

DEPARTMENT OF WATER AND SANITATION**NO. 610****17 JULY 2015****DEPARTMENT OF WATER AND SANITATION****NATIONAL WATER ACT, 1998
(ACT NO.36 OF 1998)****PROPOSED CLASSES AND RESOURCE QUALITY OBJECTIVES OF WATER RESOURCES
FOR CATCHMENTS OF THE UPPER VAAL**

I, Nomvula Paula Mokonyane, in my capacity as Minister of Water and Sanitation, and duly authorised in terms of section 13(4) of the National Water Act (Act No. 36 of 1998) hereby publishes for public comment the proposed classes of water resources and resource quality objectives for catchments of the Upper Vaal, in the Schedule, to be issued under section 13(4) of the National Water Act (No. 36 of 1998).

Any person who wishes to submit written comments with regard to the proposed classes and resource quality objectives should submit the comments within 60 days from the date of publication of this Notice to:

Director: Water Resource Classification
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MRS NP MOKONYANE
MINISTER OF WATER AND SANITATION
DATE: 01. 07. -15

SCHEDULE

PROPOSED CLASSES AND RESOURCE QUALITY OBJECTIVES OF WATER RESOURCES FOR CATCHMENTS OF THE UPPER VAAL IN TERMS OF SECTION 13(1)(A) AND (B) OF THE NATIONAL WATER ACT (ACT NO.36 OF 1998)

1. DESCRIPTION OF WATER RESOURCE

1. The proposed classes and resource quality objectives are determined for all or part of every significant water resource within the catchments of the Upper Vaal as set out below:

Water Management Area: Vaal
Drainage Region: C Primary Drainage Region
River(s): Vaal and Wilge River Systems

2. The Minister has, in terms of section 12 of the National Water Act (Act No 36 of 1998), prescribed a system for classifying water resources by promulgating Regulation 810, Government Gazette 33541 dated 17 September 2010. In terms of section 13(1) of the Act the Minister must, as soon as reasonably practicable after the Minister has prescribed a system for classifying water resources and subject to subsection (4), by notice in the *Gazette*, determine for all or part of every significant water resource, a class in accordance with the prescribed classification system.
3. The Minister, in terms of section 13(1)(a) of the Act, proposes to determine the following classes of each significant water resource for catchments of the Upper Vaal.
4. The Minister, in terms of section 13(1)(b) of the Act, proposes to determine the following resource quality objectives for each significant water resource for catchment of the Upper Vaal.

2. DETERMINATION OF THE CLASS OF WATER RESOURCES AND RESOURCE QUALITY OBJECTIVES IN TERMS OF SECTION 13(1)(A) AND (B) OF THE NATIONAL WATER ACT (ACT NO.36 OF 1998)

1. A summary of the water resource classes for Integrated Units of Analysis (Figure 1) and ecological categories for the Upper Vaal is set out in Table 1.
2. Integrated Units of Analysis (IUA) are classified in terms of their extent of permissible utilization and protection as either Class I: indicating high environmental protection and minimal utilization; or Class II indicating moderate protection and moderate utilization; and Class III indicating sustainable minimal protection and high utilization.
3. Resource Quality Objectives (RQO) are defined for each prioritised resource unit (RU) or hydrological node (Figure 2 and Table 2) for every IUA in terms of water quantity, quality, habitat and biota as shown in Tables 3 – 9 respectively.
4. Where specified, the ecological category or Recommended Ecological Category (REC) 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 a predevelopment condition.
5. RQO are applicable from 1 April 2016.

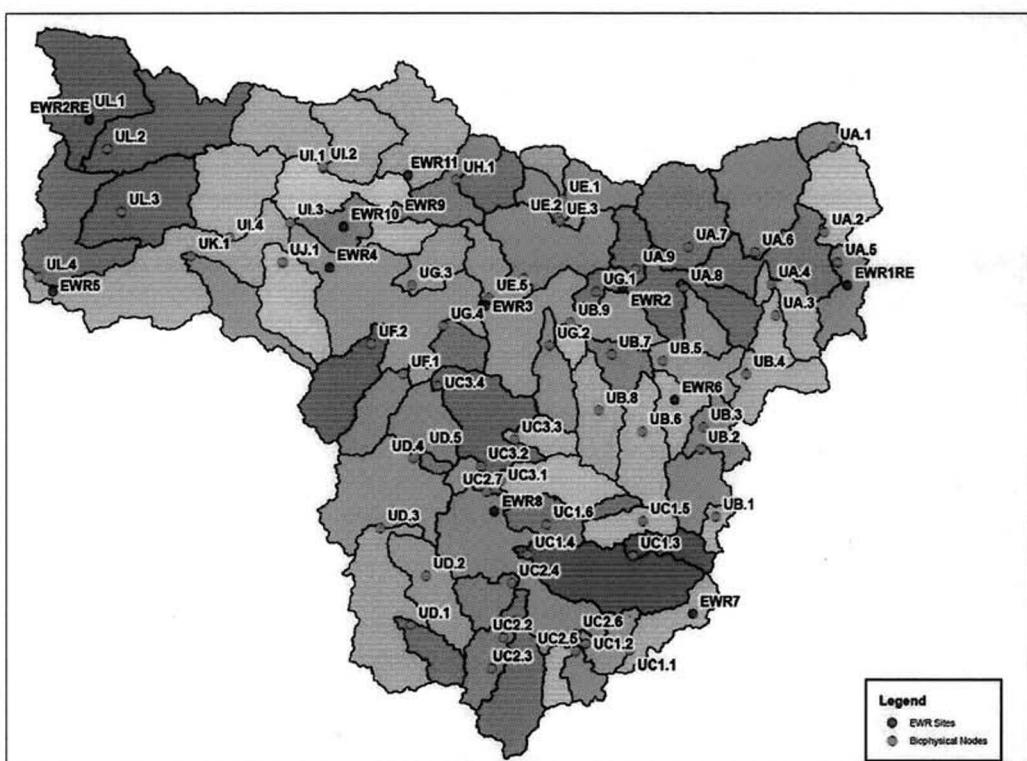


Figure 2: Resource Units (Hydro Nodes) in the Upper Vaal

Table 1: Water Resource Classes per Integrated Unit of Analysis and Ecological Categories per Biophysical Node

Integrated Unit of Analysis (IUA)	Water Resource Class for IUA	Biophysical Node Name	Quaternary Catchment	Major River Name	Tributary Name	Gross Catchment Area (km ²)	Natural MAR (million m ³ /a)	Present Ecological State	Recommended Ecological Category
Vaal River upstream of Grooidraai Dam (UA)	II	UA.1	C11A	Vaal		197	13.27	B/C	B
		UA.2	C11B	Vaal	Rietsspruit	1073	69.33	C	C
		UA.3	C11E	Vaal	Rietsspruit	215	12.03	C	C
		UA.4	C11E	Vaal	Klein Vaal	746	41.73	C	C
		UA.5	C11D	Vaal	Dinkwaterspruit	533	41.66	C/D	C/D
		UA.6	C11G	Vaal	Blesboskenspruit	1331	66.07	C/D	C/D
		UA.7	C11H	Vaal	Kaalspruit	1084	70.66	C/D	C/D
		UA.8	C11K	Vaal	Leeupspruit	355	18.62	B/C	B/C
		UA.9	C11K	Vaal		340	18.07	C	C
		EWR1RE	C11C	Vaal	Klein Vaal	318	26.09	C	C
Klip River (Free State) (UB)	II	UB.1	C11J	Vaal		4984	288.8	B/C	B/C
		UB.2	C13C	Vaal	Klip	88	5.67	B	B
		UB.3	C13C	Vaal	Klip (Grooidraai)	837	54	B/C	B
		UB.4	C13D	Vaal	Sandspruit	1090	68.04	B/C	B
		UB.5	C13A	Klip	Kommandospruit	595	51.37	C	C
		UB.6	C13B	Klip	Klip (Grootdraai)	1139	78.84	C	C
		UB.7	C13E	Vaal	Spruitsonderdrif	603	33.6	B/C	B
		UB.8	C13F	Vaal		4129	248.05	C/D	C/D
		UB.9	C13G	Klip		435	20.8	C	C
		EWR6	C13H	Vaal	Klip	589	19.22	C/D	C/D
Upper Wilge River (UC1)	II	UC1.1	C81B	Vaal	Wilge	1583	95.31	B/C	B/C
		UC1.2	C81B	Vaal	Wilge	591	69.03	B	B
		UC1.3	C81L	Wilge	Meul	932	81.11	C	C
		UC1.4	C81M	Wilge	Meul	364	26.49	B	B
		UC1.5	C82A	Wilge	Cornelius	1831	104.03	C	C
		UC1.6	C82B	Wilge	Cornells	156	7.82	C	C
		EWR7	C81A	Vaal	Wilge	812	39.63	C	C
		UC2.1	C81F	Vaal	Elands	170	23.47	A/B	AVB
		UC2.2	C81G	Elands	Klerkspruit	1405	114.76	C/D	C/D
		UC2.3	C81G			435	22.13	C	C
Wilge River and tributaries (UC2)	II	UC2.4	C81J	Wilge	Vaalbankspruit	115	5.85	B	B
		UC2.5	C81C	Nuwejaarspruit	Frasier/Modder	392	12	C	C
		UC2.6	C81E	Wilge	Nuwejaarspruit	250	18.41	B/C	B/C
		UC2.7	C82D	Wilge	Russe-spruit	527	39.87	C	C
		EWR8	C82C	Vaal	Wilge	572	19.6	C	C
						7503	474.25	C	C

Integrated Unit of Analysis (IUA)	Water Resource Class for IUA	Biophysical Node Name	Quaternary Catchment	Major River Name	Tributary Name	Gross Catchment Area (km ²)	Natural MAR (million m ³ /a)	Present Ecological State	Recommended Ecological Category
Lower Wilge River (UC3)	II	UC3.1	C82G	Wilge	Holspruit	729	32.9	C	C
		UC3.2	C82G	Wilge	Wilge Trib	152	6.34	B/C	B/C
		UC3.3	C82F	Wilge	Grootspruit	286	11.08	C	C
		UC3.4	C82H	Vaal	Wilge	10633	59.39	C/D	C/D
Liebenbergsvlei River (UD)	III	UD.1	C83A	Liebenbergsvlei		375	14.36	C	C
		UD.2	C83D	Liebenbergsvlei	Tierkloof	465	12.42	C	C
		UD.3	C83E	Liebenbergsvlei	Tierkloof	891	23.31	C	C
		UD.4	C83G	Liebenbergsvlei	Unnamed tributary	139	4.74	B/C	B
Waterval River (UE)	III	UE.1	C83H	Liebenbergsvlei	Unnamed tributary	76	2.66	B/C	B
		UE.2	C12D	Vaal	Waterval	695	59.33	C	C
		UE.3	C12F	Vaal	Waterval	970	80.37	D	D
		UE.4	C12F	Waterval	Unnamed tributary	41	2.12	C	C
		UE.5	C12G	Vaal	Waterval	2278	149.84	D	D
Kromspruit and Skulpspruit (UF)	II	UF.1	C83K	Wilge	Kromspruit	2787	177.67	D	D
		UF.2	C83L	Vaal	Klip (flows into Vaal Dam from FS)	546	25.7	C	C
Vaal River from Grootdraai Dam to Vaal Dam (UG)	II	UG.1	C11M	Vaal	Brakspruit	765	35.59	C	C
		UG.2	C12A	Vaal	Venterspruit	485	3.36	C	C
		UG.3	C12K	Vaal	Molispruit	479	21	C	C
		UG.4	C12J	Vaal	Bankplasspruit	344	22	C	C
		EWR2	C11M	Vaal		7995	12.43	C	C
		EWR3	C12H	Vaal		15638	457.68	C	C
Suikerbosrand River (UH)	II	UH.1	C21A	Vaal	Suikerbosrand	707	852.13	C	C
		EWR9	C21C	Vaal	Suikerbosrand	1175	28.65	B/C	B
Klip River (Gauteng) (UJ)	III	UJ.1	C22C	Klip River	Rietspruit	857	31.31	C	B/C
		UJ.2	C22D	Vaal	Klip River	893	36.6	E	D
		UJ.3	C22E	Vaal	Rietspruit	2309	39.21	E	D
		UJ.4	C22J	Vaal	Klip River	926	96.98	E	D
		EWR10	C21G	Vaal	Rietspruit	3271	22.1	D/E	D
		EWR11	C21F	Suikerbosrand	Blesbokspruit	1098	86.97	C/D	C/D
Taaibospruit (UJ)	III	UJ.1	C22G	Vaal	Taaibospruit	831	29.14	D	D
Kromelimbogg spruit (UK)	III	UK.1	C23B	Vaal	Kromelimbogg spruit	724	18.4	D	D
							14.3	C	C

Integrated Unit of Analysis (IUA)	Water Resource Class for IUA	Biophysical Node Name	Quaternary Catchment	Major River Name	Tributary Name	Gross Catchment Area (km ²)	Natural MAR (million m ³ /a)	Present Ecological State	Recommended Ecological Category
Mooi River (UL)	III	UL.1	C23F	Vaal	Mooi River	1324	37.69	C/D	C/D
		UL.2	C23E	Mooi	Mooirivierloop	1360	25.96	E	D
		UL.3	C23K	Mooi	Loopspruit	890	20.26	E	D
		UL.4	C23L	Vaal	Mooi	5535	132.21	D	D
		EWR2RE	C23G	Vaal	Mooi	1324	37.69	D	D
Vaal River reach from Vaal Dam to C23L (UM)	III	EWR4	C22F	Vaal		38638	1977.26	C	B/C
		EWR5	C23L	Vaal		49739	2288.01	C/D	C

Table 2: Prioritised Resource Units (RU) delineated for the Upper Vaal

IUA Name	RU	Hydro Node	River Name
UA. Vaal River upstream of Grootdraai Dam	1	UA.1	Vaal
	2	UA.2	Vaal
	3	EVR1RE	Vaal
	4	UA.3	Rietspruit
	5	UA.4	Vaal
	6	UA.5	Vaal
	7	UA.6	Vaal
	8	EWR1	Vaal
	9	UA.7	Vaal
	10	UA.8	Vaal
	11	UA.9	Vaal
UB. Klip River (Free State)	12	UB.1	Vaal
	13	UB.2	Vaal
	14	UB.3	Vaal
	15	EVR6	Vaal
	16	UB.4	Klip
	17	UB.5	Klip
	18	UB.6	Klip
	19	UB.7	Vaal
	20	UB.8	Klip
	21	UB.9	Vaal
	22	EWR7	Vaal
UC1. Upper Wilge River	23	UC1.1	Vaal
	24	UC1.2	Vaal
	25	UC1.3	Wilge
	26	UC1.4	Wilge
	27	UC1.5	Wilge
	28	UC1.6	Wilge
	29	UC2.1	Vaal
UC2. Wilge River and tributaries	30	UC2.2	Elands
	31	UC2.3	
	32	UC2.4	Wilge
	33	UC2.5	Nuwejaarspruit
	34	UC2.6	Wilge
	35	EWR8	Vaal
	36	UC2.7	Wilge
UC3. Lower Wilge River	37	UC3.1	Wilge
	38	UC3.2	Wilge
	39	UC3.3	Wilge
	40	UC3.4	Vaal
UD. Liebenbergsvlei River	41	UD.1	Liebenbergsvlei
	42	UD.2	Liebenbergsvlei
	43	UD.3	Liebenbergsvlei
	44	UD.4	Liebenbergsvlei
	45	UD.5	Liebenbergsvlei
UE. Waterval River	46	UE.1	Vaal
	47	UE.2	Vaal
	48	UE.3	Waterval
	49	UE.4	Vaal
	50	UE.5	Vaal
UF. Kromspruit and Skulpspruit	51	UF.1	Wilge
	52	UF.2	Vaal
UG. Vaal River from Grootdraai Dam to Vaal Dam	53	EWR2	Vaal
	54	UG.1	Vaal
	55	UG.2	Vaal
	56	EWR3	Vaal
	57	UG.3	Vaal
	58	UG.4	Vaal

IUA Name	RU	Hydro Node	River Name
IUA Name	RU	Hydro Node	River Name
UH. Suikerbosrand River		59 UH.1	Vaal
		60 EVR9	Suikerbosrand
		61 EVR10	Blesbokspruit
		62 EVR11	Blesbokspruit
		63 UI.1	NatalSpruit
UI. Klip River (Gauteng)		64 UI.2	Klip
		65 UI.3	Klip
		66 UI.4	Riet
UJ. Taaibosspuit		67 UJ.1	Vaal
UK. Kromelimoogspruit		68 UK.1	Vaal
		69 UL.1	Vaal
		70 EVR2RE	Vaal
UL. Mooi River		71 UL.2	Mooi
		72 UL.3	Mooi
		73 UL.4	Vaal
		74 EVR4	Vaal
UM. Vaal River reach from Vaal Dam to C23L		75 EVR5	Vaal

Table 3: Resource Quality Objectives for RIVER WATER QUANTITY in priority RUs in the Upper Vaal

IUA	Class	River	RU	Node	REC	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits				
										Maintenance low flows (m ³ /s) (Percentile)	Drought flows (m ³ /s) (Percentile)			
UA	II	Vaal	RU8	EWR1	B/C (B)	Quantity	Low Flows		EWRI maintenance low and drought flows: Vaal EWRI in C11J VMAR = 332.3x10 ⁶ m ³ REC=B/C category (equivalent to EcoClassification score 70-80)*	Oct 2.9 (50) Nov 3.7 (70) Dec 4 (50) Jan 4.3 (50) Feb 5.2 (50) Mar 3.7 (30) Apr 3 (40) May 2.6 (50) Jun 2.5 (50) Jul 2.4 (50) Aug 2.4 (50) Sep 2.6 (50)	Oct 0.2 (99) Nov 0.22 (99) Dec 0.25 (99) Jan 0.26 (99) Feb 0.265 (99) Mar 0.04 (99) Apr 0.08 (99) May 0.03 (99) Jun 0.15 (99) Jul 0.15 (99) Aug 0.15 (99) Sep 0.16 (99)			
UB	II	Vaal	RU21	UB.9	C/D	Quantity	Low Flows		Low flows: Low flows at this site need to improve to maintain the FEPAs status of this important ecosystem. Low flows to be improved to a C category.	Oct 0.310 (40) Nov 0.358 (40) Dec 0.366 (40) Jan 0.401 (40) Feb 0.594 (40) Mar 0.341 (40) Apr 0.199 (50) May 0.102 (50) Jun 0.054 (50) Jul 0.077 (40) Aug 0.071 (50) Sep 0.092 (50)	Oct 0.000 Nov 0.000 Dec 0.000 Jan 0.000 Feb 0.000 Mar 0.000 Apr 0.000 May 0.000 Jun 0.000 Jul 0.000 Aug 0.015 (99) Sep 0.000	Maintenance low flows (m ³ /s) (Percentile)	Drought flows (m ³ /s) (Percentile)	
UC2	II	Vaal	RU35	EWR8	C	Quantity	Low Flows		EWRI maintenance low and drought flows: Winge EWRI in C82C; VMAR = 474.3x10 ⁶ m ³ , REC=C category*	Oct 0.053 (99) Nov 0.083 (99) Dec 0.97 (60) Jan 1.1(60) Feb 1.4 (60) Mar 1.25 (60)	Oct 0.011 (99) Nov 0.236 (99) Dec 0.274 (99) Jan 0.316 (99) Feb 0.422 (99) Mar 0.355 (99)	Maintenance low flows (m ³ /s) (Percentile)	Drought flows (m ³ /s) (Percentile)	

IUA	Class	River	RU	Node	REC	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits			
									High flows need to be maintained to support the ecosystem especially fish	Feb	0.231 (60)	0.079 (99)	
										Mar	0.18 (60)	0.066 (99)	
										Apr	0.16 (60)	0.064 (99)	
										May	0.143 (60)	0.059 (99)	
										Jun	0.123 (60)	0.057 (99)	
										Jul	0.08 (70)	0.05 (99)	
										Aug	0.065 (70)	0.04 (99)	
										Sep	0.075 (70)	0.04 (99)	
											Drought flows (m ³ /s) (Percentile)		
										Oct	0.034 (99)	0.034	
										Nov	0.3 (99)	0.3	
										Dec	0.3 (99)	0.3	
UI	III	Suikerbosrand	RU62	EWR11	D	Quantity	Low Flows		EWR maintenance and drought flows. Blesbospruit EWR11 in C21F, VMAR=100.69x10 ⁶ m ³ , REC = D category"	Jan	0.34 (99)	0.34	
										Feb	0.37 (99)	0.37	
										Mar	0.34 (99)	0.34	
										Apr	0.34 (99)	0.34	
										May	0.32 (99)	0.32	
										Jun	0.3 (99)	0.3	
										Jul	0.3 (99)	0.3	
										Aug	0.3 (99)	0.3	
										Sep	0.3 (99)	0.3	
											Maintenance high flows (m ³ /s)		
											Nov	50 for 3 days	
											Dec	50 for 3 days	
UM	III	Vaal	RU75	EWR5	C	Quantity	High Flows		EWR high flows: Vaal EWR5 in C23L, MAR=2288.0x10 ⁶ m ³ , REC = C category"	Jan	50 for 3 days		
										Feb	180-260 for 3-5 days		
										Mar	400-570 for 3-5 days		

Table 4: Resource Quality Objectives for RIVER WATER QUALITY in the Upper Vaal

IUA	Class	River	RU	Node	REC	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits	95th Percentile
UA	II	Vaal	RU8	EWR1	B/C (B)	Quality	Nutrients	The nutrient condition must be improved to provide for users and the ecosystem.	Phosphate(PO_4^{3-}) *	$\leq 0.020 \text{ mg/L P}$	0.121
UA	II	Vaal	RU10	UA.8	B/C	Quality	Nutrients	The nutrient condition must be maintained to provide for users and the ecosystem.	Nitrate (NO_3^-) & Nitrite (NO_2^-) *	$\leq 0.85 \text{ mg/L N}$	0.868
UC3	II	Vaal	RU40	UC3.4	C/D	Quality	Nutrients	The nutrient condition must be improved to an acceptable level for the ecosystem.	Phosphate(PO_4^{3-}) *	$\leq 0.020 \text{ mg/L P}$	0.0085
UE	III	Vaal	RU47	UE.2	D	Quality	Nutrients	The nutrient condition must be improved to an acceptable level for the ecosystem.	Nitrate (NO_3^-) & Nitrite (NO_2^-) *	$\leq 0.85 \text{ mg/L N}$	0.099
UH	II	Vaal	RU50	UE.5	D	Quality	Nutrients	The nutrient condition must be improved to an acceptable level for the ecosystem.	Phosphate(PO_4^{3-}) *	$\leq 0.075 \text{ mg/L P}$	0.08
UL	III	Mooi	RU60	EWR9	B/C	Quality	Nutrients	The nutrient condition must be improved to an acceptable level for the ecosystem.	Nitrate (NO_3^-) & Nitrite (NO_2^-) *	$\leq 2.50 \text{ mg/L N}$	1.008
UL	III	Vaal	RU71	UL.2	D	Quality	Nutrients	The nutrients should be improved to an acceptable state.	Phosphate(PO_4^{3-}) *	$\leq 0.125 \text{ mg/L P}$	0.08
UM	III	Vaal	RU73	UL.4				The nutrients should be improved to an acceptable state	Nitrate (NO_3^-) & Nitrite (NO_2^-) *	$\leq 4.00 \text{ mg/L N}$	1.008
UA	II	Vaal	RU75	EWR5	C	Quality	Nutrients	The nutrients should be improved to an acceptable state	Phosphates (RWQO) *	$\leq 0.020 \text{ mg/L P}$	0.6
UE	III	Vaal	RU8	EWR1	B/C (B)	Quality	Salts	Salt concentrations need to be maintained to meet quality requirements for agriculture and to maintain the ecosystem wellbeing.. Salts need to be improved to levels that do not threaten the ecosystem and to provide for users.	Nitrate (NO_3^-) & Nitrite (NO_2^-) *	$\leq 0.85 \text{ mg/L N}$	1.62
UI	III	Vaal	RU10	UA.8	B/C	Quality	Salts	Salts need to be improved to levels that do not threaten the ecosystem and to provide for users.	Total Ammonia*	$\leq 73 \mu\text{g/L N}$	0.4
UA	II	Vaal	RU47	UE.2	D	Quality	Salts	Salts need to be improved to levels that do not threaten the ecosystem and to provide for users.	Electrical conductivity*	$\leq 70 \text{ mS/m}$	51.
UE	III	Suikerbosrand	RU62	EWR11				Salts need to be improved to levels that do not threaten the ecosystem and to provide for users.	Electrical conductivity*	$\leq 70 \text{ mS/m}$	29.4.
UI	III	Vaal	RU65	UI.3	D	Quality	Salts	Salts need to be improved to levels that do not threaten the ecosystem and to provide for users.	Electrical conductivity*	$\leq 111 \text{ mS/m}$	79.1
UI	III	Vaal	RU66	UI.4						$\leq 111 \text{ mS/m}$	135
											90.6
											98.1

IUA	Class	River	RU	Node	REC	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits	95th Percentile
UL	III	Moi	RU71	UL.2	D	Quality	Salts	Salts need to be improved to levels that do not threaten the ecosystem and to provide for users.	Electrical conductivity*	≤ 111 mS/m	87
		Vaal	RU73	UL.4				Salts need to be improved to levels that do not threaten the ecosystem and to provide for users.	Electrical conductivity*	≤ 111 mS/m	90.5
UM	III	Vaal	RU75	EWR5	C	Quality	Salts	Salts need to be improved to levels that do not threaten the ecosystem especially fish and to provide for users.	Sulphates *	≤ 500 mg/L	132
									Electrical conductivity *	≤ 85 mS/m	84
									Sulphates *	≤ 200 mg/L	173
UA	II	Vaal	RU8	EWR1	B/C (B)				Temperature *	No data	
			RU10	UA.8	B/C	Quality	System Variables	Temperature and oxygen should be improved to support the ecosystem.	Dissolved oxygen *	≥ 7 mg/L O ₂	No data
UE	II	Vaal	RU47	UE.2	D	Quality	System Variables	Oxygen levels must be improved to support the ecosystem.	Temperature *	No data	
									Dissolved oxygen *	≥ 7 mg/L O ₂	No data
UG	II	Vaal	RU58	UG.4	C	Quality	System Variables	Temperatures and oxygen concentrations must not threaten the viability of local aquatic species.	Temperature *	No data	
									Dissolved oxygen *	≥ 6 mg/L O ₂	No data
UA	II	Vaal	RU8	EWR1	B/C (B)	Quality	Toxins	Toxics need to be maintained at levels which are non-toxic to the ecosystem.	Dissolved oxygen *	≥ 7 mg/L O ₂	No data
			RU10	UA.8	B/C	Quality	Toxins	Toxics need to be maintained at levels which are non-toxic to the ecosystem.	Endosulfan *	≤ 0.103 µg/L	No data
UB	II	Vaal	RU21	UB.9	C/D	Quality	Toxins	Ammonia toxicity must be limited for the sake of the ecosystem.	Al *	≤ 150 µg/L	No data
									As *	≤ 130 µg/L	No data
UE	II	Vaal	RU47 RU50	UE.2 UE.5	D	Quality	Toxins	The river water should not be toxic to aquatic organisms or be a threat to human health.	Cd hard *	≤ 5.0 µg/L	No data
									Cr(VI) *	≤ 200 µg/L	No data
									Cu I hard *	≤ 8.0 µg/L	No data
									Hg *	≤ 1.70 µg/L	No data
									Mn *	≤ 1300 µg/L	No data
									Pb hard *	≤ 13.00 µg/L	No data
									Se *	≤ 30 µg/L	No data

IUA	Class	River	RU	Node	REC	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits	95th Percentile
								Zn *	≤ 36 µg/L	No data	
								Chlorine *	≤ 5.0 µg/L free Cl	No data	
								Endosulfan *	≤ 0.200 µg/L	No data	
								Atrazine *	≤ 100 µg/L	No data	
								F *	≤ 2.5 mg/L	0.50	
								Al *	≤ 105 µg/L	No data	
								As *	≤ 95 µg/L	No data	
								Cd hard *	≤ 3.0 µg/L	No data	
								Cr(VI) *	≤ 121 µg/L	No data	
								Cu hard *	≤ 6.0 µg/L	No data	
								Hg *	≤ 0.97 µg/L	No data	
								Mn *	≤ 990 µg/L	No data	
								Pb hard *	≤ 9.50 µg/L	No data	
								Se *	≤ 22 µg/L	No data	
								Zn *	≤ 25 µg/L	No data	
								Chlorine *	≤ 3.1 µg/L free Cl	No data	
								Endosulfan *	≤ 0.130 µg/L	No data	
								Atrazine *	≤ 79 µg/L	No data	
								F *	≤ 3.0 mg/L	0.465	
								Al *	≤ 150 µg/L	No data	
								As *	≤ 130 µg/L	No data	
								Cd hard *	≤ 5.0 µg/L	No data	
								Cr(VI) *	≤ 200 µg/L	No data	
								Cu hard *	≤ 8.0 µg/L	No data	
								Hg *	≤ 1.70 µg/L	No data	
								Mn *	≤ 1300 µg/L	No data	
								Pb hard *	≤ 13.00 µg/L	No data	
								Se *	≤ 30 µg/L	No data	
								Zn *	≤ 36 µg/L	No data	
UG	II	Vaal	RU58	UG.4	C	Quality	Toxins	The river water should not be toxic to aquatic organisms or be a threat to human health.			
UI	III	Suikerbosrand and Vaal	RU62 RU65 RU66	EWR11 UI.3 UI.4	D	Quality	Toxins	The river water should not be toxic to aquatic organisms or be a threat to human health.			
UL	III	Mooi	RU71	UL.2	D	Quality	Toxins	The river water should not be toxic to aquatic organisms or be a threat to human health. Uranium concentrations need to be at acceptable levels.			

IUA	Class	River*	RU	Node	REC	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits	95th Percentile
									Chlorine *	≤ 5.0 µg/L free Cl	No data
									Endosulfan *	≤ 0.200 µg/L	No data
									Atrazine *	≤ 100 µg/L	No data
									Uranium *	≤ 15 µg/L	No data
UE	III	Vaal	RU47 RU50	UE.2 UE.5	D	Quality	Pathogens	Pathogens should be maintained at levels safe for human use (excluding for direct consumption).	<i>E.coli</i> *	≤ 130 counts/100 ml	No data
UI	III	Sulkerbosrant	RU62	EWR11	D	Quality	Pathogens	Pathogens should be maintained at levels safe for human use (excluding for direct consumption).	<i>E.coli</i> *	≤ 130 counts/100 ml	No data
UM	III	Vaal	RU66	UI.3 UI.4	C	Quality	Pathogens	Pathogens should be maintained at levels safe for human use (excluding for direct consumption).	<i>E.coli</i> *	≤ 130 counts/100 ml	No data

Table 5: Resource Quality Objectives for RIVER INSTREAM HABITAT and BIOTA in the Upper Vaal catchment

IUA	Class	River	RU	REC	RQO	Numerical Limits
UA. Vaal River upstream of Grootdraai Dam	II	VAAL	1	B	Instream habitat must be in a largely natural condition to support the ecosystem. Instream biota must be in a largely condition and at sustainable levels. Low and high flows must be suitable to maintain the river habitat for ecosystem condition.	Fish ecological category: ≥ B (≥ 82) Macro-invertebrate ecological category: ≥ B (≥ 82) Instream Ecosystem category: ≥ B (≥ 82)
UA. Vaal River upstream of Grootdraai Dam	II	VAAL	8	B/C	<u>Water quality:</u> Salt concentrations must be maintained to meet quality requirements for agriculture and to maintain the ecosystem wellbeing. Instream habitat must be in a better than moderately modified condition to support the ecosystem and for property values and recreation Instream biota must be in a better than moderately modified condition and at sustainable levels. The requirements of ecologically important fish species must be provided for. Low and high flows must be suitable to maintain the river habitat for ecosystem condition. <u>Water quality:</u> The nutrient concentrations must be decreased for ecosystem condition and other users.	Hydrological category: ≥ B (≥ 82) Water Quality category: ≥ B (≥ 82) Instream Habitat Integrity category: ≥ B/C (≥ 78) Fish ecological category: ≥ B/C (≥ 78) Macro-invertebrate ecological category: ≥ B/C (≥ 78) Instream Ecosystem category: ≥ B/C (≥ 78) Hydrological category: ≥ B/C (≥ 78) Water Quality category: ≥ B/C (≥ 78)
UA. Vaal River upstream of Grootdraai Dam	II	VAAL	10	B/C	<u>Water quality:</u> The nutrient concentrations must be decreased for ecosystem condition and other users. Instream habitat must be in a better than moderately modified condition to support the ecosystem and for property values and recreation Instream biota must be in a better than moderately modified condition and at sustainable levels. The requirements of ecologically important fish species must be provided for. Low and high flows must be suitable to maintain the river habitat for ecosystem condition. <u>Water quality:</u> The nutrient concentrations must be decreased for ecosystem condition and other users.	Hydrological category: ≥ B/C (≥ 78) Water Quality category: ≥ B/C (≥ 78) Instream Habitat Integrity category: ≥ B/C (≥ 78) Fish ecological category: ≥ B/C (≥ 78) Macro-invertebrate ecological category: ≥ B/C (≥ 78) Instream Ecosystem category: ≥ B/C (≥ 78) Hydrological category: ≥ B/C (≥ 78) Water Quality category: ≥ B/C (≥ 78)
UB. Klip River (Free State)	II	KLIP	21	C/D	<u>Water quality:</u> The nutrient concentrations must be decreased for ecosystem condition and other users. Instream habitat must be in a better than largely modified condition to support the ecosystem. Instream biota must be in a better than largely modified condition and at sustainable levels to support biodiversity. Flows must be	Instream Habitat Integrity category: ≥ C/D (≥ 58) Fish ecological category: ≥ C/D (≥ 58) Macro-invertebrate ecological category: ≥ C/D (≥ 58) Instream Ecosystem category: ≥ C/D (≥ 58)

IA	Class	River	RU	REC	RQO	Numerical Limits
UC2. Wilge River and tributaries	II	WILGE	35	C	suitable to maintain the river habitat for ecosystem condition. Low flows must be suitable to maintain the FEPAs status. Water quality, Ammonia toxicity must be limited to protect the ecosystem. Instream habitat must be in a moderately modified or better condition to support the ecosystem.	category ≥ C/D (≥ 58) Hydrological category ≥ C/D (≥ 58) FEPA required low flows: ≥ C (≥ 58) Water Quality category ≥ C/D (≥ 58) Instream Habitat Integrity category ≥ C (≥ 62) Fish ecological category ≥ C (≥ 62) Macro-invertebrate ecological category ≥ C (≥ 62) Instream Ecosystem category ≥ C (≥ 62) Hydrological category ≥ C (≥ 62) Water Quality category ≥ C (≥ 62)
UC3. Lower Wilge River	II	LOWER WILGE	40	C/D	Instream habitat must be in a better than largely modified condition to support the ecosystem. Instream biota must be in a better than largely modified condition and at sustainable levels. Flows must be suitable to maintain the river habitat for ecosystem condition. Low flows must mimic the natural flow patterns Water quality: Nutrient concentrations must be suitable for users and to protect the ecosystem. Pathogens must be maintained at levels safe for human use (excluding for direct consumption).	Instream Habitat Integrity category ≥ C/D (≥ 58) Fish ecological category ≥ C/D (≥ 58) Macro-invertebrate ecological category ≥ C/D (≥ 58) Instream Ecosystem category ≥ C/D (≥ 58) Hydrological category ≥ C/D (≥ 58) Water Quality category ≥ C/D (≥ 58)
UD. Liebenbergsvlei River	III	Liebenbergsvlei River	45	B	Instream habitat must be in a largely natural condition to support the ecosystem. Instream biota must be in a largely condition and at sustainable levels. Low and high flows must be suitable to maintain the river habitat for ecosystem condition. Flows must reflect the flow regime of the region. Water quality: Water quality should be in a close to natural condition.	Instream Habitat Integrity category ≥ B (≥ 82) Fish ecological category: ≥ B (≥ 82) Macro-invertebrate ecological category: ≥ B (≥ 82) Instream Ecosystem category ≥ B (≥ 82) Water Quality category ≥ B (≥ 82) Instream Habitat Integrity category ≥ D (≥ 42) Fish ecological category ≥ D (≥ 42) Macro-invertebrate ecological category: ≥ D (≥ 42) Instream Ecosystem category ≥ D (≥ 42)
UE. Waterval River	III	Waterval River	47	D	Instream habitat must be in a largely modified or better condition to support the ecosystem. Instream biota must be in largely modified or better condition. Flows must be in largely modified or better condition. Water quality:	

IUA	Class	River	RU	REC	RQO		Numerical Limits
						The nutrient concentrations must be improved to an acceptable level for the ecosystem.	Hydrological category ≥ D (≥ 42)
						Salt concentrations must be improved to levels that do not threaten the ecosystem and to provide for users.	Water Quality category ≥ D (≥ 42)
						Oxygen levels must be improved to support the ecosystem.	
						The river water must not be toxic to aquatic organisms or be a threat to human health.	
						Pathogens must be at levels safe for human use (excluding for direct consumption).	
UE. Waterval River	III	Waterval River	50	D		Instream habitat must be in a largely modified or better condition to support the ecosystem. Instream biota must be in largely modified or better condition. The requirements of fish species of ecological importance must be provided for. Flows must be in largely modified or better condition. Water quality. The nutrient concentrations must be improved to an acceptable level for the ecosystem and to limit filamentous algal growth. The river water must not be toxic to aquatic organisms or be a threat to human health. Pathogens must be at levels safe for human use (excluding for direct consumption).	Instream Habitat Integrity category ≥ D (≥ 42) Fish ecological category ≥ D (≥ 42) Macro-invertebrate ecological category ≥ D (≥ 42) Instream Ecosystem category ≥ D (≥ 42) Hydrological category ≥ D (≥ 42) Water Quality category ≥ D (≥ 42)
UG. Vaal River from Grootdraai Dam to Vaal Dam	II	VAAAL	58	C		Instream habitat must be in a moderately modified or better condition to support the ecosystem.	Instream Habitat Integrity category ≥ C (≥ 62) Fish ecological category ≥ C (≥ 62)
						Instream biota must be in a moderately modified or better condition. The requirements of fish species of ecological importance must be provided for.	Macro-invertebrate ecological category ≥ C (≥ 62)
						Flows must be suitable to maintain the river habitat for ecosystem condition. Low flows must be sufficient to support the ecosystem and to provide for the requirements of irrigation and other users.	Instream Ecosystem category ≥ C (≥ 62)
						Water Quality. Temperatures and oxygen concentrations must not threaten the viability of aquatic biota.	Hydrological category ≥ C (≥ 62)
						The river water must not be toxic to aquatic organisms or be a threat to human health.	Water Quality category ≥ C (≥ 62)
UH. Suikerbosrand River	II	Suikerbosrand River	60	B/C		Instream habitat must be in a better than moderately modified condition to support the ecosystem. Instream biota must be in a better than moderately modified condition and at sustainable levels. Low and high flows must be suitable to maintain the river habitat for ecosystem condition. Low flows must be sufficient for users. Water quality. The nutrient concentrations must be decreased for ecosystem condition and other users. Temperature and oxygen	Instream Habitat Integrity category ≥ B/C (≥ 78) Fish ecological category ≥ B/C (≥ 78) Macro-invertebrate ecological category ≥ B/C (≥ 78) Instream Ecosystem category ≥ B/C (≥ 78) Hydrological category ≥ B/C (≥ 78) Water Quality category ≥ B/C (≥ 78)

IUA	Class	River	RU	REC	RQO	Numerical Limits
UH Suikerbosrand River	II	Blesbokspruit	62	D	must be suitable to support the ecosystem in a good condition.	Instream Habitat Integrity category $\geq D$ (≥ 42) Fish ecological category $\geq D$ (≥ 42) Macro-invertebrate ecological category $\geq D$ (≥ 42) Instream Ecosystem category $\geq D$ (≥ 42) Hydrological category $\geq D$ (≥ 42) Water Quality category $\geq D$ (≥ 42) Water Quality category $\geq D$ (≥ 42)
Ul Klip River (Gauteng)	III	Klip River	65	D	Instream habitat must be in a largely modified or better condition to support the ecosystem. Instream biota must be in largely modified or better condition. Flows must be in largely modified or better condition. Low flows must be suitable to support the ecosystems functions. <u>Water quality:</u> The nutrient concentrations must be decreased to an acceptable mesotrophic state. Salt concentrations must be at levels that do not threaten the ecosystem and are suitable for users. The river water must not be toxic to aquatic organisms or be a threat to human health. Pathogens must be at levels safe for human use (excluding for direct consumption).	Instream Habitat Integrity category $\geq D$ (≥ 42) Fish ecological category $\geq D$ (≥ 42) Macro-invertebrate ecological category $\geq D$ (≥ 42) Instream Ecosystem category $\geq D$ (≥ 42) Hydrological category $\geq D$ (≥ 42) Water Quality category $\geq D$ (≥ 42) Instream Habitat Integrity category $\geq D$ (≥ 42) Fish ecological category $\geq D$ (≥ 42) Macro-invertebrate ecological category $\geq D$ (≥ 42) Instream Ecosystem category $\geq D$ (≥ 42) Hydrological category $\geq D$ (≥ 42) Water Quality category $\geq D$ (≥ 42) Dissolved organic carbon concentrations must not cause the ecosystem to
Ul Klip River (Gauteng)	III	Riet	66	D	Instream habitat must be in a largely modified or better condition to support the ecosystem. Instream biota must be in largely modified or better condition. Flows must be in largely modified or better condition. Low flows must be suitable to support the ecosystem functions. <u>Water quality:</u> Salt concentrations must be at levels that do not threaten the ecosystem and are suitable for users.	Instream Habitat Integrity category $\geq D$ (≥ 42) Fish ecological category $\geq D$ (≥ 42) Macro-invertebrate ecological category $\geq D$ (≥ 42) Instream Ecosystem category $\geq D$ (≥ 42) Hydrological category $\geq D$ (≥ 42) Water Quality category $\geq D$ (≥ 42)

IUA	Class	River	RU	REC	RQO	Numerical Limits
						The river water must not be toxic to aquatic organisms or be a threat to human health.
						Pathogens must be at levels safe for human use (excluding for direct consumption).
UJ. Taalibosspuit	III	Taalibosspuit	67	D		Instream habitat must be in a largely modified or better condition to support the ecosystem. Instream biota must be in largely modified or better condition. Flows must be in largely modified or better condition. Low flows must be suitable to support the ecosystem functions. Water quality, Salt concentrations must be at levels that do not threaten the ecosystem and are suitable for users. The river water must not be toxic to aquatic organisms or be a threat to human health.
UL. Mool River	III	Mool River	71	D		Instream habitat must be in a largely modified or better condition to support the ecosystem. Instream biota must be in largely modified or better condition. Flows must be in largely modified or better condition. Low flows must be suitable to support the ecosystem functions. <u>Water quality:</u> The nutrient concentrations must be decreased for ecosystem condition and other users. Salt concentrations must be at levels that do not threaten the ecosystem and are suitable for users. The river water must not be toxic to aquatic organisms or be a threat to human health. Uranium must be at acceptable levels
UL. Mool River	III	Mool River	73	D		Instream habitat must be in a largely modified or better condition to support the ecosystem. Instream biota must be in largely modified or better condition. Flows must be in largely modified or better condition. Low flows must be suitable to support the ecosystem functions. Water quality, The nutrient concentrations must be decreased for ecosystem condition and other users. Salt concentrations must be at levels that do not threaten the ecosystem and are suitable for users.
UM. Vaal River reach from Vaal Dam to C23L	III	Vaal	75	C		Instream habitat must be in a moderately modified or better condition to support the ecosystem. Water hyacinth should be at levels that do not lower instream habitat conditions to less than moderately modified. Instream biota must be in moderately modified or better condition. The

IUA	Class	River	RU	REC	RQO	Numerical Limits
					requirements of fish species of ecological importance should be provided for.	<p>Flows must be in moderately modified or better condition. High flows must be sufficient to support ecosystem functions.</p> <p><u>Water quality:</u></p> <p>The nutrient concentrations must be decreased for ecosystem condition and other users.</p> <p>Salt concentrations must be at levels that do not threaten the ecosystem function and are detrimental to fish species and are suitable for users.</p> <p>Pathogens must be at levels safe for human use (excluding for direct consumption).</p> <p>Fish ecological category: $\geq C (\geq 62)$</p> <p>Macro-invertebrate ecological category: $\geq C (\geq 62)$</p> <p>Instream Ecostatus category $\geq C (\geq 62)$</p> <p>Hydrological category $\geq C (\geq 62)$</p> <p>Water Quality category: $\geq C (\geq 62)$</p>

Table 6: Resource Quality Objectives for RIVER RIPARIAN ZONE HABITAT in the Upper Vaal

IUA	Class	River	RU	REC	RQO	Numerical Limits
UA. Vaal River upstream of Grootdraai Dam	II	VAAL	1	B	The riparian zone must be in a largely natural condition. Riparian vegetation must be in a largely natural condition. The requirements of plant species of ecological importance must be provided for.	Riparian Zone Habitat Integrity category ≥ B (≥ 82) Riparian ecosystem category: ≥ B (≥ 82) Hydrological category ≥ B (≥ 82)
UA. Vaal River upstream of Grootdraai Dam	II	VAAL	8	B/C	The riparian zone must be in a better than moderately modified condition and must support property and recreational values. Riparian vegetation must be in a better than moderately modified condition. The requirements of plant species of ecological importance must be provided for.	Riparian Zone Habitat Integrity category ≥ B/C (≥ 78) Riparian ecosystem category:≥ B/C (≥ 78) Hydrological category≥ B/C (≥ 78)
UA. Vaal River upstream of Grootdraai Dam	II	VAAL	10	B/C	The riparian zone must be in a better than moderately modified condition. Riparian vegetation must be in a better than moderately modified condition. The requirements of plant species of ecological importance must be provided for.	Riparian Zone Habitat Integrity category ≥ B/C (≥ 78) Riparian ecosystem category:≥ B/C (≥ 78) Hydrological category≥ B/C (≥ 78)
UB. Klip River (Free State)	II	KLIP	21	C/D	The riparian zone must be in a better than largely modified condition to control negative influences on the river system. Riparian vegetation must be in better than largely modified condition.	Riparian Zone Habitat Integrity category ≥ C/D (≥ 58) Riparian ecosystem category: ≥ C/D (≥ 58) Hydrological category ≥ C/D (≥ 58)
UC2. Wilge River and tributaries	II	WILGE	35	C	The riparian zone must be in a moderately modified condition or better. Riparian vegetation must be in a moderately modified condition or better.	Riparian Zone Habitat Integrity category ≥ C (≥ 62) Riparian ecosystem category: ≥ C (≥ 62) Hydrological category ≥ C (≥ 62)

UA	Class	River	RU	REC	RQO	Numerical Limits
UC3. Lower Wilge River	II	LOWER WILGE	40	C/D	The riparian zone must be in a better than largely modified condition to control negative influences on the river system. Riparian vegetation must be in better than largely modified condition.	Riparian Zone Habitat integrity category \geq C/D (\geq 58) Riparian ecosystem category: \geq C/D (\geq 58)
UD. Liebenbergsvlei River	III	Liebenbergsvlei River	45	B	Flows must be suitable to maintain the riparian zone habitat for ecosystem condition. Low flows must mimic the the natural flow patterns The riparian zone must be in a largely natural condition. Riparian vegetation must be in a largely natural condition. The requirements of plant species and assemblages of ecological importance must be provided for. Low and high flows must be suitable to maintain the riparian zone habitat for ecosystem condition.	Hydrological category \geq C/D (\geq 58) Riparian Zone Habitat integrity category \geq B (\geq 82) Riparian ecosystem category: \geq B (\geq 82) Hydrological category \geq B (\geq 82)
UE. Waterval River	III	Waterval River	47	D	The riparian zone must be in a largely modified or better condition. Riparian vegetation must be in a largely modified or better condition. Low and high flows must be in a largely modified or better condition.	Riparian Zone Habitat integrity category \geq D (\geq 42) Riparian ecosystem category: \geq D (\geq 42) Hydrological category \geq D (\geq 42)
UE. Waterval River	III	Waterval River	50	D	The riparian zone must be in a largely modified or better condition. Riparian vegetation must be in a largely modified or better condition. Low and high flows must be in a largely modified or better condition.	Riparian Zone Habitat integrity category \geq D (\geq 42) Riparian ecosystem category: \geq D (\geq 42) Hydrological category \geq D (\geq 42)
UG. Vaal River from Grootdraai Dam to Vaal Dam	II	VAAL	58	C	The riparian zone must be in a moderately modified condition or better. Riparian vegetation must be in a moderately modified condition or better. Low and high flows must be in a moderately modified condition or better.	Riparian Zone Habitat integrity category \geq C (\geq 62) Riparian ecosystem category: \geq C (\geq 62) Hydrological category \geq C (\geq 62)
UH. Suikerbosrand River	II	Suikerbosrand River	60	B/C	The riparian zone must be in a better than moderately modified condition. Riparian vegetation must be in a better than moderately modified condition. The requirements of plant species of ecological importance must be provided for. Low and high flows must be suitable to maintain the riparian zone habitat for ecosystem condition.	Riparian Zone Habitat integrity category \geq B/C (\geq 78) Riparian ecosystem category: \geq B/C (\geq 78) Hydrological category \geq B/C (\geq 78)

IUA	Class	River	RU	REC	RQO	Numerical Limits
UH. Suikerbosrand River	II	Blesbospruit	62	D	The riparian zone must be in a largely modified or better condition. Riparian vegetation must be in a largely modified or better condition. Low and high flows must be in a largely modified or better condition.	Riparian Zone Habitat Integrity category ≥ D (≥ 42) Riparian ecosystem category: ≥ D (≥ 42) Hydrological category ≥ D (≥ 42)
UJ. Klip River (Gauteng)	III	Klip River	65	D	The riparian zone must be in a largely modified or better condition. Riparian vegetation must be in a largely modified or better condition. Low and high flows must be in a largely modified or better condition.	Riparian Zone Habitat Integrity category ≥ D (≥ 42) Riparian ecosystem category: ≥ D (≥ 42) Hydrological category ≥ D (≥ 42)
UJ. Klip River (Gauteng)	III	Riet	66	D	The riparian zone must be in a largely modified or better condition. Riparian vegetation must be in a largely modified or better condition. Low and high flows must be in a largely modified or better condition.	Riparian Zone Habitat Integrity category ≥ D (≥ 42) Riparian ecosystem category: ≥ D (≥ 42) Hydrological category ≥ D (≥ 42)
UJ. Taalbospruit	III	Taalbospruit	67	D	The riparian zone must be in a largely modified or better condition. Riparian vegetation must be in a largely modified or better condition. Low and high flows must be in a largely modified or better condition.	Riparian Zone Habitat Integrity category ≥ D (≥ 42) Riparian ecosystem category: ≥ D (≥ 42) Hydrological category ≥ D (≥ 42)
UJ. Mooi River	III	Mooi River	71	D	The riparian zone must be in a largely modified or better condition. Riparian vegetation must be in a largely modified or better condition. Low and high flows must be in a largely modified or better condition.	Riparian Zone Habitat Integrity category ≥ D (≥ 42) Riparian ecosystem category: ≥ D (≥ 42) Hydrological category ≥ D (≥ 42)
UJ. Mooi River	III	Mooi River	73	D	The riparian zone must be in a largely modified or better condition. Riparian vegetation must be in a largely modified or better condition. Low and high flows must be in a largely modified or better condition.	Riparian Zone Habitat Integrity category ≥ D (≥ 42) Riparian ecosystem category: ≥ D (≥ 42) Hydrological category ≥ D (≥ 42)

IUA	Class	River	RU	REC	RQO	Numerical Limits
UM. Vaal River reach from Vaal Dam to C23L	III	VAAL	75	C	The riparian zone must be in a moderately modified condition or better. Riparian vegetation must be in a moderately modified condition or better. Low and high flows must be in a moderately modified condition or better.	Riparian Zone Habitat Integrity category ≥ C (≥ 62) Riparian ecosatus category. $\geq C$ (≥ 62) Hydrological category $\geq C$ (≥ 62)

Table 7: Resource Quality Objectives for DAM WATER QUANTITY in the Upper Vaal

IUA	Dams	RU	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits
Amerfoort Dam (27°4'1"S; 29°53'1"E)	RU4				Dam levels must be sufficient for release for domestic supply to Amersfoort and the surrounding small irrigation areas	Flow releases: Skupspruit in C11E, VMAR = $12.035 \times 10^6 \text{m}^3$, PES=C	Maintenance low flows (m ³ /s) (Percentile)
					Low Flows		Drought flows (m ³ /s) (Percentile)
UA	Grootdraai Dam (26°55'9.2"S; 29°17'41.6"E)	RU10	Quantity		Dam levels must remain sufficient to provide for municipal and industrial use, as well as releases for ecosystem function downstream.	Flow releases: Vaal EWR2 in C11M VMAR = $457.7 \times 10^6 \text{m}^3$ REC=C category*. (Releases from C1R002)	Maintenance low flows (m ³ /s) (Percentile)
							Drought flows (m ³ /s) (Percentile)
Sterkfontein Dam (28°23'15"S; 29°1'1"E)	RU33 and 34				Dam levels must be sufficient for releases to protect ecosystem function and for municipal and industrial use downstream.	Flow releases: Nuwejaarspruit in C81D, VMAR = $40.089 \times 10^6 \text{m}^3$, REC=C/D	Maintenance low flows (m ³ /s) (Percentile)
					Flows	The dam is filled from the Thukela catchment, the increased dam levels from the transfer must be maintained such that they support the protection of ecosystem function within the dam.	Drought flows (m ³ /s) (Percentile)

IUA	Dams	RU	Component	Sub Component	RQO	Indicator/ measure		Numerical Limits
							Aug	0.048 (50)
							Sep	0.083 (50)
								0.035 (99)
								0.070 (60)
						Maintenance low flows (m ³ /s) (Percentile)		Drought flows (m ³ /s) (Percentile)
						Oct 0.12 (60)		0.05 (99)
						Nov 0.177 (60)		0.06 (99)
						Dec 0.147 (60)		0.06 (99)
						Jan 0.182 (60)		0.06 (99)
						Feb 0.231 (60)		0.079 (99)
						Mar 0.18 (60)		0.06 (99)
						Apr 0.16 (60)		0.064 (99)
						May 0.143 (60)		0.059 (99)
						Jun 0.123 (60)		0.057 (99)
						Jul 0.08 (70)		0.05 (99)
						Aug 0.065 (70)		0.04 (99)
						Sep 0.075 (70)		0.04 (99)
						Maintenance low flows (m ³ /s) (Percentile)		Drought flows (m ³ /s) (Percentile)
						Oct 0.12 (70)		0.106 (99)
						Nov 0.12 (70)		0.109 (99)
						Dec 0.12 (70)		0.106 (99)
						Jan 0.128 (60)		0.108 (99)
						Feb 0.155 (60)		0.124 (99)
						Mar 0.153 (50)		0.115 (99)
						Apr 0.16 (60)		0.12 (99)
						May 0.154 (60)		0.116 (99)
						Jun 0.154 (60)		0.118 (99)
						Jul 0.146 (60)		0.113 (99)
						Aug 0.143 (60)		0.112 (99)
						Sep 0.137 (70)		0.113 (99)
						Maintenance low flows (m ³ /s) (Percentile)		Drought flows (m ³ /s) (Percentile)
						Oct 6.16 (95)		2.55 (99)
						Nov 8.56 (90)		3.59 (99)
						Dec 9.36 (95)		4.30 (99)
						Jan 10.51 (95)		4.79 (99)
						Feb 13.61 (85)		6.15 (99)
						Mar 10.97 (90)		4.99 (99)
						Apr 8.67 (85)		3.76 (99)
						May 6.19 (85)		2.96 (99)
						Jun 4.98 (90)		2.45 (99)
						Jul 4.58 (90)		2.27 (99)
						Aug 4.29 (95)		2.15 (99)

IUA	Dams	RU	Component	Sub Component	RQO	Indicator/ measure	Sep 4.69 (95)	2.33 (99)	Numerical Limits
	Vaal Dam (26°32'57"S, 28°06'58"E)	RU74				Dam levels must be maintained such that they are sufficient for municipal, industrial and irrigation releases as well as protection of ecosystem function downstream.	Maintenance low flows (m ³ /s) (Percentile) Oct 13.05 (70) Nov 16.02 (50) Dec 17.65 (50) Jan 18.23 (50) Feb 17.38 (50) Mar 16.6 (50) Apr 13.95 (40) May 11.01 (60) Jun 10.03 (70) Jul 9.54 (95) Aug 9.37 (95) Sep 9.37 (95)	Drought flows (m ³ /s) (Percentile) 3.44 (99) 5.04 (99) 5.58 (99) 5.98 (90) 6.63 (95) 5.56 (95) 4.72 (99) 4.14 (99) 4.14 (99) 3.98 (99) 3.98 (99) 3.98 (99)	High flows (m ³ /s)

Table 8: Resource Quality Objectives for DAM WATER QUALITY in the Upper Vaal

IUA	Dams	RU	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits	95th Percentile
UA	Grootdraai Dam (26°55'9.2"S; 28°17'41.6"E)	RU10	Quality	Nutrients	The system must be maintained in a mesotrophic state or better.	Phosphate(PO_4) * Nitrate (NO_3) & Nitrite (NO_2) *	≤ 0.025 mg/L P ≤ 1.00 mg/L N	0.0085
UB	Vrededorp/Thembaalihle Dam (27°26'21.8"S; 29°11'45.1"E)	RU20	Quality	Nutrients	The system must be maintained in a mesotrophic state or better.	Phosphate(PO_4) * Nitrate (NO_3) & Nitrite (NO_2) *	≤ 0.025 mg/L P ≤ 0.025 mg/L N	0.2
UD	Gerrards Dam (28°16'55.3"S; 28°17'30.6"E)	RU43	Quality	Nutrients	Nutrients must be maintained at mesotrophic levels.	Phosphate(PO_4) * Nitrate (NO_3) & Nitrite (NO_2) *	≤ 0.025 mg/L P ≤ 1.00 mg/L N	0.006
UL	Loch Athlone Dam (28°15'0.9"S; 28°18'31.4"E)	RU41			Nutrients must be maintained at mesotrophic levels so as to retain the recreational value of the dam.	Phosphate(PO_4) * Nitrate (NO_3) & Nitrite (NO_2) *	≤ 0.025 mg/L P ≤ 1.00 mg/L N	0.024
UM	Saulspoort Dam (Sol Plaatjie Dam) (28°13'1.5"S; 28°21'46.9"E)	RU72	Quality	Nutrients	Nutrients must be maintained at mesotrophic levels to protect the ecosystem and also the fitness for use.	Phosphate(PO_4) * Nitrate (NO_3) & Nitrite (NO_2) *	≤ 0.025 mg/L P ≤ 1.00 mg/L N	0.022
	Klipdrift Dam (26°37'0"S; 27°17'52"E)	RU73			The system is currently in a eutrophic state and must be improved and maintained in a mesotrophic state.	Phosphate(PO_4) * Nitrate (NO_3) & Nitrite (NO_2) *	≤ 0.025 mg/L P ≤ 1.00 mg/L N	0.031
	Boskop Dam (26°33'42"S; 27°6'41"E)				Nutrient concentrations must be maintained such that the system is in a mesotrophic state	Phosphate(PO_4) * Nitrate (NO_3) & Nitrite (NO_2) *	≤ 0.025 mg/L P ≤ 1.00 mg/L N	0.006
	Vaal Barrage (26°45'53"S; 27°41'3"E)	RU75	Quality	Nutrients	The system is currently eutrophic and must be improved and maintained in a mesotrophic state.	Phosphate(PO_4) * Nitrate (NO_3) & Nitrite (NO_2) *	≤ 0.025 mg/L P ≤ 1.00 mg/L N	0.295
	Vaal Dam (26°52'57"S; 28°6'58"E)				The system must be improved and managed in a mesotrophic state.	Phosphate(PO_4) * Nitrate (NO_3) & Nitrite (NO_2) *	≤ 0.025 mg/L P ≤ 1.00 mg/L N	0.021
								0.2

IUA	Dams	RU	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits	95th Percentile
UB	Vredethembaaiie Dam (27°26'21.8"S; 29°11'45.1"E)	RU 20	Quality	Salts	Salt levels must be maintained at concentrations where they do not impact negatively on the ecosystem.	Electrical Conductivity*	≤ 85 mS/m	84.8
UL	Klipdrift Dam (26°37'0"S; 27°17'52"E)	RU 72	Quality	Salts	Salt levels must be maintained at concentrations where they do not impact negatively on the ecosystem.	Electrical Conductivity*	≤ 85 mS/m	102
UM	Vaal Barrage (26°45'53"S; 27°41'3"E)	RU 75	Quality	Salts	Salt levels must be maintained at concentrations where they do not impact negatively on the ecosystem.	Electrical Conductivity*	≤ 85 mS/m	80.4
UL	Boskop Dam (26°33'42"S; 27°6'41"E)	RU 73	Quality	System Variables	The pH of the water in the dam should not negatively impact on ecosystem function.	pH max *	≥ 8.8	8.7
UA	Grootdraai Dam (26°55'9.2"S; 29°17'41.6"E)	RU10	Quality	Toxins	Toxicity must be maintained better than concentrations that would pose a threat to human health. The dam must be maintained in a mesotrophic state to avoid cyanobacterial blooms and the associated algal toxins.	pH min *	≤ 5.9	8.1
UD	Gerrands Dam (28°16'55.3"S; 28°17'30.6"E) Loch Athlone Dam (28°15'0.9"S; 28°18'31.4"E) Sealspoort Dam (Sol Plaatjie Dam) (28°13'1.5"S; 28°21'46.9"E)	RU 43	Quality	Toxins	The system must be maintained in a mesotrophic condition to avoid cyanobacteria and the associated algal toxins.	Chl-a: phytoplankton*	≤ 20 µg/L	No data
UL	Klipdrift Dam (26°37'0"S; 27°17'52"E)	RU 72	Quality	Toxins	To avoid cyanobacteria blooms, the dam must be maintained in a mesotrophic state.	Chl-a: phytoplankton*	≤ 20 µg/L	No data
UM	Vaal Barrage (26°45'53"S; 27°41'3"E)	RU 75	Quality	Toxins	The system must be maintained in a mesotrophic state to prevent build-up of cyanobacteria blooms and associated algal toxins. The water in the Barrage should not contain toxins including metals at levels that pose a threat to human health.	Chl-a: phytoplankton*	≤ 20 µg/L	No data
	Vaal Dam (26°52'57"S; 28°6'58"E)	RU 74			The system must be maintained in a mesotrophic state to avoid cyanobacterial blooms and associated algal toxins.	Chl-a: phytoplankton*	≤ 20 µg/L	No data

Table 9: Resource Quality Objectives for GROUNDWATER in the Upper Vaal

IUA	RU	Component	RQO	Indicator/ measure	Numerical Limits
All	All Prioritised RUs	Quantity	Where water use is higher than requirements for Reserve, Schedule 1 and General Authorizations, abstraction rates should not exceed the average recharge values of the aquifer based on the area.	Abstraction Volume (Q) per hectare > Reserve, Schedule and General Authorizations.	$Q <$ Average recharge per hectare
	RU1 RU2 RU3 RU5 RU6 RU7 RU10 RU11 RU33 RU35 RU40 RU42 RU44 RU43 RU46 RU47 RU59 RU60 RU74				At least one Ngwqi MP monitoring site that is representative of the aquifer. Water level fluctuations in Dolomitic aquifers ⁶ should not exceed 6m.
	RU69				Water level fluctuations around the average site water level should not exceed 4.05 m
	RU63				Water level fluctuations around the average site water level should not exceed 15.3 m
	RU71				Water level fluctuations around the average site water level should not exceed 13.8 m
	RU64				Water level fluctuations around the average site water level should not exceed 14.8 m
	RU66	Aquifer	Medium to long-term water trends should not show negative decline or deviation from the natural trend	Depth to Groundwater Level according to Groundwater Monitoring Guidelines.	Water level fluctuations around the average site water level should not exceed 23.6 m
	RU75				Water level fluctuations around the average site water level should not exceed 9.8 m
	RU70				Water level fluctuations around the average site water level should not exceed 15.4 m
	RU62				Water level fluctuations around the average site water level should not exceed 11.8 m
	RU73				Water level fluctuations around the average site water level should not exceed 4.2 m
	RU65				Water level fluctuations around the average site water level should not exceed 22.9 m
	RU72				Water level fluctuations around the average site water level should not exceed 7.16 m