financial year**
Category 1	Small users, laboratories and refurbishes	44	R61,726	R66,978	R2,947,032
Category 2	Scrap processors, scrap smelter and service providers	27	R77,157	R83,723	R2,260,521
Category 3	Fertilizers and other lesser mining and mineral processing facilities	5	R432,083	R468,851	R2,344,255
Category 4	Medium operators and other lesser mining and mineral processing facilities	41	R493,478	R535,470	R21,954,270
Category 5	Large operators which include major mining and mineral processing facilities	12	R1,172,798	R1,272,596	R15,271,152
Total		**129**	**R2,237,242**	**R2,427,618**	**R44,777,230**

Eskom KNPS-normal operation			R85,507,227	R92,783,424	R92,783,424
Eskom KNPS-Steam generator replacement			R20,885,957	R22,663,224	R22,663,224
Eskom-Thyspunt-Nuclear installation site license application			R0.00	R19,066,625	R19,066,625
Necsa-Pelindaba			R45,083,422	R48,919,746	R48,919,746
Necsa- Vaalputs			R6,944,196	R7,535,105	R7,535,105
Total			**R158,420,802**	**R190,968,124**	**R190,968,124**
Accumulated fees			**R160,658,044**	**R193,215,742**	**R235,745,354**

DEPARTMENT OF TRADE, INDUSTRY AND COMPETITION

NOTICE 517 OF 2020

INTERNATIONAL TRADE ADMINISTRATION COMMISSION

CUSTOMS TARIFF APPLICATIONS

LIST 08/2020

The International Trade Administration Commission (herein after referred to as ITAC or the Commission) has received the following applications concerning the Customs Tariff. Any objection to or comment on these representations should be submitted to the Chief Commissioner, ITAC, Private Bag X753, Pretoria, 0001. Attention is drawn to the fact that the rate of duty mentioned in these applications is that requested by the applicant and that the Commission may, depending on its findings, recommend a lower or higher rate of duty.

CONFIDENTIAL INFORMATION

The submission of confidential information to the Commission in connection with customs tariff applications is governed by section 3 of the Tariff Investigations Regulations, which regulations can be found on ITAC's website at http://www.itac.org.za/documents/R.397.pdf.
These regulations require that if any information is considered to be confidential, then a non-confidential version of the information must be submitted, simultaneously with the confidential version. In submitting a non-confidential version the regulations are strictly applicable and require parties to indicate:

- *Each instance where confidential information has been omitted and the reasons for confidentiality;*
- *A summary of the confidential information which permits other interested parties a reasonable understanding of the substance of the confidential information; and*
- *In exceptional cases, where information is not susceptible to summary, reasons must be submitted to this effect.*

This rule applies to all parties and to all correspondence with and submissions to the Commission, which unless clearly indicated to be confidential, will be made available to other interested parties.

The Commission will disregard any information indicated to be confidential that is not accompanied by a proper non-confidential summary or the aforementioned reasons.
If a party considers that any document of another party, on which that party is submitting representations, does not comply with the above rules and that such deficiency affects that party's ability to make meaningful representations, the details of the deficiency and the reasons why that party's rights are so affected must be submitted to the commission in writing forthwith (and at the latest 14 days prior to the date on which that party's submission is due).
Failure to do so timeously will seriously hamper the proper administration of the investigation, and such party will not be able to subsequently claim an inability to make meaningful representations on the basis of the failure of such other party to meet the requirements.

1. INCREASE IN THE RATE OF CUSTOMS DUTY ON:

- "Cans, of a capacity of 0.125 li but not exceeding 8 li, which are to be closed by soldering or crimping, classifiable in tariff subheading 7310.21 by the creation of a new 8-digit tariff subheading under 7310.21 for "of a capacity of 0.125 li or more but not exceeding 8 li";
- "Other cans, of capacity of 0.125 li or more but not exceeding 8 li, classifiable in tariff subheading 7310.29, by the creation of a new 8-digit tariff subheading under 7310.29 for "of a capacity of 0.125 li or more but not exceeding 8 li";
- "Cans, of a capacity exceeding 8 li but not exceeding 25 li, which are to be closed by soldering or crimping, classifiable in tariff subheading 7310.21 by the creation of a new 8-digit tariff subheading under 7310.21 for ''of a capacity exceeding 8 li but not exceeding 25 li";
- "Other cans, of a capacity exceeding 8 li but not exceeding 25 li, classifiable in tariff subheading 7310.29, by the creation of a new 8-digit tariff subheading under 7310.29 for "of a capacity exceeding 8 li but not exceeding 25 li"; and
- "Aerosol cans, of a capacity of 0.075 li or more but not exceeding 0.5 li, classifiable under subheading 7310.29 for "aerosol cans of a capacity of 0.075 li or more but not exceeding 500 ml".

APPLICANT:

Rheem SA (Pty) Ltd
8-10 The Avenue East
Prospecton
ISIPINGO BEACH
4133

And

SA Steelpack (Pty) Ltd
Unit 3, 9 Edmund Morewood Road
Tongaat
DURBAN
4400

Enquiries: ITAC Ref: 23/2019, Enquires: Mr. Pfarelo Phaswana / Ms. Ndivhudza Mokou, Tel: 012 394 3628/3627 or email pphaswana@itac.org.za/nramphabana@itac.org.za.

REASONS FOR THE APPLICATION:

The applicant submitted, *inter alia*, the following reasons for the application:

- Local manufacturers of tinplate cans, pails, and aerosol cans have, over the recent years, lost market share due to low priced imports from China;

- Low priced imports of the subject products are currently free of duty and enable importers to sell cans locally at drastically reduced prices;

- This has impacted negatively on plant utilisation, leading to higher unit costs of production, reduced profitability, and little or no return on investment;

- Low priced imports have resulted in the downsizing of local production and subsequently led to job losses; and

- Tariff support will allow the domestic industry to compete favourable, increase market share and result in increased job opportunities.

PUBLICATION PERIOD:

Representation should be made within **four (4)** weeks of the date of this notice.

2. REBATE FACILITY ON:

Goods for experimental purposes:

"Arms and ammunition, parts and accessories thereof, classifiable in Chapter 93, for the purposes of testing and experimenting therewith as the National Conventional Arms Control Committee and the Directorate for Conventional Arms Control may allow by specific permit in terms of the National Conventional Arms Control Act, 41 of 2002"

Provided that:

(i) Goods imported under this rebate item shall be limited to goods imported for testing purposes and shall not be sold or disposed to any other party or be removed to the area of Botswana, Eswatini, Lesotho or Namibia unless under specific authority of the National Conventional Arms Control Committee and the Directorate for Conventional Arms Control; and

(ii) Goods not consumed or destroyed during the testing process must be exported within 180 days from the date of the said import permits issued by the National Conventional Arms Control Committee and the Directorate for Conventional Arms Control."

APPLICANT:
Denel SOC Limited trading as Denel Overberg Test Range

Private Bag X12

BREDASDORP

7208

Enquiries: ITAC Ref: 08/2020. Ms Diphetogo Rathete / Ms Lufuno Maliaga. Tel: 012 394 3683/3835 or email drathete@itac.org.za/lmaliaga@itac.org.za.

REASONS FOR THE APPLICATION:

As motivation for the application, the applicant cited, *inter alia*, the following reasons:

- Denel has been conducting business since the mid 1980's as a testing facility. Historically, the applicant imported weapons, weaponry systems, ammunition and other related items to be tested for its international clients under Rebate Item 412.01, in accordance to the required NCACC and ITAC permits obtained;
- Furthermore, the applicant has also utilised Rebate Item 412.11 successfully in certain instances. However, in certain instances there have been disputes on whether goods imported by Denel for testing are eligible under Rebate Items 412.01 and 412.11;
- Due to the unique nature of Denel's business, no adequate provision has been made to address this specific situation and the wording in the current rebate items can be interpreted in an ambiguous manner;
- Customs duties payable upon importation of weapons, weaponry systems, ammunition and related items would negatively affect the competitive position and threaten the sustainability of Denel's business; and
- The duty relief will contribute to the reduction of cost and improve the competitive position of the domestic industry testing facility.

PUBLICATION PERIOD:

Written representations **should** be submitted within four (4) weeks of the date of this notice.

BOARD NOTICES • RAADSKENNISGEWINGS

BOARD NOTICE 122 OF 2020

South African Council for the Architectural Profession

Amendment to the Final Guideline for Professional Fees issued in terms of Section 34 (2) of the Architectural Profession Act, 2000 Act 44 of 2000

(Page 3 of 33 of the Board Notice 91 of 2000, no 43591 published on 7 August 2020 under National Government Gazette has been amended as follows)

Table 3: High Complexity

HIGH COMPLEXITY					
Cost Bracket	Value of works		Primary Fee	Plus, secondary fee	
	From	To		Add %	On balance over
	A	B	C	D	E
1.	1,00	200 000,00	21 600,00	**16,80%**	**1,00**
2.	200 001,00	650 000,00	55 199,83	**16,20%**	**200 001,00**
3.	650 001,00	2 000 000,00	128 099,67	**14,40%**	**650 001,00**
4.	2 000 001,00	4 000 000,00	322 499,53	**12,60%**	**2 000 001,00**
5.	4 000 001,00	6 500 000,00	574 499,40	**12,00%**	**4 000 001,00**
6.	6 500 001,00	13 000 000,00	874 499,28	**11,40%**	**6 500 001,00**
7.	13 000 001,00	40 000 000,00	1 615 499,17	**10,80%**	**13 000 001,00**
8.	40 000 001,00	130 000 000,00	4 531 499,06	**10,20%**	**40 000 001,00**
9.	130 000 001,00	260 000 000,00	13 711 498,96	**9,90%**	**130 000 001,00**
10.	260 000 001,00	520 000 000,00	26 581 498,86	**9,60%**	**260 000 001,00**
11.	520 000 001,00	1 040 000 000,00	51 541 498,76	**9,30%**	**520 000 001,00**
12.	1 040 000 001,00		99 901 498,67	**9,00%**	**1 040 000 001,00**

Method of Fee Calculation

- Primary Fee (C) for applicable Cost Bracket of Value of Works.
- Secondary Fee (D) for applicable Cost Bracket of Value of Works.
- Calculated as (Applicable Value of Works minus Column E) x % in terms of Column D.

Example: Fee Calculations – From tables above.

Complexity	**Low Complexity**	**Medium Complexity**	**High Complexity**
Value of Works	R 3 000 000	R 3 000 000	R 3 000 000
Primary Fee	R214 999,68	R271 342,39	R 322 499,53
Secondary Fee	(R 3 000 000 - R 2 000 001) x 8.40% R 999 999 x 8.40% R 83 999,92	(R 3 000 000 - R 2 000 001) x 10.60% R 999 999 x 10.60% R 105 999,89	(R 3 000 000 - R 2 000 001) x 12.60% R 999 999 x 12.60% R 125 999,89
Professional Fee	Primary Fee + Secondary Fee R214 999.68+ R83 999.92 R 298 999.60	Primary Fee + Secondary Fee R 271342.39+ R 105999.89 **R 377 342,28 (*fee corrected)**	Primary Fee + Secondary Fee R 322 499.53 + R 125 999,87 R 448 499,40

Printed by and obtainable from the Government Printer, Bosman Street, Private Bag X85, Pretoria, 0001
Contact Centre Tel: 012-748 6200. eMail: info.egazette@gpw.gov.za
Publications: Tel: (012) 748 6053, 748 6061, 748 6065