DEPARTMENT OF WATER AND SANITATION

NO. 1625 **17 December 2021**

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

PROPOSED RESERVE DETERMINATION OF WATER RESOURCES FOR THE MZIMVUBU CATCHMENT

I, Senzo Mchunu, Minister of Water and Sanitation, hereby in terms of section 16(3) of the National Water Act, 1998 (Act No.36 of 1998) hereby publish for public comments the proposed Reserve of the water resources for the Mzimvubu catchment area, as set out in the Schedule.

Any person who wishes to submit written comments with regard to the proposed Reserve should submit their comments within 60 days from the date of publication of this Notice to:

Director: Reserve Determination
Attention: Mr Atwaru Yakeen
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Ndinaye Building 178 Francis Baard Street
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MR SENZO MCHUNU, MP

MINISTER OF WATER AND SANITATION

DATE: 22/10/2021

SCHEDULE

PROPOSED RESERVE OF WATER RESOURCES FOR THE MZIMVUBU CATCHMENT IN TERMS OF SECTION 16(1) AND (2) OF THE NATIONAL WATER ACT, 1998 (ACT NO. 36 OF 1998)

DESCRIPTION OF WATER RESOURCE

1. (1) The Reserve is determined for all or part of every significant water resource within the Mzimvubu catchment as set out below:

Catchment:	Mzimvubu
Drainage areas:	Secondary drainage area T3 (Mzimvubu)
River(s) and estuary:	Major rivers include the Mzimvubu, Mzintlava, Thina, Kinira, Tsitsa and Inxu (Wildebees) rivers, and the Mzimvubu Estuary

(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 Government *Gazette* No. 33541 dated 17 September 2010. In terms of section 16(1) of the Act, the Minister must, as soon as reasonably practicable after the class of all or part of a water resource has been determined, by Notice in the *Gazette*, determine the Reserve for all or part of that water resource.

(3) The Minister, in terms of section 16(3) of the Act, proposes, for the purpose of section 16(1) of the Act, the following Reserve determination for the Mzimvubu catchment.

2. ACRONYMS AND DEFINITIONS

2.1 Acronyms

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

2.1 Definitions

Baseflow is 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.

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

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

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

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

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

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

River Node (biophysical node): These are modelling point's representative of an upstream reach or area of an aquatic eco-system (rivers, wetlands, estuaries and groundwater) for which a suite of relationships apply.

Sub-quaternary catchments: A finer subdivision of the quaternary catchments (the catchment areas of tributaries of main stem rivers in quaternary catchments).

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

PROPOSED RESERVE DETERMINATION AS REQUIRED IN TERMS OF SECTION 16(1) AND (2) OF THE NATIONAL WATER ACT, 1998

3. (1) A summary of the quantity component for the Rivers which include the EWR (**Figure 1**) and the BHN in terms of section 16(1) of the Act for the Mzimvubu catchment is set out in Section 4. **Table 4.1** includes the results of the priority sites.
(2) A summary of the quality component for the River at EWR sites in terms of section 16(1) of the Act for the Mzimvubu catchment is set out in **Table 5.1-5.5**.

(3) A summary of the wetland component in terms of section 16(1) of the Act for the Mzimvubu catchment is set out in **Table 6.1-6.5.**

(4) A summary of the Estuary component in terms of section 16(1) of the Act for the Mzimvubu catchment is set out in **Table 7.1-7.2.**

(5) A summary of the groundwater contribution to the Reserve for Water Quantity in terms of section 16(1) of the Act for the Mzimvubu catchment is set out in **Table 8.1**

(6) A summary of the groundwater contribution to the Reserve for Water Quality in terms of section 16(1) of the Act for the Mzimvubu catchments is set out in **Table 9.1 - 9.3**.

(7) 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 – RIVER QUANTITY COMPONENT

Proposed results for the Reserve determination and ecological categorisation for the Mzimvubu catchment, where the Reserve amounts are expressed as a percentage of the NMAR for the respective catchments (cumulative) in terms of section (16)(1).

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

Quaternary catchment	RU Node	River	PES	REC	Mean Annual Runoff (10^6 m^3)	BHN Mm^3/a @ 25L ppd
T31A	T31-1	Mzimvubu	B/C	B/C	32.73	0.008
T31B	T31-2	Krom	B	B/C	31.33	0.008
T31C	T31-3	Mzimvubu	B	B	87.01	0.006
T31C	T31-4	Nyongo	C	C	8.92	0.053
T31D	T31-5	Mzimvubu	B	B	104.92	0.013
T31D	T31-6	Riet	C	C	13.98	0.006
T31E	T31-7	Tswereka	B	B	12.78	0.015
T31E	T31-8	Tswereka	B/C	B/C	29.55	0.092
T31E	T31-9	Unknown	C	C	4	0.001
T31F	T31-11	Unknown	B/C	B/C	3.71	0.001
T31F	T31-12[1]	Mzimvubu	C	C	190.45	0
T31G	T31-13[1]	Mzimvubu	B/C	B/C	217.82	0.01
T31H	T31-14	Mvenyane	B	B	23.98	0.003
T31H	T31-15	Mvenyane	B/C	B/C	40.83	0.044
T31H	T31-16	Mkemane	B	B	13.61	0.027
T31H	T31-17	Unknown	C	C	1.3	0.005
T31H	T31-18	Mkemane	C/D	C/D	64.81	0.025
T31J	T31-19[1]	Mzimvubu	B/C	B/C	335.66	2
T32A	T32-1	Mzintlava	C	B/C	9.46	0.007
T32A	T32-2	Mzintlava	C	C	37.6	0.004
T32B	T32-3	Mzintlava	C	B/C	11.08	0.019
T32C	T32-4	Mill Stream	C	B/C	4.26	0.002
T32C	T32-5	aManzamnyama	B/C	B/C	13.86	0.012
T32C	T32-6	Mzintlava	B	B	86.17	0.021
T32C	T32-7	Unknown	B/C	B/C	8.53	0
T32D	T32-8	Droewig	C	C	18.43	0.007
T32D	T32-9	Mzintlava	D	D	98.14	0.002
T32D	T32-10	Mzintlava	D	D	134.49	0.019
T32E	T32-11[1]	Mvalweni	C/D	C/D	223.24	0.107
T32F	T32	Mzintlava	C/D	C/D	223.24	0.304
T32G	T32-12	Mzintlavana	B/C	B/C	57.16	0.247
T32H	T32-13[1]	Mzintlava	C	C	348.86	0.364
T33A	T33-1	Mafube	B	B	20.45	0.006
T33A	T33-2	Kinira	B/C	B/C	26.29	0.129
T33A	T33-3	Unknown	C	C	97.37	0.021
T33B	T33-4	Jordan	B	B	33.94	0.02

Quaternary catchment	RU Node	River	PES	REC	Mean Annual Runoff (10^6 m^3)	BHN Mm^3/a @ 25L ppd
T33B	T33-5	Seeta	B/C	B/C	69.76	0.032
T33B	T33-6	Mosenene	C	C	94.27	0.012
T33C	T33-7[1]	Morulane	C	C	36.158	0.102
T33D	T33-7[1]	Kinira	C	C	302.96	0.11
T33E	T33-8	Somabadi	C	C	6.17	0.024
T33F	T33-9[1]	Kinira	C	C	368.32	0.038
T33F	T33-10	Ncome	C	C	15.58	0.031
T33G	MRU Kinira (MzimEWR3)	Kinira	C	C	407.12	0.158
T33G	T33-11	Cabazi	C	C	14.01	0.044
T33H	T33-12	Mnceba	C	C	17.05	0.113
T33H	T33-13	Caba	C	C	9.22	0.065
T34A	T34-2	Thina	B	B	32.91	0
T34A	T34-3	Thina	B/C	B/C	41.14	0.027
T34B	T34-4	Phiri-e-ntso	B	B	68.08	0.01
T34B	T34	Thina	B	A/B	95.826	0.048
T34C	T34-1	Phinari	B	B	33.59	0.009
T34D	T34-5	Thina	C	C	123.48	0.054
T34D	T34-6	Tokwana	C	C	20.35	0.129
T34E	T34-7	Luzi	B	B	45.2	0.001
T34F	T34-8	Luzi	B/C	B/C	84.7	0.048
T34G	T34-9	Nxaxa	B	B	27.13	0.055
T34H	T34-10	Tsilithwa	B	B	20.07	0.039
T34H	T34-11	Ngcothi	B	B	11.86	0.037
T34H	T34-12	Ngcibira	C	C	18.25	0.02
T34K	MRU Thina_C (MzimEWR2)	Thina	C	C	404.51	0.356
T35A	T35-1	Tsitsa	B	B	101.14	0.008
T35B	T35-2	Pot	B	B	79.71	0.002
T35C	T35-3	Klein-Mooi	B	B	63.69	0.001
T35D	T35-4	Mooi	C	C	127.57	0.012
T35E	T35-5	Gqukunqa	B	B	46.09	0.049
T35F	T35-6	Inxu	B	B	37.64	0.001
T35G	T35-7	Gqaqala	B	B	26.15	0.02
T35F	T35-8	Kuntombizininzi	B	B	14.29	0.001
T35G	MRU Gat IFR1[2]	Gatberg	B/C	B	10.9	3
T35H	MRU Inxu EWR 1[2]	Inxu	B/C	B/C	44.38	0.099
T35H	T35-9	KuNgindi	B/C	B/C	35.07	0.002
T35H	T35-10	Qwakele	C	C	19.87	0.026
T35J	T35-11	Ncolosi	C/D	C/D	29.76	0.1
T35K	T35-12	Culunca	C	C	18.12	0.054
T35K	T35-13	Tyira	C/D	C/D	14.72	0.046

Quaternary catchment	RU Node	River	PES	REC	Mean Annual Runoff (10^6 m^3)	BHN Mm^3/a @ 25L ppd
T35K	T35-14	Xokonxa	C	C	36.24	0.093
T35K	MRU Tsitsa Ca (MzimEWR1)	Tsitsa	C	C	438.04	0.038
T35L	T35-15	Ngcolora	C	C	10.19	0.02
T35M	T35-16	Ruze	B	B	13.52	0.029
T36A	T36-1	Mzintshana	B	B	14.34	0.087
T36A	T36-2	Mkata	B	B	9.78	0.073
T36A	MRU Mzim (MzimEWR4)	Mzimvubu	C	C	2655.13	0.133

1) NMAR is the Natural Mean Annual Runoff.
2) This amount represents the long term mean based on the NMAR. If the NMAR changes, this volume will also change.
3) Represents the percentage of BHN.
4) The total Reserve amount accounts for both the Ecological Reserve and the Basic Human Needs Reserve (BHN).

5. SURFACE-WATER – RIVER QUALITY COMPONENT

Summary of the Quality component at EWR sites

5.1. Water quality assessment for MzimEWR1 on the Tsitsa River

River	Tsitsa	**Water Quality Monitoring Points**	
		RC	Benchmark tables (DWAF, 2008)
EWR Site	MzimEWR1	**PES**	T3H006Q01 (*n* = 136-180; 2000-2016)
	Parameter / units	**PES value**	**Ecological Category / comment**
Inorganic salt ions (mg/L)	Sulphate as SO_4	13.4	Inorganic salt assessment not triggered due to low Electrical Conductivity levels
	Sodium as Na	13.0	
	Magnesium as Mg	9.03	
	Calcium as Ca	18.10	
	Chloride as Cl	13.15	
	Potassium as K	2.54	
Electrical conductivity	mS/m	22.84	A
Nutrients (mg/L)	SRP-P	0.012	B
	TIN-N	0.146	A
Physical variables	pH (5 th and 95th % tiles)	7.3 + 8.28	B
	Temperature (° C)	-	Natural temperature range expected. Supported by data from Madikizela et al., 2001.
	Dissolved oxygen (mg/L)	-	Natural oxygen range expected. Supported by data from Madikizela et al., 2001.
	Turbidity (NTU)	114: 95th percentile 54: 50th percentile (n=4; 2015-2016)	Moderate – Large change: Erosion and urban runoff processes are known causes of unnaturally large increases in sediment loads and turbidity.
Response variable	Chl-*a*: phytoplankton (ug/L)	-	
	Macroinvertebrate score (MIRAI) SASS score ASPT score	72.91%	C
	Diatoms	SPI=15.7 (n=4)	B
	Fish score (FRAI)	68.3%	C
Toxics (mg/L)	Ammonia (as N)	0.01	A
Overall site classification (from PAI table)			**B (86.4%)**

5.2. Water quality assessment for MzimEWR2 on the Thina River

River	Thina	**Water Quality Monitoring Points**	
		RC	Benchmark tables (DWAF, 2008)
EWR Site	MzimEWR2	**PES**	T3H005Q01 (*n* = 135-188; 2000-2016)
	Parameter / units	**PES value**	**Ecological Category / comment**
Inorganic salt ions (mg/L)	Sulphate as SO_4	10.87	Inorganic salt assessment not triggered due to low Electrical Conductivity levels
	Sodium as Na	9.17	
	Magnesium as Mg	7.36	
	Calcium as Ca	15.33	
	Chloride as Cl	8.01	
	Potassium as K	2.42	
Electrical conductivity	mS/m	18.7	A
Nutrients (mg/L)	SRP-P	0.014	B
	TIN-N	0.146	A
Physical variables	pH (5th and 95th % tiles)	7.23 + 8.25	B
	Temperature (° C)	-	Natural temperature range expected. Supported by data from Madikizela et al., 2001.
	Dissolved oxygen (mg/L)	-	Natural oxygen range expected. Supported by data from Madikizela et al., 2001.
	Turbidity (NTU)	-	Moderate changes to the catchment land-use have resulted in unnaturally high sediment loads and high turbidities during runoff events.
Response variable	Chl-*a*: phytoplankton (ug/L)	-	
	Macroinvertebrate score (MIRAI) SASS score ASPT score	76.56%	C
	Diatoms	SPI=17.8 (n=1)	Modified to a B category as dominant population suggests a recent high flow event
	Fish score (FRAI)	78.4%	B/C
Toxics (mg/L)	Ammonia (as N)	0.018	B
	Fluoride (F)	0.485	A
Overall site classification (from PAI table)			**B (85.5%)**

5.3. Water quality assessment for Mzim EWR3 on the Kinira River

River	Kinira	**Water Quality Monitoring Points**	
		RC	Benchmark tables (DWAF, 2008)
EWR Site	MzimEWR3	**PES**	T3H019Q01 (*n* = 72-94; 2007-2016)
	Parameter / units	**PES value**	**Ecological Category / comment**
Inorganic salt ions (mg/L)	Sulphate as SO_4	7.08	Inorganic salt assessment not triggered due to low Electrical Conductivity levels
	Sodium as Na	18.74	
	Magnesium as Mg	14.29	
	Calcium as Ca	32.71	
	Chloride as Cl	9.50	
	Potassium as K	2.82	
Electrical conductivity	mS/m	32.11	A/B
Nutrients (mg/L)	SRP-P	0.010	B
	TIN-N	0.10	A
Physical variables	pH (5 th and 95th % tiles)	7.36 + 8.53	B
	Temperature (° C)	-	Natural temperature range expected.
	Dissolved oxygen (mg/L)	-	Natural oxygen range expected.
	Turbidity (NTU)		Serious changes due to serious erosion problems. Increased turbidity levels are present most of the time, with large silt loads deposited and a serious reduction in habitat.
Response variable	Chl-*a*: phytoplankton (ug/L)	-	
	Macroinvertebrate score (MIRAI) SASS score ASPT score	74.68%	C
	Diatoms	SPI=14.5 (n=1)	B/C: Diatoms growing in conditions of reduced light penetration (i.e. high turbidity), were present in the sample.
	Fish score (FRAI)	62.7%	C
Toxics (mg/L)	Ammonia (as N)	0.012	A/B
	Fluoride (F)	0.514	A
Overall site classification (from PAI table)			**B/C (81.8%)**

5.4. Water quality assessment for MzimEWR4 on the Mzimvubu River

River	Mzimvubu	**Water Quality Monitoring Points**	
		RC	Benchmark tables (DWAF, 2008)
EWR Site	MzimEWR4	**PES**	T3H020Q01 (*n* = 69-73; 2000-2016)
	Parameter / units	**PES value**	**Ecological Category / comment**
Inorganic salt ions (mg/L)	Sulphate as SO_4	7.33	Inorganic salt assessment not triggered due to low Electrical Conductivity levels
	Sodium as Na	19.52	
	Magnesium as Mg	13.67	
	Calcium as Ca	19.93	
	Chloride as Cl	15.87	
	Potassium as K	2.70	
Electrical conductivity	mS/m	28.44	A
Nutrients (mg/L)	SRP-P	0.006	A/B
	TIN-N	0.100	A
Physical variables	pH (5th and 95th % tiles)	7.43 + 8.32	B
	Temperature (° C)	-	Natural temperature range expected.
	Dissolved oxygen (mg/L)	-	Natural oxygen range expected.
	Turbidity (NTU)	-	Although there are severe erosion problems in the upper catchments, the impact has been classified as Moderate due to the size of the river system which moderates the impact, and the naturally turbid state of the Mzimvubu River. Moderate changes imply that catchment land-use have resulted in unnaturally high sediment loads and high turbidities during runoff events.
Response variable	Chl-*a*: phytoplankton (ug/L)	-	
	Macroinvertebrate score (MIRAI) SASS score ASPT score	74.10%	C
	Diatoms	SPI=17.0 (n=1)	B: Dominant species suggest flows recently elevated, and diatoms growing in conditions of reduced light penetration (i.e. high turbidity), were present in the sample.
	Fish score (FRAI)	76.1%	C
Toxics (mg/L)	Ammonia (as N)	0.006	A
Overall site classification (from PAI table)			**A/B (88.3%)**

Summary of the Quality component at Desktop level

Table 5.5. Desktop Water quality assessments

	Quaternary catchment	RU	Water resource	Component	Sub-Component	Indicator	Ecospecs PES and REC
IUA T32_a: Mzintlava	T32C	RU T32-6: T32C-05273	Mzintlava	River Water Qualtiy	Nutrients	Orthophosphate	50th percentile of the data must be less than 0.025 mg/L PO_4-P (aquatic ecosystems: driver).
				River Water Qualtiy	Toxics		95th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
	T32C, T32D	RU T32-9: T32D-05352	Mzintlava	River Water Qualtiy	Nutrients	Orthophosphate	50th percentile of the data must be less than 0.125 mg/L PO_4-P (aquatic ecosystems: driver).
				River Water Qualtiy	Toxics		95th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
IUA T32_b: Mzintlava	T32D	RU T32-10: T32D-05373	Mzintlava	River Water Quality	Nutrients	Orthophosphate	50th percentile of the data must be less than 0.125 mg/L PO_4-P (aquatic ecosystems: driver).
				River Water Quality	Toxics		95th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
				River Water Quality	Salts	Electrical conductivity	95th percentile of the data must be less than or equal to 55 mS/m (aquatic ecosystems: driver).
	T32E, T32F	RU T32-11: T32F-05464	Mvalweni	River Water Quality	Nutrients	Orthophosphate	50th percentile of the data must be less than 0.125 mg/L PO_4-P (aquatic ecosystems: driver).
				River Water Quality	Nutrients	Total Inorganic Nitrogen	50th percentile of the data must be less than 1.0 mg/L TIN-N (aquatic ecosystems: driver).
				River Water Quality	Toxics		95th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
				River Water Quality	Salts	Electrical conductivity	95th percentile of the data must be less than or equal to 30 mS/m (aquatic ecosystems: driver).
IUA T33_a: Kinira	T33A	RU T33-3: T33A-04990, T33A-04991	Kinira	River Water Quality	Nutrients	Orthophosphate	50th percentile of the data must be less than 0.025 mg/L PO_4-P (aquatic ecosystems: driver).
IUA T33_b: Kinira	T33G	**MRU Kinira (MzimEWR3):** T33E-05213, T33F-05326, T33G-05395	Kinira	River Water Quality	Suspended sediments	Turbidity/clarity or TSS levels	A large change from natural with erosion being a known cause of unnaturally large increases in sediment loads and turbidity. Habitat often silted but clears (aquatic ecosystems: driver).

	Quaternary catchment	RU	Water resource	Component	Sub-Component	Indicator	Ecospecs PES and REC
IUA T34_b: Thina	T34D	RU T34-6: T34D-05463	Tokwana	River Water Quality	Nutrients	Orthophosphate	50th percentile of the data must be less than 0.025 mg/L PO_4-P (aquatic ecosystems: driver).
					Toxics		95th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
IUA T34_b: Thina	T34J, T34K	**MRU Thina_C (MzimEWR2):** T34H-05772, T34H-05838, T34K-05835	Thina		Nutrients	Orthophosphate	50th percentile of the data must be less than 0.025 mg/L (aquatic ecosystems: driver).
IUA T35_a: Tsitsa	T35C, T35D	RU T35-4: T35C-05874	Mooi	River Water Quality	Nutrients	Orthophosphate	50th percentile of the data must be less than 0.025 mg/L PO_4-P (aquatic ecosystems: driver).
					Toxics		95th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
IUA T35_b: Tsitsa	T35H	MRU Inxu (EWR1): T35F-06020	Inxu	River Water Quality	Nutrients	Orthophosphate	50th percentile of the data must be less than 0.075 mg/L PO_4-P (aquatic ecosystems: driver).
					Toxics		95th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
IUA T35_c: Tsitsa	T35K	RU T35-14: T35K-06167	Xokonxa	River Water Quality	Nutrients	Orthophosphate	50th percentile of the data must be less than 0.125 mg/L PO_4-P (aquatic ecosystems: driver).
					Toxics		95th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
IUA T35_d: Tsitsa	T35K	**MRU Tsitsa_Ca (MzimEWR1):** T35E-05977, T35K-06037, T35K-06098, T35L-05976	Tsitsa	River Water Quality	Nutrients	Orthophosphate	50th percentile of the data must be less than 0.015 mg/L (aquatic ecosystems: driver).
IUA T36_a: Mzimvubu	T36A	**MRU Mzim (MzimEWR4):** T36A-06250, T36A-06354, T36B-06391	Mzimvubu	River Water Quality	Suspended sediments	Turbidity/clarity or TSS levels	Moderate changes from natural with temporary high sediment loads and turbidity during runoff events. Urban activities and land-use have resulted in high sediment loads

6. SURFACE-WATER – WETLANDS COMPONETS

Summary of the Wetlands assessment

6.1. Desktop Wetland and Ecoclassification

SQ Code	Name	PES	Wetland EI	Wetland ES	RES
T31A-04712	Mzimvubu	C	HIGH	LOW	B/C
T31B-04745	Krom	B	HIGH	MODERATE	B/C
T31B-04868	Krom	B	VERY HIGH	MODERATE	A
T31B-04873	Name unknown	B	VERY HIGH	MODERATE	A
T31C-04796	Mngeni	C	HIGH	MODERATE	B/C
T31C-04866	Mzimvubu	B/C	MODERATE	MODERATE	B/C
T31C-04879	Nyongo	C	MODERATE	VERY HIGH	C
T31D-04926	Mzimvubu	C	HIGH	MODERATE	C
T31D-04936	Riet	B/C	VERY HIGH	MODERATE	A
T31D-05030	Riet	C	HIGH	LOW	B/C
T31D-05060	Mzimvubu	D	HIGH	MODERATE	C
T31D-05076	Mzimvubu	C	VERY HIGH	VERY LOW	B
T31E-04836	Tswereka	B	HIGH	MODERATE	B/C
T31E-04910	Malithasana	D	HIGH	MODERATE	C/D
T33D-05063	Kinira	D	VERY HIGH	VERY LOW	C
T33D-05106	Pabatlong	C/D	HIGH	VERY HIGH	C
T33D-05150	Kinira	C/D	HIGH	LOW	C
T33E-05213	Kinira	C/D	HIGH	MODERATE	C
T33E-05367	Somabadi	C/D	MODERATE	VERY HIGH	C/D
T33F-05285	Rolo	D	MODERATE	VERY LOW	D
T33F-05326	Kinira	C/D	HIGH	VERY LOW	C
T33F-05398	Kinira	C/D	HIGH	VERY LOW	C
T33F-05439	Ncome	C/D	MODERATE	VERY LOW	C/D
T33G-05395	Kinira	C/D	HIGH	LOW	C
T33G-05587	Cabazi	C/D	MODERATE	HIGH	C
T33G-05659	Mzimvubu	B	MODERATE	MODERATE	B
T33H-05638	Mnceba	C	MODERATE	VERY HIGH	C
T33H-05680	Mzimvubu	C	MODERATE	LOW	C
T33H-05803	Caba	C/D	HIGH	MODERATE	C
T33H-05821	Mzimvubu	C	MODERATE	MODERATE	C
T33J-05834	Mzimvubu	C	MODERATE	LOW	C
T34A-05394	Vuvu	B/C	HIGH	HIGH	B
T34A-05404	Thina	C	HIGH	VERY LOW	B/C
T34A-05408	Khohlong	C	HIGH	VERY LOW	B/C
T34A-05415	Thina	B/C	HIGH	VERY LOW	B
T34B-05269	Nxotshana	B/C	HIGH	VERY LOW	B
T34B-05275	Phiri-e-ntso	B/C	HIGH	VERY LOW	B
T34B-05351	Thina	C/D	HIGH	VERY LOW	C
T34B-05356	Thina	C/D	HIGH	LOW	C
T34B-05385	Thina	C/D	HIGH	VERY LOW	C
T34C-05168	Tinana	B	HIGH	VERY LOW	A/B
T34C-05292	Tinana	C	MODERATE	LOW	C

T34D-05412	Thina	C	HIGH	LOW	B/C
T34D-05460	Thina	D	HIGH	LOW	C/D
T34E-05495	Bradgate se Loop	B/C	HIGH	VERY LOW	B
T34E-05503	Luzi	C	HIGH	VERY LOW	B/C
T34E-05507	Luzi	C	HIGH	LOW	B/C
T34F-05512	Luzi	C	HIGH	VERY LOW	B/C
T34G-05543	Thina	C	HIGH	LOW	B/C
T34G-05634	Nxaxa	C/D	VERY HIGH	LOW	C
T34G-05667	Thina	B/C	MODERATE	LOW	B/C
T34H-05598	Thina	D	HIGH	MODERATE	C/D
T34H-05772	Thina	B	HIGH	LOW	A/B
T34H-05826	Ngcothi	B/C	HIGH	LOW	B
T34K-05835	Thina	B/C	HIGH	MODERATE	B
T35A-05596	Tsitsana	B/C	HIGH	VERY LOW	B
T35A-05648	Tsitsa	B	HIGH	LOW	A/B
T35A-05750	Tsitsa	C/D	HIGH	VERY LOW	C
T35B-05709	Pot	B/C	HIGH	VERY LOW	B
T35B-05798	Pot	C/D	HIGH	LOW	C
T35B-05815	Little Pot	C	VERY HIGH	LOW	B
T35C-05858	Mooi	C	HIGH	VERY LOW	B/C
T35C-05874	Mooi	C/D	VERY HIGH	MODERATE	B
T35C-05930	Klein-Mooi	C	HIGH	VERY LOW	B/C
T35D-05721	Tsitsa	D	HIGH	LOW	C/D
T35D-05844	Mooi	B	HIGH	MODERATE	A/B
T35E-05780	Gqukunqa	B	MODERATE	VERY LOW	A/B
T35E-05908	Tsitsa	C	HIGH	MODERATE	B/C
T35E-05977	Tsitsa	C	MODERATE	HIGH	B/C
T35F-05973	Kuntombizininzi	B	VERY HIGH	MODERATE	A
T35F-05999	Inxu	B/C	HIGH	LOW	B
T35F-06020	Inxu	D	VERY HIGH	LOW	C
T35G-06002	Inxu	C	HIGH	LOW	B/C
T35G-06021	Inxu	C	HIGH	VERY LOW	B/C
T35G-06069	Gatberg	B/C	VERY HIGH	LOW	B
T35G-06074	Gatberg	B/C	HIGH	VERY LOW	B
T35G-06099	Gatberg	B/C	VERY HIGH	LOW	B
T35G-06100	Name unknown	C	MODERATE	VERY LOW	C
T35G-06108	Inxu	B	HIGH	LOW	A/B
T35G-06118	Gatberg	B/C	VERY HIGH	MODERATE	B/C
T35G-06133	Name unknown	C	HIGH	LOW	B/C
T35G-06135	Gqaqala	C	VERY HIGH	MODERATE	B
T35G-06148	Name unknown	A	HIGH	VERY HIGH	A
T35G-06169	Gqaqala	C	HIGH	LOW	B/C
T35G-06179	Name unknown	C	HIGH	LOW	B/C
T35H-06024	Inxu	C	MODERATE	LOW	C
T35H-06053	Inxu	C	MODERATE	MODERATE	C

T35H-06186	Umnga	C	HIGH	HIGH	B/C
T35H-06240	KuNgindi	C	VERY HIGH	MODERATE	B
T35H-06282	Umnga	B	HIGH	MODERATE	A/B
T35J-06106	Ncolosi	D	MODERATE	MODERATE	D
T35K-05897	Culunca	D	MODERATE	HIGH	C/D
T35K-05904	Tyira	D	MODERATE	HIGH	C/D
T35K-06037	Tsitsa	C	MODERATE	VERY HIGH	B
T35K-06167	Xokonxa	C	HIGH	MODERATE	B/C
T35L-05976	Tsitsa	C	VERY HIGH	HIGH	B
T35L-06190	Tsitsa	B	HIGH	LOW	A/B
T35L-06226	Ngcolora	D	HIGH	HIGH	C/D
T35M-06187	Tsitsa	B	MODERATE	MODERATE	B
T35M-06275	Ruze	B	HIGH	MODERATE	A/B
T36A-06250	Mzimvubu	C	MODERATE	LOW	C
T36B-06391	Mzimvubu	C/D	VERY HIGH	MODERATE	C

7. SURFACE WATER: ESTUARINE COMPONENTS OF THE RESERVE

Downstream boundary: 31°37'52" S, 29°32'59" E (Estuary mouth)
Upstream boundary: 31°29'7.15" S, 29°22'59.66" E
Lateral boundaries: 5 m contour above mean sea level (MSL) along each bank

The PES of an estuary is assessed in terms of the degree of similarity to reference conditions. The Estuarine Health Index is used to determine the PES and corresponds to an ecological category that describes the health using six categories, ranging from natural (A) to critically modified (F). As per the EHI the different components assessed are: Abiotic components: Hydrology, physical habitat, hydrodynamics and water quality. Biotic components: Microalgae, macrophytes, invertebrates, fish and birds.

Quaternary Catchment	Water Resource	PES	EIS	REC	NMAR (MCM)
T36B	Mzimvubu	B	Moderate	B	2 613.5

Table 7.2 Recommended Ecological Flow scenario for the Mzimvubu Estuary (REC – Category B)

%iles	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
99.9	324	449	401	611	672	970	487	391	297	314	155	747
99	279	406	392	599	619	691	374	235	295	232	143	272
95	129	275	300	446	541	526	264	81	81	103	56	83
90	92	189	254	310	508	369	174	65	47	34	37	51
85	80	129	201	222	381	278	131	55	34	29	27	29
80	58	92	176	178	272	237	111	45	28	25	23	23
70	41	67	130	147	188	201	102	33	21	20	17	19
60	32	57	71	107	153	162	81	25	18	17	14	15
50	27	47	53	82	121	133	70	23	16	14	13	14
40	24	39	43	70	86	113	58	20	14	12	12	12
30	23	37	39	58	70	80	52	18	13	12	11	11
20	21	35	34	52	58	68	48	17	12	10	10	10
15	20	32	33	43	54	63	44	16	11	10	10	10
10	19	31	31	37	46	57	40	15	11	10	10	9
5	18	30	27	35	40	47	35	15	11	10	9	8
1	16	28	26	30	31	37	31	13	10	9	8	8

8. GROUNDWATER - QUANTITY COMPONENT

There are 51 quaternary catchments within the Mzimvubu T3 catchment. The basic human needs Reserve 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 groundwater quantity component was determined using values (i.e. recharge, baseflow and population) obtained during the determination of the groundwater Reserve study in the Mzimvubu to Keiskamma WMA - Eastern Region (DWA, 2012).

Table 8.1: The Groundwater Quantity Component of the Reserve for the Mzimvubu T3 Catchment

Quaternary catchment	Area (km^2)	Recharge (Mm^3/a)	Population	Baseflow (Mm^3/a)	EWR_MLF (Mm^3/a)	BHN Reserve (Mm^3/a)	EWR as % of Recharge	BHN as % of Recharge
T31A	221.3	11.61	493	9.68	0.69	0	5.93	0
T31B	284	16.55	2903	6.18	0.42	0.03	2.55	0.18
T31C	290.6	15.25	13110	6.26	0.41	0.12	2.71	0.79
T31D	352.5	20.54	3587	5.27	0.32	0.04	1.56	0.19
T31E	508.7	26.7	12815	8.24	0.33	0.12	1.24	0.45
T31F	606.9	28.09	2188	11.89	0.29	0.02	1.05	0.07
T31G	208.4	12.14	262	6.35	0.58	0	4.77	0
T31H	616.2	35.9	29073	12.34	0.36	0.26	1.02	0.72
T31J	506.4	29.5	21943	13.68	0.5	0.2	1.69	0.68
T32A	347.1	20.23	2246	9.07	0.46	0.02	2.25	0.1
T32B	306.5	17.86	4658	9.11	0.49	0.04	2.77	0.22
T32C	372.9	21.73	39324	10.69	0.48	0.36	2.23	1.66
T32D	350.2	20.4	3405	6.02	0.33	0.03	1.61	0.15
T32E	382	22.26	32609	4.47	0.17	0.3	0.77	1.35
T32F	296	17.24	23029	4.65	0.2	0.21	1.16	1.22
T32G	437.7	25.5	42683	5.54	0.14	0.39	0.55	1.53
T32H	452.2	26.35	36169	6.32	0.17	0.33	0.64	1.25
T33A	341.4	17.92	56453	6.11	0.2	0.51	1.13	2.85
T33B	268.2	14.08	30627	6.07	0.23	0.28	1.62	1.99
T33C	237.7	12.48	17759	324	0.23	0.16	1.81	1.28
T33D	358	18.8	33472	3.84	0.22	0.3	1.19	1.6
T33E	267.1	15.56	14955	2.18	0.22	0.14	1.44	0.9
T33F	437	25.46	21162	4.88	0.21	0.19	0.83	0.75
T33G	502	29.25	29938	6.2	0.26	0.27	0.88	0.92
T33H	516	30.06	58784	4.43	0.2	0.54	0.67	1.8
T33J	456.4	25.59	38276	3.48	0.19	0.34	0.75	1.33
T33K	169.1	9.85	13409	2.16	0.22	0.12	2.24	1.22
T34A	671.9	32.27	8720	5.69	0.38	0.08	1.18	0.25
T34B	601.9	31.59	6940	5.17	0.37	0.06	1.18	0.19
T34C	366.9	19.26	9860	5.11	0.36	0.09	1.89	0.47
T34D	461	24.2	21115	7.4	0.39	0.19	1.62	0.79

Quaternary catchment	Area (km^2)	Recharge (Mm^3/a)	Population	Baseflow (Mm^3/a)	EWR_MLF (Mm^3/a)	BHN Reserve (Mm^3/a)	EWR as % of Recharge	BHN as % of Recharge
T34E	241.5	12.67	3000	6.24	0.43	0	3.36	0
T34F	246.1	12.92	5627	5.49	0.39	0.05	3	0.39
T34G	281.9	14.8	14867	7.81	0.38	0.13	2.6	0.88
T34H	590.1	34.38	46605	12.59	0.45	0.42	1.3	1.22
T34J	296.3	17.26	23028	2.61	0.29	0.21	1.7	1.22
T34K	332.9	19.4	20920	2.54	0.2	0.19	1.02	0.98
T35A	475.1	24.94	10162	11.96	0.43	0.09	1.72	0.36
T35B	395.7	20.77	0	10.04	0.39	0	1.88	0
T35C	306.1	16.07	2934	9.56	0.48	0.23	2.99	1.43
T35D	347.8	18.25	8329	7.24	0.45	0.08	2.46	0.44
T35E	491.8	28.65	25094	13.11	0.43	0.22	1.51	0.77
T35F	358.7	18.83	1271	8.43	0.45	0.01	2.39	0.05
T35G	574.5	30.15	6074	10.31	0.45	0.05	1.48	0.17
T35H	519.3	27.26	27442	12.34	0.4	0.25	1.46	0.92
T35J	188.4	10.98	15134	12.44	1.17	0.39	10.61	3.55
T35K	624.8	36.4	53682	2.87	0.12	0.49	0.32	1.35
T35L	340.1	19.81	21721	2.87	0.2	0.2	0.99	1.01
T35M	304.5	17.74	20465	4.14	0.19	0.19	1.08	1.07
T36A	462	55.9	29898	11.73	0.27	0.27	0.48	0.48
T36B	264.4	31.99	21375	10..01	0.26	0.19	0.81	0.59

9. GROUNDWATER QUALITY COMPONENT

In the determinations of the groundwater quality component the ambient groundwater quality is compared to Class 1 potability value (SANS 2005). The lowest or more conservative value of the two is selected. In instances where the ambient value is selected, it is increased by 10 per cent. In instances where the ambient quality, of geological origin, exceeds the potability value the ambient water quality is used. The groundwater quality should at all times comply in all respects with the quality specifications set as per water quality guidelines contained in Table 2 below. The groundwater quality of the Mzimvubu catchment was assessed per quaternary level and the results are summarised in Table 3 below.

Table 9.1. Assessment guide for the suitability of groundwater for potable use

Chemical Parameter	Target Water Quality Ranges[1]				
	Units	Class 0	Class I	Class II	Class III
pH (pH Units)		6 - 9	5 - 6 & 9 - 9.5	4 - 5& > 9.5 - 10	< 4 or > 10
Total Dissolved Solids	mg/l	0 - 450	450 - 1000	1000 - 2450	> 2450
Electrical Conductivity	mS/m	0 - 70	70 - 150	150 - 300	> 370
Calcium as Ca	mg/l	0 - 80	80 - 150	150 - 300	> 300
Magnesium as Mg	mg/l	0 - 30	30 - 70	70 -100	> 100
Sodium as Na	mg/l	0 - 100	100 - 200	200 - 400	> 400
Chloride as Cl	mg/l	0 - 100	100 - 200	200 - 600	> 600
Sulphate as SO_4	mg/l	0 - 200	200 - 400	400 - 600	> 600
Nitrate as NO_x N	mg/l	0 - 6	6 - 10	10 - 20	> 20
Flouride as F	mg/l	0 - 1	1 - 1.5	1.5 - 3.5	> 3.5
Faecal coliforms	counts/100ml	0	0 - 1	1 - 10	> 10

1) Ref: South African Water Quality Guidelines, Volume 1: Domestic Water Use, 2nd Ed. 1996. Department of Water Affairs and Forestry. Pretoria, South Africa.

NOTE:

Class 0: Water is classed as ideal drinking water, suitable for life time use. The values are essentially the same as the target water guideline in the South African Water Quality Guideline for Domestic Use.

Class I: **Water is still safe for life time use; however some mild health effects may, in very rare cases, occur. They may also be some aesthetic effects.**

Class II: Water allowable for limited short term or emergency use. Health effects may be felt more commonly, as compared to Class I, especially by those who are long term users of the water. Therefore, it is not recommended that the water be used continuously for life. This is only class in the guideline which is not specific in terms of the exact duration that the water can be used for. It states that it can be used for short term use; but does not define what length of time "short term" refers to.

Class III: Class III water will cause serious health effects, particular in infants and elderly people. Use of this water is not recommended for drinking purposes.

Table 9.2: The Groundwater Quality Component of the Reserve for the Mzimvubu T3 Catchment

Quaternary		pH	EC	Ca	Mg	Na	Tal	Cl	SO4	NO3	F
catchment			(mS/m)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
T31A	No of Samples	11	11	11	11	11	11	11	11	11	11
	Ambient GW Quality	8.52	41	7.11	1.2	79.66	134.62	33.01	9.2	0.04	4.08
	5 percentile	8.18	37.4	5.99	0.5	74.14	125.59	26.9	5.49	0.02	2.92
	95 percentile	8.72	47.1	11.69	2.13	86.76	148.81	42.54	12.48	0.1	4.74
	GW Quality Reserve	9.37	45.1	7.82	1.32	87.62	148.08	36.31	10.12	0.04	4.48
T31C	No of Samples	8	8	8	8	8	8	8	8	8	8
	Ambient GW Quality	8.57	41.25	7.46	1.19	82.47	137.1	32.84	8.81	0.04	4.07
	5 percentile	8.18	37.95	5.88	0.69	75.36	124.92	26.48	5.74	0.02	2.9
	95 percentile	8.72	47.43	11.78	2.14	86.97	149.44	42.96	12.53	0.1	4.77
	GW Quality Reserve	9.43	45.38	8.2	1.31	90.72	150.81	36.12	9.7	0.05	4.47
T31E	No of Samples	9	9	9	9	9	9	9	9	9	9
	Ambient GW Quality	8.62	41	7.81	1.2	79.66	134.62	33.01	9.2	0.04	4.06
	5 percentile	8.18	37.32	5.88	0.5	74.4	125.14	26.62	5.48	0.02	2.91
	95 percentile	8.72	47.32	11.75	2.14	86.9	149.23	42.85	12.51	0.09	4.58
	GW Quality Reserve	9.49	45.1	8.59	1.32	87.62	148.08	36.31	10.12	0.04	4.46
T33A	No of Samples	7	7	7	7	7	7	7	7	7	7
	Ambient GW Quality	7.62	30.5	7.1	2.7	15.54	91.61	6.09	2	0.04	0.22
	5 percentile	7.04	10.5	4.07	0.73	5.73	38.41	1.5	2	0.02	0.1
	95 percentile	8.25	39.65	22.59	9.71	87.38	177.92	10.03	20.66	1.21	1.51
	GW Quality Reserve	8.38	33.55	7.81	2.97	17.09	100.77	6.7	2.2	0.04	0.24

Quaternary		pH	EC	Ca	Mg	Na	Tal	Cl	SO4	NO3	F
catchment			(mS/m)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
T33B	No of Samples	11	11	11	11	11	11	11	11	11	11
	Ambient GW Quality	8.45	42.2	7.81	1.2	83.04	137.73	38.6	11.2	0.04	3.85
	5 percentile	8.15	37.64	5.61	0.5	74.64	126.95	27.74	5.5	0.02	2.57
	95 percentile	8.71	54.1	11.52	2.09	108.18	160.79	48.47	20.45	0.1	4.68
	GW Quality Reserve	9.3	46.42	8.59	1.32	91.34	151.5	42.46	12.32	0.04	4.24
T33C	No of Samples	9	9	9	9	9	9	9	9	9	9
	Ambient GW Quality	8.62	41	7.81	1.2	79.66	134.62	33.01	9.2	0.04	4.06
	5 percentile	8.18	37.32	5.88	0.5	74.4	125.14	26.62	5.48	0.02	2.91
	95 percentile	8.72	47.32	11.75	2.14	86.9	149.23	42.85	12.51	0.09	4.58
	GW Quality Reserve	9.49	45.1	8.59	1.32	87.62	148.08	36.31	10.12	0.04	4.46
T33D	No of Samples	11	11	11	11	11	11	11	11	11	11
	Ambient GW Quality	8.52	41	7.11	1.2	79.66	134.62	33.01	9.2	0.04	4.08
	5 percentile	8.18	37.4	5.99	0.5	74.14	125.59	26.9	5.49	0.02	2.92
	95 percentile	8.72	47.1	11.69	2.13	86.76	148.81	42.54	12.48	0.1	4.74
	GW Quality Reserve	9.37	45.1	7.82	1.32	87.62	148.08	36.31	10.12	0.04	4.48
T34E	No of Samples	6	6	6	6	6	6	6	6	6	6
	Ambient GW Quality	8.52	43.25	9.02	1.7	80.78	135.49	36.96	9.34	0.05	3.82
	5 percentile	8.17	37.9	5.88	0.65	76.24	124.47	27.3	5.68	0.03	2.88
	95 percentile	8.72	47.65	11.84	2.15	87.12	145.52	43.3	12.42	0.09	4.64
	GW Quality Reserve	9.37	47.58	9.92	1.87	88.86	149.04	40.66	10.27	0.05	4.2

Quaternary catchment		pH	EC (mS/m)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	Tal (mg/l)	Cl (mg/l)	SO4 (mg/l)	NO3 (mg/l)	F (mg/l)
T34F	No of Samples	4	4	4	4	4	4	4	4	4	4
	Ambient GW Quality	8.31	45.75	10.82	1.88	82.78	137.59	40.97	11.45	0.05	3.29
	5 percentile	8.17	41.34	7.58	1.7	77.19	124.83	34.19	6.37	0.02	2.87
	95 percentile	8.66	47.87	11.89	2.17	87.26	146	43.6	12.51	0.07	3.99
	GW Quality Reserve	9.14	50.33	11.9	2.07	91.05	151.35	45.07	12.6	0.05	3.62
T34G	No of Samples	4	4	4	4	4	4	4	4	4	4
	Ambient GW Quality	8.31	45.75	10.82	1.88	82.78	137.59	40.97	11.45	0.05	3.29
	5 percentile	8.17	41.34	7.58	1.7	77.19	124.83	34.19	6.37	0.02	2.87
	95 percentile	8.66	47.87	11.89	2.17	87.26	146	43.6	12.51	0.07	3.99
	GW Quality Reserve	9.14	50.33	11.9	2.07	91.05	151.35	45.07	12.6	0.05	3.62
T35A	No of Samples	3	3	3	3	3	3	3	3	3	3
	Ambient GW Quality	8.21	46	11.4	2.07	86.04	141.92	41.03	11.71	0.06	3
	5 percentile	8.17	45.55	10.35	1.73	80.17	134.12	40.92	11.25	0.04	2.86
	95 percentile	8.4	47.98	11.92	2.17	87.33	146.24	43.76	12.56	0.07	3.52
	GW Quality Reserve	9.03	50.6	12.54	2.28	94.64	156.11	45.13	12.88	0.06	3.3
T35B	No of Samples	3	3	3	3	3	3	3	3	3	3
	Ambient GW Quality	7.71	23.1	13.5	2.5	28.7	118.9	4.7	6.4	0.13	0.21
	5 percentile	7.47	5.55	2.88	0.7	6.47	28.45	1.82	5.77	0.03	0.15
	95 percentile	8.28	38.31	38.61	8.26	39.59	136.54	21.8	9.55	1.86	0.28
	GW Quality Reserve	8.48	25.41	14.85	2.75	31.57	130.79	5.17	7.04	0.14	0.23

Quaternary catchment		pH	EC (mS/m)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	Tal (mg/l)	Cl (mg/l)	SO4 (mg/l)	NO3 (mg/l)	F (mg/l)
T35C	No of Samples	6	6	6	6	6	6	6	6	6	6
	Ambient GW Quality	8.52	43.25	9.02	1.7	80.78	135.49	36.96	9.34	0.05	3.82
	5 percentile	8.17	37.9	5.88	0.65	76.24	124.47	27.3	5.68	0.03	2.88
	95 percentile	8.72	47.65	11.84	2.15	87.12	145.52	43.3	12.42	0.09	4.64
	GW Quality Reserve	9.37	47.58	9.92	1.87	88.86	149.04	40.66	10.27	0.05	4.2
T35D	No of Samples	2	2	2	2	2	2	2	2	2	2
	Ambient GW Quality	8.31	46.85	11.11	1.94	83.49	139.99	40.97	12.18	0.06	3.21
	5 percentile	8.22	45.64	10.32	1.72	79.91	133.93	40.92	11.75	0.06	2.88
	95 percentile	8.41	48.07	11.89	2.16	87.08	146.04	41.02	12.6	0.07	3.55
	GW Quality Reserve	9.14	51.54	12.22	2.13	91.84	153.99	45.07	13.4	0.07	3.53
T35F	No of Samples	5	5	5	5	5	5	5	5	5	5
	Ambient GW Quality	8.62	41	7.81	1.7	82.05	137.73	33.01	7.48	0.04	4.06
	5 percentile	8.17	37.72	5.8	0.62	76.2	124.24	26.94	5.64	0.02	2.88
	95 percentile	8.72	47.76	11.86	2.16	87.19	145.76	43.43	12.36	0.09	4.68
	GW Quality Reserve	9.49	45.1	8.59	1.87	90.25	151.5	36.31	8.23	0.05	4.46
T35G	No of Samples	1	1	1	1	1	1	1	1	1	1
	Ambient GW Quality	7.71	23.1	13.5	2.5	40.8	118.9	4.7	6.4	0.13	0.29
	5 percentile	7.71	23.1	13.5	2.5	40.8	118.9	4.7	6.4	0.13	0.29
	95 percentile	7.71	23.1	13.5	2.5	40.8	118.9	4.7	6.4	0.13	0.29
	GW Quality Reserve	8.48	25.41	14.85	2.75	44.88	130.79	5.17	7.04	0.14	0.32

Quaternary catchment		pH	EC (mS/m)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	Tal (mg/l)	Cl (mg/l)	SO4 (mg/l)	NO3 (mg/l)	F (mg/l)
T35H	No of Samples	3	3	3	3	3	3	3	3	3	3
	Ambient GW Quality	8.62	41	7.81	1.7	82.05	137.73	33.01	7.48	0.06	4.06
	5 percentile	8.25	40.64	7.18	1.15	77.3	124.78	32.7	5.71	0.02	2.97
	95 percentile	8.7	47.48	11.56	2.13	86.93	145.82	40.12	12.14	0.1	4.07
	GW Quality Reserve	9.49	45.1	8.59	1.87	90.25	151.5	36.31	8.23	0.06	4.46
T31B	No of Samples	7	7	7	7	7	7	7	7	7	7
	Ambient GW Quality	8.2	33	32.16	15.17	12.32	140.87	8.23	4.46	0.83	0.19
	5 percentile	7.96	26.44	22.23	7.65	6.98	92.25	5.81	2	0.1	0.15
	95 percentile	8.39	46.73	48.84	19.33	19.16	191.4	32.43	8.47	5.24	0.66
	GW Quality Reserve	9.02	36.3	35.37	16.69	13.55	154.96	9.05	4.91	0.92	0.21
T31D	No of Samples	6	6	6	6	6	6	6	6	6	6
	Ambient GW Quality	8.18	37.35	34.48	15.96	12.59	144.57	11.02	4.06	1.15	0.22
	5 percentile	7.96	26.03	22.59	7.49	8.06	92.05	5.82	2	0.2	0.14
	95 percentile	8.38	46.83	48.98	19.41	19.5	193.42	33.46	8.52	5.39	0.66
	GW Quality Reserve	9	41.09	37.92	17.55	13.84	159.03	12.12	4.46	1.26	0.24
T31G	No of Samples	8	8	8	8	8	8	8	8	8	8
	Ambient GW Quality	8.21	32.85	30.67	15.17	12.59	144.49	8.16	4.93	0.75	0.22
	5 percentile	7.97	24.89	22.53	7.8	7.02	92.44	5.07	2	0.11	0.15
	95 percentile	8.38	46.64	48.7	19.26	18.81	189.37	31.39	8.41	5.09	0.66
	GW Quality Reserve	9.03	36.14	33.74	16.68	13.84	158.93	8.98	5.42	0.82	0.24

Quaternary		pH	EC	Ca	Mg	Na	Tal	Cl	SO4	NO3	F
catchment			(mS/m)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
T31H	No of Samples	7	7	7	7	7	7	7	7	7	7
	Ambient GW Quality	8.24	38.1	33.85	13.75	22.1	160.16	11.3	5.96	1.05	0.27
	5 percentile	8.19	30.48	22.99	3.36	11.98	108.09	6.99	2.85	0.32	0.17
	95 percentile	8.36	47.39	45.51	16.02	34.6	202.03	19.99	17.25	6.85	1.14
	GW Quality Reserve	9.07	41.91	37.23	15.12	24.31	176.18	12.43	6.55	1.16	0.29
T31J	No of Samples	9	9	9	9	9	9	9	9	9	9
	Ambient GW Quality	8.23	37.4	30.75	10.04	19.02	143.41	11.3	5.96	0.96	0.26
	5 percentile	7.85	22.02	15.69	3.76	8.83	81.6	5.03	2	0.14	0.15
	95 percentile	8.35	47.12	44.92	15.81	34.03	201.57	19.36	18.99	6.8	1.12
	GW Quality Reserve	9.05	41.14	33.83	11.04	20.92	157.75	12.43	6.55	1.06	0.29
T32A	No of Samples	11	11	11	11	11	11	11	11	11	11
	Ambient GW Quality	7.89	51.6	26.4	18.1	34.5	135.2	38.8	4.8	5.93	0.16
	5 percentile	6.97	28.75	14.65	8.95	21.75	53.25	19.9	2	1.03	0.12
	95 percentile	9.06	75.2	54.1	23.8	62.15	185	107.55	9.5	11.4	0.29
	GW Quality Reserve	8.68	56.76	29.04	19.91	37.95	148.72	42.68	5.28	6.53	0.18
T32B	No of Samples	13	13	13	13	13	13	13	13	13	13
	Ambient GW Quality	7.73	39.4	20.7	14.7	33.3	128.8	37.7	4.3	5.93	0.15
	5 percentile	6.53	16.96	6.36	4.78	15.64	28.56	9.3	2	1.05	0.1
	95 percentile	8.99	72.04	52.04	23.14	61.34	182.52	99.6	9.5	11.31	0.28
	GW Quality Reserve	8.5	43.34	22.77	16.17	36.63	141.68	41.47	4.73	6.53	0.17

Quaternary catchment		pH	EC (mS/m)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	Tal (mg/l)	Cl (mg/l)	SO4 (mg/l)	NO3 (mg/l)	F (mg/l)
T32C	No of Samples	7	7	7	7	7	7	7	7	7	7
	Ambient GW Quality	8.08	33.2	28.41	10.32	11.4	108.42	11.69	2	0.14	0.15
	5 percentile	7.53	6.4	4.41	2.7	3.36	22.59	4.49	2	0.04	0.07
	95 percentile	8.58	56.83	45.13	21.62	31.75	240.35	43.94	14.43	2.73	1.57
	GW Quality Reserve	8.88	36.52	31.26	11.35	12.54	119.26	12.86	2.2	0.16	0.16
T32D	No of Samples	10	10	10	10	10	10	10	10	10	10
	Ambient GW Quality	8.33	39.2	34.02	10.83	22.15	154.56	9.96	6.88	1.02	0.23
	5 percentile	7.95	19.05	7.96	2.01	8.29	77.75	1.5	2	0.04	0.13
	95 percentile	8.58	59.18	47.95	30.55	59.53	227.04	47.65	29.48	5.2	2.46
	GW Quality Reserve	9.17	43.12	37.42	11.91	24.37	170.01	10.95	7.56	1.13	0.26
T32E	No of Samples	8	8	8	8	8	8	8	8	8	8
	Ambient GW Quality	8.34	40.85	35.64	16.6	20.76	174.38	10.86	6.22	1.17	0.22
	5 percentile	8.21	25.25	16.54	8.15	11.24	96.37	3.12	2	0.05	0.12
	95 percentile	8.56	57.17	51.69	26.58	34.64	234.53	37.1	19.76	2.77	0.74
	GW Quality Reserve	9.17	44.94	39.2	18.26	22.84	191.82	11.95	6.84	1.29	0.25
T32F	No of Samples	6	6	6	6	6	6	6	6	6	6
	Ambient GW Quality	7.64	30.6	7.1	3.15	22.77	124.85	6.13	2	0.12	0.27
	5 percentile	7.32	11.93	4.62	0.69	10.7	41.65	1.98	2	0.03	0.11
	95 percentile	8.25	39.78	22.79	9.89	87.91	179.27	10.07	21.22	1.26	1.58
	GW Quality Reserve	8.4	33.66	7.81	3.47	25.04	137.34	6.74	2.2	0.13	0.3

Quaternary catchment		pH	EC (mS/m)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	Tal (mg/l)	Cl (mg/l)	SO4 (mg/l)	NO3 (mg/l)	F (mg/l)
T32G	No of Samples	8	8	8	8	8	8	8	8	8	8
	Ambient GW Quality	8.34	40.85	34.76	16.6	19.46	167.34	10.86	4.07	1.3	0.21
	5 percentile	8.21	24.64	16.23	8.53	10.88	94.46	5.78	2	0.08	0.12
	95 percentile	8.57	57.8	52.94	26.96	29.62	237.03	35.74	10.86	2.79	0.49
	GW Quality Reserve	9.17	44.94	38.23	18.26	21.41	184.07	11.95	4.48	1.43	0.23
T32H	No of Samples	3	3	3	3	3	3	3	3	3	3
	Ambient GW Quality	7.83	33.9	13.02	2.68	58.29	156.83	5	5.44	0.04	0.34
	5 percentile	7.7	24.36	11.25	1.86	30.48	104.3	2.3	2.34	0.04	0.27
	95 percentile	8.01	34.35	15.01	3	61.67	160.86	5.83	6.89	0.18	1.58
	GW Quality Reserve	8.61	37.29	14.32	2.95	64.12	172.51	5.5	5.98	0.04	0.38
T33E	No of Samples	4	4	4	4	4	4	4	4	4	4
	Ambient GW Quality	8.38	49.35	25.8	6.8	83.5	162.55	69.45	15.2	1.16	4.48
	5 percentile	7.52	42	3.36	0.5	47.25	54.29	30.34	6.8	0.02	0.57
	95 percentile	9.01	83.9	81.14	23.39	87.63	278.3	78.99	27.51	5.09	9.4
	GW Quality Reserve	9.21	54.29	28.38	7.48	91.85	178.81	76.4	16.72	1.27	4.92
T33F	No of Samples	5	5	5	5	5	5	5	5	5	5
	Ambient GW Quality	7.65	30.7	7.1	2.7	30	158.1	6.17	2	0.04	0.33
	5 percentile	7.41	15.7	4.59	0.65	11.67	46.72	3.94	2	0.02	0.11
	95 percentile	8.25	39.9	22.99	10.07	88.45	180.62	10.12	21.77	1.32	1.64
	GW Quality Reserve	8.42	33.77	7.81	2.97	33	173.91	6.79	2.2	0.04	0.36

Quaternary catchment		pH	EC (mS/m)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	Tal (mg/l)	Cl (mg/l)	SO4 (mg/l)	NO3 (mg/l)	F (mg/l)
T33G	No of Samples	4	4	4	4	4	4	4	4	4	4
	Ambient GW Quality	8.42	49	40.6	19.27	22.03	203.98	13.86	6.52	1.98	0.23
	5 percentile	8.33	39.2	33.63	10.79	20.66	150.91	11.84	2.62	0.32	0.21
	95 percentile	8.51	59.06	55.43	28.68	31.61	242.02	42.4	12.08	2.82	0.56
	GW Quality Reserve	9.26	53.9	44.66	21.2	24.24	224.38	15.25	7.17	2.18	0.26
T33H	No of Samples	7	7	7	7	7	7	7	7	7	7
	Ambient GW Quality	8.34	44.3	40.1	20.3	20.9	215.9	13.64	6.14	1.31	0.23
	5 percentile	8.32	35.5	32.13	11.12	12.22	145.42	6	2	0.08	0.14
	95 percentile	8.57	58.11	53.56	27.77	35.06	238.28	40.53	21.61	2.8	0.77
	GW Quality Reserve	9.18	48.73	44.11	22.33	22.99	237.49	15	6.76	1.44	0.25
T33J	No of Samples	4	4	4	4	4	4	4	4	4	4
	Ambient GW Quality	7.93	34.15	12.03	2.22	60.17	158.9	5.05	5.45	0.08	1.03
	5 percentile	7.71	24.89	5.76	1.68	32.02	107.22	2.45	2.52	0.04	0.27
	95 percentile	8.41	35.85	14.9	2.99	73.96	161.26	5.8	6.81	0.19	2.02
	GW Quality Reserve	8.72	37.57	13.24	2.45	66.18	174.79	5.56	5.99	0.09	1.13
T33K	No of Samples	3	3	3	3	3	3	3	3	3	3
	Ambient GW Quality	7.83	33.9	13.02	2.68	58.29	156.83	5	5.44	0.04	0.34
	5 percentile	7.7	24.36	11.25	1.86	30.48	104.3	2.3	2.34	0.04	0.27
	95 percentile	8.01	34.35	15.01	3	61.67	160.86	5.83	6.89	0.18	1.58
	GW Quality Reserve	8.61	37.29	14.32	2.95	64.12	172.51	5.5	5.98	0.04	0.38

Quaternary catchment		pH	EC (mS/m)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	Tal (mg/l)	Cl (mg/l)	SO4 (mg/l)	NO3 (mg/l)	F (mg/l)
T34H	No of Samples	1	1	1	1	1	1	1	1	1	1
	Ambient GW Quality	7.69	23.3	13.02	3.04	27.39	98.47	5.92	2	0.2	0.34
	5 percentile	7.69	23.3	13.02	3.04	27.39	98.47	5.92	2	0.2	0.34
	95 percentile	7.69	23.3	13.02	3.04	27.39	98.47	5.92	2	0.2	0.34
	GW Quality Reserve	8.46	25.63	14.32	3.34	30.12	108.31	6.51	2.2	0.22	0.38
T34J	No of Samples	2	2	2	2	2	2	2	2	2	2
	Ambient GW Quality	7.93	75.2	54.1	22.95	54.45	157.8	104.55	7.7	9.34	0.24
	5 percentile	7.89	60.98	44.83	19.22	43.88	147	66.08	6.08	7.9	0.16
	95 percentile	7.97	89.42	63.37	26.69	65.03	168.6	143.03	9.32	10.78	0.31
	GW Quality Reserve	8.72	82.72	59.51	25.25	59.9	173.58	115.01	8.47	10.28	0.26
T34K	No of Samples	1	1	1	1	1	1	1	1	1	1
	Ambient GW Quality	7.97	91	64.4	27.1	66.2	169.8	147.3	5.9	7.74	0.32
	5 percentile	7.97	91	64.4	27.1	66.2	169.8	147.3	5.9	7.74	0.32
	95 percentile	7.97	91	64.4	27.1	66.2	169.8	147.3	5.9	7.74	0.32
	GW Quality Reserve	8.77	100.1	70.84	29.81	72.82	186.78	162.03	6.49	8.51	0.35
T35E	No of Samples	2	2	2	2	2	2	2	2	2	2
	Ambient GW Quality	8.03	31.55	27.45	5.7	34.75	128.7	14.2	8.15	1.09	0.25
	5 percentile	7.74	23.95	14.9	2.82	29.31	119.88	5.65	6.58	0.23	0.21
	95 percentile	8.31	39.16	40.01	8.58	40.2	137.52	22.75	9.73	1.96	0.29
	GW Quality Reserve	8.83	34.71	30.2	6.27	38.23	141.57	15.62	8.97	1.2	0.28

Quaternary catchment		pH	EC (mS/m)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	Tal (mg/l)	Cl (mg/l)	SO4 (mg/l)	NO3 (mg/l)	F (mg/l)
T35J	No of Samples	1	1	1	1	1	1	1	1	1	1
	Ambient GW Quality	8.3	61.6	27.1	20.2	58.6	96.9	61.5	68.6	7.93	0.62
	5 percentile	8.3	61.6	27.1	20.2	58.6	96.9	61.5	68.6	7.93	0.62
	95 percentile	8.3	61.6	27.1	20.2	58.6	96.9	61.5	68.6	7.93	0.62
	GW Quality Reserve	9.13	67.76	29.81	22.22	64.46	106.59	67.65	75.46	8.72	0.68
T35K	No of Samples	5	5	5	5	5	5	5	5	5	5
	Ambient GW Quality	7.83	33.9	11.05	2.27	58.29	156.83	5	5.46	0.04	0.34
	5 percentile	7.62	18.66	5.94	1.68	21.79	78.4	2.55	2.69	0.04	0.14
	95 percentile	8.39	35.76	14.79	2.97	73.26	161.24	5.75	6.94	0.18	2
	GW Quality Reserve	8.61	37.29	12.16	2.5	64.12	172.51	5.5	6	0.04	0.38
T35L	No of Samples	4	4	4	4	4	4	4	4	4	4
	Ambient GW Quality	7.94	34.3	12.43	4.23	54.92	158.56	6.13	7.45	0.04	0.46
	5 percentile	7.4	30.53	4.56	0.61	17.71	101.58	3.8	2	0.02	0.14
	95 percentile	8.25	40.03	23.19	10.25	88.99	181.97	8.91	22.32	1.33	1.71
	GW Quality Reserve	8.74	37.73	13.68	4.65	60.41	174.41	6.74	8.19	0.04	0.51
T35M	No of Samples	3	3	3	3	3	3	3	3	3	3
	Ambient GW Quality	7.65	30.7	19.76	7.2	30	158.1	6.17	12.9	0.04	0.33
	5 percentile	7.38	30.52	6.58	1.17	16.98	98.26	3.68	3.09	0.02	0.13
	95 percentile	8.2	37.18	23.4	10.43	74.86	158.93	9.07	22.88	1.4	0.56
	GW Quality Reserve	8.42	33.77	21.73	7.92	33	173.91	6.79	14.19	0.04	0.36

Quaternary catchment		pH	EC (mS/m)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	Tal (mg/l)	Cl (mg/l)	SO4 (mg/l)	NO3 (mg/l)	F (mg/l)
T36A	No of Samples	2	2	2	2	2	2	2	2	2	2
	Ambient GW Quality	7.99	2115	57.75	65.25	5942.85	2960.4	5127.8	3623.65	0.08	0.53
	5 percentile	7.8	364.5	20.27	33.98	775.37	501.06	831.38	416.91	0.03	0.43
	95 percentile	8.18	3865.5	95.24	96.53	11110.34	5419.74	9424.22	6830.4	0.13	0.63
	GW Quality Reserve	8.79	2326.5	63.53	71.78	6537.14	3256.44	5640.58	3986.02	0.09	0.58
T36B	No of Samples	3	3	3	3	3	3	3	3	3	3
	Ambient GW Quality	8.01	170	16.1	30.5	201.2	227.8	354	60.6	0.08	0.42
	5 percentile	7.8	49.58	14.48	12.14	53.15	67.51	92.73	17.58	0.03	0.2
	95 percentile	8.18	3671	91.07	93.05	10536.17	5146.48	8946.84	6474.09	0.13	0.62
	GW Quality Reserve	8.81	187	17.71	33.55	221.32	250.58	389.4	66.66	0.09	0.46

A summary of the water quality class and parameters of concern per quaternary catchment is shown in Table 4. The parameter of concern is the parameter that was used to make a decision about the water quality class of the quaternary.

Table 9.3. Water quality class and parameters of concern

Quaternary catchment	Class	Parameters of concern
T31A	0	None
T31B	0	None
T31C	0	None
T31D	0	None
T31E	0	None
T31F	0	None
T31G	0	None
T31H	0	None
T31J	0	None
T32A	0	None
T32B	0	None
T32C	0	None
T32D	0	None
T32E	0	None
T32F	0	None
T32G	0	None
T32H	0	None
T33A	0	None
T33B	0	None
T33C	0	None
T33D	0	None
T33E	0	None
T33F	0	None
T33G	0	None
T33H	0	None
T33J	0	None
T33K	0	None
T34A	1	None
T34B	1	None
T34C	1	None
T34D	1	None
T34E	0	None
T34F	0	None
T34G	0	None
T34H	0	None
T34J	1	Electrical Conductivity, Chloride and Nitrate

Quaternary catchment	Class	Parameters of concern
T34K	1	Chloride
T35A	0	None
T35B	0	None
T35C	0	None
T35D	0	None
T35E	0	None
T35F	0	None
T35G	0	None
T35H	0	None
T35J	0	None
T35K	0	None
T35L	0	None
T35M	0	None
T36A	3	Electrical conductivity, Sodium, Chloride and Phosphate
T36B	2	Electrical conductivity, Sodium and Chloride

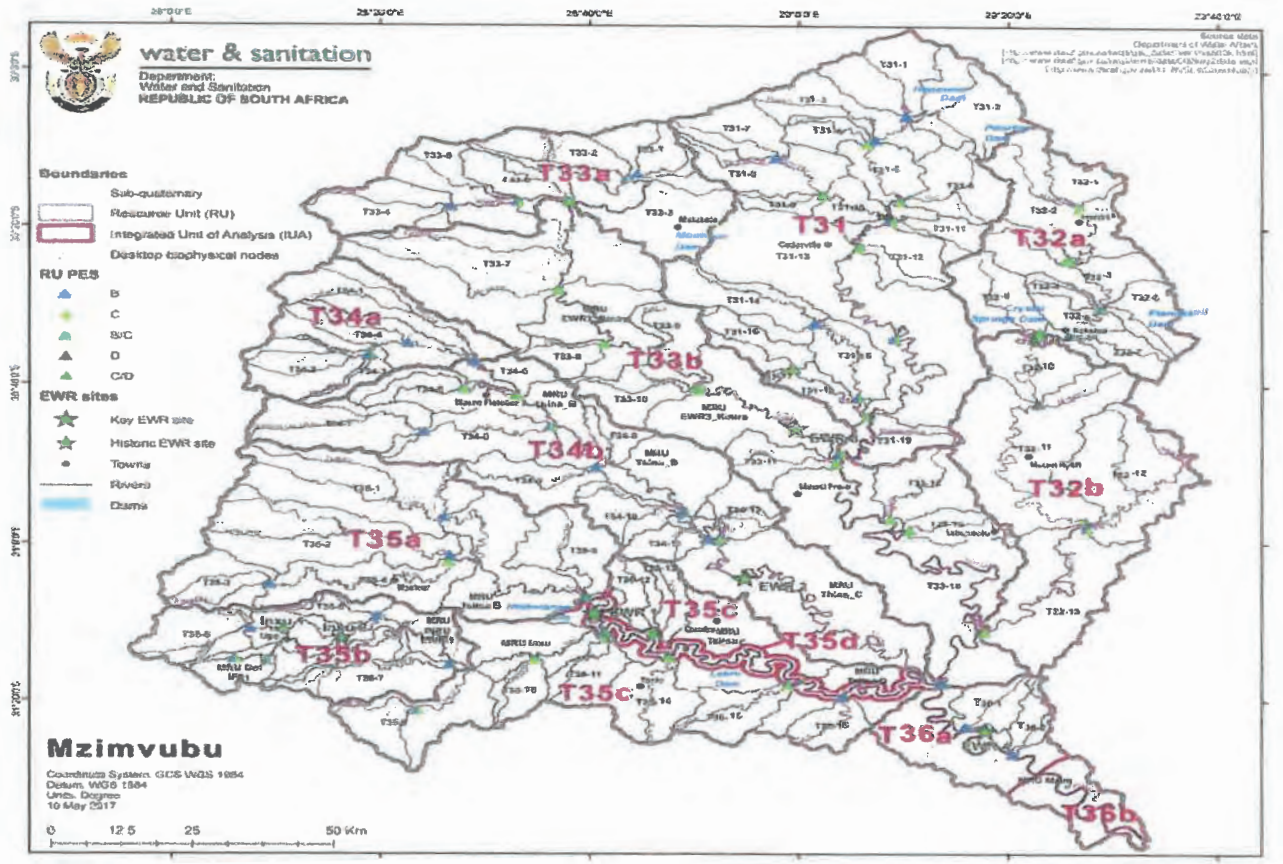

Figure 1: Locality map for the Mzimvubu, catchment.

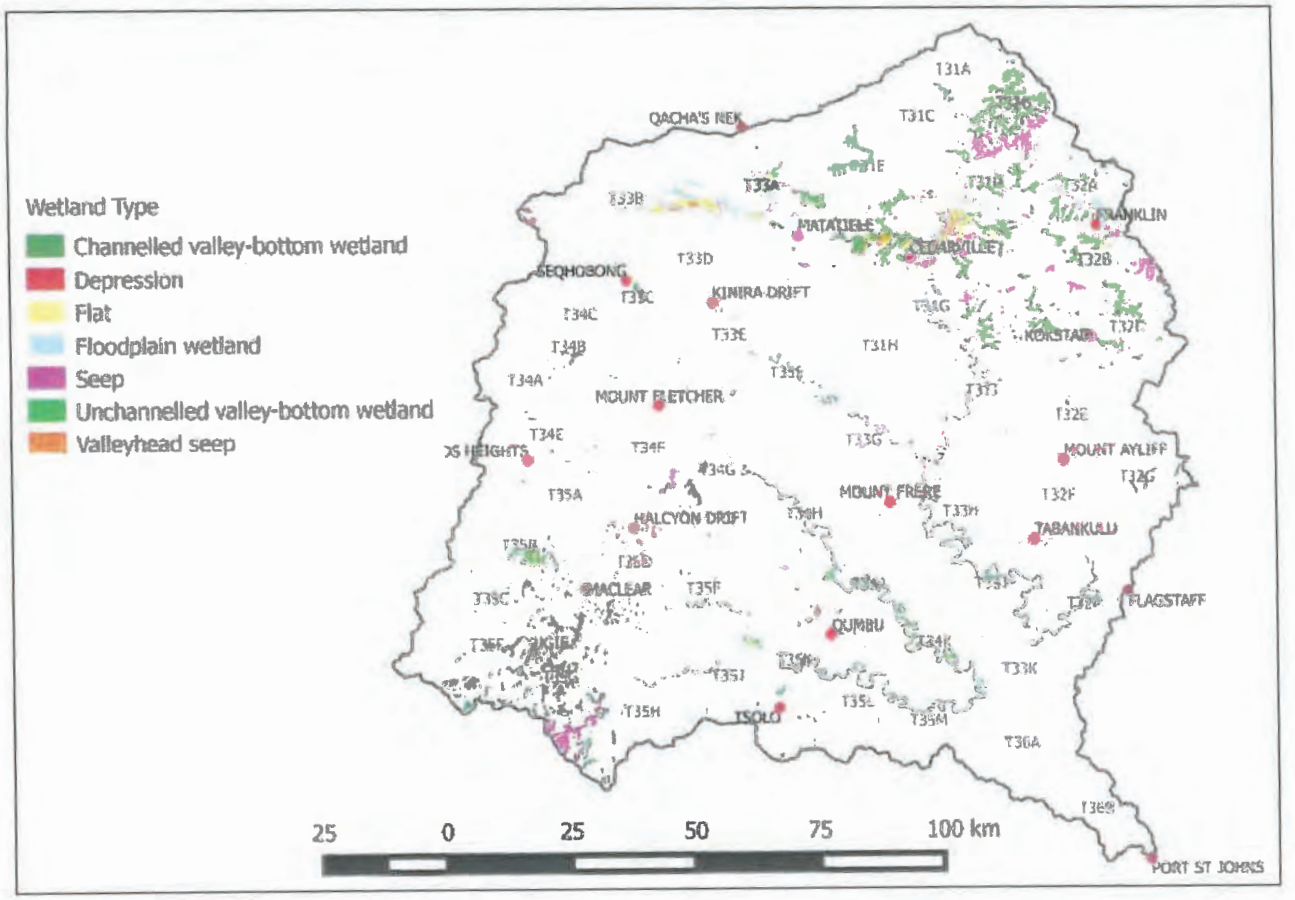

Figure 2 **Study area: T3 primary catchment showing quaternary catchments and distribution of wetland types**

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