DEPARTMENT OF WATER AND SANITATION

NO. 1669 **14 January 2022**

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

RESERVE DETERMINATION FOR WATER RESOURCES OF THE MOKOLO AND MATLABAS CATCHMENTS

I, Senzo Mchunu, in my capacity as Minister of Water and Sanitation, and duly authorised in terms of sections 16(1) of the National Water Act, 1998 (Act No. 36 of 1998) , hereby publish the Reserve determination for water resources of the Mokolo and Matlabas catchments.

Director: Reserve Determination

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SENZO MCHUNU (MP)
MINISTER OF WATER AND SANITATION
DATE: 13/10/2021

RESERVE DETERMINATION FOR WATER RESOURCES OF THE MOKOLO AND MATLABAS CATCHMENTS IN TERMS OF SECTION 16(1) AND (2) OF THE NATIONAL WATER ACT, 1998 (ACT NO. 36 OF 1998)

SCHEDULE

1. DESCRIPTION OF WATER RESOURCE

1.1 The Reserve is determined for all or part of every significant water resource within the Mokolo and Matlabas catchments as set out below:

- Water Management Area: Limpopo
- Drainage Regions: A Primary Drainage Region (A41 and A42)
- Rivers: Mokolo, Mamba and Matlabas

1.2 The Minister has, in terms of section 12 of the National Water Act, 1998 (Act No.36 of 1998) ("the Act"), prescribed a system for classifying water resources by issuing Government Notice No. R. 810, published in *Gazette* No. 33541 dated 17 September 2010.

1.3 The Minister, in terms of section 16(1) of the Act, determines the following Reserve for the Mokolo and Matlabas catchments.

2. ACRONYMS AND DEFINITIONS

2.1 Acronyms

BHN	Basic Human Needs
EC	Ecological Category
EcoSpecs	Ecological Specifications
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
ESA	Ecological Support Areas
EWR	Ecological Water Requirement
EWR Site	Ecological Water Requirement Site
GRAII	Groundwater Resource Assessment Phase II
GRDM	Groundwater Resource Directed Measures
GRUs	Groundwater Resource Units
MAR	Mean Annual Runoff
MCM	Million Cubic Metres
MLF	Maintenance Low Flow
NMAR	Natural Mean Annual Runoff
PES	Present Ecological Status
RC	Reference conditions
REC	Recommended Ecological Category
TEACHA	Tools for Ecological Aquatic Chemical Habitat Assessment
TPCs	Thresholds of Potential Concern
WUL	Water Use Licence
WQSU	Water quality sub-unit

2.2 Definitions

In this Notice any word or expression to which a meaning has been assigned in the Act shall have the meaning so assigned and, 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;

"**biophysical node**" means the modelling point's which is a representative of an upstream reach or area of an aquatic eco-system such as rivers, wetlands, estuaries and groundwater for which a suite of relationships apply;

"**ecological importance and sensitivity**" 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**" means the flow patterns such as the magnitude, timing and duration, and water quality needed to maintain a riverine ecosystem in a particular condition. This term refers to both the quantity and the quality of the components;

"**ecological water requirement sites**" means specific points on the river, as determined through the site selection process, which consists of a length of a river 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 such as fish, invertebrates and riparian vegetation;

"**present ecological status**" 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 ranging from near natural to completely modified;

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

"**recommended ecological category**" 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, which refers to unmodified, natural to Category D, which refers to largely modified;

"**reserve**" means the quantity and quality of the water required to satisfy the BHN by securing a basic water supply and to protect the aquatic ecosystem in order to secure ecologically sustainable development and use of the relevant water resource; and

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"the **Act**" means the National Water Act, 1998 (Act No. 36 of 1998).

3. RESERVE DETERMINATION

(1) The Reserve which includes the EWR and the BHN Reserve for the Rivers at EWR sites and selected biophysical nodes in the Mokolo and Matlabas catchments are set out in Paragraph 4, Table 4.1.

(2) The water quality component of the Reserve for the Rivers at the EWR sites in Mokolo and Matlabas catchments, in terms of section 16(1) of the Act, is set out in Pargraph 5, Tables 5.1 - 5.10.

(3) The Groundwater Reserve for Water Quantity, in terms of section 16(1) of the Act, for the Mokolo and Matlabas catchments are set out in Paragraph 6, Table 6.1.

(4) The Mokolo and Matlabas catchments locality and EWR sites are indicated in Figure 1.

(5) The Groundwater Reserve for Water Quality, in terms of section 16(1) of the Act, for the Mokolo and Matlabas catchments are set out in Paragraph 7, Tables 7.1 - 7.5.

(6) The Reserve will apply from the date signed off as determined in terms of section 16(1) of the Act, unless otherwise specified by the Minister.

4. SURFACE WATER QUANTITY COMPONENT FOR RIVERS

The results for the Reserve determination and ecological categorisation for the Mokolo and Matlabas catchments, where the Reserve amounts are expressed as a percentage of the NMAR for the respective catchments in terms of section (16)(1) of the Act .

Table 4.1: Summary of the quantity component for the Rivers which include the EWR & BHN for the priority sites

Node Name	Quaternary Catchment	River Name	PES	EIS	NMAR (MCM)[1]	EWR % NMAR[2]	BHN Reserve[3] (%NMAR)	Total Reserve[4] (%NMAR)
HN51	A42B	Grootspruit (source) to confluence with Sand	D	Moderate	27.8	21.73	0	21.73
EWR Site MOK_EWR1 A	A42C	Mokolo to confluence with Dwars	C/D	High	84.84	16.7	0.048	16.748
EWR Site MOK_EWR1 B	A42E	Mokolo to confluence with Sterkstroom	B/C	High	135.03	13.6	0.090	13.69
HN54	A42D	Sterkstroom (source) to confluence with Mokolo,	B	Very high	43.45	52.63	0	52.63
EWR Site MOK_EWR2	A42F	Mokolo River in A42F to inflow Mokolo Dam,	B/C	Very high	196.2	11.7	0.103	11.803
EWR Site MOK_EWR3	A42G	Mokolo Dam to upper portion of A42G (10km downstream of dam)	B/C	Very high	214.5	8.9	0.111	9.011
EWR Site MOK_EWR4	A42G	Mokolo main stem	C	Very high	253.3	12.3	0.111	12.411
HN59	A41A	Headwaters Mothlabatsi (Matlabas-Zyn-Kloof, peatlands)	A	Very high	5.23	57.07	0	57.07
MAT Rapid_EWR 3	A41B	Mamba to confluence with Mothlabatsi	B/C	High	9.54	35.49	0	35.49
MAT Rapid_EWR 2	A41B	Matlabas/Motlhabatsi confluence (outlet of IUA)	B/C	High	32.80	33.23	0	33.23
MAT Rapid_EWR 4	A41C	Matlabas	B	Moderate	35.58	33.42	0	33.42

(1) These amounts represent the long term mean based on the NMAR. If the NMAR changes, this volume will also change.

(2) Represents the percentage of BHN.

(3) The total Reserve amount accounts for both the Ecological Reserve and the BHN.

The REC has not been recommended for approval for this preliminary Reserve but the maintenance of the current operating of the system was recommended.

5. SURFACE WATER - QUALITY COMPONENT FOR RIVERS

5.1 Summary of the Quality component at EWR sites

Table 5.1: PES categories and overall site assessment for EWR 1A in the Mokolo River- WQSU1 4

RIVER	Mokolo River		Water Quality Monitoring Points	
WQSU	4		RC	A4H002Q01, '77-'79, n = 68
EWR SITE	1A		PES	A4H002Q01, '02-'07 (with 1 point in 2007), n = 48 (but 37 for F and SO4)
Confidence assessment		Confidence in the assessment is moderate, as little DO, temp., turbidity or toxics data, although the gauging weir is close to the EWR site.		
Water Quality Constituents		RC Value	PES Value	Category (Rating) / Comment
Inorganic Salts* (mg/L)	MgSO4		-	TEACHA could not be used and EC used as surrogate
	Na2SO4		-	
	MgCl2		-	
	CaCl2		-	
	NaCl		-	
	CaSO4		-	
Nutrients (mg/L)	SRP	0.011	0.0165	B (1): Benchmark category was recalibrated
	TIN	0.080	0.123	A (0)
Physical variables	pH (5th and 95th percentiles)	6.68 - 7.70	6.92 - 7.83	A (0)
	Temperature		-	No data, but few impacts expected. Catchment not pristine, so A/B (0.5) – qualitative assessment only
	Dissolved oxygen		-	
	Turbidity (NTU)		-	No data, but loads not expected to be high. B (1) – qualitative assessment only
	Electrical conductivity (mS/m)	12.28	12.05	A (0)
Response variables	Chl-a: periphyton		EWR 1A: 21.58	C/D (2.5) (n=1)
	Chl-a: phytoplankton		-	-
	Biotic community composition: macroinvertebrate (ASPT) score		SASS: 127 ASPT: 5.3	C (62.3)

RIVER	Mokolo River		Water Quality Monitoring Points	
WQSU	4		RC	A4H002Q01, '77-'79, n = 68
EWR SITE	1A		PES	A4H002Q01, '02-'07 (with 1 point in 2007), n = 48 (but 37 for F and SO4)
Confidence assessment		Confidence in the assessment is moderate, as little DO, temp., turbidity or toxics data, although the gauging weir is close to the EWR site.		
Water Quality Constituents		RC Value	PES Value	Category (Rating) / Comment
	Fish		70.3	C - largely flow-related
	Diatoms		EWR 1A: SPI = 17.3 and 16.8	A/B (0.5) (n = 2)
Toxics (mg/L)	Fluoride	0.10	0.18	A (0)
	Ammonia		0.001	A (0)
OVERALL SITE CLASSIFICATION (from PAI)			B/C (80 %)	

* To be generated using TEACHA when the TPC for EC is exceeded or salt pollution is expected

Table 5.2: Ecospecs relating to physico-chemical data: PES

River: Mokolo		EWR Site: 1A	Monitoring site: A4H002Q01
Water quality metrics		ECOSPEC: PES	
Inorganic salts*	MgSO4	The 95th percentile of the data must be ≤ 16 mg/L.	
	Na2SO4	The 95th percentile of the data must be ≤ 20 mg/L.	
	MgCl2	The 95th percentile of the data must be ≤15 mg/L.	
	CaCl2	The 95th percentile of the data must be ≤ 21 mg/L.	
	NaCl	The 95th percentile of the data must be ≤ 45 mg/L.	
	CaSO4	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 and 95th percentiles of the data must range from 6.5 to 8.0.	
	Temperature	Small deviation from the natural temperature range.	
	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; minor silting of instream habitats acceptable.	
Nutrients (mg/L)	TIN	The 50th percentile of the data must be ≤ 0.25 mg/L.	
	PO4-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 < 10 µg/L.**	
	Chl-a periphyton	The 50th percentile of the data must be ≤ 52.5 mg/m2.***	
	Toxics	The 95th percentile of the data must be within the Chronic Effects Value (CEV) as stated in DWAF (1996).	

* To be generated using TEACHA when the TPC for EC is exceeded or salt pollution is expected

** No phytoplankton data were available for this assessment. All EcoSpecs and TPCs need verification as range is based on expert judgement.

*** Periphyton (21.58 mg/m2) is actually in a C/D category (C = 12 - 21 mg/m2 and D = 21 - 84 mg/m2; DWAF, 2008), so therefore the upper boundary of a C/D has been defined as the EcoSpec for the PES.

Table 5.3: PES categories and overall site assessment for EWR 1B in the Mokolo River- WQSU 4

RIVER	Mokolo River		Water Quality Monitoring Points	
WQSU	4		RC	A4H002Q01, '77 - '79, n = 68
EWR SITE	1B		PES	A4H002Q01, '02-'07 (with 1 point in 2007), n = 48 (but 37 for F and SO4)
Confidence assessment		Confidence in the assessment is moderate, as little DO, temp., turbidity or toxics data. Data from A4H002Q01 is used for EWR 1A and B, with modifications to the PAI table – particularly based on on-site indicators.		
Water Quality Constituents		RC Value	PES Value	Category (Rating) / Comment
Inorganic* salts (mg/L)	MgSO4		-	TEACHA could not be used and EC used as surrogate
	Na2SO4		-	
	MgCl2		-	
	CaCl2		-	
	NaCl		-	
	CaSO4		-	
Nutrients (mg/L)	SRP	0.011	0.0165	B (1): Benchmark category was recalibrated
	TIN	0.080	0.123	A (0)
Physical variables	pH (5th and 95th percentiles)	6.68 and 7.70	6.92 – 7.83	A (0)
	Temperature		-	No data, but few impacts expected. Catchment not pristine, so B (1) due to the impact of zero flows – qualitative assessment only
	Dissolved oxygen		-	
	Turbidity (NTU)		-	No data, but loads not expected to be high. B (1) – qualitative assessment only
	Electrical conductivity (mS/m)	12.28	12.05	A (0)
Response variables	Chl-a: periphyton		WQ site 3 (Dwars): 19.04 (high SD)	C (2) (n=1)
	Chl-a: phytoplankton		-	-
	Biotic community composition:		SASS: 130	

RIVER	Mokolo River		Water Quality Monitoring Points	
WQSU	4		RC	A4H002Q01, '77 - '79, n = 68
EWR SITE	1B		PES	A4H002Q01, '02-'07 (with 1 point in 2007), n = 48 (but 37 for F and SO4)
Confidence assessment		Confidence in the assessment is moderate, as little DO, temp., turbidity or toxics data. Data from A4H002Q01 is used for EWR 1A and B, with modifications to the PAI table – particularly based on on-site indicators.		
Water Quality Constituents		RC Value	PES Value	Category (Rating) / Comment
	macroinvertebrate (ASPT) score		ASPT: 5.4 (Jan '08) SASS: 188 ASPT: 6.1 (June '08)	B/C
	Fish		72.4	C
	Diatoms		EWR 1B: SPI = 18.8 WQ site 3 (Dwars): 15.9	A (0) (n=1) B (1) (n=2)
Toxics (mg/L)	Fluoride	0.10	0.18	A (0)
	Ammonia		0.001	A (0)
OVERALL SITE CLASSIFICATION (from PAI)			B/C (80.8%)	

* To be generated using TEACHA when the TPC for EC is exceeded or salt pollution is expected

Table 5.4: EcoSpecs relating to physico-chemical data: PES

River: Mokolo		EWR Site: 1B	Monitoring site: A4H002Q01
Water quality metrics		ECOSPEC: PES	
Inorganic salts* (mg/L)	MgSO4	The 95th percentile of the data must be ≤ 16 mg/L.	
	Na2SO4	The 95th percentile of the data must be ≤ 20 mg/L.	
	MgCl2	The 95th percentile of the data must be ≤15 mg/L.	
	CaCl2	The 95th percentile of the data must be ≤ 21 mg/L.	
	NaCl	The 95th percentile of the data must be ≤ 45 mg/L.	
	CaSO4	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 and 95th percentiles of the data must range from 6.5 to 8.0.	
	Temperature	Small deviation from the natural temperature range.	
	Dissolved oxygen	The 5th percentile of the data must be ≥ 7.0 mg/L.	
	Turbidity	Vary by a small amount from the natural turbidity range; minor silting of instream habitats acceptable.	
Nutrients (mg/L)	TIN	The 50th percentile of the data must be ≤ 0.25 mg/L.	
	PO4-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 < 10 µg/L.**.	
	Chl-a periphyton	The 50th percentile of the data must be ≤ 21 mg/m2.	
	Toxics	The 95th percentile of the data must be within the CEV as stated in DWAF (1996).	

* To be generated using TEACHA when the TPC for EC is exceeded or salt pollution is expected

** No phytoplankton data were available for this assessment. All EcoSpecs and TPCs need verification as range is based on expert judgement.

Table 5.5: PES categories and overall site assessment for EWR 2 in the Mokolo River- WQSU 4

RIVER	Mokolo River		Water Quality Monitoring Points	
WQSU	4		RC	A4H005Q01, '77 - '80, n = 85 (but 163 for EC)
EWR SITE	2		PES	A4H005Q01, '98 - '01, n = 39 (but 47 for TIN)
Confidence assessment		Confidence in the assessment is low. Little DO, temp., turbidity or toxics data are available, and although the gauging weir is close to the EWR site, present state data is only available up until 2001.		
Water Quality Constituents		RC Value	PES Value	Category (Rating) / Comment
Inorganic Salts (mg/L)	MgSO4		-	TEACHA could not be used and EC used as surrogate
	Na2SO4		-	
	MgCl2		-	
	CaCl2		-	
	NaCl		-	
	CaSO4		-	
Nutrients (mg/L)	SRP	0.011	0.0059	A (0): Benchmark category was recalibrated – RC data very variable
	TIN	0.06	0.02	A (0). RC data very variable
Physical variables	pH (5th and 95th percentiles)	6.00 and 7.25	7.46 - 7.87	A (0): Benchmark category recalibrated for lower A category
	Temperature		-	No data, but few impacts expected. Some temperature and DO fluctuations may occur at low flows - B (1) – qualitative assessment only
	Dissolved oxygen		-	
	Turbidity (NTU)		-	No data, but loads not expected to be high. A/B (0.5) – qualitative assessment only
	Electrical conductivity (mS/m)	9.09	9.4	A (0)
Response variables	Chl-a: periphyton		EWR 2: 25.54 WQ site 4: 18.68 (high SD)	D (3) (n=1). SD high across 3 replicates C (2) (n=1)
	Chl-a: phytoplankton		-	-

RIVER	Mokolo River		Water Quality Monitoring Points	
WQSU	4		RC	A4H005Q01, '77 - '80, n = 85 (but 163 for EC)
EWR SITE	2		PES	A4H005Q01, '98 - '01, n = 39 (but 47 for TIN)
Confidence assessment		Confidence in the assessment is low. Little DO, temp., turbidity or toxics data are available, and although the gauging weir is close to the EWR site, present state data is only available up until 2001.		
Water Quality Constituents		RC Value	PES Value	Category (Rating) / Comment
	Biotic community composition: macro - invertebrate (ASPT) score		Jan '08: SASS – 82; ASPT - 5.1 March '08: SASS - 126 ; ASPT - 6.6	C
	Fish		65.1	C
	Diatoms		EWR 2: SPI=16.1 WQ site 4: 18.8	B (1) (n=2) A (0) (n=1)
Toxics (mg/L)	Fluoride	0.19	0.15	A (0)
	Ammonia		0.002	A (0)
OVERALL SITE CLASSIFICATION (from PAI)			B (84.2)	

Table 5.6: EcoSpecs relating to physico-chemical data: PES

River: Mokolo		EWR: 2	Monitoring site: A4H002Q01
Water quality metrics		ECOSPEC: PES	
Inorganic salts* (mg/L)	MgSO4	The 95th percentile of the data must be ≤ 16 mg/L.	
	Na2SO4	The 95th percentile of the data must be ≤ 20 mg/L.	
	MgCl2	The 95th percentile of the data must be ≤15 mg/L.	
	CaCl2	The 95th percentile of the data must be ≤ 21 mg/L.	
	NaCl	The 95th percentile of the data must be ≤ 45 mg/L.	
	CaSO4	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 and 95th percentiles of the data must range from 6.5 to 8.0.	
	Temperature	Small deviation from the natural temperature range.	
	Dissolved oxygen	The 5th percentile of the data must be ≥ 7 mg/L.	
	Turbidity	Vary by a small amount from the natural turbidity range; minor silting of instream habitats acceptable.	
Nutrients (mg/L)	TIN	The 50th percentile of the data must be ≤ 0.25 mg/L.	
	PO4-P	The 50th percentile of the data must be ≤ 0.015 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 ≤ 52.5 mg/m2. ***	
	Toxics	The 95th percentile of the data must be within the TWQR as stated in DWAF (1996).	

* To be generated using TEACHA when the TPC for EC is exceeded or salt pollution expected.

** No phytoplankton data were available for this assessment. All EcoSpecs and TPCs need verification as based on expert judgement.

*** Periphyton (25.54 mg/m2) is actually in a C/D category (C= 12 - 21 and D= 21 - 84 mg/m2, DWAF 2008), so have defined the upper boundary of a C/D as the EcoSpec for PES.

Table 5.7: PES categories and overall site assessment for EWR 3 in the Mokolo River- WQSU 5

RIVER	Mokolo River		Water Quality Monitoring Points	
WQSU	5		RC	A4H007Q01, '77 - '80, n = 82
EWR SITE	3		PES	A4H010Q01, '92 - '96, n = 27 (but 19 for temp. and 6 for NH3)
Confidence assessment		Confidence in the assessment is low as little DO, temp., turbidity or toxics data are available. Although the gauging weir is close to the EWR site, present state data only until 1996. RC data sourced from A4H007Q01 on the Tambotie River (same EcoRegion level II).		
Water Quality Constituents		RC Value	PES Value	Category (Rating) / Comment
Inorganic salts (mg/L)	MgSO4		-	TEACHA could not be used and EC used as surrogate
	Na2SO4		-	
	MgCl2		-	
	CaCl2		-	
	NaCl		-	
	CaSO4		-	
Nutrients (mg/L)	SRP	0.007	0.015	A (0): Benchmark category was recalibrated -- Data very variable
	TIN	0.065	0.067	A (0). Data very variable
Physical variables	pH (5th and 95th percentiles)	5.14 and 6.70	7.2 and 7.76	B (1): RC data 5.14 (5th percentile) and 6.7 (95th percentile) -- reliability?
	Temperature (10th and 90th percentiles)		12 – 25	Little data, but site downstream Mokolo Dam (even if multi-level off take, probably bottom release due to low flows in the dam), so dam impacts on temperature and DO expected. C (2)
	Dissolved oxygen		-	
	Turbidity (NTU)		-	No data, but loads not expected to be high. A/B (0.5) – qualitative assessment only
	Electrical conductivity (mS/m)	15 and 24	10.87	A (0)

RIVER	Mokolo River		Water Quality Monitoring Points	
WQSU	5		RC	A4H007Q01, '77 - '80, n = 82
EWR SITE	3		PES	A4H010Q01, '92 - '96, n = 27 (but 19 for temp. and 6 for NH3)
Confidence assessment		Confidence in the assessment is low as little DO, temp., turbidity or toxics data are available. Although the gauging weir is close to the EWR site, present state data only until 1996. RC data sourced from A4H007Q01 on the Tambotie River (same EcoRegion level II).		
Water Quality Constituents		RC Value	PES Value	Category (Rating) / Comment
Response variable	Chl-a: periphyton		17.28	C (2) (n=1)
	Chl-a: phytoplankton		-	-
	Biotic community composition: macroinvertebrate (ASPT) score		SASS:130 ASPT: 5.0 SASS: 149 ASPT: 5.7	C
	Fish		65.8	C
	Diatoms		SPI=16.6 (Sept 07) SPI=17.4 (Jan 08) SPI=18.4 (Mar 08)	B (1) (n=3) A (0) A (0)
Toxics (mg/L)	Fluoride	6.77	0.278	A (0)
	Ammonia	0.160	0.001	A (0)
OVERALL SITE CLASSIFICATION (from PAI)			B/C (79.2)	

Table 5.8: EcoSpecs relating to physico-chemical data: PES

River: Mokolo		EWR: 3	Monitoring site: A4H010Q01
Water quality metrics		ECOSPEC: PES	
Inorganic salts* (mg/L)	MgSO4	The 95th percentile of the data must be ≤ 16 mg/L.	
	Na2SO4	The 95th percentile of the data must be ≤ 20 mg/L.	
	MgCl2	The 95th percentile of the data must be ≤15 mg/L.	
	CaCl2	The 95th percentile of the data must be ≤ 21 mg/L.	
	NaCl	The 95th percentile of the data must be ≤ 45 mg/L.	
	CaSO4	The 95th percentile of the data must be ≤ 351 mg/L.	
Physical variables (mg/L)	EC	The 95th percentile of the data must be ≤ 30 mS/m.	
	pH	The 5th and 95th percentiles of the data must range from 6.5 to 8.0.	
	Temperature	Vary by more than 2°C, i.e. a large change to the temperature regime occurs often. Most moderately temperature sensitive species would be in lower abundances and frequency of occurrence than expected for reference. Biological assessments therefore recommended and initiate baseline monitoring for this variable if Level II or higher of the DSS.	
	Dissolved oxygen	The 5th percentile of the data must be ≥ 6 mg/L.	
	Turbidity	Vary by a small amount from the natural turbidity range; minor silting of instream habitats acceptable.	
Nutrients	TIN	The 50th percentile of the data must be ≤ 0.25 mg/L.	
	PO4-P	The 50th percentile of the data must be ≤ 0.015 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 ≤ 21 mg/m2.	
	Toxics	The 95th percentile of the data must be within the TWQR as stated in DWAF (1996).	

* To be generated using TEACHA when the TPC for EC is exceeded or salt pollution expected

** No phytoplankton data were available for this assessment. All EcoSpecs and TPCs need verification as based on expert judgement.

Table 5.9: PES categories and overall site assessment for EWR 4 in the Mokolo River- WQSU 5

RIVER	Mokolo River		Water Quality Monitoring Points	
WQSU	5		RC	A4H007Q01, '77 - '80, n = 82
EWR SITE	4		PES	A4H010Q01, '92-'96, n = 27 (but 19 for temp. and 6 for NH3)
Confidence assessment		Confidence in the assessment is low as little DO, temp., turbidity or toxics data are available. Data from A4H010Q01 is used for EWR 3 and 4, with modifications to the PAI table – particularly based on on-site indicators and the influence of Poer-se-loop tributary joining the Mokolo River between the two sites. Present state data only until 1996 and RC data sourced from A4H007Q01 on the Tambotie River (same EcoRegion level II).		
Water Quality Constituents		RC Value	PES Value	Category (Rating) / Comment
Inorganic salts (mg/L)	MgSO4		-	TEACHA could not be used and EC used as surrogate
	Na2SO4		-	
	MgCl2		-	
	CaCl2		-	
	NaCl		-	
	CaSO4		-	
Nutrients (mg/L)	SRP	0.007	0.015	A (0): Benchmark category was recalibrated – Data very variable
	TIN	0.065	0.067	A (0). Data very variable
Physical variables	pH (5th and 95th percentiles)	5.14 and 6.70	7.2 - 7.76	B (1): RC data 5.14 (5th percentile) and 6.7 (95th percentile) – reliability?
	Temperature		-	No data, but no impacts expected. Small temperature and DO fluctuations may occur - B (1) – qualitative assessment only
	Dissolved oxygen		-	
	Turbidity (NTU)		-	No data, but loads not expected to be too high and river generally clear. A (0) – qualitative assessment only
	Electrical conductivity (mS/m)	15 and 24	10.87	A (0)
Response variable	Chl-a: periphyton		-	-

RIVER	Mokolo River		Water Quality Monitoring Points	
WQSU	5		RC	A4H007Q01, '77 - '80, n = 82
EWR SITE	4		PES	A4H010Q01, '92-'96, n = 27 (but 19 for temp. and 6 for NH3)
Confidence assessment		Confidence in the assessment is low as little DO, temp., turbidity or toxics data are available. Data from A4H010Q01 is used for EWR 3 and 4, with modifications to the PAI table – particularly based on on-site indicators and the influence of Poer-se-loop tributary joining the Mokolo River between the two sites. Present state data only until 1996 and RC data sourced from A4H007Q01 on the Tambotie River (same EcoRegion level II).		
Water Quality Constituents		RC Value	PES Value	Category (Rating) / Comment
	Chl-a: phytoplankton		-	-
	Biotic community composition: macroinvertebrate (ASPT) score		SASS: 126 ASPT: 4.8	C
	Fish		63.73	C
	Diatoms		Sept '07: SPI=17.8 March '08: SPI=17.4	A (0) (n=2)
Toxics (mg/L)	Fluoride	6.77	0.278	A (0)
	Ammonia	0.160	0.001	A (0)
OVERALL SITE CLASSIFICATION (from PAI)			B (86.8)	

Table 5.10: EcoSpecs relating to physico-chemical data: PES

River: Mokolo		EWR: 4	Monitoring site: A4H010Q01
Water quality metrics		ECOSPEC: PES	
Inorganic salts* (mg/L)	MgSO4	The 95th percentile of the data must be ≤ 16 mg/L.	
	Na2SO4	The 95th percentile of the data must be ≤ 20 mg/L.	
	MgCl2	The 95th percentile of the data must be ≤15 mg/L.	
	CaCl2	The 95th percentile of the data must be ≤ 21 mg/L.	
	NaCl	The 95th percentile of the data must be ≤ 45 mg/L.	
	CaSO4	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 and 95th percentiles of the data must range from 6.5 to 8.0.	
	Temperature	Small to moderate deviation from the natural temperature range. Some highly temperature sensitive species in lower abundances and frequency of occurrence than expected for reference.	
	Dissolved oxygen	The 5th percentile of the data must be ≥ 7 mg/L.	
	Turbidity	No known concerns about turbidity; changes in turbidity appear to be natural.	
Nutrients (mg/L)	TIN	The 50th percentile of the data must be ≤ 0.25 mg/L.	
	PO4-P	The 50th percentile of the data must be ≤ 0.015 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 ≤ 21 mg/m2 .	
	Toxics	An impact is expected if the 95th percentile of the data exceeds the TWQR as stated in DWAF (1996).	

*: To be generated using TEACHA when the TPC for EC is exceeded or salt pollution is expected

**: No phytoplankton data were available for this assessment. All EcoSpecs and TPCs need verification as range is based on expert judgement.

6. GROUNDWATER - QUANTITY COMPONENT

The groundwater quantity component was determined using values such as recharge, baseflow, and stress index, obtained during the determination of water resource classes and associated resource quality objectives in the Mokolo and Matlabas catchments, DWS 2015, shown in Table 6.1. The average annual groundwater recharge for the entire catchment based on the GRA II dataset is estimated to be more than 16.25 Mm^3/a. The EWR_MLF values were obtained from the Intermediate groundwater Reserve determination study for the Limpopo catchment (Water Geosciences Consulting, 2011).

Population values were obtained from the Water Services dataset of 2011. BHN provides for the essential needs of individuals served by the water resource in question and includes water for drinking, food preparation and for personal hygiene. A life-line amount of 25 litres per person per day was used. The current study approach also took cognisance of the GRA II and WARMS 2013 datasets to achieve a more balanced estimate of groundwater use. The groundwater stress index reflects groundwater used versus recharge.

6.1 Summary of the Quantity component of the Groundwater Reserve

Table 6.1: Mokolo and Matlabas Quantity component of the Groundwater Reserve

Quat	Area (km)	Recharge (Mm3/a)	Population (Water services) 2011)	Baseflow (Mm3/a)	EWR_MLF (Mm3/a)	BHN Reserve (Mm3/a)	Reserve (Mm3/a)	Reserve as % of Recharge	Current Groundwater Use (Mm3/a)	Stress Index
A41A	692	17.66	6785	5.06	3.18	0.06	3.24	18.34	1.22	0.07
A41B	358	7.86	5175	1.79	0.75	0.05	0.80	10.18	0.15	0.02
A41C	1111	13.23	7749	0.85	0.39	0.07	0.46	3.48	0.25	0.02
A41D	1913	16.71	5483	0.54	0.54	0.05	0.59	3.53	2.76	0.16
A41E	1940	12.41	7886	0.17	0.53	0.07	0.60	4.83	1.79	0.14
A42A	573	18.19	3793	9.46	4.07	0.03	4.10	22.54	4.56	0.25
A42B	522	15.77	3443	8.93	4.05	0.03	4.08	26.90	4.47	0.28
A42C	698	27.02	6031	11.56	2.83	0.06	2.89	10.69	5.51	0.20
A42D	497	16.86	2662	6.49	9.19	0.02	9.21	54.62	2.93	0.17
A42E	1007	32.98	13391	11.87	8.18	0.12	8.30	25.17	8.10	0.24
A42F	1022	22.46	1958	4.23	2.48	0.02	2.50	11.13	2.66	0.12
A42G	1207	26.40	2188	2.53	2.70	0.02	2.72	10.30	0.13	0.004
A42H	1057	18.15	17266	2.02	0.63	0.16	0.79	4.35	0.09	0.004
A42J	1 812	12.81	2812	0.74	0.36	0.03	0.39	3.04	2.12	0.16

7. GROUNDWATER - QUALITY COMPONENT

7.1 Summary of the Quality component of the Groundwater Reserve

Table 7.1: Groundwater quality per Quaternary Catchments (A41A, A41B, A41C and A41D)

Chemical Parameter	Unit	Quaternary Catchmentss A41A, A41B, A41C & A41D												
		No. of Samples				Ambient GW quality or median[1]				BHN Reserve[2]	Groundwater Quality Reserve[3]			
		A41 A	A41 B	A41 C	A41D	A41A	A41B	A41C	A41D		A41A	A41B	A41C	A41D
pH		70	259	70	259	7.51	7.61	7.51	7.61	5.0 – 9.5 (±0.1)	6.76-8.26	6.85-8.37	7.85-8.26	6.85-8.37
Electrical Conductivity	mS/m	70	259	70	259	97.50	130.00	97.50	130.00	<150	107.25	143.00	107.25	143.00
Calcium as Ca	mg/l	70	259	70	259	49.90	76.50	49.90	76.50	<150	54.89	84.15	54.89	84.15
Magnesium as Mg	mg/l	70	259	70	259	37.55	52.80	37.55	52.80	<100	41.31	58.08	41.31	58.08
Sodium as Na	mg/l	70	259	70	259	105.70	129.10	105.70	129.10	<200	116.27	142.01	116.27	142.01
Chloride as Cl	mg/l	70	259	70	259	78.30	143.10	78.30	143.10	<200	86.13	157.41	86.13	157.41
Sulphate as SO_4	mg/l	70	259	70	259	21.65	38.87	21.65	38.87	<400	23.82	42.76	23.82	42.76
Nitrate as NO_x-N	mg/l	70	259	70	259	3.90	4.53	3.90	4.53	<10	4.29	4.98	4.29	4.98
Fluoride as F	mg/l	70	259	70	259	1.28	0.85	1.28	0.85	<1.0	1.28	0.94	1.28	0.94

(1) Based on data obtained from the National Groundwater Archive. Values reported are the statistical median of each parameter.

(2) Ref: *Quality of Domestic Water Supplies, Volume 1: Assessment Guide, 2nd Ed.*1998. Water Research Commission Report No: TT 101/98. Pretoria, South Africa (Set for a Class 1).

(3) Where a difference in the water quality values for the ambient groundwater quality and BHN was found, the lesser or more protective value was selected for the groundwater quality Reserve. Where the ambient groundwater quality was selected as the groundwater quality Reserve, the value was scaled up by 10 per cent provided that the value does not exceed the BHN Reserve.

Table 7.2: Groundwater quality per Quaternary Catchments (A41E, A42A, A42B and A42C)

Chemical Parameter	Unit	Quaternary Catchmentss A41E, A42A, A42B & A42C												
		No. of Samples				Ambient GW quality or median[1]				BHN Reserve[2]	Groundwater Quality Reserve[3]			
		A41E	A42A	A42B	A42C	A41E	A42A	A42B	A42C		A41E	A42A	A42B	A42C
pH		99	4	4	47	7.70	6.88	7.55	8.10	5.0 – 9.5 (±0.1)	6.93-8.47	6.19-7.57	6.80-8.30	7.29-8.91
Electrical Conductivity	mS/m	99	4	4	47	163.20	14.10	23.75	33.30	<150	163.20	15.51	26.13	36.63
Calcium as Ca	mg/l	96	3	4	41	79.50	3.40	18.85	17.70	<150	87.45	3.74	20.74	19.47
Magnesium as Mg	mg/l	96	3	4	41	47.20	6.10	9.75	5.61	<100	51.92	6.71	10.73	6.17
Sodium as Na	mg/l	96	3	4	41	213.05	5.60	12.30	52.50	<200	213.05	6.16	13.53	57.75
Chloride as Cl	mg/l	97	4	4	41	280.00	14.10	7.25	11.00	<200	280.00	15.51	7.98	12.10
Sulphate as SO_4	mg/l	96	3	4	41	76.50	10.20	8.60	7.78	<400	84.15	11.22	9.46	8.55
Nitrate as NO_x-N	mg/l	97	4	4	42	6.70	0.07	0.19	1.64	<10	7.37	0.07	0.20	1.80
Fluoride as F	mg/l	97	3	4	41	1.10	0.38	0.57	0.42	<1.0	1.10	0.42	0.62	0.46

(1) Based on data obtained from the National Groundwater Archive. Values reported are the statistical median of each parameter.

(2) Ref: *Quality of Domestic Water Supplies, Volume 1: Assessment Guide, 2nd Ed.*1998. Water Research Commission Report No: TT 101/98. Pretoria, South Africa (Set for a Class 1).

(3) Where a difference in the water quality values for the ambient groundwater quality and BHN was found, the lesser or more protective value was selected for the groundwater quality Reserve. Where the ambient groundwater quality was selected as the groundwater quality Reserve, the value was scaled up by 10 per cent provided that the value does not exceed the BHN Reserve.

Table 7.3: Groundwater quality per Quaternary Catchment (A42D, A42E, A42F,and A42G)

Chemical Parameter	Unit	Quaternary Catchments A42D, A42E, A42F & A42G												
		No. of Samples				Ambient GW quality or median[1]				BHN Reserve[2]	Groundwater Quality Reserve[3]			
		A42D	A42E	A42F	A42G	A42D	A42E	A42F	A42G		A42D	A42E	A42F	A42G
pH		3	12	3	20	7.07	7.56	7.93	7.34	5.0 – 9.5 (±0.1)	6.36-7.78	6.80-8.31	7.14-8.72	6.61-8.07
Electrical Conductivity	mS/m	3	12	3	20	42.10	58.85	25.50	27.60	<150	46.31	64.74	28.05	30.36
Calcium as Ca	mg/l	3	12	2	20	41.60	30.25	10.25	8.35	<150	45.76	33.28	11.28	9.19
Magnesium as Mg	mg/l	3	12	2	20	8.30	17.10	7.55	5.60	<100	9.13	18.81	8.31	6.16
Sodium as Na	mg/l	2	12	2	20	26.20	24.35	17.10	15.40	<200	28.82	26.79	18.81	16.94
Chloride as Cl	mg/l	3	12	3	20	17.00	33.70	6.85	10.90	<200	18.70	37.07	7.54	11.99
Sulphate as SO_4	mg/l	3	12	2	20	14.00	8.55	5.30	6.65	<400	15.40	9.41	5.83	7.32
Nitrate as NO_x-N	mg/l	2	12	2	20	0.22	0.06	0.16	0.09	<10	0.24	0.06	0.18	0.10
Fluoride as F	mg/l	3	12	3	20	0.12	0.35	0.50	0.22	<1.0	0.13	0.39	0.55	0.24

(1) Based on data obtained from the National Groundwater Archive. Values reported are the statistical median of each parameter.

(2) Ref: *Quality of Domestic Water Supplies, Volume 1: Assessment Guide, 2nd Ed.*1998. Water Research Commission Report No: TT 101/98. Pretoria, South Africa (Set for a Class 1).

(3) Where a difference in the water quality values for the ambient groundwater quality and BHN was found, the lesser or more protective value was selected for the groundwater quality Reserve. Where the ambient groundwater quality was selected as the groundwater quality Reserve, the value was scaled up by 10 per cent provided that the value does not exceed the BHN Reserve.

Table 7.4: Groundwater quality per Quaternary Catchment (A42H and A42J)

Chemical Parameter	Unit	Quaternary Catchments A42H & A42J						
		No. of Samples		Ambient GW quality or median[1]		BHN Reserve[2]	Groundwater Quality Reserve[3]	
		A42H	A42J	A42H	A42J		A42H	A42J
pH		48	54	8.23	7.44	5.0 – 9.5 (±0.1)	7.41-9.06	6.70-8.18
Electrical Conductivity	mS/m	48	54	159.50	199.85	<150	159.50	199.85
Calcium as Ca	mg/l	47	54	7.50	71.00	<150	8.25	78.10
Magnesium as Mg	mg/l	47	54	1.20	40.35	<100	1.32	44.39
Sodium as Na	mg/l	47	54	313.56	196.45	<200	313.56	200
Chloride as Cl	mg/l	47	54	284.00	302.60	<200	284.00	302.60
Sulphate as SO_4	mg/l	47	54	135.33	129.05	<400	148.86	141.96
Nitrate as NO_x-N	mg/l	47	54	0.08	7.50	<10	0.09	8.25
Fluoride as F	mg/l	43	54	12.62	1.21	<1.0	12.62	1.21

(1) Based on data obtained from the National Groundwater Archive. Values reported are the statistical median of each parameter.

(2) Ref: *Quality of Domestic Water Supplies, Volume 1: Assessment Guide, 2nd Ed.*1998. Water Research Commission Report No: TT 101/98. Pretoria, South Africa (Set for a Class 1).

(3) Where a difference in the water quality values for the ambient groundwater quality and BHN was found, the lesser or more protective value was selected for the groundwater quality Reserve. Where the ambient groundwater quality was selected as the groundwater quality Reserve, the value was scaled up by 10 per cent provided that the value does not exceed the BHN Reserve.

A total of 2 quaternary catchmentss (A41A and A41B) do not have adequate groundwater chemistry data for comprehensive analysis of the ambient status. The ambient groundwater quality for A41A and A41B was therefore extrapolated from neighbouring quaternary catchments (A41C and A41D) with a similar geology because geology has a huge bearing on the water quality of an area.

Table 7.5: Summary of the water quality class and parameters of concern

Quaternary catchment	Water quality class (WRC, 1998)	Water quality parameters of concern
A41A	II	Fluoride
A41B	I	Electrical Conductivity, Chloride and Sodium
A41C	II	Fluoride
A41D	I	Electrical Conductivity,Chloride and Sodium
A41E	II	Chloride, Electrical Conductivity and sodium
A42A	0	None
A42B	0	None
A42C	0	None
A42D	0	None
A42E	0	None
A42F	0	None
A42G	0	None
A42H	III	Fluoride
A42J	III	Chloride, Electrical Conductivity and fluoride

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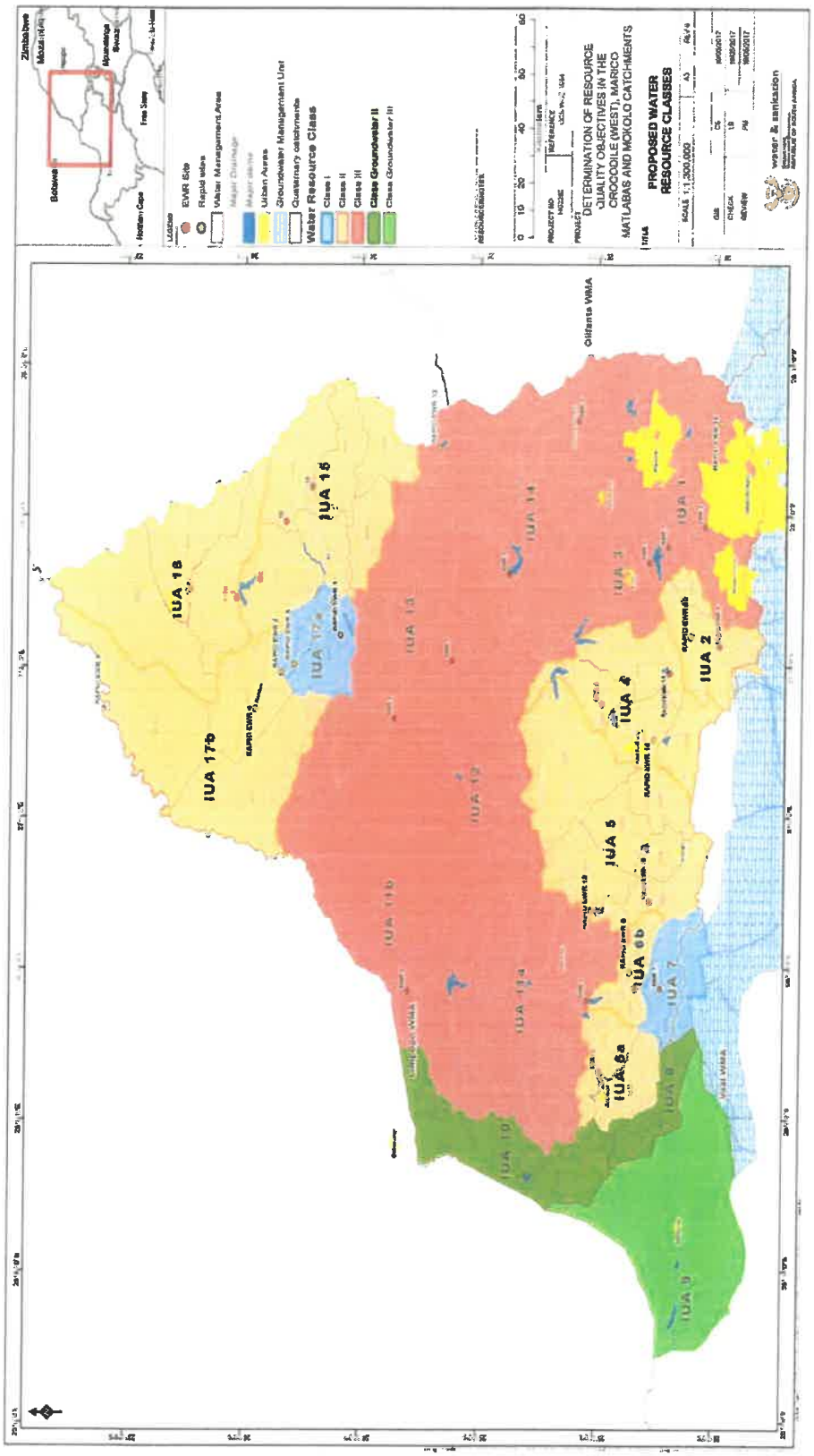

Figure 1: Locality map for the Crocodile (West), Marico, Mokolo and Matlabas catchmentss illustrating the Water Resource class and EWR sites.

WATER EN SANITASIE, DEPARTEMENT VAN

NO. 1669 **14 Januarie 2022**

NASIONALE WATERWET, 1998 (WET NO. 36 VAN 1998)

RESERWEBEPALING VIR WATERHULPBRONNE VAN DIE MOKOLO- EN DIE MATLABAS-OPVANGGEBIED

Ek, Senzo Mchunu, in my hoedanigheid van Minister van Water en Sanitasie, behoorlik daartoe gemagtig by artikel 16(1) van die Nasionale Waterwet, 1998 (Wet No. 36 van 1998), bepaal hierby die Reserwe vir waterhulpbronne van die Mokolo- en die Matlabas-opvanggebied.

Direkteur: Reserwebepaling

Aandag: Mnr. Yakeen Atwaru

Departement van Water en Sanitasie

Ndinaye-gebou

Francis Baard-straat 185

Privaat Sak X313

Pretoria

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E-pos: atwaruy@dws.gov.za

Meneer. SENZO MCHUNU (MP)
MINISTER VAN WATER EN SANITASIE
DATUM: 13/10/2021

RESERWEBEPALING INGEVOLGE ARTIKEL 16(1) VAN DIE NASIONALE WATERWET, 1998 (WET NO. 36 VAN 1998), VIR WATERHULPBRONNE VAN DIE MOKOLO- EN DIE MATLABAS-OPVANGGEBIED

BYLAE

1. BESKRYWING VAN WATERHULPBRON

1.1 Die Reserwe word bepaal vir die geheel of 'n gedeelte van elke betekenisvolle waterhulpbron in die Mokolo- en die Matlabas-opvanggebied, soos hier onder uiteengesit:

- Waterbestuursgebied: Limpopo
- Dreineerstreek: 'n Primêre dreineerstreek (A41 en A42)
- Riviere: Mokolo, Mamba en Matlabas

1.2 Die Minister het ingevolge artikel 12 van die Nasionale Waterwet, 1998 (Wet No. 36 van 1998), by Goewermentskennisgewing No. R.810, gepubliseer in *Staatskoerant* No. 33541 van 17 September 2010, 'n stelsel voorgeskryf vir die klassifisering van waterhulpbronne.

1.3 Die Minister bepaal ingevolge artikel 16(1) van die Wet onderstaande Reserwe vir die Mokolo- en die Matlabas-opvanggebied.

2. AKRONIEME EN WOORDOMSKRYWING

2.1 Akronieme

AEK	Aanbevole ekologiese kategorie
BMB	Basiese menslike behoeftes
DPK's	Drempels van potensiële kommer
EBS	Ekologiese belang en sensitiwiteit
EK	Ekologiese kategorie
ES	Ekologiese spesifikasies
ESG	Ekologiese steungebiede
EWB	Ekologiese waterbenodigdhede
EWB-terrein	Ekologiese waterbenodigdhedeterrein
GHE's	Grondwaterhulpbroneenhede
GHE II	Grondwaterhulpbronevaluering, Fase II
GHGM	Grondwaterhulpbrongerigte maatreëls
GJA	Gemiddelde jaarlikse afloop
HES	Huidige ekologiese status
ILF	Instandhoudings- lae vloei
MEACHE	Middele vir ekologiese akwatiese chemiese habitatevaluering
MKM	Miljoen kubieke meter
NGJA	Natuurlike gemiddelde jaarlikse afloop
OIE	Omgewingsinwerkingsevaluasie
VT	Verwysingstoestande
WGL	Watergebruikslisensie
WGSE	Watergehalte-subeenheid

2.2 Woordomskrywing

In hierdie Kennisgewing het 'n woord of uitdrukking waaraan 'n bekenis in die Wet geheg is, daardie betekenis en, tensy uit die samehang anders blyk, beteken—

"**aanbevole ekologiese kategorie**" 'n ekologiese kategorie wat die ekologiese bestuursdoelwit aandui wat behaal moet word vir 'n waterhulpbron op grond van sy ekologiese klassifikasie, welke kategorie kan wissel van Kategorie A, wat 'n ongewysigde, natuurlike waterhulpbron behels, tot Kategorie D, wat 'n grotendeels gewysigde waterhulpbron behels;

"**aanvulling**" die byvoeging van water tot die versadigingsone, hetsy deur afwaartse deursypeling van neerslag of oppervlakwater, of deur die sywaartse migrasie van grondwater uit naasliggende waterdraers;

"**basisvloei**" volgehoue vloei in riviere gedurende droë of redelike mooiweerstoestande wat nie noodwendig aan grondwater toegeskryf kan word nie, met inbegrip van bydraes deur vertraagde bolaagvloei en grondwaterafloop;

"**biofisiese nodus**" die modelleringspunt wat verteenwoordigend is van 'n boloop of 'n gebied van 'n waterekosisteem, soos 'n rivier, 'n vleiland, 'n riviermonding en grondwater, waarop 'n stel verhoudings van toepassing is;

"**die Wet**" die Nasionale Waterwet, 1998 (Wet No. 36 van 1998);

"**ekologiese belang en sensitiwiteit**" sleutelaanwysers in die ekologiese klassifisering van waterhulpbronne, waarin ekologiese belang betrekking het op die aanwesigheid, verteenwoordigendheid en diversiteit van spesies in die biota en habitat, en ekologiese sensitiwiteit betrekking het op die kwesbaarheid van die habitat en biota vir wysigings wat in watervloei, watervlakke en fisies-chemiese toestande kan intree;

"**ekologiese watervereistes**" die vloeipatrone, soos die grootte, tydbepaling en duur, en die watergehalte, wat nodig is om 'n rivierekosisteem in 'n bepaalde toestand te hou, en die term het betrekking op sowel die hoeveelheid as die gehalte van die komponente;

"**ekologiese waterbenodigdhedeterreine**" bepaalde punte in die rivier soos vasgestel deur die terreinseleksieproses, wat bestaan uit 'n stuk van 'n rivier met verskillende dwarssnitte vir sowel hidrouliese as ekologiese doeleinde, welke terreine voldoende aanwysers bied om omgewingsvloei te evalueer en om die toestand van die aandrywers van die biofisiese komponente, soos hidrologie, geomorfologie en fisies-chemiese biologiese reaksies, soos vis, ongewerweldes en oewerplantegroei te evalueer;

"**huidige ekologiese status**" 'n kategorie wat die huidige gesondheid of integriteit van verskillende biologiese kenmerke van die waterhulpbron aandui, vergeleke met die natuurlike of bykans natuurlike

verwysingstoestande; die resultate van die proses verstrek word as ekologiese kategorieë wat strek van amper natuurlik tot heeltemal gewysig; en

"**reserwe**" die hoeveelheid en gehalte van die water wat benodig word om aan die BMB te voldoen deur 'n basiese watervoorraad te verseker en om die waterekosisteem te beskerm ten einde ekologies volhoubare ontwikkeling en gebruik van die betrokke waterhulpbron te verseker.

3. RESERWEBEPALING

(1) Die Reserwe, wat die EWB en die BMB-reserwe vir die riviere by EWB-terreine en geselekteerde biofisiese nodusse in die Mokolo- en die Matlabas-opvanggebied insluit, word in Tabel 4.1 in paragraaf 4 uiteengesit.

(2) Die watergehaltekomponent van die Reserwe vir die riviere by die EWB-terreine in die Mokolo- en die Matlabas-opvanggebied ingevolge artikel 16(1) van die Wet word in Tabelle 5.1 tot 5.10 in paragraaf 5 uiteengesit.

(3) Die grondwaterreserwe vir waterhoeveelheid vir die Mokolo- en die Matlabas-opvanggebied ingevolge artikel 16(1) van die Wet word in Tabel 6.1 in paragraaf 6 uiteengesit.

(4) Die ligging van die Mokolo- en die Matlabas-opvanggebied en die EWB-terreine word in Figuur 1 aangedui.

(5) Die grondwaterreserwe vir watergehalte vir die Mokolo- en die Matlabas-opvanggebied ingevolge artikel 16(1) van die Wet word in Tabelle 7.1 tot 7.5 in paragraaf 7 uiteengesit.

(6) Die Reserwe geld vanaf die datum bepaal ingevolge artikel 16(1) van die Wet, tensy die Minister anders bepaal.

4. DIE KOMPONENT OPPERVLAKWATERHOEVEELHEID VIR RIVIERE

Die uitslae van die Reserwebepaling en ekologiese kategorisering vir die Mokolo- en die Matlabas-opvanggebied verskyn hier onder, waarin die Reserwehoeveelhede uitgedruk word as 'n persentasie van die NGJA vir die verskillende opvanggebiede, ingevolge artikel 16(1) van die Wet:

Tabel 4.1: Samevatting van die hoeveelheidkomponent vir die riviere, met inbegrip van die EWB en BMB vir die prioriteitsterreine

Nodusnaam	Kwaternêre opvanggebied	Riviernaam	HES	EBS	NGJA (MKM)[1]	EWB % NGJA[2]	BMB-reserwe[3] (% NGJA)	Totale Reserwe[4] (% NGJA)
HN51	A42B	Grootspruit (oorsprong) tot samevloeiing met Sand	D	Matig	27,8	21,73	0	21,73
EWB-terrein MOK_EWB1A	A42C	Mokolo tot samevloeiing met Dwars	C/D	Hoog	84,84	16,7	0,048	16,748
EWB-terrein MOK_EWB1B	A42E	Mokolo tot samevloeiing met Sterkstroom	B/C	Hoog	135,03	13,6	0,090	13,69
HN54	A42D	Sterkstroom (oorsprong) tot samevloeiing met Mokolo,	B	Baie hoog	43,45	52,63	0	52,63
EWB-terrein MOK_EWB2	A42F	Mokolorivier in A42F tot invloei Mokolodam	B/C	Baie hoog	196,2	11,7	0,103	11,803
EWB-terrein MOK_EWB3	A42G	Mokolodam tot boonste gedeelte van A42G (10 km stroomaf van dam)	B/C	Baie hoog	214,5	8,9	0.111	9,011
EWB-terrein MOK_EWB4	A42G	Mokolo-hoofstam	C	Baie hoog	253,3	12,3	0,111	12,411
HN59	A41A	Bolope Mothlabatsi (Matlabas-Zyn-Kloof, veengrond)	A	Baie hoog	5,23	57.07	0	57,07
MAT Stroomversnelling_EWB3	A41B	Mamba tot samevloeiing met Mothlabatsi	B/C	Hoog	9,54	35,49	0	35,49
MAT Stroomversnelling_EWB2	A41B	Matlabas-Motlhabatsi-samevloeiing (uitlaat van IUA[4])	B/C	Hoog	32,80	33,23	0	33,23
MAT Stroomversnelling_EWB4	A41C	Matlabas	B	Matig	35,58	33,42	0	33,42

(1) Hierdie hoeveelhede verteenwoordig die langtermyngemiddelde gegrond op die NGJA. Indien die NGJA verander, sal dié volume ook verander.

(2) Verteenwoordig die persentasie van BMB.

(3) Die totale Reserwehoeveelheid behels sowel die ekologiese reserwe as die BMB.

(4) IUA: *integrated unit of analysis* – geïntegreerde ontledingseenheid

Die AEK word nie vir hierdie voorlopige reserwe vir goedkeuring aanbeveel nie, maar die handhawing van die huidige bedryf van die stelsel word aanbeveel.

5. OPPERVLAKWATER – GEHALTEKOMPONENT VIR RIVIERE

5.1 Samevatting van die gehaltekomponent by EWB-terreine

Tabel 5.1: HES-kategorieë en oorhoofse terreinevaluering vir EWB 1A in die Mokolorivier – WGSE 1 4

RIVIER	Mokolorivier		Watergehaltemoniteringspunte	
WGSE	4		VT	A4H002Q01, '77-'79, n = 68
EWB-TERREIN	1A		HES	A4H002Q01, '02-'07 (met 1 punt in 2007), n = 48 (maar 37 vir F en SO_4)
Vertrouensevaluering		Vertroue in die evaluering is matig, aangesien min OS-, temperatuur-, troebelheids- of toksiendata beskikbaar is, hoewel die meetwal na aan die EWB-terrein is.		
Watergehalte-bestanddele		VT-waarde	HES-waarde	Kategorie (waardebepaling) / Kommentaar
Anorganiese soute * (mg/L)	$MgSO_4$		-	MEACHE kon nie gebruik word nie; EK is in plaas daarvan gebruik
	Na_2SO_4		-	
	$MgCl_2$		-	
	$CaCl_2$		-	
	NaCl		-	
	$CaSO_4$		-	
Nutriënte (mg/L)	SRP[1]	0,011	0,0165	B (1): Normkategorie is geherkalibreer
	Totale anorganiese stikstof	0,080	0,123	A (0)
Fisiese veranderlikes	pH (5de en 95ste persentiel)	6,68 – 7,70	6,92 - 7,83	A (0)
	Temperatuur		-	Geen data nie, maar min uitwerkings word verwag. Opvanggebied nie ongerep nie; A/B (05) dus – slegs kwalitatiewe evaluering
	Opgeloste suurstof		-	
	Troebelheid (NTU[2])		-	Geen data nie, maar groot ladings word nie verwag nie. B (1) – slegs kwalitatiewe evaluering
	Elektriese geleivermoë (mS/m)	12,28	12,05	A (0)
Responsveranderlikes	Chl-a: perifiton		EWB 1A: 21,58	C/D (2,5) (n=1)
	Chl-a: fitoplankton		-	-

RIVIER	Mokolorivier		Watergehaltemoniteringspunte	
WGSE	4		VT	A4H002Q01, '77-'79, n = 68
EWB-TERREIN	1A		HES	A4H002Q01, '02-'07 (met 1 punt in 2007), n = 48 (maar 37 vir F en SO_4)
Vertrouensevaluering		Vertroue in die evaluering is matig, aangesien min OS-, temperatuur-, troebelheids- of toksiendata beskikbaar is, hoewel die meetwal na aan die EWB-terrein is.		
Watergehalte-bestanddele		VT-waarde	HES-waarde	Kategorie (waardebepaling) / Kommentaar
	Samestelling van biotiese gemeenskap: telling van makro-ongewerweldes (ASPT[3])		SASS[4]: 127 ASPT[3]: 5,3	C (62,3)
	Vis		70,3	C – grotendeels vloeiverwant
	Diatome		EWR 1A: SPI[6] = 17,3 en 16,8	A/B (0,5) (n = 2)
Toksiene (mg/L)	Fluoried	0,10	0,18	A (0)
	Ammoniak		0,001	A (0)
ALGEHELE KLASSIFIKASIE (volgens PAI[3])			B/C (80 %)	

* Moet bereken word met behulp van MEACHE wanneer die DPK vir EK oorskry word of soutbesoedeling verwag word.

Tabel 5.2: ES in verband met fisies-chemiese data: HES

Rivier: Mokolo		EWB-terrein: 1A	Moniteringsterrein: A4H002Q01
Watergehaltemetrie		ES: HES	
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 ≤ 30 mS/m wees.	
	pH	Die 95ste persentiel van die data moet strek van 6,5 tot 8,0.	
	Temperatuur	Klein afwyking van die natuurlike temperatuurstrek.	
	Opgeloste suurstof	Die 5de persentiel van die data moet ≥ 7,5 mg/L wees.	
	Troebelheid	Verskil in klein mate van die natuurlike troebelheidstrek; geringe aanslikking van instroomhabitats aanvaarbaar.	
Nutriënte (mg/L)	Totale anorganiese stikstof	Die 50ste persentiel van die data moet ≤ 0,25 mg/L wees.	
	PO_4-P	Die 50ste persentiel van die data moet ≤ 0,025 mg/L wees.	
Responsveranderlikes	Chl-a: fitoplankton	Die 50ste persentiel van die data moet < 10 µg/L wees.**	
	Chl-a: perifiton	Die 50ste persentiel van die data moet ≤ 52,5 mg/m^2 wees.***	
	Gifstowwe	Die 95ste persentiel van die data moet binne die Chroniese-effekwaarde (CEW) wees soos vermeld in DWAF (1996).	

* Moet bereken word met behulp van MEACHE wanneer die DPK vir EK oorskry word of soutbesoedeling verwag word.

** Geen fitoplanktondata was vir hierdie evaluering beskikbaar nie. Al die ES en DPK's moet geverifieer word aangesien strek berus op deskundige oordeel.

*** Perifiton (21,58 mg/m^2) is eintlik 'n C/D-kategorie (C = 12 - 21 mg/m^2 and D = 21 - 84 mg/m^2; DWAF, 2008); die boonste grens van 'n C/D word dus gedefinieer as die ES vir die HES.

Tabel 5.3: HES-kategorieë en oorhoofse terreinevaluering vir EWB 1B in die Mokolorivier – WGSE 4

RIVIER	Mokolorivier		Watergehaltemoniteringspunte	
WGSE	4		VT	A4H002Q01, '77 - '79, n = 68
EWB-terrein	1B		HES	A4H002Q01, '02-'07 (met 1 punt in 2007), n = 48 (maar 37 vir F en SO_4)
Vertrouensevaluering		Vertroue in die evaluering is matig, aangesien min OS-, temperatuur-, troebelheids- of toksienedata beskikbaar is. Data van A4H002Q01 word gebruik vir EWB 1A en B, met wysigings aan die PAI-tabel[1] – veral gebaseer op aanwysers op terrein.		
Watergehalte-bestanddele		VT-waarde	HES-waarde	Kategorie (Waardebepaling) / Kommentaar
Anorganiese* soute (mg/L)	$MgSO_4$		-	MEACHE kon nie gebruik word nie en EK is in plaas daarvan gebruik
	Na_2SO_4		-	
	$MgCl_2$		-	
	$CaCl_2$		-	
	NaCl		-	
	$CaSO_4$		-	
Nutriënte (mg/L)	SRP[2]	0,011	0,0165	B (1): Normkategorie is geherkalibreer
	Totale anorganiese stikstof	0,080	0,123	A (0)
Fisiese veranderlikes	pH (5de en 95ste persentiel)	6,68 en 7,70	6,92 – 7,83	A (0)
	Temperatuur		-	Geen data nie, maar min uitwerkings word verwag. Opvanggebied nie ongerep nie; dus B(1) as gevolg van die uitwerking van zero vloei – slegs kwalitatiewe evaluering.
	Opgeloste suurstof		-	
	Troebelheid (NTU[3])		-	Geen data nie, maar ladings waarskynlik nie hoog nie. B (1) – slegs kwalitatiewe evaluering.
	Elektriese geleivermoë (mS/m)	12,28	12,05	A (0)
Responsveranderlikes	Chl-a: perifiton		WG-terrein 3 (Dwars): 19,04 (hoë SA[4])	C (2) (n=1)

RIVIER	Mokolorivier		Watergehaltemoniteringspunte	
WGSE	4		VT	A4H002Q01, '77 - '79, n = 68
EWB-terrein	1B		HES	A4H002Q01, '02-'07 (met 1 punt in 2007), n = 48 (maar 37 vir F en SO_4)
Vertrouensevaluering		Vertroue in die evaluering is matig, aangesien min OS-, temperatuur-, troebelheids- of toksienedata beskikbaar is. Data van A4H002Q01 word gebruik vir EWB 1A en B, met wysigings aan die PAI-tabel[1] – veral gebaseer op aanwysers op terrein.		
Watergehalte-bestanddele		VT-waarde	HES-waarde	Kategorie (Waardebepaling) / Kommentaar
	Chl-a: fitoplankton		-	-
	Samestelling van biotiese gemeenskap: telling van makro-ongewerweldes (ASPT[5])		SASS[5]: 130 ASPT[5]: 5,4 (Jan. '08) SASS[6]: 188 ASPT[5]: 6,1 (Jun. '08)	B/C
	Vis		72,4	C
	Diatome		EWB 1B: SPI[7] = 18,8 WG-terrein 3 (Dwars): 15,9	A (0) (n=1) B (1) (n=2)
Toksiene (mg/L)	Fluoried	0,10	0,18	A (0)
	Ammoniak		0,001	A (0)
OORHOOFSE TERREINKLASSIFIKASIE (volgens PAI[1])			B/C (80,8%)	

* Moet bereken word met behulp van MEACHE wanneer die DPK vir EK oorskry word of soutbesoedeling verwag word.

Tabel 5.4: ES met betrekking totfisies-chemiese data: HES

Rivier: Mokolo		EWB-terrein: 1B	Moniteringsterrein: A4H002Q01
Watergehaltemetrie		ES: HES	
Anorganiese soute* (mg/L)	$MgSO_4$	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	EC	Die 95ste persentiel van die data moet ≤ 30 mS/m wees.	
	pH	Die 95ste persentiel van die data moet strek van 6,5 tot 8,0.	
	Temperatuur	Klein afwyking van die natuurlike temperatuurstrek wees.	
	Opgeloste suurstof	Die 95ste persentiel van die data moet ≥ 7,0 mg/L wees.	
	Troebelheid	Verskil in klein mate van die natuurlike troebelheidstrek; geringe aanslikking van instroomhabitats aanvaarbaar.	
Nutriënte (mg/L)	Totale anorganiese stikstof	Die 50ste persentiel van die data moet ≤ 0,25 mg/L wees.	
	PO_4-P	Die 50ste persentiel van die data moet ≤ 0,025 mg/L wees.	
Responsveranderlikes	Chl-a: fitoplankton	Die 50ste persentiel van die data moet < 10 µg/L wees.**	
	Chl-a: perifiton	Die 50ste persentiel van die data moet ≤ 21 mg/m^2 wees.	
	Toksiene	Die 95ste persentiel van die data moet binne die Chroniese-effekwaarde (CEW) wees soos vermeld in DWAF (1996).	

* Moet bereken word met behulp van MEACHE wanneer die DPK vir EK oorskry word of soutbesoedeling verwag word.

** Geen fitoplanktondata was vir hierdie evaluering beskikbaar nie. Al die ES en DPK's moet geverifieer word aangesien strek berus op deskundige oordeel.

Tabel 5.5: HES-kategorieë en oorhoofse terreinevaluering vir EWB 2 in die Mokolorivier- WGSE 4

RIVIER	Mokolorivier		Watergehaltemoniteringspunte	
WGSE	4		VT	A4H005Q01, '77 - '80, n = 85 (maar 163 vir EK)
EWB-TERREIN	2		HES	A4H005Q01, '98 - '01, n = 39 (maar 47 vir TOTALE ANORGANIESE STIKSTOF)
Vertrouensevaluering		Vertroue in die evaluering is laag. Min OS-, temperatuur-, troebelheids- of toksiendata is beskikbaar, en hoewel die meetwal na aan die EWB-terrein is, is huidigestand-data slegs tot 2001 beskikbaar.		
Watergehaltebestanddele		VT-waarde	HES-waarde	Kategorie (Waardebepaling) / Kommentaar
Anorganiese soute (mg/L)	$MgSO_4$		-	MEACHE kon nie gebruik word nie; EK is in plaas daarvan gebruik
	Na_2SO_4		-	
	$MgCl_2$		-	
	$CaCl_2$		-	
	NaCl		-	
	$CaSO_4$		-	
Nutriënte (mg/L)	SRP[1]	0,011	0,0059	A (0): Normkategorie is geherkalibreer – VT baie veranderlik
	Totale anorganiese stikstof	0,06	0,02	A (0). VT-data baie veranderlik
Fisiese veranderlikes	pH (5de en 95ste persentiel)	6,00 en 7,25	7,46 – 7,87	A (0): Normkategorie is geherkalibreer vir laer A-kategorie.
	Temperatuur		-	Geen data nie, maar min uitwerkings word verwag. Fluktuasies in temperatuur en OS[6] kan by lae vloei voorkom – B (1) – slegs kwalitatiewe evaluering
	Opgeloste suurstof		-	
	Troebelheid (NTU[2])		-	Geen data nie, maar ladings waarskynlik nie hoog nie. A/B (0,5) – slegs kwalitatiewe evaluering
	Elektriese geleivermoë (mS/m)	9,09	9,4	A (0)

RIVIER	Mokolorivier		Watergehaltemoniteringspunte	
WGSE	4		VT	A4H005Q01, '77 - '80, n = 85 (maar 163 vir EK)
EWB-TERREIN	2		HES	A4H005Q01, '98 - '01, n = 39 (maar 47 vir TOTALE ANORGANIESE STIKSTOF)
Vertrouensevaluering		Vertroue in die evaluering is laag. Min OS-, temperatuur-, troebelheids- of toksiendata is beskikbaar, en hoewel die meetwal na aan die EWB-terrein is, is huidigestand-data slegs tot 2001 beskikbaar.		
Watergehaltebestanddele		VT-waarde	HES-waarde	Kategorie (Waardebepaling) / Kommentaar
Responsveranderlikes	Chl-a: perifiton		EWB 2: 25,54 WG-terrein 4: 18,68 (hoë SA[5])	D (3) (n=1). SA[5] hoog in drie replikate C (2) (n=1)
	Chl-a: fitoplankton		-	-
	Samestelling van biotiese gemeenskap: telling van makro-ongewerweldes (ASPT[3])		Jan '08: SASS[6] – 82; ASPT[3] - 5.1 Maart '08: SASS[6] - 126 ; ASPT[3] - 6,6	C
	Vis		65,1	C
	Diatome		EWB 2: SPI[7] = 16,1 WG terrein 4: 18.8	B (1) (n=2) A (0) (n=1)
Toksiene (mg/L)	Fluoried	0,19	0,15	A (0)
	Ammoniak		0,002	A (0)
OORHOOFSE TERREINKLASSIFIKASIE (volgens PAI[4])			B (84.2)	

Tabel 5.6: ES met betrekking tot fisies-chemiese data: HES

Rivier: Mokolo		EWB: 2	Moniteringsterrein: A4H002Q01
Watergehaltemetrie		ES: HES	
Anorganiese soute* (mg/L)	$MgSO_4$	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 ≤ 30 mS/m wees.	
	pH	Die 5de en 95ste persentiel van die data moet van 6,5 tot 8,0 strek.	
	Temperatuur	Klein afwyking van die natuurlike temperatuurstrek.	
	Opgeloste suurstof	Die 5de persentiel van die data moet ≥ 7 mg/L wees.	
	Troebelheid	Verskil in klein mate van die natuurlike troebelheidstrek; geringe aanslikking van instroomhabitats aanvaarbaar.	
Nutriënte (mg/L)	Totale anorganiese stikstof	Die 50ste persentiel van die data moet ≤ 0,25 mg/L wees.	
	PO_4-P	Die 50ste persentiel van die data moet ≤ 0,015 mg/L wees.	
Responsveranderlikes	Chl-a: fitoplankton	Die 50ste persentiel van die data moet < 10 µg/L wees.**	
	Chl-a: perifiton	Die 50ste persentiel van die data moet ≤ 52,5 mg/m^2 wees. ***	
	Toksiene	Die 95ste persentiel van die data moet binne die Teikenwatergehaltestrek wees soos vermeld in DWAF (1996).	

* Moet bereken word met behulp van MEACHE wanneer die DPK vir EK oorskry word of soutbesoedeling verwag word.

** Geen fitoplanktondata was vir hierdie evaluering beskikbaar nie. Al die ES en DPK's moet geverifieer word op grond van deskundige oordeel.

*** Perifiton (25,54 mg/m^2) is in werklikheid in 'n C/D-kategorie (C= 12 - 21 en D= 21 - 84 mg/m^2; DWAF 2008), die boonste grens van 'n C/D word dus gedefinieer as die ES vir die HES.

Tabel 5.7: HES-kategorieë en oorhoofse terreinevaluering vir EWB 3 in die Mokolorivier – WGSE 5

RIVIER	Mokolorivier		Watergehaltemoniteringspunte	
WGSE	5		VT	A4H007Q01, '77 –'80, n = 82
EWB-terrein	3		HES	A4H010Q01, '92 – '96, n = 27 (maar 19 vir temperatuur en 6 vir NH_3)
Vertrouensevaluering		Vertroue in die evaluering is laag, want min OS-, temperatuur-, troebelheids- of toksiendata is beskikbaar. Hoewel die meetwal na aan die EWB-terrein is, is huidigestand-data slegs tot 1996 beskikbaar. VT-data verkry van A4H007Q01 in die Tambotierivier (dieselfde ekologiese streek, vlak II).		
Watergehaltebestanddele		VT-waarde	HES-waarde	Kategorie (Waardebepaling) / Kommentaar
Anorganiese soute (mg/L)	$MgSO_4$		-	MEACHE kon nie gebruik word nie; EK is in plaas daarvan gebruik
	Na_2SO_4		-	
	$MgCl_2$		-	
	$CaCl_2$		-	
	NaCl		-	
	$CaSO_4$		-	
Nutriënte (mg/L)	SRP[1]	0,007	0,015	A (0): Normkategorie is geherkalibreer – data baie veranderlik
	Totale anorganiese stikstof	0,065	0,067	A (0). Data baie veranderlik
Fisiese veranderlikes	pH (5de en 95ste persentiel)	5,14 en 6.70	7,2 en 7,76	B (1): VT-data 5,14 (5de persentiel) en 6,7 (95ste persentiel) – betroubaarheid?
	Temperatuur (10de en 90de persentiel)		12 – 25	Min data, maar die terrein is stroomaf van die Mokolodam (selfs indien meervlakkige onttrekpunt, waarskynlik bodemuitlaat vanweë lae vloei in die dam); dam het dus na verwagting uitwerking op temperatuur en OS. C (2)
	Opgeloste suurstof		-	
	Troebelheid (NTU^2)		-	Geen data nie, maar lading na verwagting nie hoog nie. A/B (0,5) – slegs kwalitatiewe evaluering

RIVIER	Mokolorivier		Watergehaltemoniteringspunte	
WGSE	5		VT	A4H007Q01, '77 –'80, n = 82
EWB-terrein	3		HES	A4H010Q01, '92 – '96, n = 27 (maar 19 vir temperatuur en 6 vir NH_3)
Vertrouensevaluering		Vertroue in die evaluering is laag, want min OS-, temperatuur-, troebelheids- of toksiendata is beskikbaar. Hoewel die meetwal na aan die EWB-terrein is, is huidigestand-data slegs tot 1996 beskikbaar. VT-data verkry van A4H007Q01 in die Tambotierivier (dieselfde ekologiese streek, vlak II).		
Watergehaltebestanddele		VT-waarde	HES-waarde	Kategorie (Waardebepaling) / Kommentaar
	Elektriese geleivermoë (mS/m)	15 and 24	10,87	A (0)
Responsveranderlike	Chl-a: perifiton		17,28	C (2) (n=1)
	Chl-a: fitoplankton		-	-
	Samestelling van biotiese gemeenskap: Telling van makro-ongewerweldes ($ASPT^3$)		$SASS^5$:130 $ASPT^3$: 5,0 $SASS^5$: 149 $ASPT^3$: 5,7	C
	Vis		65.8	C
	Diatome		SPI[6] = 16.6 (Sept '07) SPI = 17.4 (Jan '08) SPI=18.4 (Mrt '08)	B (1) (n=3) A (0) A (0)
Toksiene (mg/L)	Fluoried	6,77	0,278	A (0)
	Ammoniak	0,160	0,001	A (0)
OORHOOFSE TERREINKLASSIFIKASIE (volgens PAI^4)			B/C (79,2)	

Tabel 5.8: ES met betrekking totfisies-chemiese data: HES

Rivier: Mokolo		EWB: 3	Moniteringsterrein: A4H010Q01
Watergehaltemetrie		ES: HES	
Anorganiese soute* (mg/L)	$MgSO_4$	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 (mg/L)	EC	Die 95ste persentiel van die data moet ≤ 30 mS/m wees.	
	pH	Die 5de en die 95ste persentiel van die data moet strek van 6,5 tot 8,0.	
	Temperature	Wissel met meer as 2°C, d.w.s. 'n groot verandering in die temperatuurregime kom dikwels voor. Die meeste redelik temperatuursensitiewe spesies minder talryk wees en voorkomsfrekwensie sal laer wees as wat vir verwysing verwag word. Biologiese evaluering word dus aanbeveel en basislynmonitering moet vir hierdie veranderlike begin word by Vlak II of hoë van die DSS[1].	
	Opgeloste suurstof	Die 5de persentiel van die data moet ≥ 6 mg/L wees.	
	Troebelheid	Verskil in geringe mate van die natuurlike troebelheidstrek; geringe aanslikking van instroomhabitats is aanvaarbaar.	
Nutriënte	Totale anorganiese stikstof	Die 50ste persentiel van die data moet ≤ 0,25 mg/L wees.	
	PO_4-P	Die 50ste persentiel van die data moet ≤ 0.015 mg/L wees.	
Responsveranderlikes	Chl-a: fitoplankton	Die 50ste persentiel van die data moet < 10 µg/L wees.**	
	Chl-a: perifiton	Die 50ste persentiel van die data moet ≤ 21 mg/m^2 wees.	
	Toksiene	Die 95ste persentiel van die data moet binne die Teikenwatergehaltestrek (TWGS) wees soos vermeld in DWAF (1996).	

* Moet bereken word met behulp van MEACHE wanneer die DPK vir EK oorskry word of soutbesoedeling verwag word.

** Geen fitoplanktondata was vir hierdie evaluering beskikbaar nie. Al die ES en DPK's moet geverifieer word op grond van deskundige oordeel.

Tabel 5.9: HES-kategorieë en oorhoofse terreinevaluering vir EWB 4 in die Mokolorivier – WGSE 5

RIVIER	Mokolorivier		Watergehaltemoniteringspunte	
WGSE	5		VT	A4H007Q01, '77 - '80, n = 82
EWB-TERREIN	4		PES	A4H010Q01, '92-'96, n = 27 (maar 19 vir temperatuur en 6 vir NH_3)
Vertrouensevaluering		Vertroue is laag, want min OS-, temperatuur-, troebelheids- of toksiendata is beskikbaar. Data van A4H010Q01 word gebruik vir EWB 3 en 4, met wysigings aan die PAI[3]-tabel – veral op grond van aanwysers op terrein en die invloed van die sytak Poer-se-loop, wat tussen die twee terreine by die Mokolorivier aansluit. Huidigestand-data slegs tot 1996 en VT-data afkomstig van A4H007Q01 in die Tambotierivier (dieselfde ekostreek, vlak II).		
Watergehaltebestanddele		VT-waarde	HES-waarde	Kategorie (Waardebepaling) / Kommentaar
Anorganiese soute (mg/L)	$MgSO_4$		-	MEACHE kon nie gebruik word nie; EK is in plaas daarvan gebruik
	Na_2SO_4		-	
	$MgCl_2$		-	
	$CaCl_2$		-	
	NaCl		-	
	$CaSO_4$		-	
Nutriënte (mg/L)	Oplosbare reaktiewe fosfor (SRP)	0,007	0,015	A (0): Normkategorie is geherkalibreer – data baie veranderlik
	Totale anorganiese stikstof	0,065	0,067	A (0). Data baie veranderlik
Fisiese veranderlikes	pH (5de en 95ste persentiel)	5,14 en 6,70	7,2 - 7,76	B (1): VT-data 5,14 (5de persentiel) and 6,7 (95ste persentiel) – betroubaarheid?
	Temperatuur		-	Geen data nie, maar geen uitwerkings word verwag nie. Klein OS- en temperatuurfluktuasies kan voorkom – B (1) – slegs kwalitatiewe evaluering
	Opgeloste suurstof		-	

RIVIER	Mokolorivier		Watergehaltemoniteringspunte	
WGSE	5		VT	A4H007Q01, '77 - '80, n = 82
EWB-TERREIN	4		PES	A4H010Q01, '92-'96, n = 27 (maar 19 vir temperatuur en 6 vir NH_3)
Vertrouensevaluering		Vertroue is laag, want min OS-, temperatuur-, troebelheids- of toksiendata is beskikbaar. Data van A4H010Q01 word gebruik vir EWB 3 en 4, met wysigings aan die PAI[3]-tabel – veral op grond van aanwysers op terrein en die invloed van die sytak Poer-se-loop, wat tussen die twee terreine by die Mokolorivier aansluit. Huidigestand-data slegs tot 1996 en VT-data afkomstig van A4H007Q01 in die Tambotierivier (dieselfde ekostreek, vlak II).		
Watergehaltebestanddele		VT-waarde	HES-waarde	Kategorie (Waardebepaling) / Kommentaar
	Troebelheid (NTU[1])		-	Geen data nie, maar daar word nie verwag dat ladings te hoog sal wees nie en rivier is oor die algemeen helder. A (0) – slegs kwalitatiewe evaluering
	Elektriese geleivermoë (mS/m)	15 en 24	10,87	A (0)
Responsveranderlike	Chl-a: perifiton		-	-
	Chl-a: fitoplankton		-	-
	Samestelling van biotiese gemeenskap: Telling van makro-ongewerweldes (ASPT[2])		SASS[4]: 126 ASPT[2]: 4.8	C
	Vis		63,73	C
	Diatome		Sept '07: SPI[5] = 17.8 Mrt '08: SPI = 17.4	A (0) (n=2)
Toksiene (mg/L)	Fluoried	6,77	0,278	A (0)
	Ammoniak	0,160	0,001	A (0)
OORHOOFSTE TERREINKLASSIFIKASIE (volgens PAI[3])			B (86,8)	

Tabel 5.10: ES met betrekking tot fisies-chemiese data: HES

Rivier: Mokolo		EWB: 4	Moniteringsterrein: A4H010Q01
Watergehaltemetrie		ES: HES	
Anorganiese soute* (mg/L)	$MgSO_4$	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	EC	Die 95ste persentiel van die data moet ≤ 30 mS/m wees.	
	pH	Die 5de en 95ste persentiel van die data moet van 6,5 tot 8,0 strek.	
	Temperatuur	Klein tot matige afwyking van die natuurlike temperatuurstrek. Party hoogs temperatuursensitiewe spesies in kleiner getalle en voorkomsfrekwensies as wat vir verwysings verwag is.	
	Opgeloste suurstof	Die 5de persentiel van die data moet ≥ 7 mg/L wees.	
	Troebelheid	Geen bekende kommer oor troebelheid nie; veranderinge in troebelheid skynbaar natuurlik.	
Nutriënte (mg/L)	Totale anorganiese stikstof	Die 50ste persentiel van die data moet ≤ 0,25 mg/L wees.	
	PO_4-P	Die 50ste persentiel van die data moet ≤ 0,015 mg/L wees.	
Responsveranderlikes	Chl-a: fitoplankton	Die 50ste persentiel van die data moet < 10 µg/L wees.**	
	Chl-a: perifiton	Die 50ste persentiel van die data moet ≤ 21 mg/m^2 wees.	
	Toksiene	'n Uitwerking word verwag indien die 95ste persentiel van die data die Teikenwatergehaltestrek oorskry soos vermeld in DWAF (1996).	

*: Moet bereken word met behulp van MEACHE wanneer die DPK vir EK oorskry word of soutbesoedeling verwag word.

** Geen fitoplanktondata was vir hierdie evaluering beskikbaar nie. Al die ES en DPK's moet geverifieer word aangesien die strek op deskundige oordeel berus.

6. GRONDWATER – HOEVEELHEIDSKOMPONENT

Die grondwaterhoeveelheidskomponent is bepaal aan die hand van waardes soos aanvulling, basisvloei en spanningsindeks verkry tydens die bepaling van waterhulpbronklasse en gepaardgaande hulpbrongehalteoogmerke in die Mokolo- en die Matlabas-opvanggebied, DWS 2015, getoon in Tabel 6.1. Die gemiddelde jaarlikse grondwateraanvulling vir die hele opvanggebied gebaseer op die GHE II-datastel word geraam op meer as 16,25 Mm^3/a. Die EWB-ILF-waardes is verkry uit die studie vir die Tussentydse Grondwaterreserwebepaling vir die Limpopo-opvanggebied (Intermediate Groundwater Reserve Determination Study, Water Geosciences Consulting, 2011).

Bevolkingswaardes is verkry uit die Waterdienste-datastel van 2011. BMB maak voorsiening vir die noodsaaklike behoeftes van individue wat deur die betrokke waterhulpbron gedien word en dit sluit water vir drink- en kookdoeleindes en vir persoonlike higiëne in. 'n Oorlewingshoeveelheid van 25 liter per persoon per dag is gebruik. Die benadering van die huidige studie het kennis geneem van die GHE II- en die WARMS 2013-datastel om 'n meer gebalanseerde beraming van grondwatergebruik te maak. Die grondwaterspanningsindeks toon grondwatergebruik teenoor grondwateraanvulling.

6.1 Samevatting van die hoeveelheidskomponent van die Grondwaterreserwe

Tabel 6.1: Mokolo- en Matlabas-hoeveelheidskomponent van die Grondwaterreserwe

Kwat.	Opper-vlakte (km^2)	Aanvulling (Mm^3/a)	Bevolking (Water-dienste) 2011)	Basisvloei (Mm^3/a)	EWB_ILF (Mm^3/a)	BMB-reserwe (Mm^3/a)	Reserwe (Mm^3/a)	Reserwe as % of Aanvulling	Huidige grond-water-gebruik (Mm^3/a)	Spannings-indeks
A41A	692	17,66	6 785	5,06	3,18	0,06	3,24	18,34	1,22	0,07
A41B	358	7,86	5 175	1,79	0,75	0,05	0,80	10,18	0,15	0,02
A41C	1 111	13,23	7 749	0,85	0,39	0,07	0,46	3,48	0,25	0,02
A41D	1 913	16,71	5 483	0,54	0,54	0,05	0,59	3,53	2,76	0,16
A41E	1 940	12,41	7 886	0,17	0,53	0,07	0,60	4,83	1,79	0,14
A42A	573	18,19	3793	9,46	4,07	0,03	4,10	22,54	4,56	0,25
A42B	522	15,77	3 443	8,93	4,05	0,03	4,08	26,90	4,47	0,28
A42C	698	27,02	6 031	11,56	2,83	0,06	2,89	10,69	5,51	0,20
A42D	497	16,86	2 662	6,49	9,19	0,02	9,21	54,62	2,93	0,17
A42E	1 007	32,98	13 391	11,87	8,18	0,12	8,30	25,17	8,10	0,24
A42F	1 022	22,46	1 958	4,23	2,48	0,02	2,50	11,13	2,66	0,12
A42G	1 207	26,40	2 188	2,53	2,70	0,02	2,72	10,30	0,13	0,004
A42H	1 057	18,15	17 266	2,02	0,63	0,16	0,79	4,35	0,09	0,004
A42J	1 812	12,81	2 812	0,74	0,36	0,03	0,39	3,04	2,12	0,16

7. GRONDWATER – GEHALTEKOMPONENT

7.1 Samevatting van die gehaltekomponent van die Grondwaterreserwe

Tabel 7.1: Grondwatergehalte per kwaternêre opvanggebied (A41A, A41B, A41C en A41D)

Chemiese parameter	Eenheid	Kwaternêre opvanggebiede A41A, A41B, A41C & A41D												
		Aantal monsters				Omringende GW-gehalte of mediaan[1]				BMB-reserwe[2]	Grondwatergehaltereserwe[3]			
		A41A	A41B	A41C	A41D	A41A	A41B	A41C	A41D		A41A	A41B	A41C	A41D
pH		70	259	70	259	7,51	7,61	7,51	7,61	5,0 – 9,5 (±0,1)	6,76-8,26	6,85-8,37	7,85-8,26	6,85-8,37
Elektriese geleivermoë	mS/m	70	259	70	259	97,50	130,00	97,50	130,00	<150	107,25	143,00	107,25	143,00
Kalsium as Ca	mg/l	70	259	70	259	49,90	76,50	49,90	76,50	<150	54,89	84,15	54,89	84,15
Magnesium as Mg	mg/l	70	259	70	259	37,55	52,80	37,55	52,80	<100	41,31	58,08	41,31	58,08
Natrium as Na	mg/l	70	259	70	259	105,70	129,10	105,70	129,10	<200	116,27	142,01	116,27	142,01
Chloried as Cl	mg/l	70	259	70	259	78,30	143,10	78,30	143,10	<200	86,13	157,41	86,13	157,41
Sulfaat as SO_4	mg/l	70	259	70	259	21,65	38,87	21,65	38,87	<400	23,82	42,76	23,82	42,76
Nitraat as NO_x-N	mg/l	70	259	70	259	3,90	4,53	3,90	4,53	<10	4,29	4,98	4,29	4,98
Fluoried as F	mg/l	70	259	70	259	1,28	0,85	1,28	0,85	<1,0	1,28	0,94	1,28	0,94

(1) Gebaseer op data verkry uit die Nasionale Grondwaterargief. Die waardes aangegee is die statistiese mediaan van elke parameter.

(2) Verwysing: *Quality of Domestic Water Supplies, Volume 1: Assessment Guide, 2nd Ed.*1998. Water Research Commission Report No: TT 101/98. Pretoria, Suid-Afrika (Stel vir 'n Klas 1).

(3) Indien 'n verskil tussen die watergehaltewaardes vir die omringende grondwatergehalte en die BMB gevind is, is die laer of meer beskermende waarde vir die Grondwatergehaltereserwe gekies. Indien die omringende grondwatergehalte as die Grondwatergehaltereserwe gekies is, is die waarde met 10 persent opgeskaleer, mits die waarde nie die BMB-reserwe oorskry nie.

Tabel 7.2: Grondwatergehalte per kwaternêre opvanggebied (A41E, A42A, A42B en A42C)

Chemiese parameter	Eenheid	Kwaternêre opvanggebiede A41E, A42A, A42B & A42C												
		Aantal monsters				Omringende GW-gehalte of mediaan[1]				BMB-reserwe[2]	Grondwatergehaltereserwe[3]			
		A41E	A42A	A42B	A42C	A41E	A42A	A42B	A42C		A41E	A42A	A42B	A42C
pH		99	4	4	47	7,70	6,88	7,55	8,10	5,0 – 9,5 (±0,1)	6,93-8,47	6,19-7,57	6,80-8,30	7,29-8,91
Elektriese geleivermoë	mS/m	99	4	4	47	163,20	14,10	23,75	33,30	<150	163,20	15,51	26,13	36,63
Kalsium as Ca	mg/l	96	3	4	41	79,50	3,40	18,85	17,70	<150	87,45	3,74	20,74	19,47
Magnesium as Mg	mg/l	96	3	4	41	47,20	6,10	9,75	5,61	<100	51,92	6,71	10,73	6,17
Natrium as Na	mg/l	96	3	4	41	213,05	5,60	12,30	52,50	<200	213,05	6,16	13,53	57,75
Chloried as Cl	mg/l	97	4	4	41	280,00	14,10	7,25	11,00	<200	280,00	15,51	7,98	12,10
Sulfaat as SO_4	mg/l	96	3	4	41	76,50	10,20	8,60	7,78	<400	84,15	11,22	9,46	8,55
Nitraat as NO_x-N	mg/l	97	4	4	42	6,70	0,07	0,19	1,64	<10	7,37	0,07	0,20	1,80
Fluoried as F	mg/l	97	3	4	41	1,10	0,38	0,57	0,42	<1,0	1,10	0,42	0,62	0,46

(1) Gebaseer op data verkry uit die Nasionale Grondwaterargief. Die waardes aangegee is die statistiese mediaan van elke parameter.

(2) Verwysing: *Quality of Domestic Water Supplies, Volume 1: Assessment Guide, 2nd Ed.*1998. Water Research Commission Report No: TT 101/98. Pretoria, Suid-Afrika (Stel vir 'n Klas 1).

(3) Indien 'n verskil tussen die watergehaltewaardes vir die omringende grondwatergehalte en die BMB gevind is, is die laer of meer beskermende waarde vir die Grondwatergehaltereserwe gekies. Indien die omringende grondwatergehalte as die Grondwatergehaltereserwe gekies is, is die waarde met 10 persent opgeskaleer, mits die waarde nie die BMB-reserwe oorskry nie.

Tabel 7.3: Grondwatergehalte per kwaternêre opvanggebied (A42D, A42E, A42F,en A42G)

Chemiese parameter	Eenheid	Kwaternêre opvanggebiede A42D, A42E, A42F & A42G												
		Aantal monsters				Omringende GW-gehalte of mediaan[1]				BMB-reserwe[2]	Grondwatergehaltereserwe[3]			
		A42D	A42E	A42F	A42G	A42D	A42E	A42F	A42G		A42D	A42E	A42F	A42G
pH		3	12	3	20	7,07	7,56	7,93	7,34	5,0 – 9,5 (±0,1)	6,36-7,78	6,80-8,31	7,14-8,72	6,61-8,07
Elektriese geleivermoë	mS/m	3	12	3	20	42,10	58,85	25,50	27,60	<150	46,31	64,74	28,05	30,36
Kalsium as Ca	mg/l	3	12	2	20	41,60	30,25	10,25	8,35	<150	45,76	33,28	11,28	9,19
Magnesium as Mg	mg/l	3	12	2	20	8,30	17,10	7,55	5,60	<100	9,13	18,81	8,31	6,16
Natrium as Na	mg/l	2	12	2	20	26,20	24,35	17,10	15,40	<200	28,82	26,79	18,81	16,94
Chloried as Cl	mg/l	3	12	3	20	17,00	33,70	6,85	10,90	<200	18,70	37,07	7,54	11,99
Sulfaat as SO_4	mg/l	3	12	2	20	14,00	8,55	5,30	6,65	<400	15,40	9,41	5,83	7,32
Nitraat as NO_x-N	mg/l	2	12	2	20	0,22	0,06	0,16	0,09	<10	0,24	0,06	0,18	0,10
Fluoried as F	mg/l	3	12	3	20	0,12	0,35	0,50	0,22	<1,0	0,13	0,39	0,55	0,24

(1) Gebaseer op data verkry uit die Nasionale Grondwaterargief. Die waardes aangegee is die statistiese mediaan van elke parameter.

(2) Verwysing: *Quality of Domestic Water Supplies, Volume 1: Assessment Guide, 2nd Ed.*1998. Water Research Commission Report No: TT 101/98. Pretoria, Suid-Afrika (Stel vir 'n Klas 1).

(3) Indien 'n verskil tussen die watergehaltewaardes vir die omringende grondwatergehalte en die BMB gevind is, is die laer of meer beskermende waarde vir die Grondwatergehaltereserwe gekies. Indien die omringende grondwatergehalte as die Grondwatergehaltereserwe gekies is, is die waarde met 10 persent opgeskaleer, mits die waarde nie die BMB-reserwe oorskry nie.

Tabel 7.4: Grondwatergehalte per kwaternêre opvanggebied (A42H en A42J)

Chemiese parameter	Eenheid	Kwaternêre opvanggebiede A42H & A42J						
		Aantal monsters		Omringende GW-gehalte of mediaan[1]		BMB-reserwe[2]	Grondwatergehaltereserwe[3]	
		A42H	A42J	A42H	A42J		A42H	A42J
pH		48	54	8,23	7,44	5,0 – 9,5 (±0,1)	7,41-9,06	6,70-8,18
Elektriese geleivermoë	mS/m	48	54	159,50	199,85	<150	159,50	199,85
Kalsium as Ca	mg/l	47	54	7,50	71,00	<150	8,25	78,10
Magnesium as Mg	mg/l	47	54	1,20	40,35	<100	1,32	44,39
Natrium as Na	mg/l	47	54	313,56	196,45	<200	313,56	200
Chloried as Cl	mg/l	47	54	284,00	302,60	<200	284,00	302,60
Sulfaat as SO_4	mg/l	47	54	135,33	129,05	<400	148,86	141,96
Nitraat as NO_x-N	mg/l	47	54	0,08	7,50	<10	0,09	8,25
Fluoried as F	mg/l	43	54	12,62	1,21	<1,0	12,62	1,21

(1) Gebaseer op data verkry uit die Nasionale Grondwaterargief. Die waardes aangegee is die statistiese mediaan van elke parameter.

(2) Verwysing: *Quality of Domestic Water Supplies, Volume 1: Assessment Guide, 2nd Ed.*1998. Water Research Commission Report No: TT 101/98. Pretoria, Suid-Afrika (Stel vir 'n Klas 1).

(3) Indien 'n verskil tussen die watergehaltewaardes vir die omringende grondwatergehalte en die BMB gevind is, is die laer of meer beskermende waarde vir die Grondwatergehaltereserwe gekies. Indien die omringende grondwatergehalte as die Grondwatergehaltereserwe gekies is, is die waarde met 10 persent opgeskaleer, mits die waarde nie die BMB-reserwe oorskry nie.

Twee kwaternêre opvanggebiede (A41A en A41B) het nie voldoende chemiese data oor grondwater om omvattende ontleding van die omringende status te doen nie. Die omringende grondwatergehalte vir A41A en A41B is dus uit naasliggende kwaternêre opvanggebiede met soortgelyke geologie geëkstrapoleer, want die geologie het 'n enorme uitwerking op die watergehalte van 'n gebied.

Tabel 7.5: Samevatting van die watergehalteklas en parameters van belang

Kwaternêre opvanggebied	Watergehalteklas (WRC, 1998)	Watergehalteparameters van belang
A41A	II	Fluoried
A41B	I	Elektriese geleivermoë, chloried en natrium
A41C	II	Fluoried
A41D	I	Elektriese geleivermoë, chloried en natrium
A41E	II	Chloried, elektriese geleivermoë en natrium
A42A	0	Geen
A42B	0	Geen
A42C	0	Geen
A42D	0	Geen
A42E	0	Geen
A42F	0	Geen
A42G	0	Geen
A42H	III	Fluoried
A42J	III	Chloried, elektriese geleivermoë en fluoried

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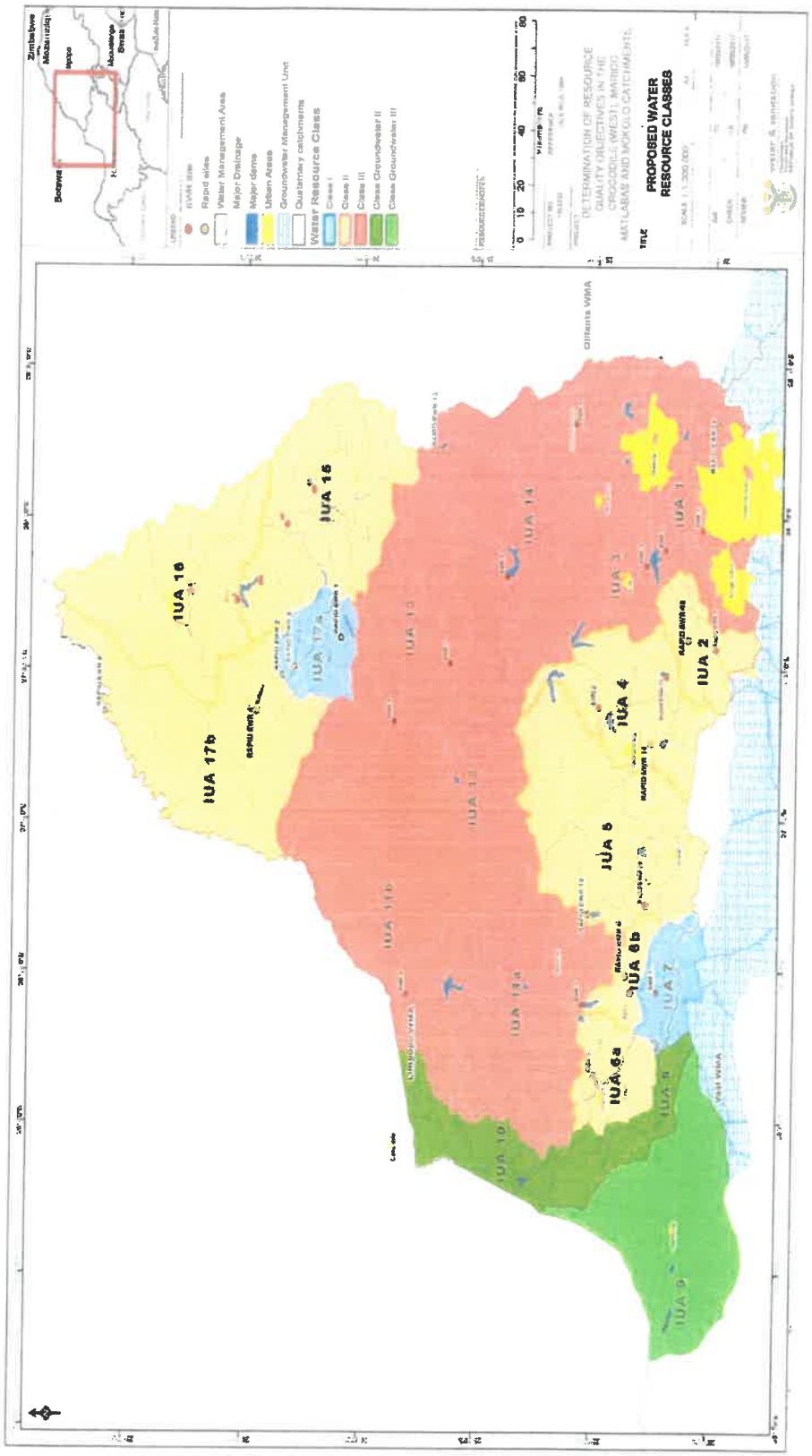

Figuur 1: Liggingskaart vir die Krokodil (Wes)-, die Marico-, die Mokolo- en die Matlabas-opvanggebied wat die waterhulpbronklas en EWB-terreine toon

TSEBIŠOKAKARETŠO

No ... **2021**

KGORO YA MEETSE LE KELELATŠHILA

MOLAO WA MEETSE WA SETŠHABA, 1998 (MOLAO WA 36 WA 1998)

TAETŠO YA TEKANO YA MEETSE YA METHOPO YA MEETSE A BOELELAMEETSE BJA MOKOLO LE MATLABAS

Nna, Senzo Mchunu, ka maemo a ka bjalo ka Tona ya Meetse le Kelelatšhila, gomme ke dumeletšwe ka maemo a a swanelago go ya ka dikarolo 16(1) tša Molao wa Bosetšhaba wa Meetse wa 1998 (Molao wa 36 wa 1998), ke phatlalatša taetšo ya tekano ya meetse a boelelameetse bja Mokolo le Matlabas.

Molaodi: Taetšo ya Tekano ya meetse

Go: Mna Yakeen Atwaru

Kgoro ya Meetse le Kelelatšhila

Moago wa Ndinaye 185 Mmila wa Francis Baard

Mokotlana wa Praebete X313

Pretoria

0001

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MR SENZO MCHUNU (MP)
TONA YA BODULO BJA BATHO, MEETSE LE KELELATŠHILA
LETŠATŠIKGWEDI:

TAETŠO YA TEKANO YA MEETSE YA METHOPO YA MEETSE A MAELELAMEETSE A MOKOLO LE MATLABAS GO YA KA KAROLO YA 16(1) LE (2) YA MOLAO WA MEETSE WA SETŠHABA, 1998 (MOLAO WA 36 WA 1998)

ŠETULE

1. TLHALOŠO YA MOTHOPO WA MEETSE

1.1 Tekano ya meetse e laetšwa ka moka goba go karolo ya mothopo ka gare ga makgobelameetse a Mokolo le Matlabas bjalo ka ge go hlalošitšwe ka fase:

- Mafelo a Taolo ya Meetse — Limpopo
- Dilete sa Kaloboelatšhila: — Seletekgolo sa Kaloboelatšhila (A41 le A42)
- Dinoka: — Mokolo, Mamba le Matlabas

1.2 Tona ya Madulo a Batho, Meetse le Kelelatšhila, gomme ke dumeletšwe ka maemo a a swanelago go ya ka dikarolo 16(1) tša Molao wa Bosetšhaba wa Meetse wa 1998 (Molao wa 36 wa 1998), ke phatlalatša taetšo ya tekano ya meetse a boelelameetse bja Mokolo le Matlabas. R. 810, e phatlaladitšwe ka Kuranteng ya Mmušo ya No. ya 33541 e ngwadilwego letšatšikgwedi la 17 Lewedi 2010.

1.3 Tona, go ya ka karolo ya 16(1) ya Molao, o laetša dikgoboketšo tše di latelago tša Tekano ya meetse ya mafelo a Boelelameetse bja Mokolo le Matlabas

2. DIAKHERONIMI LE DITLHALOŠO

2.1 Dikopafatšo

BHN	Dinyakwa tša Motho tša Motheo
EC	Legoro la Tikologo
EcoSpecs	Ditlhalošo tša Tikologo
EIA	Tekolo ya Khuetšo ya Tikologo
EIS	Bohlokwa le Boikarabelo bja Tikologo
ESA	Mafelo a Tlhokego ya Tikologo
EWR	Senyakwa sa Meetse a Tikologo
Lefelo la EWR	Lefelo la Senyakwa sa Meetse a Tikologo
GRAII	Kgato ya II ya Tekolo ya Mothopo wa Meetsefase
GRDM	Magato a a Lebišitšwego go Mothopo wa Meetsefase
GRUs	Diyuiti tša Mothopo wa Meetsefase
MAR	Palomoka ya Ngwaga ka ya Tselaboelelo
MCM	Dikhupikimetara tše Milione
MLF	Tlhokomelo ya Kelelo ya Tlase
NMAR	Palomoka ya Ngwaga ka ya Tselaboelelo ya Tlhago
PES	Seemo sa Bjale sa Tikologo
RC	Maemo a tšhupetšo
REC	Legoro la Tikologo le le Digetšwego
TEACHA	Ditlabelo tša Tekolo ya Bodulo bja Tikologo ya ka Meetseng
Di-TPC	Ditekanyo tša Kamego ye e ka Bago gona
WUL	Laesense ya Tšhomišo ya Meetse
WQSU	Yuniti ya fasana ya boleng bja meetse

2.2 Ditlhalošo

Ka Tsebišong ye lentšu lefe goba lefe goba polelo ye e filwego tlhalošo ka Molaong e tla ba le tlhalošo ye e filwego bjalo, ntle le ge kamano e laetša ka mokgwa wo mongwe—

"Kelelo ya fase" ke kelelo ye e tšweletšwago ya mo dinokeng ka nako ya maemo a bosa a a omilego goba a lokilego, fela a sa abelwa ka moka ke meetse a ka fase ga mabu; gomme a akaretša kabelo go tšwa kelelong ya ka gare ye e diegilego le go tšwa ga meetse a ka fase ga mobu.

"Moo noka e kopanago le ye nngwe gona" (kopano ya payofisikale) e ra dintlha tša mohlala tše di emetšego kelelo godimo goba bophelodulo bja ka meetseng bjalo ka dinoka, dinagamenoga, melomonoka le meetse a ka fase ga mabu moo sehlopha sa dikamano se dirang gona.

"bohlokwa le boikarabelo bja tikologo" e ra ditaetši tše bohlokwa mo go tlhopho ya tikologo ya methopo ya meetse. Bohlokwa bja tikologo bo amana le go ba gona, go emelwa le mehutahuta ya diphedi tša lefelo le itšego le bodulo. Boikarabelo bja tikologo bo amana le go ba kotsing ga bodulo le diphedi lefelong le itšego mo diphetogong tše di ka diragalago dikelelong, maemo a meetse le maemo a tikologopopego ye e nago le dikhemikale.

"dinyakwa tša meetse a tikologo" e ra mekgwa ya kelelo ye bjalo ka bogolo, nako le lebaka, le boleng bja meetse a a hlokegago go hlokomela tikologo ya dinoka maemong a itšego. Lereo le le dirišwa go ra dikarolo tša bokaakang bja boleng bja ka bobedi;

"lefelo goba setsha sa tlhokego ya meetse a tikologo" e ra dintlha tše itšego tša noka, bjalo ka ge go laeditšwe ka tshepedišo ya kgetho yeo ya setšhaba, ye e nago le botelele bja noka ya dikarolo tše di fapanego bakeng sa haedroliki le tikologo. Ditsha tše di fana ka ditaetšo tše di lekanego go lekola dikelelo tša tikogolo le go hlahloba maemo ditlhohleletšo tša tikologopopego tše di nago le dikhemikale tše bjalo ka haedrolotši, tšeomofolotši, le dikhemikale tša fisika le dikarabelo tša payolotši tše bjalo ka dihlapi, diphedi tše di se nago mokolo, le dimela tše di lego maribeng a noka;

"maemo a bjalo a tikologo" e ra legoro leole laetšago maphelo a bjale a mehuta ya boleng bja payolotši ya mothopo wa meetse, ge go bapetšwa le maemo a tlhago goba a a swanago le tšhupetšo ya tlhago. Dipoelo tša tshepedišo di fanwa bjalo ka Magoro a Tikologo go thoma kgauswi le tlhago go fihla tše di fetotšwego ka botlalo;

"tsošološo" e ra koketšo ya meetse lefelong la go tlala monola, e ka ba ka nwelelo ya fase ya pula goba meetse a a lego boalong le/goba go elela ga meetse a ka fase ga mobu a a lego kgauswi le maswikameetse;

"legoro le le digetšwego la tikologo" e ra legoro le le laetšago nepišo ya taolo ya tikologo ya mothopo wa meetse ye e theilwego go tlhopho ya tikologo yeo e swanetšego go fihlelelwa. Magoro a tloga ka Legoro la A leo le šupetšago go se se sa fetolwago, tlhago go fihla go Sehlopha sa D se se fetotšwego kudu.

"tekano ya meetse" e ra bokaakang le boleng bja meetse ao a hlokagala go kgotsofatša BHN ka go boloka kabo ya motheo ya meetse le go šireletša bophelodulo bja ka meetseng tikologo ya meetse bakeng sa go tiiša tlhabollo ya maleba ya mothopo wa meetse;

"Molao" e ra Molao wa Bosetšhaba wa Meetse, 1998 (Molao wa 36 wa 1998);

3. TAETŠO YA TEKANO YA MEETSE

(1) Tekano ya meetse e akaretša tekano ya meetse ya EWR le BHN bakeng sa Dinoka ka ditsheng tša EWR le mafelo a a kgethilwego a go kgobela meetse a Mokolo le Matlabas bjalo ka ge go hlalošitšwe ka go Temana ya 4, Lenaneotlhophong la 4.1.

(2) Tekano ya meetse e akaretša tekano ya meetse ya EWR le BHN bakeng sa Dinoka ka ditsheng tša EWR le makgobelameetse a Mokolo le Matlabas, go ya ka karolo ya 16(1) ya Molao, e laeditšwe ka go Temana ya 5, Lenaneotlhophong la 5.1 - 5.10.

(3) Tekano ya meetse ya Meetse a ka fase ga mabu ya Boleng bja Meetse, go ya ka karolo ya 16(1) ya Molao, bakeng sa makgobelameetse a Mokolo le Matlabas bjalo ka ge go hlalošitšwe ka go Temana ya 6, Lenaneotlhophong la 6.1.

(4) Mafelo a bolokelameetse a Mokolo le Matlabas le ditsha tša EWR di laeditšwe ka go Seswantšho sa 1.

(5) Tekano ya meetse ya Meetse a ka fase ga mabu ya Boleng bja Meetse, go ya ka karolo ya 16(1) ya Molao, bakeng sa makgobelameetse a Mokolo le Matlabas bjalo ka ge go hlalošitšwe ka go Temana ya 7, Mananeotlhophong a 7.1 - 7.5.

(6) Tekano ya meetse e tla šoma go tloga ka letšatšikgwedi le le saennwego bjalo ka ge go laeditšwe go ya ka karolo ya 16 (1) ya Molao, ntle le ge go laeditšwe ka mokgwa wo mongwe ke Tona.

4. KAROLO YA BOKAAKANG BJA MEETSE A KA GODIMO A DINOKA

Dipoelo tša taetšo ya Tekano ya meetse le tlhopho ya tikologo ya maelelameetse a Mokolo le Matlabas, moo dipalo tša Tekano ya meetse di hlagišwago e le diphesente tša NMAR go maelelameetse go ya ka karolo ya (16) (1) ya Molao.

Lenaneotlhopho la 4.1: Kakaretšo ya karolo ya bokaalo ya Dinoka ye e akaretšago EWR & BHN go mafelo/ditsha tše bohlokwa

Leina la Lefelo	Bokgobela meetse bja Tatelano ya bone	Leina la Noka	PES	EIS	NMAR (MCM)[1]	EWR % NMAR[2]	Tekano ya meetse ya BHN ya 3 (%NMAR)	Palomoka ya Tekano ya meetse ya 4 (%NMAR)
HN51	A42B	Grootspruit (mothopo) e tla gahlana le Sand	D	Magareng	27.8	21.73	0	21.73
Lefelo la EWR MOK_EWR1 A	A42C	Mokolo e tla gahlana le Dwars	C/D	Godimo	84.84	16.7	0.048	16.748
Lefelo la EWR la MOK_EWR1 B	A42E	Mokolo e tla gahlana le Sterkstroom	B/C	Godimo	135.03	13.6	0.090	13.69
HN54	A42D	Sterkstroom (mothopo) e tla gahlana le Mokolo,	B	Godimo kudu	43.45	52.63	0	52.63
Lefelo la EWR MOK_EWR2	A42F	Noka ya Mokolo go A42F e swanetše go elela ka gare ga Letamo la Mokolo,	B/C	Godimo kudu	196.2	11.7	0.103	11.803
Lefelo la EWR MOK_EWR3	A42G	Letamo la Mokolo go Noka ya Mokolo go iša karolong ya godimo ya A42G (10km go elela le letamo)	B/C	Godimo kudu	214.5	8.9	0.111	9.011
Lefelo la EWR MOK_EWR4	A42G	Noka ye kgolo ya Mokolo	C	Godimo kudu	253.3	12.3	0.111	12.411
HN59	A41A	Methopo ya meetse a Mothlabatsi (Matlabas-Zyn-Kloof, mehlaka)	A	Godimo kudu	5.23	57.07	0	57.07
MAT Ya ka pela_EWR3	A41B	Mamba e tla gahlana le Mothlabatsi	B/C	Godimo	9.54	35.49	0	35.49
MAT Ya ka pela_EWR2	A41B	Magahlano a Matlabas/Motlhabatsi (boelelo bja IUA)	B/C	Godimo	32.80	33.23	0	33.23
MAT Ya ka	A41C	Matlabas	B	Magareng	35.58	33.42	0	33.42

Leina la Lefelo	Bokgobela meetse bja Tatelano ya bone	Leina la Noka	PES	EIS	NMAR (MCM)[1]	EWR % NMAR[2]	Tekano ya meetse ya BHN ya 3 (%NMAR)	Palomoka ya Tekano ya meetse ya 4 (%NMAR)
pela_EWR4								

(1) Dipalomoka tše di emela tekanyo ya lebaka le letelele go ya ka NMAR. Ge NMAR e fetoga, bolumo ye le yona e tla fetoga.

(2) E emela phesente ya BHN.

(3) Palomoka ya bokaalo bja Tekano ya meetse e ikarabela go Tekano ya meetse ya Tikologo le BHN.

REC ga se ya digelwa go dumelela Tekano ye ya meetse ya mathomo eupša tlhokomelo ya tiro ya bjale ya tshepedišo e digetšwe.

5. MEETSE A KA GODIMO - BOLENG BJA KAROLO BJA DINOKA

5.1 Kakaretšo ya karolo ya boleng mafelong a EWR

Lenaneolthopho la 5.1: Magoro a PES le tekolo ya setsha ka kakaretšo ya EWR 1A nokeng ya Mokolo- WQSU1 4

NOKA	Noka ya Mokolo		Mafelo la go Lekola Boleng bja Meetse	
WQSU	4		RC	A4H002Q01, '77-'79, n = 68
LEFELO LA EWR	1A		PES	A4H002Q01, '02-'07 (ka ntlha ya 1 go 2007), n = 48 (eupša 37 go F le SO4)
Tekolo ya potego		Potego ka go tekolo e magareng, gannyane DO, temp., go se bonale gabotse goba datha ya dilo tša mpholo, le ge e le gore seelaboleng bja meetse se kgauswi le lefelo la EWR.		
Dikarolo tša Boleng bja Meetse		Mohola wa RC	Mohola wa PES	Legoro (Tekanyo) / Tshwayotshwayo
Matswai a a sa Bolego* (mg/L)	MgSO4		-	TEACHA e be e ka se šomišwe gomme EC e šomišwa bjalo ka kemedi
	Na2SO4		-	
	MgCl2		-	
	CaCl2		-	
	NaCl		-	
	CaSO4		-	
Phepo (mg/L)	SRP	0.011	0.0165	B (1): Legoro la go bea maemo le ile la beakanyaleswa
	TIN	0.080	0.123	A (0)
Diphapano tša lefelo	pH (phesenthaele yabo 5 le yabo 95)	6.68 - 7.70	6.92 - 7.83	A (0)
	Thempheretšha		-	Ga go na datha, eupša go holofelwa diabe tše mmalwa. Boelelameetse bo na le bosodi, ka gona A/B (0.5) – tekolo ya boleng fela
	Oksitšene ye e tološitšwego		-	
	Go se bonale gabotse (NTU)		-	Ga go na datha, eupša go holofelwa diabe tše mmalwa. B (1) – tekolo ya boleng fela
	Tshepedišo ya mohlagase (mS/m)	12.28	12.05	A (0)
Diphapano tša phetolo	Chl-a: perifaetone		EWR 1A: 21.58	C/D (2.5) (n=1)
	Chl-a: faetoplanketone		-	-

NOKA	Noka ya Mokolo		Mafelo la go Lekola Boleng bja Meetse	
WQSU	4		RC	A4H002Q01, '77-'79, n = 68
LEFELO LA EWR	1A		PES	A4H002Q01, '02-'07 (ka ntlha ya 1 go 2007), n = 48 (eupša 37 go F le SO4)
Tekolo ya potego		Potego ka go tekolo e magareng, gannyane DO, temp., go se bonale gabotse goba datha ya dilo tša mpholo, le ge e le gore seelaboleng bja meetse se kgauswi le lefelo la EWR.		
Dikarolo tša Boleng bja Meetse		Mohola wa RC	Mohola wa PES	Legoro (Tekanyo) / Tshwayotshwayo
	Sebopego sa setšhaba sa diphedi: ntlha ya dihlokamekokotlo tše kgolo (ASPT)		SASS: 127 ASPT: 5.3	C (62.3)
	Hlapi		70.3	C - gagolo tša go amana le kelelo
	Ditaeathomo		EWR 1A: SPI = 17.3 le 16.8	A/B (0.5) (n = 2)
Dilo tša mpholo (mg/L)	Floraete	0.10	0.18	A (0)
	Amonia		0.001	A (0)
TLHOPHOKAKARETŠO YA LEFELO (go tšwa go PAI)			B/C (80 %)	

* E tla hlagišwa go šomišwa TEACHA ge TPC ya EC e feta goba tšhilafalo ya letswai e holofetšwe

Lenaneotlhopho la 5.2: Di-EcoSpecs tše do amanago le datha ya go amana le popego ya khemikhale PES

Noka: Mokolo		Lefelo la EWR: 1A	Lefelo la tlhokomelo: A4H002Q01
Dimetriki tša boleng bja meetse		ECOSPEC: PES	
Matswai a a sa boleng*	MgSO4	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 16 mg/L.	
	Na2SO4	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 20 mg/L.	
	MgCl2	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 15 mg/L.	
	CaCl2	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 21 mg/L.	
	NaCl	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 45 mg/L.	
	CaSO4	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 351 mg/L.	
Diphapano tša lefelo	EC	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 30 mS/m.	
	pH	Phesenthaele yabo 5 le yabo 95 ya datha e swanetše go tloga go 6.5 go ya go 8.0.	
	Thempheretšha	Phapogo ye nnyane go tloga go tekanyo ya tlhago ya thempheretšha.	
	Oksitšene ye e tološitšwego	Phesenthaele yabo 5 ya datha e swanetše go ba ≥ 7.5 mg/L..	
	Go se bonale gabotse	Go fapafapana ka palo ye nnyane go tloga go tekanyo go se bonale gabotse ya tlhago; go oketšega gannyanegannyane ga go elela ga dibaka tša tikologo go a amogelega.	
Phepo (mg/L)	TIN	Phesenthaele yabo 50 ya datha e swanetše go ba ≤ 0.25 mg/L.	
	PO4-P	Phesenthaele yabo 50 ya datha e swanetše go ba ≤ 0.025 mg/L. mg/L.	
Diphapano tša phetolo	Chl-a: faetoplanketone	Phesenthaele yabo 50 ya datha e swanetše go ba < 10 µg/L.**	
	Chl-a: perifaetone	Phesenthaele yabo 50 ya datha e swanetše go ba ≤ 52.5 mg/m2.***	
	Dilo tša mpholo	Phesenthaele yabo 95 ya datha e swanetše go ba ka gare ga Boleng bja Diabe tša Nako ye telele (CEV) bjalo ka ge go boletšwe go DWAF (1996).	

* E tla hlagišwa go šomišwa TEACHA ge TPC ya EC e feta goba tšhilafalo ya letswai e holofetšwe

** Ga go na datha ya faethoplantone ye e bego e hwetšagala bakeng sa tekolo ye. Di-EcoSpecs ka moka le di-TPC di hloka netefatšo ka ge mehuta e ithekgile ka kahlolo ya ditsebi.

*** Perifaetone (21.58 mg/m2) ka kgonthe e legorong la C/D (C = 12 - 21 mg / m2 le D = 21 - 84 mg/m2; DWAF, 2008), ka gona molwane wa ka godimo wa C/D o hlalošitšwe bjalo ka EcoSpec bakeng sa PES.

Lenaneolthopho la 5.3: Magoro a PES le tekolo ya setsha ka kakaretšo ya EWR 1B Nokeng ya Mokolo- WQSU1

NOKA	Noka ya Mokolo		Mafelo la go Lekola Boleng bja Meetse	
WQSU	4		RC	A4H002Q01, '77 - '79, n = 68
LEFELO LA EWR	1B		PES	A4H002Q01, '02-'07 (ka ntlha ya 1 go 2007), n = 48 (eupša 37 go F le SO4)
Tekolo ya potego		Potego ka go tekolo e magareng, bjalo ka DO e nnyane, temp., go se bonale gabotse goba datha ya dilo tša mpholo. Datha go tšwa go A4H002Q01 e šomišetšwa EWR 1A le B, ka diphetolo go lenaneotlhopho la PAI – kudukudu e theilwe go ditaetši tša lefelo.		
Dikarolo tša Boleng bja Meetse		Mohola wa RC	Mohola wa PES	Legoro (Tekanyo) / Tshwayotshwayo
Matswai a a sa* boleng* (mg/L)	MgSO4		-	TEACHA e be e ka se šomišwe gomme EC e šomišwa bjalo ka kemedi
	Na2SO4		-	
	MgCl2		-	
	CaCl2		-	
	NaCl		-	
	CaSO4		-	
Phepo (mg/L)	SRP	0.011	0.0165	B (1): Legoro la go bea maemo le ile la beakanyaleswa
	TIN	0.080	0.123	A (0)
Diphapano tša lefelo	pH (phesenthaele yabo 5 le yabo 95)	6.68 and 7.70	6.92 – 7.83	A (0)
	Thempheretšha		-	Ga go na datha, eupša go holofelwa diabe tše mmalwa. Boelelameetse bo na le bosodi, ka gona B (1) ka baka la khuetšo ya kelelo yeo e sego ya lefeela – tekolo ya boleng fela
	Oksitšene ye e tološitšwego		-	
	Go se bonale gabotse (NTU)		-	Ga go na datha, eupša go holofelwa diabe tše mmalwa. B (1) – tekolo ya boleng fela
	Tshepedišo ya mohlagase (mS/m)	12.28	12.05	A (0)
Diphapano tša phetolo	Chl-a: perifaetone		Lefelo la 3 la WQ (Dwars): 19.04 (SD ya godimo)	C (2) (n=1)

NOKA	Noka ya Mokolo		Mafelo la go Lekola Boleng bja Meetse	
WQSU	4		RC	A4H002Q01, '77 - '79, n = 68
LEFELO LA EWR	1B		PES	A4H002Q01, '02-'07 (ka ntlha ya 1 go 2007), n = 48 (eupša 37 go F le SO4)
Tekolo ya potego		Potego ka go tekolo e magareng, bjalo ka DO e nnyane, temp., go se bonale gabotse goba datha ya dilo tša mpholo. Datha go tšwa go A4H002Q01 e šomišetšwa EWR 1A le B, ka diphetolo go lenaneotlhopho la PAI – kudukudu e theilwe go ditaetši tša lefelo.		
Dikarolo tša Boleng bja Meetse		Mohola wa RC	Mohola wa PES	Legoro (Tekanyo) / Tshwayotshwayo
	Chl-a: faetoplanketone		-	-
	Sebopego sa setšhaba sa diphedi: ntlha ya dihlokamekokotlo tše kgolo (ASPT)		SASS: 130 ASPT: 5.4 (Jan '08) SASS: 188 ASPT: 6.1 (June '08)	B/C
	Hlapi		72.4	C
	Ditaeathomo		EWR 1B: SPI = 18.8 Lefelo la 3 la WQ (Dwars): 15.9	A (0) (n=1) B (1) (n=2)
Dilo tša mpholo (mg/L)	Floraete	0.10	0.18	A (0)
	Amonia		0.001	A (0)
TLHOPHOKAKARETŠO YA LEFELO (go tšwa go PAI)			B/C (80.8%)	

* E tla hlagišwa go šomišwa TEACHA ge TPC ya EC e feta goba tšhilafalo ya letswai e holofetšwe

Lenaneotlhopho la 5.4: Di-EcoSpecs tše do amanago le datha ya go amana le popego ya khemikhale PES

Noka: Mokolo		Lefelo la EWR: 1B	Lefelo la tlhokomelo: A4H002Q01
Dimetriki tša boleng bja meetse		ECOSPEC: PES	
Matswai a a sa boleng* (mg/L)	MgSO4	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 16 mg/L.	
	Na2SO4	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 20 mg/L.	
	MgCl2	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 15 mg/L.	
	CaCl2	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 21 mg/L.	
	NaCl	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 45 mg/L.	
	CaSO4	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 351 mg/L.	
Diphapano tša lefelo	EC	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 30 mS/m.	
	pH	Phesenthaele yabo 5 le yabo 95 ya datha e swanetše go tloga go 6.5 go ya go 8.0.	
	Thempheretšha	Phapogo ye nnyane go tloga go tekanyo ya tlhago ya thempheretšha.	
	Oksitšene ye e tološitšwego	Phesenthaele yabo 5 ya datha e swanetše go ba ≥ 7.0 mg/L.	
	Go se bonale gabotse	Go fapafapana ka palo ye nnyane go tloga go tekanyo go se bonale gabotse ya tlhago; go oketšega gannyanegannyane ga go elela ga dibaka tša tikologo go a amogelega.	
Phepo (mg/L)	TIN	Phesenthaele yabo 50 ya datha e swanetše go ba ≤ 0.25 mg/L.	
	PO4-P	Phesenthaele yabo 50 ya datha e swanetše go ba ≤ 0.025 mg/L. mg/L.	
Diphapano tša phetolo	Chl-a: faetoplanketone	Phesenthaele yabo 50 ya datha e swanetše go ba < 10 µg/L.**.	
	Chl-a: perifaetone	Phesenthaele yabo 50 ya datha e swanetše go ba ≤ 21 mg/m2.	
	Dilo tša mpholo	Phesenthaele yabo 95 ya datha e swanetše go ba ka gare ga CEV bjalo ka ge go boletšwe go DWAF (1996).	

* E tla hlagišwa go šomišwa TEACHA ge TPC ya EC e feta goba tšhilafalo ya letswai e holofetšwe

** Ga go na datha ya faethoplantone ye e bego e hwetšagala bakeng sa tekolo ye. Di-EcoSpecs ka moka le di-TPC di hloka netefatšo ka ge mehuta e ithekgile ka kahlolo ya ditsebi.

Lenaneolthopho la 5.5: Magoro a PES le tekolo ya setsha ka kakaretšo ya EWR 1B Nokeng ya Mokolo- WQSU4

NOKA	Noka ya Mokolo		Mafelo la go Lekola Boleng bja Meetse	
WQSU	4		RC	A4H005Q01, '77 - '80, n = 85 (eupša 163 bakeng sa EC)
LEFELO LA EWR	2		PES	A4H005Q01, '98 - '01, n = 39 (eupša 47 bakeng sa TIN)
Tekolo ya potego		Potego ka go tekolo e fase. DO ye nnyane, temp., go se bonale gabotse goba datha ya dilo tša mpholo, le ge e le gore seelaboleng bja meetse se kgauswi le lefelo la EWR, hlagiša datha ya mmušo go fihlela ka 1996.		
Dikarolo tša Boleng bja Meetse		Mohola wa RC	Mohola wa PES	Legoro (Tekanyo) / Tshwayotshwayo
Matswai a a sa Salts (mg/L)	MgSO4		-	TEACHA e be e ka se šomišwe gomme EC e šomišwa bjalo ka kemedi
	Na2SO4		-	
	MgCl2		-	
	CaCl2		-	
	NaCl		-	
	CaSO4		-	
Phepo (mg/L)	SRP	0.011	0.0059	A (0): Legoro la go bea maemo le ile la beakanyaleswa- Datha ya RC e fapane kudu
	TIN	0.06	0.02	A (0). Datha ya RC e fapane kudu
Diphapano tša lefelo	pH (phesenthaele yabo 5 le yabo 95)	6.00 le 7.25	7.46 - 7.87	A (0): Legoro la go bea maemo le ile la beakanyaleswabakeng sa legoro la A
	Thempheretšha		-	Ga go na datha, eupša go holofelwa diabe tše mmalwa. Thempheretšha ye nngwe le go fetofetoga ga maemo ga DO go ka diragala dikelelong tša fase - B (1) - tekolo ya boleng fela
	Oksitšene ye e tološitšwego		-	
	Go se bonale gabotse (NTU)		-	Ga go na datha, eupša go holofelwa diabe tše mmalwa. A/B (0.5) – tekolo ya boleng fela
	Tshepedišo ya mohlagase (mS/m)	9.09	9.4	A (0)

NOKA	Noka ya Mokolo		Mafelo la go Lekola Boleng bja Meetse	
WQSU	4		RC	A4H005Q01, '77 - '80, n = 85 (eupša 163 bakeng sa EC)
LEFELO LA EWR	2		PES	A4H005Q01, '98 - '01, n = 39 (eupša 47 bakeng sa TIN)
Tekolo ya potego		Potego ka go tekolo e fase. DO ye nnyane, temp., go se bonale gabotse goba datha ya dilo tša mpholo, le ge e le gore seelaboleng bja meetse se kgauswi le lefelo la EWR, hlagiša datha ya mmušo go fihlela ka 1996.		
Dikarolo tša Boleng bja Meetse		Mohola wa RC	Mohola wa PES	Legoro (Tekanyo) / Tshwayotshwayo
Diphapano tša phetolo	Chl-a: perifaetone		EWR 2: 25.54 Lefelo la 4 la WQ:18.68 (SD ya godimo)	D (3) (n=1). SD e godimo ka makga a mararo C (2) (n=1)
	Chl-a: faetoplanketone		-	-
	Sebopego sa setšhaba sa diphedi: ntlha ya dihlokamekokotlo tše kgolo (ASPT)		Jan '08: SASS – 82; ASPT - 5.1 Matšhe '08: SASS - 126 ; ASPT - 6.6	C
	Hlapi		65.1	C
	Ditaeathomo		EWR 2: SPI=16.1 Lefelo la 3 la WQ: 18.8	B (1) (n=2) A (0) (n=1)
Dilo tša mpholo (mg/L)	Floraete	0.19	0.15	A (0)
	Amonia		0.002	A (0)
TLHOPHOKAKARETŠO YA LEFELO (go tšwa go PAI)			B (84.2)	

Lenaneotlhopho la 5.6: Di-EcoSpecs tše di amanago le datha ya go amana le popego ya khemikhale PES

Noka: Mokolo		EWR: 2	Lefelo la tlhokomelo: A4H002Q01
Dimetriki tša boleng bja meetse		ECOSPEC: PES	
Matswai a a sa boleng* (mg/L)	MgSO4	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 16 mg/L.	
	Na2SO4	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 20 mg/L.	
	MgCl2	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 15 mg/L.	
	CaCl2	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 21 mg/L.	
	NaCl	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 45 mg/L.	
	CaSO4	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 351 mg/L.	
Diphapano tša lefelo	EC	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 30 mS/m.	
	pH	Phesenthaele yabo 5 le yabo 95 ya datha e swanetše go tloga go 6.5 go ya go 8.0.	
	Thempheretšha	Phapogo ye nnyane go tloga go tekanyo ya tlhago ya thempheretšha.	
	Oksitšene ye e tološitšwego	Phesenthaele yabo 5 ya datha e swanetše go ba ≥ 7mg/L.	
	Go se bonale gabotse	Go fapafapana ka palo ye nnyane go tloga go tekanyo go se bonale gabotse ya tlhago; go oketšega gannyanegannyane ga go elela ga dibaka tša tikologo go a amogelega.	
Phepo (mg/L)	TIN	Phesenthaele yabo 50 ya datha e swanetše go ba ≤ 0.25 mg/L.	
	PO4-P	Phesenthaele yabo 50 ya datha e swanetše go ba ≤ 0.015 mg/L.	
Diphapano tša phetolo	Chl-a: faetoplanketone	Phesenthaele yabo 50 ya datha e swanetše go ba < 10 µg/L.**	
	Chl-a: perifaetone	Phesenthaele yabo 50 ya datha e swanetše go ba ≤ 52.5 mg/m2. ***	
	Dilo tša mpholo	Phesenthaele yabo 95 ya datha e swanetše go ba ka gare ga TWQR bjalo ka ge go boletšwe go DWAF (1996).	

* E tla hlagišwa go šomišwa TEACHA ge TPC ya EC e feta goba tšhilafalo ya letswai e holofetšwe

** Ga go na datha ya faethoplantone ye e bego e hwetšagala bakeng sa tekolo ye. Di-EcoSpecs ka moka le di-TPC di hloka netefatšo bjalo ka ge go ithekgilwe ka kahlolo ya ditsebi.

*** Perifaetone (25.54 mg/m2) ka kgonthe e legorong la C/ D (C = 12 - 21 le D = 21 - 84 mg/m2, DWAF 2008), ka gona molwane wa ka godimo wa C/D o hlalošitšwe bjalo ka EcoSpec bakeng sa PES.

Lenaneolthopho la 5.37: Magoro a PES le tekolo ya setsha ka kakaretšo ya EWR 3 Nokeng ya Mokolo- WQSU5

NOKA	Noka ya Mokolo		Mafelo la go Lekola Boleng bja Meetse	
WQSU	5		RC	A4H007Q01, '77 - '80, n = 82
LEFELO LA EWR	3		PES	A4H010Q01, '92 - '96, n = 27 (eupša 19 bakeng sa temp. le 6 bakeng sa NH3)
Tekolo ya potego		Potego ka go tekolo e magareng, bjalo ka DO e nnyane, temp., go se bonale gabotse goba datha ya dilo tša mpholo e a hwetšagala. Le ge e le gore seelaboleng bja meetse se kgauswi le lefelo la EWR, hlagiša datha ya mmušo go fihlela ka 1996. Datha ya RC e tšerwe go tšwa go A4H007Q01 nokeng ya Tambotie (Maemo a swanago a EcoRegion II).		
Dikarolo tša Boleng bja Meetse		Mohola wa RC	Mohola wa PES	Legoro (Tekanyo) / Tshwayotshwayo
Matswai a a sa boleng* (mg/L)	MgSO4		-	TEACHA e be e ka se šomišwe gomme EC e šomišwa bjalo ka kemedi
	Na2SO4		-	
	MgCl2		-	
	CaCl2		-	
	NaCl		-	
	CaSO4		-	
Phepo (mg/L)	SRP	0.007	0.015	A (0): Legoro la go bea maemo le ile la beakanyaleswa – Datha e fapane kudu
	TIN	0.065	0.067	A (0). Datha e fapane kudu
Diphapano tša lefelo	pH (phesenthaele yabo 5 le yabo 95)	5.14 le 6.70	7.2 le 7.76	B (1): Datha ya RC datha ya 5.14 (phesenthaele yabo 5) le 6.7 (phesenthaele yabo 95) - tshepagalo?
	Thempheretšha (phesenthaele yabo 10 le yabo 90)		12 – 25	Datha ye nnyane, eupša lefelo la fase letamong la Mokolo (le ge o tšea maemo a mantši, mohlomongwe go lokollwa ka fase ka lebaka la kelelo ya fase ka letamong), ka gona letamo le ama thempheretšha mohlomong gomme DO e a holofelwa. C (2)
	Oksitšene ye e tlošitšwego		-	
	Go se bonale gabotse (NTU)		-	Ga go na datha, eupša go holofelwa diabe tše mmalwa. A/B (0.5) – tekolo ya boleng fela

NOKA	Noka ya Mokolo		Mafelo la go Lekola Boleng bja Meetse	
WQSU	5		RC	A4H007Q01, '77 - '80, n = 82
LEFELO LA EWR	3		PES	A4H010Q01, '92 - '96, n = 27 (eupša 19 bakeng sa temp. le 6 bakeng sa NH3)
Tekolo ya potego		Potego ka go tekolo e magareng, bjalo ka DO e nnyane, temp., go se bonale gabotse goba datha ya dilo tša mpholo e a hwetšagala. Le ge e le gore seelaboleng bja meetse se kgauswi le lefelo la EWR, hlagiša datha ya mmušo go fihlela ka 1996. Datha ya RC e tšerwe go tšwa go A4H007Q01 nokeng ya Tambotie (Maemo a swanago a EcoRegion II).		
Dikarolo tša Boleng bja Meetse		Mohola wa RC	Mohola wa PES	Legoro (Tekanyo) / Tshwayotshwayo
	Tshepedišo ya mohlagase (mS/m)	15 and 24	10.87	A (0)
Phapano ya lefelo	Chl-a: perifaetone		17.28	C (2) (n=1)
	Chl-a: faetoplanketone		-	-
	Sebopego sa setšhaba sa diphedi: ntlha ya dihlokamekokotlo tše kgolo (ASPT)		SASS:130 ASPT: 5.0 SASS: 149 ASPT: 5.7	C
	Hlapi		65.8	C
	Ditaeathomo		SPI=16.6 (Sept 07) SPI=17.4 (Jan 08) SPI=18.4 (Mar 08)	B (1) (n=3) A (0) A (0)
Dilo tša mpholo (mg/L)	Floraete	6.77	0.278	A (0)
	Amonia	0.160	0.001	A (0)
TLHOPHOKAKARETŠO YA LEFELO (go tšwa go PAI)			B/C (79.2)	

Lenaneotlhopho la 5.8: Di-EcoSpecs tše do amanago le datha ya go amana le popego ya khemikhale PES

Noka: Mokolo		EWR: 3	Lefelo la tlhokomelo: A4H002Q01
Dimetriki tša boleng bja meetse		ECOSPEC: PES	
Matswai a a sa boleng* (mg/L)	MgSO4	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 16 mg/L.	
	Na2SO4	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 20 mg/L.	
	MgCl2	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 15 mg/L.	
	CaCl2	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 21 mg/L.	
	NaCl	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 45 mg/L.	
	CaSO4	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 351 mg/L.	
Diphapano tša lefelo (mg/L)	EC	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 30 mS/m.	
	pH	Phesenthaele yabo 5 le yabo 95 ya datha e swanetše go tloga go 6.5 go ya go 8.0.	
	Thempheretšha	Go fapana ka makga a a fetago 2 ° C, ke gore phetogo ye kgolo go peakanyo ya thempheretšha e diragala kgafetša. Mehuta ye mentši ya diphedi tše di phelago dithempheretšheng tše di lego magareng e tla ba maemong a fase le bokgafetšakgafetšo bja tiragalo go feta ka moo go bego go holofetšwe bakeng sa tšhupetšo. Ditshekatsheko tša payolotši ka gona di ile tša digelwa le go thoma tlhahlobo ya mathomo bakeng sa phapano ye ge Memo a II goba a godimo a DSS	
	Oksitšene ye e tološitšwego	Phesenthaele yabo 5 ya datha e swanetše go ba ≥ 6 mg/L.	
	Go se bonale gabotse	Go fapafapana ka palo ye nnyane go tloga go tekanyo go se bonale gabotse ya tlhago; go oketšega gannyanegannyane ga go elela ga dibaka tša tikologo go a amogelega.	
Phepo	TIN	Phesenthaele yabo 50 ya datha e swanetše go ba ≤ 0.25 mg/L.	
	PO4-P	Phesenthaele yabo 50 ya datha e swanetše go ba ≤ 0.015 mg/L.	
Diphapano tša phetolo	Chl-a: faetoplanketone	Phesenthaele yabo 50 ya datha e swanetše go ba < 10 µg/L.**	
	Chl-a: perifaetone	Phesenthaele yabo 50 ya datha e swanetše go ba ≤ 21 mg/m2.	
	Dilo tša mpholo	Phesenthaele yabo 95 ya datha e swanetše go ba ka gare ga TWQR bjalo ka ge go boletšwe go DWAF (1996).	

* E tla hlagišwa go šomišwa TEACHA ge TPC ya EC e feta goba tšhilafalo ya letswai e holofetšwe

** Ga go na datha ya faethoplantone ye e bego e hwetšagala bakeng sa tekolo ye. Di-EcoSpecs ka moka le di-TPC di hloka netefatšo bjalo ka ge go ithekgilwe ka kahlolo ya ditsebi.

Lenaneolthopho la 5.9: Magoro a PES le tekolo ya setsha ka kakaretšo ya EWR 3 Nokeng ya Mokolo- WQSU5

NOKA	Noka ya Mokolo		Mafelo la go Lekola Boleng bja Meetse	
WQSU	5		RC	A4H007Q01, '77 - '80, n = 82
LEFELO LA EWR	4		PES	A4H010Q01, '92 - '96, n = 27 (eupša 19 bakeng sa temp. le 6 bakeng sa NH3)
Tekolo ya potego		Potego ka go tekolo e magareng, bjalo ka DO e nnyane, temp., go se bonale gabotse goba datha ya dilo tša mpholo e a hwetšagala. Datha go tšwa go A4H002Q01 e šomišetšwa EWR 3 le 4, ka diphetoolo go lenaneotlhopho la PAI – kudukudu e theilwe go ditaetši tša lefelo le khuetšo ya nokakeledi ya Poer-se-loop yeo e gahlanago le Noka ya Mokolo magareng ga ditsha tše pedi. Datha ya bjale ya mmušo go fihlela 1996 le datha ya RC ye e tšwago go A4H007Q01 Nokeng ya Tambotie (maemo a swanago a EcoRegion ya maemo a swanago a EcoRegion II).		
Dikarolo tša Boleng bja Meetse		Mohola wa RC	Mohola wa PES	Legoro (Tekanyo) / Tshwayotshwayo
Matswai a a sa boleng* (mg/L)	MgSO4		-	TEACHA e be e ka se šomišwe gomme EC e šomiša bjalo ka kemedi
	Na2SO4		-	
	MgCl2		-	
	CaCl2		-	
	NaCl		-	
	CaSO4		-	
Phepo (mg/L)	SRP	0.007	0.015	A (0): Legoro la go bea maemo le ile la beakanyaleswa – Datha e fapane kudu
	TIN	0.065	0.067	A (0). Datha e fapane kudu
Diphapano tša lefelo	pH (phesenthaele yabo 5 le yabo 95)	5.14 le 6.70	7.2 - 7.76	B (1): Datha ya RC datha ya 5.14 (phesenthaele yabo 5) le 6.7 (phesenthaele yabo 95) - tshepagalo?
	Thempheretšha		-	Ga go na datha, ga go diabe tše di holofelwago. Thempheretšha ye nnyane le go fetofetoga ga maemo ga DO go ka diragala dikelelong tša fase - tekolo ya boleng fela
	Oksitšene ye e tološitšwego		-	
	Go se bonale gabotse (NTU)		-	Ga go na datha, eupša go holofelwa diabe tše mmalwa le noka ka kakaretšo di sekile A (0) – tekolo ya boleng fela

NOKA	Noka ya Mokolo		Mafelo la go Lekola Boleng bja Meetse	
WQSU	5		RC	A4H007Q01, '77 - '80, n = 82
LEFELO LA EWR	4		PES	A4H010Q01, '92 - '96, n = 27 (eupša 19 bakeng sa temp. le 6 bakeng sa NH3)
Tekolo ya potego		Potego ka go tekolo e magareng, bjalo ka DO e nnyane, temp., go se bonale gabotse goba datha ya dilo tša mpholo e a hwetšagala. Datha go tšwa go A4H002Q01 e šomišetšwa EWR 3 le 4, ka diphetoolo go lenaneotlhopho la PAI – kudukudu e theilwe go ditaetši tša lefelo le khuetšo ya nokakeledi ya Poer-se-loop yeo e gahlanago le Noka ya Mokolo magareng ga ditsha tše pedi. Datha ya bjale ya mmušo go fihlela 1996 le datha ya RC ye e tšwago go A4H007Q01 Nokeng ya Tambotie (maemo a swanago a EcoRegion ya maemo a swanago a EcoRegion II).		
Dikarolo tša Boleng bja Meetse		Mohola wa RC	Mohola wa PES	Legoro (Tekanyo) / Tshwayotshwayo
	Tshepedišo ya mohlagase (mS/m)	15 and 24	10.87	A (0)
Phapano ya lefelo	Chl-a: perifaetone		-	-
	Chl-a: faetoplanketone		-	-
	Sebopego sa setšhaba sa diphedi: ntlha ya dihlokamekokotlo tše kgolo (ASPT)		SASS: 126 ASPT: 4.8	C
	Hlapi		63.73	C
	Ditaeathomo		Sept '07: SPI=17.8 Matšhe '08: SPI=17.4	A (0) (n=2)
Dilo tša mpholo (mg/L)	Floraete	6.77	0.278	A (0)
	Amonia	0.160	0.001	A (0)
TLHOPHOKAKARETŠO YA LEFELO (go tšwa go PAI)			B (86.8)	

Lenaneotlhopho la 5.10: Di-EcoSpecs tše di amanago le datha ya go amana le popego ya khemikhale: PES

Noka: Mokolo		EWR: 4	Lefelo la tlhokomelo: A4H002Q01
Dimetriki tša boleng bja meetse		ECOSPEC: PES	
Matswai a a sa boleng* (mg/L)	MgSO4	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 16 mg/L.	
	Na2SO4	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 20 mg/L.	
	MgCl2	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 15 mg/L.	
	CaCl2	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 21 mg/L.	
	NaCl	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 45 mg/L.	
	CaSO4	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 351 mg/L.	
Diphapano tša lefelo	EC	Phesenthaele yabo 95 ya datha e swanetše go ba ≤ 30 mS/m.	
	pH	Phesenthaele yabo 5 le yabo 95 ya datha e swanetše go tloga go 6.5 go ya go 8.0.	
	Thempheretšha	Phapogo ye nnyane go tloga go tekanyo ya tlhago ya thempheretšha. Mehuta ye emngwe ya diphedi tše di phelago dithepheretšheng tše di lego godimo kudu e tla ba maemong a fase le bokgafetšakgafetšo bja tiragalo go feta ka moo go bego go holofetšwe bakeng sa tšhupetšo.	
	Oksitšene ye e tološitšwego	Phesenthaele yabo 5 ya datha e swanetše go ba ≥ 7mg/L.	
	Go se bonale gabotse	Ga go na dingongorego tse tsebagalago mabapi le go se bonale gabotse; liphetogo tša go se bonale gabotse di bonagala e le tša tlhago	
Phepo (mg/L)	TIN	Phesenthaele yabo 50 ya datha e swanetše go ba ≤ 0.25 mg/L.	
	PO4-P	Phesenthaele yabo 50 ya datha e swanetše go ba ≤ 0.015 mg/L.	
Diphapano tša phetolo	Chl-a: faetoplanketone	Phesenthaele yabo 50 ya datha e swanetše go ba < 10 µg/L.**	
	Chl-a: perifaetone	Phesenthaele yabo 50 ya datha e swanetše go ba ≤ 21 mg/m2.	
	Dilo tša mpholo	Khuetšo e holofelwa ge e le gore phesenthaele yabo 95 ya datha e feta TWQR bjalo ka ge go boletšwe go DWAF (1996).	

* E tla hlagišwa go šomišwa TEACHA ge TPC ya EC e feta goba tšhilafalo ya letswai e holofetšwe

** Ga go na datha ya faethoplantone ye e bego e hwetšagala bakeng sa tekolo ye. Di-EcoSpecs ka moka le di-TPC di hloka netefatšo ka ge mehuta e ithekgile ka kahlolo ya ditsebi.

6. MEETSE A KA FASE GA MPBU - BOKAAKANG BJA BOLENG

Karolo ya bokaakang bja meetse a ka fase ga mobu e ile ya laetšwa go šomišwa boleng bjo bjalo ka go tlatša gape, kelelo ya fase ya meetse, le tšhupane ya kgatelelo, ye e hweditšwego nakong ya taetšo ya magoro a methopo ya meetse le dinepo tša boleng bja mothopo tše di amanago le bokgobelameetse bja Mokolo le Matlabas, DWS 2015, tše di bontšhitšwego go lenaeotlhopo la 6.1. Palogare ya go tlatša gape ya meetse a ka fase ga mobu ya ngwaga ka ngwaga ya bokgobelameetse ka moka go ya ka sete ya datha ya GRA II e lekanyetšwa go feta 16.25 Mm3/a. Ditekanyetšo tša EWR_MLF di humanwe go tšwa dinyakišišong tša Magareng tša Taetšo ya Tekano ya meetse ya meetse a ka fase ga mobu a boelelameetse bja Limpopo (Water Geosciences Consulting, 2011).

Ditekanyetšo tša setšhaba di humanwe go kgoboketšo ya datha ya Ditirelo tša Meetse tša 2011. BHN e fana ka dinyakwa tše bohlokwa tša batho ba ba direlwago ke mothopo wa meetse wo o amegago gomme e akaretša meetse ao a nwewago, go apea dijo le boipabalelo. Go šomišitšwe palo sekgontšhi ya dilitara tše 25 ka motho ka letšatši. Mokgwa wa bjale wa go ithuta gape o amogetše didathasete tša GRA II le WARMS 2013 go fihlelela tekanyetšo ye e lekalekanego ya tšhomišo ya meetse a ka fase ga mobu. Tšhupetšo ya kgatelelo ya meetse a ka fase ga mobu e laetša meetse a ka fase ga mobu a o a šomošitšwego kgahlanong le a go tlatša gape.

6.1 Kakaretšo ya karolo ya Bokaakang ditsheng tša Tekano ya meetse ya Meetse a ka fase ga mobu

Lenaneotlhopho la 6.1: Karolo ya Bokaakang ditsheng tša Tekano ya meetse ya Meetse a ka fase ga mobu

Quat	Tikologo (km)	Go tlatša gape (Mm3/a)	Population (Ditirelo tša meetse) 2011)	Kelelo ya fase ya meetse (Mm3/a)	EWR_MLF (Mm3/a)	Tekano ya meetse ya BHN (Mm3/a)	Tekano ya meetse (Mm3/a)	Tekano ya meetse bjalo ka % ya Go tlatša gape	Tšhomišo ya Bjale ya Meetse a ka fase ga mobu (Mm3/a)	Tšhupane ya Kgatelelo
A41A	692	17.66	6785	5.06	3.18	0.06	3.24	18.34	1.22	0.07
A41B	358	7.86	5175	1.79	0.75	0.05	0.80	10.18	0.15	0.02
A41C	1111	13.23	7749	0.85	0.39	0.07	0.46	3.48	0.25	0.02
A41D	1913	16.71	5483	0.54	0.54	0.05	0.59	3.53	2.76	0.16
A41E	1940	12.41	7886	0.17	0.53	0.07	0.60	4.83	1.79	0.14
A42A	573	18.19	3793	9.46	4.07	0.03	4.10	22.54	4.56	0.25
A42B	522	15.77	3443	8.93	4.05	0.03	4.08	26.90	4.47	0.28
A42C	698	27.02	6031	11.56	2.83	0.06	2.89	10.69	5.51	0.20
A42D	497	16.86	2662	6.49	9.19	0.02	9.21	54.62	2.93	0.17
A42E	1007	32.98	13391	11.87	8.18	0.12	8.30	25.17	8.10	0.24
A42F	1022	22.46	1958	4.23	2.48	0.02	2.50	11.13	2.66	0.12
A42G	1207	26.40	2188	2.53	2.70	0.02	2.72	10.30	0.13	0.004
A42H	1057	18.15	17266	2.02	0.63	0.16	0.79	4.35	0.09	0.004
A42J	1 812	12.81	2812	0.74	0.36	0.03	0.39	3.04	2.12	0.16

7. MEETSE A KA FASE GA MOBU - KAROLO YA BOLENG

7.1 Kakaretšo ya karolo ya Boleng mafelong a Tekano ya meetse ya Meetse a ka fase ga mobu

Lenaneotlhopho la 7.1: Boleng bja meetse a ka fase ga mobu ka Bokgobelameetse bja Tatelano ya bone (A41A, A41B, A41C le A41D)

Diparameta tša Dikhemikale	Leka la	Bokgobelameetse bja Tatelano ya bone A41A, A41B, A41C & A41D												
		Aowa. ya Disampole				Modikologo GW boleng goba molagare wa 1)				Tekano ya meetse ya BHN ya 2)	Tekano ya meetse ya 3 ya Boleng bja Meetse a ka fase ga mobu)			
		A41 A	A41 B	A41 C	A41D	A41A	A41B	A41C	A41D		A41A	A41B	A41C	A41D
pH		70	259	70	259	7.51	7.61	7.51	7.61	5.0 – 9.5 (±0.1)	6.76-8.26	6.85-8.37	7.85-8.26	6.85-8.37
Tshepedišo ya mohlagase	mS/m	70	259	70	259	97.50	130.00	97.50	130.00	<150	107.25	143.00	107.25	143.00
Kalasiamo bjalo ka Ca	mg/l	70	259	70	259	49.90	76.50	49.90	76.50	<150	54.89	84.15	54.89	84.15
Maknesiamo bjalo ka Mg	mg/l	70	259	70	259	37.55	52.80	37.55	52.80	<100	41.31	58.08	41.31	58.08
Sodiamo bjalo ka Na	mg/l	70	259	70	259	105.70	129.10	105.70	129.10	<200	116.27	142.01	116.27	142.01
Kloraete bjalo ka Cl	mg/l	70	259	70	259	78.30	143.10	78.30	143.10	<200	86.13	157.41	86.13	157.41
Salafaete bjalo ka SO4	mg/l	70	259	70	259	21.65	38.87	21.65	38.87	<400	23.82	42.76	23.82	42.76
Naetreite bjalo ka NOx-N	mg/l	70	259	70	259	3.90	4.53	3.90	4.53	<10	4.29	4.98	4.29	4.98
Floraete bjalo ka F	mg/l	70	259	70	259	1.28	0.85	1.28	0.85	<1.0	1.28	0.94	1.28	0.94

(1) Go ya ka datha yeo e hwetšagalago go Akhaebe ya Bosetšhaba ya Meetse a ka Fase ga mobu. Ditekanyetšo tše di begilwego ke molagare wa dipalopalo go parameta ye nngwe le ye nngwe.

(2) Tšhup: Quality of Domestic Water Supplies, Volume 1: Assessment Guide, 2nd Ed.1998. Water Research Commission Report No: TT 101/98. Pretoria, South Africa (Set for a Class 1).

(3) Moo phapano go ditekanyetšo tša boleng bja meetse bakeng sa boleng bja meetse a ka fase ga bobu a tikologo le BHN e hweditšwego, boleng bjo fase goba bjo bo šireletšago bo ile bja kgethwa bakeng sa Tekano ya meetse ya boleng bja meetse a ka fase ga mobu. Moo boleng bja meetse a ka fase ga mobu a kgethilwego bjalo ka Tekano ya meetse ya boleng bja meetse a ka fase g mobu, boleng bo ile bja oketšwa ka diphesente tše 10 ge fela boleng bo sa fete Tekano ya meetse ya BHN.

Lenaneotlhopho la 7.4: Boleng bja meetse a ka fase ga mobu ka Bokgobelameetse bja Tatelano ya bone (A41E, A42A, A42B le A42C)

Diparameta tša Dikhemikale	Leka la	Bokgobelameetse bja Tatelano ya bone A41E, A42A, A42B & A42C											
		Aowa. ya Disampole				Modikologo GW boleng goba molagare wa 1)				Tekano ya meetse ya BHN ya 2)	Tekano ya meetse ya 3 ya Boleng bja Meetse a ka fase ga mobu)			
		A41E	A42A	A42B	A42C	A41E	A42A	A42B	A42C		A41E	A42A	A42B	A42C
pH		99	4	4	47	7.70	6.88	7.55	8.10	5.0 – 9.5 (±0.1)	6.93-8.47	6.19-7.57	6.80-8.30	7.29-8.91
Tshepedišo ya mohlagase	mS/m	99	4	4	47	163.20	14.10	23.75	33.30	<150	163.20	15.51	26.13	36.63
Kalasiamo bjalo ka Ca	mg/l	96	3	4	41	79.50	3.40	18.85	17.70	<150	87.45	3.74	20.74	19.47
Maknesiamo bjalo ka Mg	mg/l	96	3	4	41	47.20	6.10	9.75	5.61	<100	51.92	6.71	10.73	6.17
Sodiamo bjalo ka Na	mg/l	96	3	4	41	213.05	5.60	12.30	52.50	<200	213.05	6.16	13.53	57.75
Kloraete bjalo ka Cl	mg/l	97	4	4	41	280.00	14.10	7.25	11.00	<200	280.00	15.51	7.98	12.10
Salafaete bjalo ka SO4	mg/l	96	3	4	41	76.50	10.20	8.60	7.78	<400	84.15	11.22	9.46	8.55
Naetreite bjalo ka NOx-N	mg/l	97	4	4	42	6.70	0.07	0.19	1.64	<10	7.37	0.07	0.20	1.80
Floraete bjalo ka F	mg/l	97	3	4	41	1.10	0.38	0.57	0.42	<1.0	1.10	0.42	0.62	0.46

(1) Go ya ka datha yeo e hwetšagalago go Akhaebe ya Bosetšhaba ya Meetse a ka Fase ga mobu. Ditekanyetšo tše di begilwego ke molagare wa dipalopalo go parameta ye nngwe le ye nngwe.

(2) Tšhup: Quality of Domestic Water Supplies, Volume 1: Assessment Guide, 2nd Ed.1998. Water Research Commission Report No: TT 101/98. Pretoria, South Africa (Set for a Class 1).

(3) Moo phapano go ditekanyetšo tša boleng bja meetse bakeng sa boleng bja meetse a ka fase ga bobu a tikologo le BHN e hweditšwego, boleng bjo fase goba bjo bo šireletšago bo ile bja kgethwa bakeng sa Tekano ya meetse ya boleng bja meetse a ka fase ga mobu. Moo boleng bja meetse a ka fase ga mobu a kgethilwego bjalo ka Tekano ya meetse ya boleng bja meetse a ka fase g mobu, boleng bo ile bja oketšwa ka diphesente tše 10 ge fela boleng bo sa fete Tekano ya meetse ya BHN.

Lenaneotlhopho la 7.3: Boleng bja meetse a ka fase ga mobu ka Bokgobelameetse bja Tatelano ya bone (A42D, A42E, A42F, le A42G)

Diparameta tša Dikhemikale	Lekala	Bokgobelameetse bja Tatelano ya bone A42D, A42E, A42F & A42G											
		Aowa. ya Disampole				Modikologo GW boleng goba molagare wa 1)				Tekano ya meetse ya BHN ya 2)	Tekano ya meetse ya 3 ya Boleng bja Meetse a ka fase ga mobu)			
		A42D	A42E	A42F	A42G	A42D	A42E	A42F	A42G		A42D	A42E	A42F	A42G
pH		3	12	3	20	7.07	7.56	7.93	7.34	5.0 – 9.5 (±0.1)	6.36-7.78	6.80-8.31	7.14-8.72	6.61-8.07
Tshepedišo ya mohlagase	mS/m	3	12	3	20	42.10	58.85	25.50	27.60	<150	46.31	64.74	28.05	30.36
Kalasiamo bjalo ka Ca	mg/l	3	12	2	20	41.60	30.25	10.25	8.35	<150	45.76	33.28	11.28	9.19
Maknesiamo bjalo ka as Mg	mg/l	3	12	2	20	8.30	17.10	7.55	5.60	<100	9.13	18.81	8.31	6.16
Sodiamo bjalo ka Na	mg/l	2	12	2	20	26.20	24.35	17.10	15.40	<200	28.82	26.79	18.81	16.94
Kloraete bjalo ka Cl	mg/l	3	12	3	20	17.00	33.70	6.85	10.90	<200	18.70	37.07	7.54	11.99
Salafaete bjalo ka SO4	mg/l	3	12	2	20	14.00	8.55	5.30	6.65	<400	15.40	9.41	5.83	7.32
Naetreite bjalo ka NOx-N	mg/l	2	12	2	20	0.22	0.06	0.16	0.09	<10	0.24	0.06	0.18	0.10
Floraete bjalo ka F	mg/l	3	12	3	20	0.12	0.35	0.50	0.22	<1.0	0.13	0.39	0.55	0.24

(1) Go ya ka datha yeo e hwetšagalago go Akhaebe ya Bosetšhaba ya Meetse a ka Fase ga mobu. Ditekanyetšo tše di begilwego ke molagare wa dipalopalo go parameta ye nngwe le ye nngwe.

(2) Tšhup: Quality of Domestic Water Supplies, Volume 1: Assessment Guide, 2nd Ed.1998. Water Research Commission Report No: TT 101/98. Pretoria, South Africa (Set for a Class 1).

(3) Moo phapano go ditekanyetšo tša boleng bja meetse bakeng sa boleng bja meetse a ka fase ga bobu a tikologo le BHN e hweditšwego, boleng bjo fase goba bjo bo šireletšago bo ile bja kgethwa bakeng sa Tekano ya meetse ya boleng bja meetse a ka fase ga mobu. Moo boleng bja meetse a ka fase ga mobu a kgethilwego bjalo ka Tekano ya meetse ya boleng bja meetse a ka fase g mobu, boleng bo ile bja oketšwa ka diphesente tše 10 ge fela boleng bo sa fete Tekano ya meetse ya BHN.

Lenaneotlhopho la 7.4: Boleng bja meetse a ka fase ga mobu ka Bokgobelameetse bja Tatelano ya bone (A42H le A42J)

Diparameta tša Dikhemikale	Leka la	Bokgobelameetse bja Tatelano ya bone A42H & A42J						
		Aowa. ya Disampole		Modikologo GW boleng goba molagare wa 1)		Tekano ya meetse ya BHN ya 2)	Tekano ya meetse ya 3 ya Boleng bja Meetse a ka fase ga mobu)	
		A42H	A42J	A42H	A42J		A42H	A42J
pH		48	54	8.23	7.44	5.0 – 9.5 (±0.1)	7.41-9.06	6.70-8.18
Tshepedišo ya mohlagase	mS/m	48	54	159.50	199.85	<150	159.50	199.85
Kalasiamo bjalo ka Ca	mg/l	47	54	7.50	71.00	<150	8.25	78.10
Maknesiamo bjalo ka Mg	mg/l	47	54	1.20	40.35	<100	1.32	44.39
Sodiamo bjalo ka Na	mg/l	47	54	313.56	196.45	<200	313.56	200
Kloraete bjalo ka Cl	mg/l	47	54	284.00	302.60	<200	284.00	302.60
Salafaete bjalo ka SO4	mg/l	47	54	135.33	129.05	<400	148.86	141.96
Naetreite bjalo ka NOx-N	mg/l	47	54	0.08	7.50	<10	0.09	8.25
Floraete bjalo ka F	mg/l	43	54	12.62	1.21	<1.0	12.62	1.21

(1) Go ya ka datha yeo e hwetšagalago go Akhaebe ya Bosetšhaba ya Meetse a ka Fase ga mobu. Ditekanyetšo tše di begilwego ke molagare wa dipalopalo go parameta ye nngwe le ye nngwe.

(2) Tšhup: Quality of Domestic Water Supplies, Volume 1: Assessment Guide, 2nd Ed.1998. Water Research Commission Report No: TT 101/98. Pretoria, South Africa (Set for a Class 1).

(3) Moo phapano go ditekanyetšo tša boleng bja meetse bakeng sa boleng bja meetse a ka fase ga bobu a tikologo le BHN e hweditšwego, boleng bjo fase goba bjo bo šireletšago bo ile bja kgethwa bakeng sa Tekano ya meetse ya boleng bja meetse a ka fase ga mobu. Moo boleng bja meetse a ka fase ga mobu a kgethilwego bjalo ka Tekano ya meetse ya boleng bja meetse a ka fase g mobu, boleng bo ile bja oketšwa ka diphesente tše 10 ge fela boleng bo sa fete Tekano ya meetse ya BHN.

Palomoka ya makgobelameetse a tatelano ya bone a 2 (A41A le A41B) ga a na datha ye e lekanego ya khemistri ya meetse a ka fase ga mobu bakeng sa tshekatsheko ye e feleletšego ya maemo a tikologo. Boleng bja tikologo ya meetse a ka fase ga mobu bja A41A le A41B ka gona bo ile bja ntšhwa ka go bokgobelameetse bja tatelano ya bone bja boagišaning bja kgauswi (A41C le A41D) ka geologi ye e swanago ka lebaka la gore geologi e na le tšhušumetšo ye kgolo go boleng bja meetse bja tikologo.

Lenaneotlhopho la 7.5: Kakaretšo ya boleng bja meetse le diparameta tše di swanetšego go sekasekwa

Bokgobelameetse bja tatelano ya bone	Mafelo la go Lekola Boleng bja Meetse	Diparameta tša boleng bja meetse tše di swanetšego go sekasekwa
A41A	II	Floraete
A41B	I	Tshepedišo ya mohlagase, Kloraete le Sodiamo
A41C	II	Floraete
A41D	I	Tshepedišo ya mohlagase, Kloraete le Sodiamo
A41E	II	Kloraete, Tshepedišo ya mohlagase le sodiamo
A42A	0	Ga go selo
A42B	0	Ga go selo
A42C	0	Ga go selo
A42D	0	Ga go selo
A42E	0	Ga go selo
A42F	0	Ga go selo
A42G	0	Ga go selo
A42H	III	Floraete
A42J	III	Kloraete, Tshepedišo ya mohlagase le floraete

Seswantšho sa 1: Mmapa wa felo wa makgobelameetse a Mogalakwena (Bodikela), Marico, Mokolo le Matlabas a a bontšhago sehlopha sa Methopo ya Meetse le mafelo a EWR.