ANNEXURE

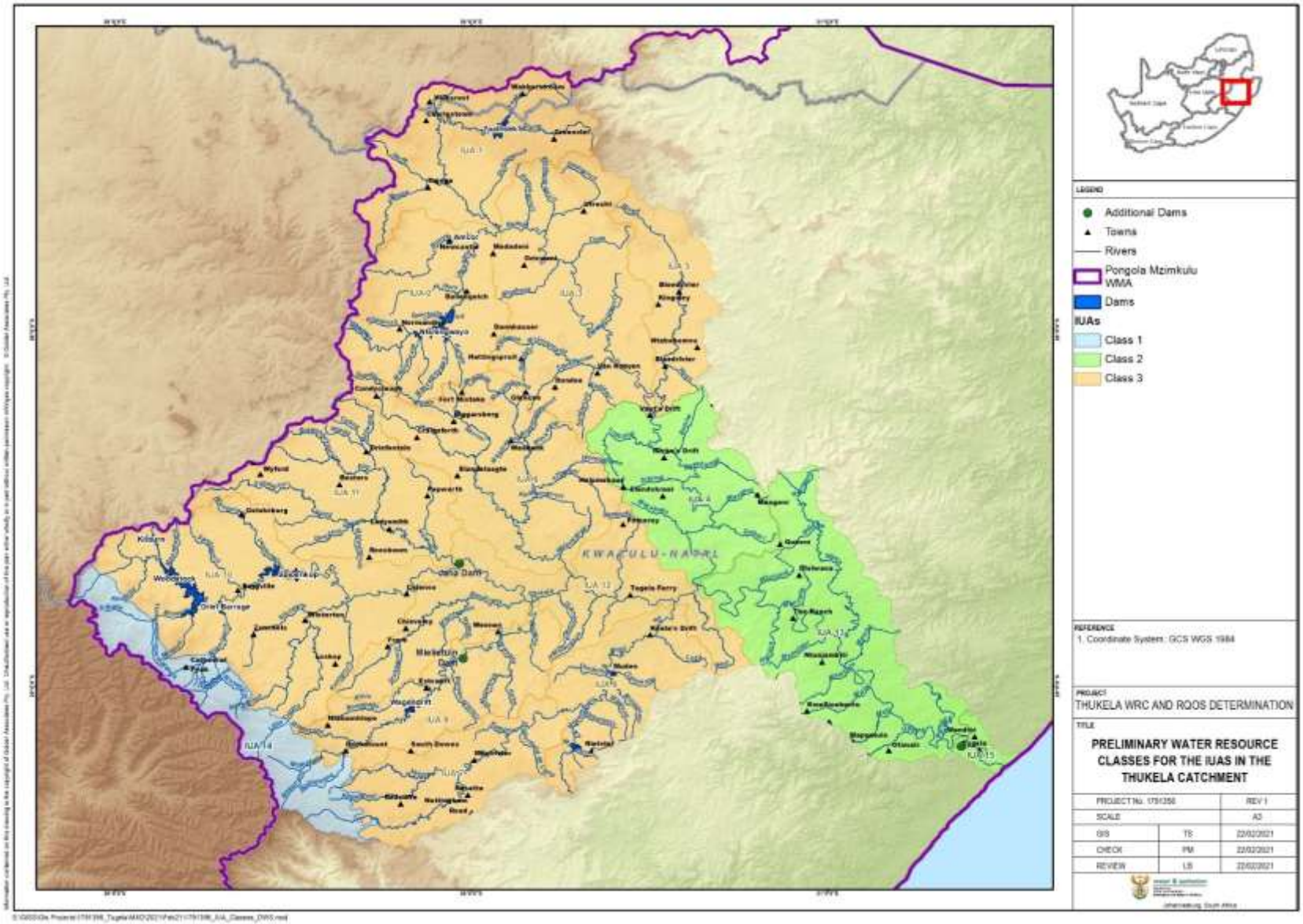

Figure 1: Water Resource Classes for the Thukela catchment

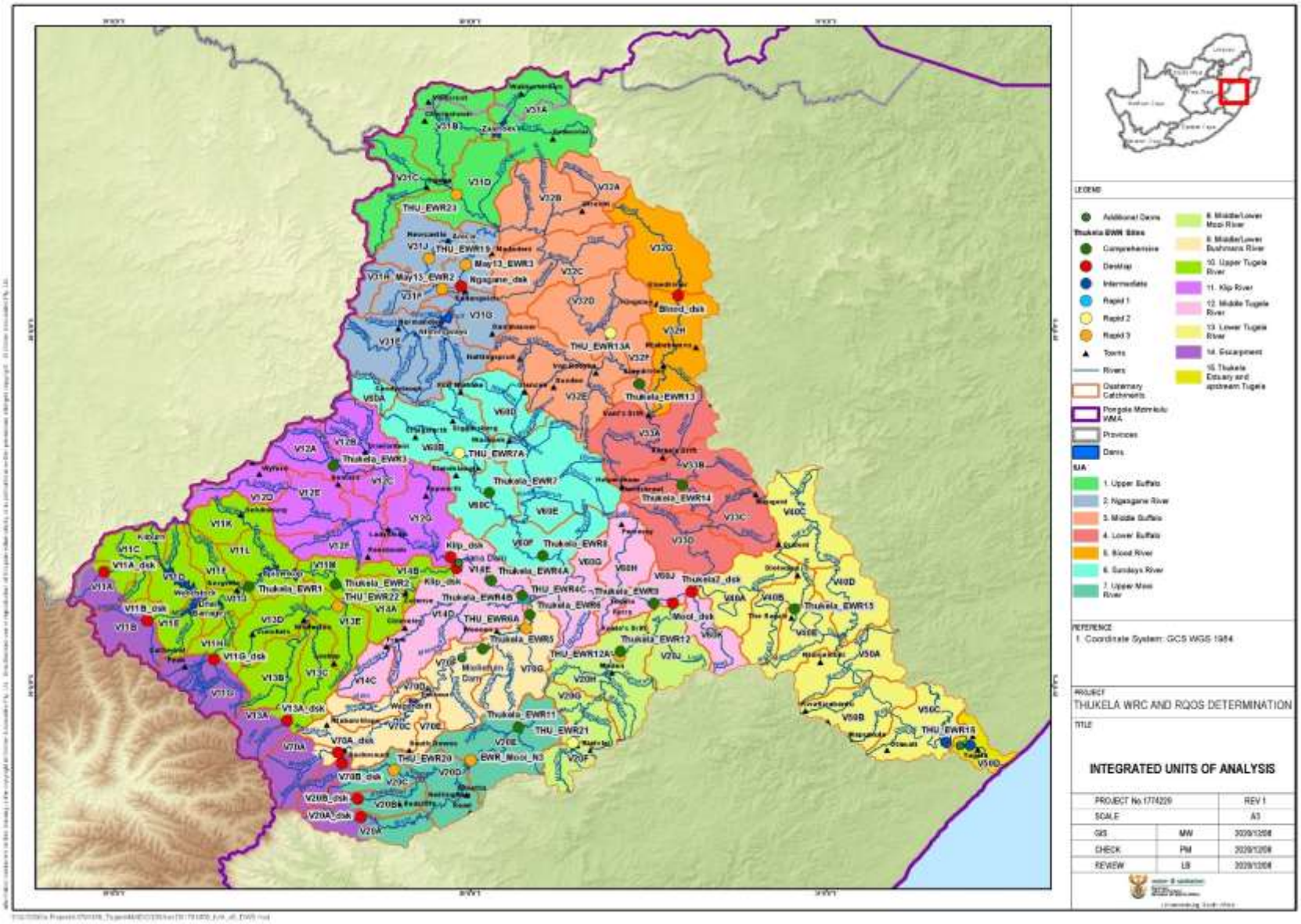

Figure 2: Integrated Units of Analysis delineated for the Thukela catchment

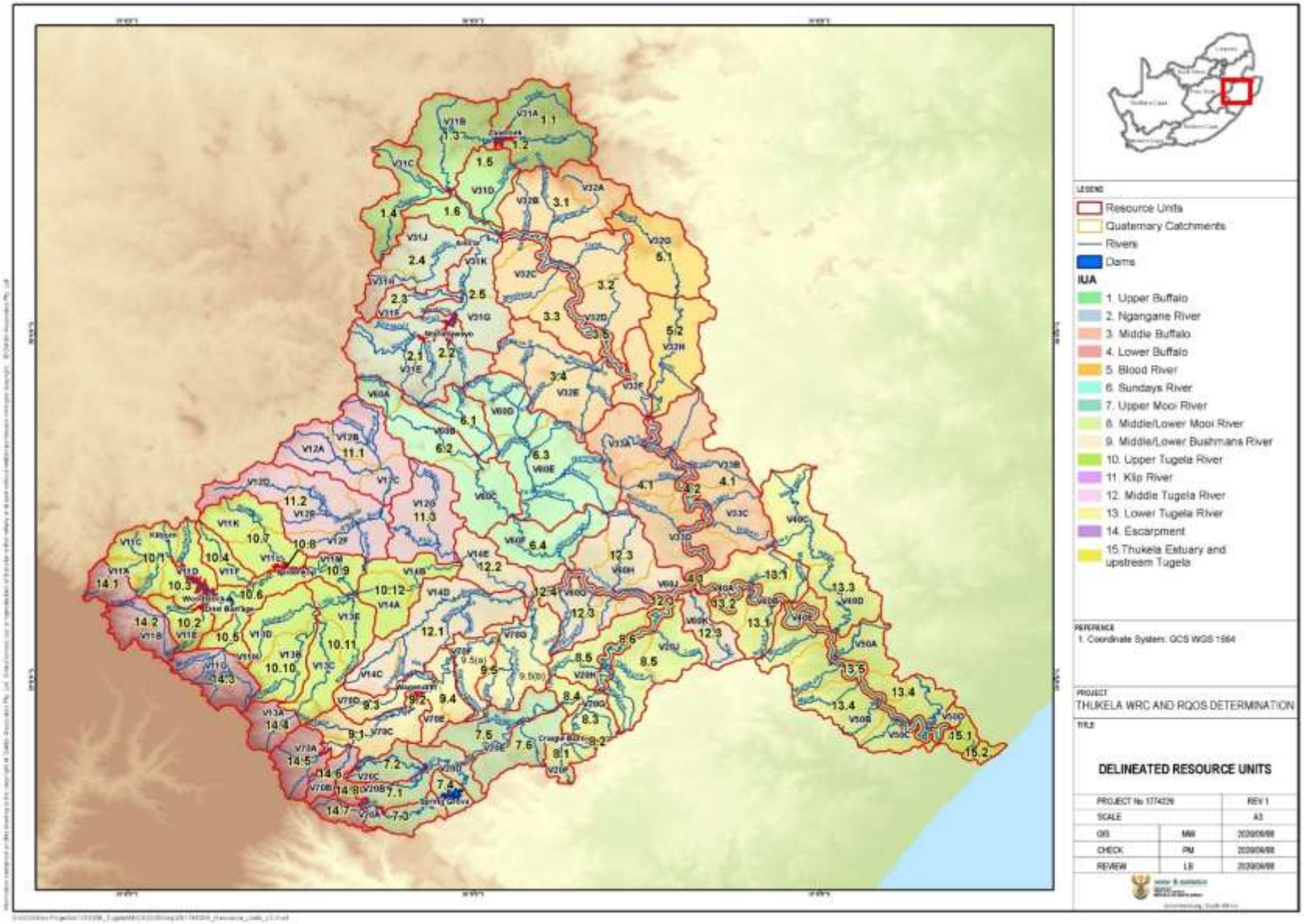

Figure 3: Resource Units of the Thukela catchment

Table 1: Summary of Water Resource Classes per Integrated Unit of Analysis (IUA) and Target Ecological Categories – Thukela catchments

IUA	Proposed Water Resource Class	Node Name	Quaternary Catchment	Resource Unit	River Name	Target Ecological Category (TEC)	Mean Annual Runoff (million m^3/a) (nMAR)	EWR as % of natural Mean annual run-off
1: Upper Buffalo River	**III**	W1	V31A	**1.1**	Wetland resource unit: Wakkerstroom	B	97.065	29.0%
		-	V31A	**1.2**	Zaaihoek Dam	-	-	-
		R1 (Desktop)	V31B	**1.3**	Buffalo and Slang rivers	C	161.44	23.12
		THU_EWR23	V31D	**1.6**	Buffalo to confluence to Ngagane	C	221.96	23.44%
2: Ngagane River	**III**	R5	V31E	**2.1**	Upper Ngagane to Ntshingwayo Dam	C	32.089	20.48%
		-	V31E	**2.2**	Ntshingwayo Dam	-	-	-
		May13_EWR2	V31F	**2.3**	Horn River	C	21.61	33.65%
		THU_EWR19	V31J	**2.4**	Ncandu River	B/C	50.83	29.36%
		May13_EWR3	V31K	**2.5**	Ngagane River	C/D	160.12	19.44%
3: Middle Buffalo River	**III**	R9	V32A, B	**3.1**	Dorps (including Kweek and Wasbankspruit) to confluence with Buffalo	-	-	-
		R10	V32D	**3.2**	Tiyna, Eerstelingsfontein	-	-	-
		-	V32E	**3.4**	Mzinyashana including Sterkstroom and Sandspruit	-	-	-
		Thukela_EWR13	V32F	**3.5**	Middle Buffalo River	C/D	695.05	17.36%
4: Lower Buffalo River	**II**	Thukela_EWR14	V33A, B, C, D	**4.2**	Lower Buffalo River	C	831.09	23.24%
5: Blood River	**III**	W2	V32G	**5.1**	Wetland RU: Blood River	-	-	-
		R15 (Blood_dsk)	V32H	**5.2**	Blood River	C	94.71	21.36%
6: Sundays River	**III**		V60B	**6.1**	Nkunzi to confluence with Upper Sundays River	C	24.94	31.79%
		Thukela_EWR7	V60C	**6.2**	Upper Sundays River	C/D	90.28	19.71%
		R16	V60D, E	**6.3**	Wasbank to confluence with Sundays	C/D	78.33	19.51
		Thukela_EWR8	V60F	**6.4**	Lower Sundays River	D	197.03	16.45%
7: Upper Mooi River	**III**	R19	V20B (lower portion), D	**7.1**	Klein - Mooi from source to Mooi confluence	C	124.85	22.83

IUA	Proposed Water Resource Class	Node Name	Quaternary Catchment	Resource Unit	River Name	Target Ecological Category (TEC)	Mean Annual Runoff (million m^3/a) (nMAR)	EWR as % of natural Mean annual run-off
		THU_EWR20	V20C	**7.2**	Nsonge River	B/C	27.13	28.99%
		R22	V20A (lower portion), D (upper)	**7.3**	Mooi upstream of Spring Grove Dam	C	92.98	22.69
		-	V20D	**7.4**	Spring Grove Dam/ Mearns Weir	-	-	-
		Thukela_EWR11	V20E	**7.5 a**	Mooi River (Short- term)	C/D	301.14	20.57%
				7.5b	Mooi River (Long term)	B/C		35.41%
		-	V20E	**7.6**	Joubertsvlei to confluence with Mooi	-	-	-
8: Middle/ Lower Mooi River	**III**	-	V20F	**8.2**	Craigieburn Dam	-	-	-
		THU_EWR21	V20G	**8.3**	Mnyamvubu River	C	31.71	19.94%
		THU_EWR12A	V20H	**8.6**	Mooi River	C	361.85	29.82%
9: Middle/ Lower Bushman's River	**III**	-	V70C	**9.2**	Wagendrift Dam	-	-	-
		R28	V70D	**9.3**	Little Bushman's to confluence with Bushman's	-	-	-
		R29	V70E, F (upper part)	**9.4**	Bushman's from Wagendrift Dam to confluence with Rensburgspruit downstream of Estcourt	-	-	-
		Thukela_EWR5	V70F (lower)	**9.5a**	Middle Bushman's River	C	281.45	29.04%
		THU_EWR6A	V70G	**9.5b**	Lower Bushman's River	C/D	298.37	40.62%
10: Upper Thukela River	**III**	R30	V11A (lower portion), C, D	**10.1**	Thukela, Putterill, Majaneni, Khombe tributary catchments	-	-	-
		-	V11D, E	**10.3**	Woodstock Dam	-	-	-
		R32	V11F	**10.4**	Sandspruit tributary catchment	-	-	-
		Thukela_EWR1	V11J	**10.6**	Upper Thukela River	D	705.42	7.04%
		-	V11L	**10.8**	Spioenkop Dam	-	-	-
		Thukela_EWR2	V11M	**10.9**	Upper Thukela River	C/D	798.4	17.67%
		R37	V13B, D	**10.10**	Sterkspruit, Situlwane tributary catchment	-	-	-
		Thukela_EWR3	V13 E	**10.11**	Little Thukela River	C/D	285.2	24.71%
		Thukela1_dsk	V14B	**10.12**	Thukela River	C/D	1145.20	18.33%

IUA	Proposed Water Resource Class	Node Name	Quaternary Catchment	Resource Unit	River Name	Target Ecological Category (TEC)	Mean Annual Runoff (million m^3/a) (nMAR)	EWR as % of natural Mean annual run-off
11: Klip River	**III**	R40	V12D, E and F	**11.1**	Sandspruit and tributaries	-	-	-
		THU_EWR22	V12A, B, C,	**11.2**	Klip River	C	52.44	22.15%
		R42 (Klip_dsk)	V12G	**11.3**	Klip River	C	253.09	20.0%
12: Middle Thukela River	**III**	Thukela_EWR4B	V14E	**12.2**	Middle Thukela River	C	1423.83	25.09%
		Thukela_EWR9	V60J	**12.4**	Middle Thukela River	D	2050.76	20.26%
13: Lower Thukela River	**II**	Thukela_EWR15	V40A, B	**13.2**	Lower Thukela River	C	3424.00	21.98%
		THU_EWR16	V50C	**13.5**	Lower Thukela River	C	3679.97	37.83%
14: Escarpment	**I**	R52 (V11A_dsk)	V11A	**14.1**	Upper Thukela River	B	82.32	Refer Table 15 for detail
		R53 (V11B_dsk)	V11B	**14.2**	Mnweni River	B	142.69	
		R54 (V11G_dsk)	V11G	**14.3**	Mlambonja River	B	191.99	
		R55 (V13A_dsk)	V13A	**14.4**	Little Thukela River	B	82.32	
		R56 (V70A_dsk)	V70A	**14.5**	Upper Bushman's River	B	113.46	
		R57 (V70B_dsk)	V70B	**14.6**	Ncibidwana River	B	44.16	
		R58 (V20A_dsk)	V20A	**14.7**	Upper Mooi River	B	42.90	
		R59 (V20B_dsk)	V20B	**14.8**	Little Mooi River (upper)	B/C	10.32	
15: Thukela Estuary and upstream Thukela reach	**II**	THU_EWR17	V50D	**15.1**	Lower Thukela River	C	3690.53	37.38%
		-	V50D	**15.2**	Estuary (8.5 km upstream)	C	-	-

Table 2: Resource Quality Objectives (RQOs) for RIVERS AND DAMS in priority Resource Units (RUs) in the Integrated Unit of Analysis 1: UPPER BUFFALO RIVER

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
IUA 1: UPPER BUFFALO RIVER	III	Wetland resource unit: Wakkerstroom **V31A**	1.1	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Slang River at V3R003 in V31A NMAR = 97.065 x10^{6}m^{3} Target Ecological Category (TEC) of a B. The maintenance low flows and drought flows must be attained to support the upstream aquatic ecosystem.	Maintenance and drought flows - specifically required for wetlands upstream of the Zaaihoek Dam (V3R003) Monitoring of flows at V3R003		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
								Oct	0.221	0.007
								Nov	0.418	0.081
								Dec	0.610	0.075
								Jan	0.83	0.180
								Feb	1.069	0.231
								Mar	0.812	0.176
								Apr	0.576	0.127
								May	0.319	0.004
								Jun	0.185	0.039
								Jul	0.142	0.036
								Aug	0.121	0.032
								Sep	0.137	0.035
				Quality	Nutrients	Nutrient levels should not deteriorate and should support aquatic ecosystem and sustain the present ecological state (PES B)	Orthophosphate as P	≤0.01 mg/L (50th percentile)		
							Total Inorganic Nitrogen (TIN)	≤0.5 milligrams per Litre (mg/L) (50th percentile)		
					Salts	Total Dissolved Solids needs to be maintained to support aquatic ecosystem and sustain the present ecological state (PES B)	Total Dissolved Solids	≤120 milligrams per Litre (mg/L) (95th percentile)		
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/100 mL)		
				Biota	Fish	Flow and water quality sensitive fish species to be maintained in a PES B ecological category. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed B ecological category. During survey in all flow habitat classes all species present (BANO, ANAT and AMOS	*Enteromius (Barbus) anoplus* (BANO) *Amphilius natalensis* (ANAT) *Anguilla mossambica* (AMOS)	. FRAI ≥ 82%). BANO and ANAT ≥ 5 individuals per species.		
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained.	Macroinvertebrate Response Assessment Index (MIRAI)	At least 2 biotopes sampled: assemblages to be ≥ A abundances		

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
						Macroinvertebrate assemblages must be maintained within a B ecological category or improved upon.	South African Scoring System (SASS) (Baetidae 2 sp Perlidae Tricorythidae Hydropsychidae 1 sp Leptoceridae Ancyidae Psephenidae	South African Scoring System (SASS) 5 score ≥180 Average Score per Taxon (ASPT): ≥6.0 MIRAI ≥ 82%
					Diatoms	Ecological category should be maintained as B.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: ≥15 PTV: 20% to < 40%
		Zaaihoek Dam **V31A**	1.2	Quantity	Dam level	Update and review operating rules to sustain optimal dam levels to support users and downstream aquatic ecosystem. The dam level must be managed to protect ecosystem function as well as downstream users.	Minimal operating level determined for the operating rules, required in the dam.	
				Quality	Nutrients	Nutrient levels must be maintained to sustain good water quality state and ecological condition.	Orthophosphate (PO_4^-) as Phosphorus	≤0.01 milligrams per Litre (mg/L) (50th percentile)
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤0.5 milligrams per Litre (mg/L) (50th percentile)
					Salts	Salinity concentrations must be maintained to sustain good water quality state and ecological condition.	Total Dissolved Solids	≤120 milligrams per Litre (mg/L) (95th percentile)
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5th percentile) and ≤9.0 (95th percentile)
						Maintain baseline clarity. Must not deviate more than 10% from background levels.	Turbidity	
					Pathogens	The presence of pathogens should not pose a risk to human health.	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)
		Buffalo and Slang **V31B**	1.3	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Buffalo River at outlet of V31B NMAR = 161.44 x10^{6}m^3 Target Ecological Category (TEC) of	Maintenance and drought flows required for the upstream Buffalo River	

	Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
Oct	0.404	0.075
Nov	0.698	0.127
Dec	0.991	0.123

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
						a C. The maintenance low flows and drought flows must be attained to support the upstream aquatic ecosystem.		Jan	1.367	0.467
								Feb	1.764	0.488
								Mar	1.353	0.373
								Apr	0.972	0.278
								May	0.565	0.078
								Jun	0.346	0.085
								Jul	0.275	0.086
								Aug	0.243	0.078
								Sep	0.404	0.075
				Quality	Nutrients	Nutrient levels must be improved to sustain the aquatic ecosystem health and to meet the prescribed ecological state	Orthophosphate (PO_4^-) as Phosphorus	≤0.5 milligrams per Litre (mg/L) (50th percentile)		
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤1 milligram per Litre (mg/L) (50th percentile)		
					Salts	Salinity levels must be maintained or improved to support downstream users.	Total Dissolved Solids	≤350 milligrams per Litre (mg/L) (95th percentile)		
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL) (95th percentile)		
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5th percentile) and ≤9.0 (95th percentile)		
					Toxic substances	Ammonia concentration should not be a threat to human or ecological health	Ammonia as N	≤0.07 milligrams per Litre (mg/L)		
				Habitat	Instream	Natural flow pattern must be maintained in C Ecological Category..	Index of Habitat Integrity (IHI): Instream	IHI ≥ 62%		
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained in a PES C ecological category. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category. During survey in all flow habitat classes all species present (BANO, ANAT, AMOS and LRUB). LRUB habitat requirement – deep pools and fast deep flow class.	*Enteromius (Barbus) anoplus* (BANO) *Amphilius natalensis* (ANAT) *Anguilla mossambica* (AMOS) *Labeo rubromaculatus* (LRUB)	FRAI≥ 62% BANO and ANAT ≥ 5 individuals per species.		

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages must be maintained within a C ecological category or improved upon.	Macroinvertebrate Response Assessment Index South African Scoring System (SASS) Baetidae 2 sp Perlidae Heptageniidae Hydropsychidae 2 sp Elmidae Leptophlebidae	At least 2 biotopes sampled: assemblages to be ≥ B abundances South African Scoring System (SASS) 5 score: 145 – 200 Average Score per Taxon (ASPT): 6.0 – 7.6 MIRAI ≥ 62%		
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 -14 PTV: 20% to < 40%		
					Riparian habitat	The riparian vegetation must be maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥62%		
		Buffalo to confluence with Ngagane **V31C, V31D** **(THU_EWR23)**	**1.6**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Buffalo River at the EWR site THU_EWR23 (-27.6221, 29.9617) in V31D NMAR = 221.96 x$10^6$$m^3$ Target Ecological Category (TEC) of a C. The maintenance low flows and drought flows must be attained to support the upstream and downstream aquatic ecosystem to the Ngagane River confluence.	Maintenance and drought flows required for the Buffalo River		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
								Oct	0.563	0.107
								Nov	0.952	0.170
								Dec	1.342	0.167
								Jan	1.866	0.641
								Feb	2.412	0.648
								Mar	1.854	0.518
								Apr	1.335	0.382
								May	0.784	0.146
								Jun	0.484	0.128
								Jul	0.386	0.121
								Aug	0.342	0.114
								Sep	0.386	0.143
				Quality	Nutrients	Nutrient levels must be maintained or improved to sustain the aquatic ecosystem health and to meet the prescribed ecological state (C ecological category)	Orthophosphate (PO_4^-) as Phosphorus	≤0.5 mg/L (50th percentile)		
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤1 milligram per Litre (mg/L) (50th percentile)		
					Salts	Salinity levels must be maintained or improved to support downstream users.	Total Dissolved Solids	≤350 milligrams per Litre (mg/L) (95th percentile)		
							Sulphate	≤80 milligrams per Litre (mg/L) (95th percentile)		

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
							Chloride	≤30 milligrams per Litre (mg/L) (95th percentile)
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5th percentile) and ≤9.0 (95th percentile)
						Alkalinity should be maintained at acceptable levels to support downstream users.	Alkalinity as mg/L $CaCO_3$	≤120 milligrams per Litre (mg/L) as $CaCO_3$
					Toxic substances	The concentrations of toxins should not be toxic to aquatic organisms and a threat to human health.	Aluminium (Al)	≤ 0.1 milligrams per Litre (mg/L) (95th percentile)
							Manganese (Mn)	≤ 0.2 milligrams per Litre (mg/L) (95th percentile)
							Cadmium (Cd)	≤ 0.001 milligrams per Litre (mg/L) (95th percentile)
							Iron (Fe)	≤ 0.1 milligrams per Litre (mg/L) (95th percentile)
							Lead (Pb) hard	≤ 0.01 milligrams per Litre (mg/L) (95th percentile)
							Copper (Cu) hard	≤ 0.007 milligrams per Litre (mg/L) (95th percentile)
							Nickel (Ni)	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)
							Ammonia (as N)	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)
				Habitat	Instream	Natural flow pattern must be maintained in C Ecological Category.	Index of Habitat Integrity (IHI): Instream	IHI ≥ 42%
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained in a PES C ecological category. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category. During survey in all flow habitat classes all species present (BANO, ANAT, AMOS, LRUB, BPAL, BPAU).	Fish Response Assessment Index (FRAI) *Enteromius (Barbus) anoplus* (BANO) *Amphilius natalensis* (ANAT) *Anguilla mossambica* (AMOS) *Labeo rubromaculatus* (LRUB) *Barbus (Enteromius) pallidus* (BPAL) *Barbus (Enteromius) paludinosus* (BPAU)	FRAI ≥ 62% BANO, BPAL, BPAU – habitat indicators; and ANAT ≥ 5 individuals per species
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)	3 biotopes sampled: assemblages to be ≥ B abundances. SASS 5 scores: 120 – 200

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
						Macroinvertebrate assemblages must be maintained within a C ecological category or improved upon.	Baetidae 2 sp Atyidae Hydracarina Heptageniidae Leptophlebiidae Ecnomidae Elmidae Tricorythidae	Average Score per Taxon (ASPT): 5.5 – 6.5 MIRAI ≥ 62%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 PTV: 20% to <40%
					Riparian habitat	The riparian vegetation must be maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI) Index of Habitat Integrity (IHI): Riparian	VEGRAI survey every 5 years. VEGRAI ≥62%

Table 3: Resource Quality Objectives for RIVERS AND DAMS in priority Resource Units in the Integrated Unit of Analysis 2: NGAGANE RIVER

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
IUA 2: NGAGANE	**III**	Upper Ngagane to Ntshingwayo Dam **V31E**	**2.1**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Ngagane River at Klipspruit confluence in V31E NMAR = 32.089 x10^{6}m^{3} Target Ecological Category (TEC) of a C category The maintenance low flows and drought flows must be attained to support the aquatic ecosystem upstream of the dam.	Maintenance and drought flows required for the wetlands and Ngagane River upstream of the Ntshingwayo Dam (V3R001)		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
								Oct	0.054	0.020
								Nov	0.082	0.014
								Dec	0.112	0.009
								Jan	0.168	0.074
								Feb	0.229	0.100
								Mar	0.189	0.083
								Apr	0.139	0.062
								May	0.082	0.037
								Jun	0.051	0.023
								Jul	0.037	0.018
								Aug	0.054	0.020
								Sep	0.082	0.014
				Quality	Nutrients	Nutrient levels must be maintained or improved to sustain the aquatic ecosystem health and to meet the prescribed ecological state (C ecological category)	Ortho-phosphate (PO_4^-) as Phosphorus	≤ 0.05 milligrams per Litre (mg/L) (50th percentile)		
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤ 1 milligram per Litre (mg/L) (50th percentile)		

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
					Salts	Salinity concentration must be maintained or improved to support downstream users.	Total Dissolved Solids	≤ 350 milligrams per Litre (mg/L) (95th percentile)
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5th percentile) and ≤9.0 (95th percentile)
				Habitat	Instream	Natural flow pattern must be maintained in C Ecological Category.	Index of Habitat Integrity (IHI): Instream	IHI Instream: (class A/B) Ecological Category (80% – 100%)
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained in a PES C ecological category. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category. During survey in all flow habitat classes all species present (BANO, ANAT, LRUB, BPAL and BPAU).	Fish Response Assessment Index (FRAI) *Enteromius (Barbus) anoplus* (BANO) *Amphilius natalensis* (ANAT) *Labeo rubromaculatus* (LRUB) *Barbus (Enteromius) pallidus* (BPAL) *Barbus (Enteromius) paludinosus* (BPAU)	FRAI ≥ 62% BANO, BPAL, BPAU – habitat indicators; and ANAT ≥ 5 individuals per species
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages must be maintained within a C ecological category or improved upon.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae >2 spp Atyidae Heptageniidae Leptophlebiidae Hydropsychidae >1 spp	At least 2 biotopes sampled; assemblages to be ≥ B abundances SASS 5 scores: 120 – 200 Average Score per Taxon (ASPT): 5.5 – 6.5 MIRAI ≥ 62%
					Diatoms	Ecological category should be maintained as B.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 15 - 17 PTV: 20% to <40%
					Riparian habitat	The riparian vegetation must be maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI) Index of Habitat Integrity (IHI): Riparian	VEGRAI survey every 5 years. VEGRAI ≥ 62%

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
		Ntshingwayo Dam **V31E**	**2.2**	Quantity	Dam level	Update and review operating rules to sustain optimal dam levels to support users and downstream aquatic ecosystem. The dam level must be managed to protect ecosystem function as well as downstream users.	Minimal operating level based on operating rules required in the dam.	
				Quality	Nutrients	Concentration of total nitrate must be maintained to sustain ecosystem health and the water quality requirements of water users. The dam must be maintained as a mesotrophic system or better. Good current state to be maintained. Prevent algal blooms.	Total Inorganic Nitrogen (TIN)	≤1.0 milligrams per Litre (mg/L) (50th percentile)
							Ortho-phosphate (PO_4^-) as Phosphorus	≤0.05 milligrams per Litre (mg/L) (50th percentile)
					Salts	The salinity in the dam must be maintained to support ecosystem health and the water quality requirements of the downstream users. Good current state to be maintained.	Total Dissolved Solids	≤120 milligrams per Litre (mg/L) (95th percentile)
					System variables	pH must be maintained within the prescribed range.	pH	6.5 (5th percentile) and 9.0 (95th percentile)
						Maintain system to ensure increase in clarity. Must not deviate more than 10% from background levels	Turbidity	
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)
				Biota	Mammals	Habitat must be maintained to support the Red List species.	Presence of: Oribi (*Ourebia ourebia*)	
					Birds	Habitat must be maintained to support the Red List species.	Presence of: Southern Bald Ibis (*Geronticus calvus*) Grey Crowned Crane (*Balearica regulorum*) Blue Crane (*Anthropoides paradiseus*) African Marsh Harrier (*Circus ranivorus*) Corned Crake (*Crex crex*)	

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
							African Grass Owl (*Tito capensis*) Secretarybird (*Sagittarius serpentarius*) Whitebellied Korhaan (*Eupodotis senegalensis*) Ground Woodpecker (*Geocolapts olivaceus*)			
					Riparian vegetation Health	To manage the water resource for maintenance of aquatic ecosystem diversity (instream, biotic and semi-aquatic species, riparian zones). Riparian zone vegetation survey at least every three years.	80% riparian vegetation cover			
		Horn to confluence with Ngagane **V31** **(May 13_ EWR 2)**	**2.3**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Horn River at the EWR site May13_ EWR2 (-27.888, 29.921) in V31F NMAR = 21.61 x10^6m^3 Target Ecological Category (TEC) of a C category The maintenance low flows and drought flows must be attained to support the upstream aquatic ecosystem.	Maintenance and drought flows required for the Horn River Monitoring of flows at V3H009		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
								Oct	0.086	0.01
								Nov	0.134	0.009
								Dec	0.183	0.009
								Jan	0.272	0.047
								Feb	0.362	0.063
								Mar	0.295	0.051
								Apr	0.209	0.037
								May	0.117	0.021
								Jun	0.069	0.013
								Jul	0.053	0.01
								Aug	0.05	0.01
								Sep	0.061	0.011
				Quality	Nutrients	Nutrient levels must be improved to sustain the aquatic ecosystem health and to meet the prescribed ecological state (C category)	Ortho-phosphate (PO_4^-) as Phosphorus	≤ 0.02 milligrams per Litre (mg/L) (50th percentile)		
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤1.0 milligrams per Litre (mg/L) (50th percentile)		
					Salts	Instream salinity must be improved to meet the recommended ecological category and the water quality requirements of the water users.	Total Dissolved Solids	≤ 350 milligrams per Litre (mg/L) (95th percentile)		
							Sulphate	≤ 165 milligrams per Litre (mg/L) (95th percentile)		
							Chloride	≤ 120 milligrams per Litre (mg/L) (95th percentile)		
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5th percentile) and ≤9.0 (95th percentile)		

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
					Toxic substances	The concentrations of toxins should not be toxic to aquatic organisms and a threat to human health.	Ammonia as N	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)
							Aluminium (Al)	≤ 0.10 milligrams per Litre (mg/L) (95th percentile)
							Manganese (Mn)	≤ 0.15 milligrams per Litre (mg/L) (95th percentile)
							Iron (Fe)	≤ 0.1 milligrams per Litre (mg/L) (95th percentile)
							Lead (Pb) hard	≤ 0.001 milligrams per Litre (mg/L) (95th percentile)
							Copper (Cu) hard	≤ 0.007 milligrams per Litre (mg/L) (95th percentile)
							Nickel (Ni)	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)
							Cobalt (Co)	≤ 0.05 milligrams per Litre (mg/L) (95th percentile)
							Zinc (Zn)	≤ 0.002 milligrams per Litre (mg/L) (95th percentile)
							Atrazine	≤0.08 milligrams per Litre (mg/L)
							Mancozeb	≤0.009 milligrams per Litre (mg/L)
							Glyphosate	≤0.7 milligrams per Litre (mg/L)
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL) (95th percentile)
				Habitat	Instream	Natural flow pattern must be maintained in B/C Ecological Category.	Index of Habitat Integrity (IHI): Instream	IHI Instream (class B/C) Ecological Category (≥ 62%)
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained or improved to a PES C ecological category.	Fish Response Assessment Index (FRAI) *Enteromius (Barbus) anoplus* (BANO) *Amphilius natalensis* (ANAT) *Anguilla mossambica* (AMOS) *Labeo rubromaculatus* (LRUB) *Barbus (Enteromius) pallidus* (BPAL) *Labeobarbus natalensis* (BNAT)	Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category. FRAI ≥ 62% During survey in all flow habitat classes all species present (BANO, ANAT, AMOS, LRUB, BPAL and BNAT). BANO, BPAL – habitat indicators; and ANAT ≥ 5 individuals per species

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages must be maintained within a C ecological category or improved upon.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae 2 spp Leptophlebiidae Tricorythidae Leptoceridae Perlidae Hydropsychidae >2spp	3 biotopes sampled: assemblages to be ≥ B abundances. SASS 5 scores: ≥213 Average Score per taxon (ASPT) score: ≥7.2 MIRAI ≥ 62%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12-14 PTV: 20% to < 40%
					Riparian	The riparian vegetation must be maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥62%
		Ncandu to confluence with Ngagane **V31H, V31J** **(THU_EWR19)**	**2.4**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Ncandu River at the EWR site THU_EWR19 (-27.8017, 29.8840) in V31J NMAR = 50.83 x$10^6$$m^3$ Target Ecological Category (TEC) of a B/C category The maintenance low flows and drought flows must be attained to support the upstream and downstream aquatic ecosystem of the Ncandu River.	Maintenance and drought flows required for the Ncandu River	
								Oct: Maintenance Low flows (m^3/s) 0.151; Drought Low flows (m^3/s) 0.023
								Nov: 0.238; 0.02
								Dec: 0.327; 0.02
								Jan: 0.488; 0.128
								Feb: 0.651; 0.170
								Mar: 0.529; 0.139
								Apr: 0.373; 0.099
								May: 0.208; 0.057
								Jun: 0.120; 0.034
								Jul: 0.091; 0.027
								Aug: 0.087; 0.026
								Sep: 0.105; 0.029
				Quality	Nutrients	Nutrient levels must be improved to sustain the aquatic ecosystem health and to meet the ecological state	Orthophosphate (PO_4^-) as Phosphorus	≤0.05 milligrams per Litre (mg/L) (50th percentile)
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤1 milligrams per Litre (mg/L) (50th percentile)
					Salts	Instream salinity must be maintained or improved upon to support the aquatic ecosystem and the water quality requirements of the water users	Total Dissolved Solids	≤350 milligrams per Litre (mg/L) (95th percentile)

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
						In-stream quality must be maintained	Sulphate	≤ 165 milligrams per Litre (mg/L) (95th percentile)
						In-stream quality must be maintained	Chloride	≤ 120 milligrams per Litre (mg/L) (95th percentile)
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5th percentile) and ≤9.0 (95th percentile)
					Toxic substances	The concentrations of toxins should not be toxic to aquatic organisms and a threat to human health.	Ammonia as N	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)
							Aluminium (Al)	≤ 0.10 milligrams per Litre (mg/L) (95th percentile)
							Manganese (Mn)	≤ 0.15 milligrams per Litre (mg/L) (95th percentile)
							Cadmium (Cd)	≤ 0.001 milligrams per Litre (mg/L) (95th percentile)
							Iron (Fe)	≤ 0.1 milligrams per Litre (mg/L) (95th percentile)
							Lead (Pb) hard	≤ 0.001 milligrams per Litre (mg/L) (95th percentile)
							Copper (Cu) hard	≤ 0.007 milligrams per Litre (mg/L) (95th percentile)
							Nickel (Ni)	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)
							Cobalt (Co)	≤ 0.05 milligrams per Litre (mg/L) (95th percentile)
							Zinc (Zn)	≤ 0.002 milligrams per Litre (mg/L) (95th percentile)
							Atrazine	≤0.08 milligrams per Litre (mg/L)
							Mancozeb	≤0.009 milligrams per Litre (mg/L)
							Glyphosate	≤0.7 milligrams per Litre (mg/L)
							Benzene	≤0.01 milligrams per Litre (mg/L) (95th percentile)
							Toluene	≤0.7 milligrams per Litre (mg/L) (95th percentile)
							Oil and grease	2.5 milligrams per Litre (mg/L)
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL) (95th percentile)
				Habitat	Instream	Natural flow pattern must be maintained in B Ecological Category.	Index of Habitat Integrity (IHI): Instream	IHI ≥ 82%
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained or	Fish Response Assessment Index (FRAI).	FRAI ≥ 72%

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
						improved to a PES B/C ecological category. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category. During survey in all flow habitat classes all species present (ANAT, AMOS, LRUB, BPAU, BNAT and BVIV).	*Amphilius natalensis* (ANAT) *Anguilla mossambica* (AMOS) *Labeo rubromaculatus* (LRUB) *Barbus (Enteromius) paludinosus* (BPAU) *Labeobarbus natalensis* (BNAT) *Barbus (Enteromius) viviparus* (BVIV)	BVIV, BNAT, BPAU – habitat indicators; and ANAT ≥ 5 individuals per species
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages must be maintained within a B/C ecological category or improved upon.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae >2 spp Heptageniidae Leptophlebiidae Tricorythidae Leptoceridae Perlidae Hydropsychidae >1spp Elmidae Psephenidae Dixidae	3 biotopes sampled: assemblages to be ≥ B abundances. SASS 5 scores: ≥190 Average Score per Taxon (ASPT) score: ≥6.0 MIRAI ≥ 62%
					Diatoms	Ecological category should be maintained as B.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 15 - 17 PTV: < 20%
					Riparian	The riparian vegetation must be maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 62%
		Ngagane from Ntshingwayo Dam to confluence with Buffalo **V31G, V31K** **(May 13_ EWR3)**	**2.5**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Ngagane River at the EWR site May13_EWR3 (-27.819, 29.987) in V31K NMAR = 160.12 x10^{6}m^{3} Target Ecological Category (TEC) of a C/D category	Maintenance and drought flows required for the Ngagane River	

	Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
Oct	0.366	0.091
Nov	0.560	0.068
Dec	0.762	0.051
Jan	1.138	0.527
Feb	1.541	0.711
Mar	1.269	0.587
Apr	0.928	0.433

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
						The maintenance low flows and drought flows must be attained to support the upstream and downstream aquatic ecosystem of the Ngagane River to the confluence with the Buffalo River.		May	0.539	0.202
								Jun	0.326	0.112
								Jul	0.243	0.123
								Aug	0.234	0.119
								Sep	0.273	0.111
					Freshets	Ecological Water Requirements (EWR) freshets to be released from Chelmsford Dam (V3R001) and Horn River	Freshets required for the Ngagane River		Freshet (m^3/s)	Days
								Nov	10.0	2
								Dec	12.0	2
								Jan	15.0	2
								Feb	20.0	2
								Mar	10.0	2
				Quality	Nutrients	Nutrient levels must be improved to sustain the aquatic ecosystem health and to meet the prescribed ecological state (C ecological category)	Orthophosphate (PO_4^-) as Phosphorus	≤0.05 milligrams per Litre (mg/L) (50th percentile)		
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤ 2.0 milligrams per Litre (mg/L) (50th percentile)		
					Salts	Salinity concentrations must be maintained or improved to support downstream users.	Total Dissolved Solids	≤350 milligrams per Litre (mg/L) (95th percentile)		
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5th percentile) and ≤9.0 (95th percentile)		
					Toxic substances	The concentrations of toxins should not be toxic to aquatic organisms and a threat to human health.	Ammonia as N	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)		
							Aluminium (Al)	≤ 0.1 milligrams per Litre (mg/L) (95th percentile)		
							Cadmium (Cd) soft	≤ 0.001 milligrams per Litre (mg/L) (95th percentile)		
							Manganese (Mn)	≤ 0.15 milligrams per Litre (mg/L) (95th percentile)		
							Iron (Fe)	≤ 0.1 milligrams per Litre (mg/L) (95th percentile)		
							Lead (Pb) hard	≤ 0.01 milligrams per Litre (mg/L) (95th percentile)		
							Copper (Cu) hard	≤ 0.007 milligrams per Litre (mg/L) (95th percentile)		
							Nickel (Ni)	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)		
							Cobalt (Co)	≤ 0.05 milligrams per Litre (mg/L) (95th percentile)		
							Zinc (Zn)	≤ 0.002 milligrams per Litre (mg/L) (95th percentile)		

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
							Atrazine	≤0.08 milligrams per Litre (mg/L)
							Mancozeb	≤0.009 milligrams per Litre (mg/L)
							Glyphosate	≤0.7 milligrams per Litre (mg/L)
							Oil and grease	2.5 milligrams per Litre (mg/L)
						Hydrocarbons	Benzene	≤0.01 milligrams per Litre (mg/L) (95th percentile)
							Toluene	≤0.7 milligrams per Litre (mg/L) (95th percentile)
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL) (95th percentile)
				Habitat	Instream	Natural flow pattern must be maintained in C Ecological Category.	Index of Habitat Integrity (IHI): Instream	IHI ≥ 62%
					Fish	Flow and water quality sensitive Fish species to be maintained or improved to a PES C/D ecological category. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category. During survey in all flow habitat classes all species present (ANAT, BPAU, BNAT, BPAL and BANO).	Fish Response Assessment Index (FRAI) *Amphilius natalensis* (ANAT) *Barbus (Enteromius) paludinosus* (BPAU) *Labeobarbus natalensis* (BNAT) *Barbus (Enteromius) pallidus* (BPAL) *Enteromius (Barbus) anoplus* (BANO)	FRAI ≥ 42% BNAT, BPAL and BANO – 2 of 3 *spp* present as habitat indicators; and ANAT ≥ 3 individuals per species
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages must be maintained within a C/D ecological category or improved upon.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae >2 spp Heptageniidae Leptophlebiidae Tricorythidae Leptoceridae Hydropsychidae >1spp Elmidae Economidae	3 biotopes sampled; assemblages to be ≥ B abundances SASS 5 scores: ≥213 Average Score per Taxon (ASPT): ≥7.2 MIRAI ≥ 52%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 PTV: 20% to <40%
					Riparian	The riparian vegetation must be maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 62%

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
							Index of Habitat Integrity (IHI): Riparian	

Table 4: Resource Quality Objectives for RIVERS AND DAMS in priority Resource Units in the Integrated Unit of Analysis IUA 3: MIDDLE BUFFALO RIVER

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
IUA 3: MIDDLE BUFFALO RIVER	**III**	Dorps (including Kweek and Wasbankspruit) to confluence with Buffalo River **V32A, B**	**3.1**	Quality	Nutrients	Nutrient levels should not deteriorate and should support aquatic ecosystem and sustain the ecological state (B ecological category)	Ortho-phosphate (PO_4^-) as Phosphorus	≤ 0.02 milligrams per Litre (mg/L) (50^{th} percentile)
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤ 1.0 milligrams per Litre (mg/L) (50^{th} percentile)
					Salts	Salinity levels must be maintained to support aquatic ecosystem and sustain the ecological state (B ecological category)	Total Dissolved Solids	≤200 milligrams per Litre (mg/L) (95^{th} percentile)
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL) (95^{th} percentile)
		Tiyna, Eersteling-Quaternary catchment **V32C, D**	**3.2**	Quality	Nutrients	Nutrient levels should not deteriorate and should support aquatic ecosystem and sustain the present ecological state (B ecological category)	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.02 milligrams per Litre (mg/L) (50^{th} percentile)
							Total Inorganic Nitrogen (NO_3) as Nitrogen	≤ 1.0 milligrams per Litre (mg/L) (50^{th} percentile)
					Salts	Salinity levels must be maintained to support aquatic ecosystem and sustain the present ecological state (B ecological category)	Total Dissolved Solids	≤200 milligrams per Litre (mg/L) (95^{th} percentile)
							Sulphate	≤ 165 milligrams per Litre (mg/L) (95^{th} percentile)
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5^{th} percentile) and ≤9.0 (95^{th} percentile)
						Maintain baseline status	Turbidity	A 10% variation from background concentration. Limits must be determined.
				Biota	Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 PTV: 20% to <40%
		Mzinyashana including	**3.4**	Quality	Nutrients	Nutrient levels should not deteriorate and should support aquatic ecosystem and sustain the	Orthophosphate (PO_4^-) as Phosphorus	≤ 0.02 milligrams per Litre (mg/L) (50^{th} percentile)

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
		Sterkstroom and Sandspruit **V32E**				ecological state (B ecological category)	Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤ 1.0 milligrams per Litre (mg/L) (50th percentile)		
					Salts	Salinity levels must be maintained to support aquatic ecosystem and sustain the ecological state (B ecological category)	Total Dissolved Solids	≤200 milligrams per Litre (mg/L) (95th percentile)		
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL) (95th percentile)		
		Buffalo from Ngagane to Blood River confluence **V32B, V32C, V32D, V32E and V32F** **(Thukela_EWR 13)**	**3.5**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Buffalo River at the EWR site Thukela_EWR13 (-28.153, 30.476) in V32F NMAR = 695.05 x$10^6 m^3$ Target Ecological Category (TEC) of a C/D category The maintenance low flows and drought flows must be attained to support the upstream and downstream aquatic ecosystem to Blood River confluence.	Maintenance and drought flows required for the upstream and downstream Buffalo River Monitoring of flows at V3H010		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
								Oct	0.86	0.418
								Nov	1.304	0.482
								Dec	1.765	0.418
								Jan	2.531	1.493
								Feb	3.276	1.928
								Mar	2.63	1.55
								Apr	1.925	1.141
								May	1.184	0.709
								Jun	0.757	0.461
								Jul	0.603	0.371
								Aug	0.563	0.348
								Sep	0.647	0.397
				Quality	Nutrients	Nutrient levels should not deteriorate and should support aquatic ecosystem and sustain the ecological state (ecological category C/D)	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.1 milligrams per Litre (mg/L) (50th percentile)		
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤2.0 milligrams per Litre (mg/L) (50th percentile)		
					Salts	Salinity concentrations must be maintained to support aquatic ecosystem and sustain the ecological state (ecological category C/D)	Total Dissolved Solids	≤350 milligrams per Litre (mg/L) (95th percentile)		
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)		
				Habitat	Instream	Natural flow pattern must be improved to a C/D Ecological Category.	Index of Habitat Integrity (IHI): Instream	IHI Instream (class C/D) Ecological Category (≥ 42%)		
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained or improved to a PES C/D ecological category. Fish Response Assessment Index (FRAI) should be conducted	Fish Response Assessment Index (FRAI) *Labeo rubromaculatus* (LRUB) *Barbus (Enteromius) paludinosus* (BPAU)	FRAI ≥ 52% BNAT, BPAL and BANO – 2 of 3 spp present as habitat indicators; and LRUB ≥ 3 individuals per species.		

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
						annually to monitor against the prescribed C/D ecological category. During survey in all flow habitat classes all species present (LRUB, BPAU, BNAT, BPAL and BANO).	*Labeobarbus natalensis* (BNAT) *Barbus (Enteromius) pallidus* (BPAL) *Enteromius (Barbus) anoplus* (BANO)	
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages must be improved to a C/D ecological category.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae >2 spp Hydropsychidae >1spp Elmidae Hydracarina	3 biotopes sampled: assemblages to be ≥ B abundances. SASS 5 scores: 77 - 180 Average Score per Taxon (ASPT): 5.5 – 7.0 MIRAI ≥ 52%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% to <40%
					Riparian habitat	The riparian vegetation must be maintained at VEGRAI ≥ C/D Ecological Category..	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥C/D ≥ 52%

Table 5: Resource Quality Objectives for RIVERS AND DAMS in priority Resource Units in the Integrated Unit of Analysis 4: LOWER BUFFALO RIVER

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
IUA 4: LOWER BUFFALO RIVER	**II**	Buffalo from Blood to Thukela confluence **V33A, V33B, V33C and V33D** **(Thukela_EWR 14)**	**4.2**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Buffalo River at the EWR site Thukela_EWR14 (-28.437, 30.595) in V33B NMAR = 831.09 x10^{6}m^3 Target Ecological Category (TEC) of a C. The maintenance low flows and drought flows must be attained to support the upstream and downstream aquatic ecosystem to Thukela River confluence.	Maintenance and drought flows required for the upstream and downstream Buffalo River		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
								Oct	1.600	0.400
								Nov	1.900	0.400
								Dec	2.700	0.400
								Jan	4.400	0.800
								Feb	5.947	1.200
								Mar	4.700	0.950
								Apr	3.300	0.900
								May	2.100	0.600
								Jun	1.670	0.500
								Jul	1.320	0.400
								Aug	1.230	0.400
								Sep	1.440	0.400

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
				Quality	Nutrients	Nutrient levels should not deteriorate and should support aquatic ecosystem and sustain the present ecological state (C/D ecological category)	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.1 milligrams per Litre (mg/L) (50^{th} percentile)
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤2.0 milligrams per Litre (mg/L) (50^{th} percentile)
					Salts	Salinity concentrations must be be maintained to support aquatic ecosystem and sustain the present ecological state (C/D ecological category)	Total Dissolved Solids	≤350 milligrams per Litre (mg/L) (95^{th} percentile)
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5^{th} percentile) and ≤9.0 (95^{th} percentile)
						Baseline clarity must be maintained. A 10% variation from background concentration.	Turbidity	
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)
				Habitat	Instream	Natural flow pattern must be maintained and/or improved to a C Ecological Category.	Index of Habitat Integrity (IHI): Instream	IHI Instream: (class C) Ecological Category (≥ 62%)
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a PES C ecological category. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category.	Fish Response Assessment Index (FRAI) *Labeobarbus natalensis* (BNAT) *Labeo molybdinus* (LMOL) *Enteromius (Barbus) anoplus* (BANO)	FRAI ≥ 62% Ensure all flow habitat classes are present for the following species: BNAT, BANO – 2 of 3 spp present as habitat indicators; and LMOL ≥ 3 individuals per species.
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages must be maintained and/or improved to a C ecological category.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Atyidae Baetidae >2 spp Tricorythidae Heptageniidae Hydropsychidae >1spp Elmidae	At least 2 biotopes sampled: assemblages to be ≥ B abundances. MIRAI ≥ 62%

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% to <40%
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 62%

Table 6: Resource Quality Objectives for RIVERS AND DAMS in priority Resource Units in the Integrated Unit of Analysis 5: BLOOD RIVER

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
IUA5: BLOOD RIVER	**III**	Wetland RU: Blood River **V32G**	**5.1**	Quality	Nutrients	Nutrient levels must be maintained to support aquatic ecosystem and sustain the present ecological state (B ecological category)	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.02 milligrams per Litre (mg/L) (50^{th} percentile)
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤1.0 milligrams per Litre (mg/L) (50^{th} percentile)
					Salts	Salinity concentrations must be maintained to support aquatic ecosystem and sustain the present ecological state (B ecological category)	Total Dissolved Solids	≤200 milligrams per Litre (mg/L) (95^{th} percentile)
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained in a PES B ecological category. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed B ecological category. During survey in all flow habitat classes all species present (BANO, ANAT and AMOS).	*Enteromius (Barbus) anoplus* (BANO) *Amphilius natalensis* (ANAT) *Anguilla mossambica* (AMOS)	FRAI ≥ 82% BANO and ANAT ≥ 5 individuals per species
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages must be maintained within a B ecological category or improved upon.	Baetidae 2 sp Perlidae Tricorythidae Hydropsychidae 1 sp Leptoceridae Ancyidae Psephenidae	At least 2 biotopes sampled: assemblages to be ≥ A abundances MIRAI ≥ 82%
					Diatoms	Ecological category should be maintained as B.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI ≥15 %PTV: 20% to < 40%

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
		Blood River from outlet of V32G to confluence with the **V32H** Buffalo River **V32H**	**5.2**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Blood River at the outlet of V32H NMAR = 94.71 x10^{6}m^{3} Target Ecological Category (TEC) of a C category The maintenance low flows and drought flows must be attained to support the upstream aquatic ecosystem.	Maintenance and drought flows required for the upstream Blood River		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
								Oct	0.240	0.088
								Nov	0.343	0.081
								Dec	0.434	0.049
								Jan	0.613	0.361
								Feb	0.782	0.487
								Mar	0.625	0.415
								Apr	0.459	0.296
								May	0.295	0.156
								Jun	0.209	0.105
								Jul	0.172	0.091
								Aug	0.164	0.091
								Sep	0.195	0.091
				Quality	Nutrients	Nutrient levels must be maintained to the support aquatic ecosystem and sustain the ecological state	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.06 milligrams per Litre (mg/L) (50th percentile)		
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤2.0 milligrams per Litre (50th percentile)		
					Salts	Salinity concentrations must be maintained to support aquatic ecosystem and sustain the ecological state	Total Dissolved Solids	≤350 milligrams per Litre (95th percentile)		
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5th percentile) and ≤9.0 (95th percentile)		
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)		
				Habitat	Instream	Natural flow pattern must be maintained in a C Ecological Category	Index of Habitat Integrity (IHI): Instream	IHI ≥62%		
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a PES C ecological category.	Fish Response Assessment Index (FRAI) *Enteromius (Barbus) anoplus* (BANO) *Labeo rubromaculatus* (LRUB) *Labeobarbus natalensis* (BNAT) *Tilapia sparrmanii* (TSPA)	Ensure all flow habitat classes are present for the following species: BNAT, BANO and TSPA – 2 of 3 spp present as habitat indicators; and LRUB ≥ 3 individuals per species. FRAI Ecological Category: C (≥ 62%)		

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages must be maintained and/or improved to a C ecological category.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Atyidae Baetidae >1 spp Tricorythidae Heptageniidae Perlidae Pyralida Hydropsychidae >1spp Elmidae Psephenidae	3 biotopes to be sampled; assemblages to be A to B abundances. MIRAI ≥ 62%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 – 14 %PTV: 20% to <40%
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 62%

Table 7: Resource Quality Objectives for RIVERS AND DAMS in priority Resource Units in the Integrated Unit of Analysis 6: SUNDAYS RIVER

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
IUA 6: SUNDAYS RIVER	**III**	Nkunzi to confluence with Sundays **V60B**	**6.1**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Nkunzi River at confluence with Sundays River in V60B NMAR = 24.94 x$10^6$$m^3$ Target Ecological Category (TEC) of a C. The maintenance low flows and drought flows must be attained to support the upstream aquatic ecosystem.	Maintenance and drought flows required for the Nkunzi River upstream of the Sundays River confluence		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
								Oct	0.068	0.030
								Nov	0.091	0.040
								Dec	0.100	0.030
								Jan	0.145	0.061
								Feb	0.191	0.08
								Mar	0.158	0.067
								Apr	0.137	0.058
								May	0.106	0.046
								Jun	0.086	0.038
								Jul	0.070	0.031
								Aug	0.063	0.028
								Sep	0.065	0.029
				Quality	Nutrients	Nutrient levels must be maintained to the support	Orthophosphate (PO_4^-) as Phosphorus	≤0.06 milligrams per Litre (mg/L) (50^{th} percentile)		

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
						aquatic ecosystem and sustain the ecological state (C ecological category)	Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤2.0 milligrams per Litre (mg/L) (50^{th} percentile)
					Salts	Salinity concentrations must be maintained to support aquatic ecosystem and sustain the ecological state (C ecological category)	Total Dissolved Solids	≤350 milligrams per Litre (mg/L) (95^{th} percentile)
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5^{th} percentile) and ≤9.0 (95^{th} percentile)
						Baseline clarity must be maintained. A 10% variation from background concentration.	Turbidity	
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)
				Habitat	Instream	Natural flow pattern must be maintained in a C Ecological Category.	Index of Habitat Integrity (IHI): Instream	IHI Instream (class C) Ecological Category (≥ 62%)
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a PES C ecological category. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category.	Fish Response Assessment Index (FRAI) *Enteromius (Barbus) anoplus* (BANO) *Labeo rubromaculatus* (LRUB) *Labeobarbus natalensis* (BNAT) *Tilapia sparrmanii* (TSPA) *Amphilius natalensis* (ANAT)	FRAI ≥ 62% Ensure all flow habitat classes are present for the following species: BNAT, BANO and TSPA – 2 of 3 spp present as habitat indicators; and LRUB ≥ 3 individuals per species.
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages must be maintained and/or improved to a C ecological category.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae 2 spp Tricorythidae Heptageniidae Hydropsychidae 2spp Economidae Psephenidae	3 biotopes to be sampled: assemblages to be A to B abundances. MIRAI ≥ 62%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI)	SPI: 12 - 14 %PTV: 20% to <40%

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
							Percentage pollution tolerant values (%PTV)			
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 62%		
		Sundays from source to confluence with Wasbank **V60A, V60B, V60C** **(Thukela_ EWR7)**	**6.2**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Sundays River at the EWR site Thukela_EWR7 (-28.458, 30.053) in V60C NMAR = 90.26 x$10^6$$m^3$ Target Ecological Category (TEC) of a C/D category The maintenance low flows and drought flows must be attained to support the upstream aquatic ecosystem.	Maintenance and drought flows required for the Sundays River Monitoring of flows at V6H004		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
								Oct	0.180	0.120
								Nov	0.240	0.140
								Dec	0.350	0.105
								Jan	0.500	0.220
								Feb	0.700	0.280
								Mar	0.520	0.240
								Apr	0.350	0.210
								May	0.260	0.160
								Jun	0.200	0.140
								Jul	0.160	0.120
								Aug	0.150	0.120
								Sep	0.160	0.110
				Quality	Nutrients	Nutrient levels must be maintained to the support aquatic ecosystem and sustain the ecological state	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.06 milligrams per Litre (mg/L) (50th percentile)		
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤1.0 milligrams per Litre (mg/L) (50th percentile)		
					Salts	Salinity concentrations must be maintained to support aquatic ecosystem and sustain the ecological state	Total Dissolved Solids	≤200 milligrams per Litre (mg/L) (95th percentile)		
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)		
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5th percentile) and ≤9.0 (95th percentile)		
						Baseline clarity must be maintained. A 10% variation from background concentration.	Turbidity			
				Habitat	Instream	Natural flow pattern must be improved to a C/D Ecological Category.	Index of Habitat Integrity (IHI): Instream	IHI ≥ 62%		

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a C/D. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category.	Fish Response Assessment Index (FRAI) *Enteromius (Barbus) anoplus* (BANO) *Labeo rubromaculatus* (LRUB) *Labeobarbus natalensis* (BNAT) *Tilapia sparrmanii* (TSPA) *Amphilius natalensis* (ANAT)	FRAI ≥ 52% Ensure all flow habitat classes are present for the following species: BNAT, BANO and TSPA – 2 of 3 spp present as habitat indicators; and LRUB ≥ 3 individuals.
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained at a C/D ecological category.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae 2 spp Heptageniidae Hydropsychidae 2spp Elmidae Hydracarina Leptophlebiiidae Aeshnidae Athericidae	3 biotopes sampled: assemblages to be A to B abundances. SASS 5 score: 117 - 180 Average Score per Taxon (ASPT): 5.6 – 6.5 MIRAI ≥ 52%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 – 14 %PTV: 20% to <40%
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C/D Ecological Category.	Vegetation Response Assessment Index (VEGRAI) Index of Habitat Integrity (IHI): Riparian	VEGRAI survey every 5 years. VEGRAI ≥ 52%
		Wasbank to confluence with Sundays **V60D, V60E**	**6.3**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Wasbank River at the confluence with the Sundays River in V60E NMAR = 78.33 x10^{6}m^3 Target Ecological Category (TEC) of a C/D category	Maintenance and drought flows required for the Wasbank River	

	Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
Oct	0.189	0.085
Nov	0.260	0.073
Dec	0.301	0.051
Jan	0.434	0.265
Feb	0.527	0.321
Mar	0.420	0.257

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
						The maintenance low flows and drought flows must be attained to support the upstream aquatic ecosystem of the Wasbank River.		Apr	0.327	0.201
								May	0.219	0.099
								Jun	0.160	0.082
								Jul	0.132	0.084
								Aug	0.132	0.084
								Sep	0.161	0.102
				Quality	Nutrients	Nutrient levels should not deteriorate and should support aquatic ecosystem and sustain the target ecological state (TEC C/D)	Orthophosphate as P	≤0.01 mg/L (50th percentile)		
							Total Inorganic Nitrogen as TIN	≤0.5 milligrams per Litre (mg/L) (50th percentile)		
					Salts	Salinity concentrations must be reduced to support aquatic ecosystem and the requirements of downstream users and sustain the ecological state.	Total Dissolved Solids	≤ 500 milligrams per Litre (mg/L) (95th percentile)		
							Sulphate	≤ 250 milligrams per Litre (mg/L) (95th percentile)		
							Chloride	≤ 120 milligrams per Litre (mg/L) (95th percentile)		
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5th percentile) and ≤9.0 (95th percentile)		
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)		
					Toxic substances	The concentrations of toxins should not be toxic to aquatic organisms and a threat to human health.	Aluminium (Al)	≤ 0.10 milligrams per Litre (mg/L) (95th percentile)		
							Manganese (Mn)	≤ 0.15 milligrams per Litre (mg/L) (95th percentile)		
							Cadmium (Cd) soft	≤ 0.001 milligrams per Litre (mg/L) (95th percentile)		
							Iron (Fe)	≤ 0.1 milligrams per Litre (mg/L) (95th percentile)		
							Lead (Pb) hard	≤ 0.01 milligrams per Litre (mg/L) (95th percentile)		
							Copper (Cu) hard	≤ 0.007 milligrams per Litre (mg/L) (95th percentile)		
							Cobalt (Co)	≤ 0.05 milligrams per Litre (mg/L) (95th percentile)		
							Nickel (Ni)	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)		
							Zinc (Zn)	≤ 0.002 milligrams per Litre (mg/L) (95th percentile)		

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
				Habitat	Instream	Natural flow pattern must be maintained or improved to a C/D Ecological Category.	Index of Habitat Integrity (IHI): Instream	IHI ≥ 52%
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC)of a C/D.	Fish Response Assessment Index (FRAI) *Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT) *Tilapia sparrmanii* (TSPA)	Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C/D ecological category. FRAI ≥ 52% Ensure all flow habitat classes are present for the following species: BNAT, BANO and TSPA – 2 of 3 spp. present as habitat indicators
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained at a C/D ecological category.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae 2 spp Heptageniidae Hydropsychidae 2spp Elmidae Leptophlebiiidae Trichorythidae Lestidae Psephenidae	At least 2 biotopes to be sampled: assemblages to be A to B abundances. SASS 5 score: ≥80 - 100 Average Score per Taxon (ASPT): ≥4.5 MIRAI ≥ 52%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% to <40%
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C/D Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 52%
		Sundays from Wasbank to Thukela confluence, including Nhlanyanga **V60F**	**6.4**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Sundays River at the EWR site Thukela_EWR 8 (-28.636, 30.204) in V60F NMAR = 197.03 x10^{6}m^{3} Target Ecological Category (TEC) of a D. The maintenance low flows and	Maintenance and drought flows required for the lower Sundays River	

	Maintenance	Drought
	Low flows (m^3/s)	Low flows (m^3/s)
Oct	0.220	0.200
Nov	0.400	0.250
Dec	0.530	0.180
Jan	0.670	0.470
Feb	0.800	0.585
Mar	0.680	0.480
Apr	0.600	0.400

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
		(Thukela_ EWR8)				drought flows must be attained to support the upstream and downstream aquatic ecosystem of the lower Sundays River to the confluence with the Thukela River.		May	0.390	0.250
								Jun	0.230	0.170
								Jul	0.190	0.140
								Aug	0.180	0.140
								Sep	0.200	0.170
				Quality	System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5th percentile) and ≤9.0 (95th percentile)		
						Baseline clarity must be maintained. A 10% variation from background concentration.	Turbidity			
						Instream salinity must be attained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Electrical Conductivity	≤ 55 milli Siemens per metre (mS/m) (95th percentile)		
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a C. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category.	Fish Response Assessment Index (FRAI) *Anguilla mossambica* (AMOS) *Enteromius (Barbus) anoplus* (BANO) *Labeo rubromaculatus* (LRUB) *Labeobarbus natalensis* (BNAT) *Tilapia sparrmanii* (TSPA) *Labeo molybdinus* (LMOL)	FRAI ≥ 62% Ensure all flow habitat classes are present for the following species: BNAT, BANO and TSPA – 2 of 3 spp present as habitat indicators; and LRUB and/ or LMOL ≥ 3 individuals per spp.		
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained or improved to a Target Ecological Category (TEC) of a C.	South African Scoring System Version 5 (SASS5) (not measured within this RU but to be achieved) Macroinvertebrate Response Assessment Index (MIRAI) Baetidae 2 spp Heptageniidae Hydropsychidae 2spp Leptophlebiiidae Tricorythidae	At least 2 biotopes sampled: assemblages to be A to B abundances. SASS 5 score: ≥120 Average Score per Taxon (ASPT): ≥4.8 MIRAI ≥ 62%		
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% to <40%		

Table 8: Resource Quality Objectives for RIVERS AND DAMS in priority Resource Units in the Integrated Unit of Analysis IUA 7: UPPER MOOI RIVER

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
IUA 7: UPPER MOOI RIVER	III	Klein - Mooi from source to Mooi confluence V20B (lower portion), V20D	7.1	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Little Mooi River at confluence with Mooi River in V20D NMAR = 124.85 x10^{6}m^{3} Target Ecological Category (TEC) of a C. The maintenance low flows and drought flows must be attained to support the upstream aquatic ecosystem.	Maintenance and drought flows required for the Little Mooi River upstream of the Mooi River confluence Monitoring of flows at V2H006		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
								Oct	0.374	0.293
								Nov	0.496	0.375
								Dec	0.619	0.466
								Jan	0.83	0.614
								Feb	0.985	0.727
								Mar	0.881	0.650
								Apr	0.718	0.536
								May	0.519	0.396
								Jun	0.395	0.309
								Jul	0.338	0.268
								Aug	0.318	0.254
								Sep	0.352	0.278
				Quality	Nutrients	Nutrient levels must be maintained to support the aquatic ecosystem and sustain the ecological state	Orthophosphate (PO_4^-) as Phosphorus	≤0.01 milligrams per Litre (mg/L) (50th percentile)		
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤0.5 milligrams per Litre (mg/L) (50th percentile)		
					Salts	Salinity concentrations must be maintained to support good water quality condition and sustain ecological state.	Total Dissolved Solids	≤ 120 milligrams per Litre (mg/L) (95th percentile)		
					System variables	pH must be maintained within the prescribed range	pH	6.5 (5th percentile) and 9.0 (95th percentile)		
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)		
					Toxic substances	The concentrations of toxic substances must pose no risk to aquatic organisms and to human health.	Ammonia as N	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)		
							Atrazine	≤0.08 milligrams per Litre (mg/L)		
							Mancozeb	≤0.009 milligrams per Litre (mg/L)		
							Glyphosate	≤0.7 milligrams per Litre (mg/L)		
				Habitat	Instream	Natural flow pattern must be maintained or improved to a C Ecological Category.	Index of Habitat Integrity (IHI): Instream	IHI ≥ 62%		
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target	Fish Response Assessment Index (FRAI)	FRAI ≥62%		

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
						Ecological Category (TEC) of a C. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category. Ensure all flow habitat classes are present for the following species: BNAT, BANO	*Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT)			
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained at a C ecological category.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae 2 spp Heptageniidae Hydropsychidae 2spp Leptophlebiiidae Trichorythidae Psephenidae Perlidae Oligoneuridae Polymitarcyidae Prosopistomatidae Pyralidae	3 biotopes sampled; assemblages to be A to B abundances SASS 5 score: ≥120 Average Score per Taxon (ASPT): ≥4.8 MIRAI ≥62%		
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% to <40%		
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years VEGRAI ≥ 62%		
		Nsonge tributary catchment **V20C** **(THU_ECOLOGICAL WATER REQUIREM**	**7.2**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Nsonge River at the EWR site THU_ EWR20 (-29.2377, 29.7853) in V20C NMAR = 27.136 x10⁶m³ Target Ecological Category (TEC)=B/C The maintenance low flows and drought flows must be attained to	Maintenance and drought flows required for the Nsonge River Monitoring of flows at V2H007		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
								Oct	0.109	0.063
								Nov	0.148	0.082
								Dec	0.188	0.102
								Jan	0.253	0.134
								Feb	0.302	0.159
								Mar	0.271	0.143
								Apr	0.219	0.118

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
		ENTS (EWR) 20)				support the upstream aquatic ecosystem.		May	0.155	0.086
								Jun	0.115	0.066
								Jul	0.097	0.057
								Aug	0.090	0.054
								Sep	0.101	0.060
				Quality	Nutrients	Nutrient levels must be maintained to support aquatic ecosystem and good water quality condition	Orthophosphate (PO_4^-) as Phosphorus	≤0.01 milligrams per Litre (mg/L) (50th percentile)		
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤0.5 milligrams per Litre (mg/L) (50th percentile)		
					Salts	Salinity concentrations must be maintained to sustain good water quality state and ecological condition.	Total Dissolved Solids	≤120 milligrams per Litre (mg/L) (95th percentile)		
					System variables	pH must be maintained within the prescribed range	pH	6.5 (5th percentile) and 9.0 (95th percentile)		
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)		
					Toxic substances	The concentrations of toxic substances must pose no risk to aquatic organisms and to human health.	Ammonia as N	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)		
							Atrazine	≤0.08 milligrams per Litre (mg/L)		
							Mancozeb	≤0.009 milligrams per Litre (mg/L)		
							Glyphosate	≤0.7 milligrams per Litre (mg/L)		
				Habitat	Instream	Natural flow pattern must be improved to a B/C Ecological Category.	Index of Habitat Integrity (IHI): Instream	Instream Habitat Integrity (class B/C) Ecological Category (≥ 72%)		
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a C. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category. Ensure all flow habitat classes are present for the following species: BNAT, BANO	Fish Response Assessment Index (FRAI) *Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT)	FRAI ≥ 62%		
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)	3 biotopes sampled: assemblages to be A to B abundances. SASS 5 score: 90 - 220		

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
						Macroinvertebrate assemblages to be improved to a Target Ecological Category (TEC) of a C.	Baetidae 2 spp Leptophlebiiidae Trichorythida	Average Score per Taxon (ASPT): 6.4 – 7.5 MIRAI ≥ 62%		
					Diatoms	Ecological category should be maintained as B.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 15 - 17 %PTV: <20%		
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ B/C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 72%		
		Mooi upstream of Spring Grove Dam **V20A (lower portion), V20D (upper)**	**7.3**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Mooi River upstream of Spring Grove Dam in V20D NMAR = 92.98 x10^6m^3 Target Ecological Category (TEC) of a C. The maintenance low flows and drought flows must be attained to support the upstream aquatic ecosystem of the Mooi River.	Maintenance and drought flows required for the Mooi River Monitoring of flows at V2H005		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
								Oct	0.265	0.227
								Nov	0.361	0.188
								Dec	0.461	0.329
								Jan	0.609	0.496
								Feb	0.743	0.602
								Mar	0.689	0.558
								Apr	0.595	0.486
								May	0.378	0.315
								Jun	0.258	0.216
								Jul	0.211	0.14
								Aug	0.201	0.134
								Sep	0.225	0.173
				Quality	Nutrients	Nutrient levels must be maintained to support aquatic ecosystem and good water quality condition, and sustain ecological integrity	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.01 milligrams per Litre (mg/L) (50th percentile)		
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤0.5 milligrams per Litre (mg/L) (50th percentile)		
					Salts	Salinity concentrations must be maintained to sustain good water quality state and ecological condition.	Total Dissolved Solids	≤120 milligrams per Litre (mg/L) (95th percentile)		
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)		
					Toxic substances	The concentrations of toxic substances must pose no risk to aquatic organisms and to human health.	Ammonia as N	≤ 0.0725 milligrams per Litre (mg/L) (95th percentile)		
							Atrazine	≤0.08 milligrams per Litre (mg/L)		
							Mancozeb	≤0.009 milligrams per Litre (mg/L)		
							Glyphosate	≤0.7 milligrams per Litre (mg/L)		

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
				Habitat	Instream	Natural flow pattern must be improved to a C Ecological Category.	Index of Habitat Integrity (IHI): Instream	IHI Instream (class C) Ecological Category (≥ 62%)
				Biota	Birds	Habitat to be maintained for Red List Species for foraging, migration, and nesting.	Cape Vulture (*Gyps coprotheres*) Grey Crowned Crane (*Balearica regulorum*) Blue Crane (*Anthopoides paradiseus*) Denham's Bustard (*Neotis denhami*) Bearded Vulture (*Gypaetus barbatus*) Crowned Eagle (*Stephanoaetus coronatus)*	
					Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a C. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category.	Fish Response Assessment Index (FRAI) *Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT)	FRAI ≥ 62% Ensure all flow habitat classes are present for the following species: BNAT, BANO
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to maintain or improved to a Target Ecological Category (TEC) of a C.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae 2 spp Leptophlebiiidae Trichorythidae Heptageniidae Hydropsychidae 2spp.	3 biotopes sampled: assemblages to be A to B abundances SASS 5 score: ≥120 Average Score per Taxon (ASPT): ≥4.8 MIRAI ≥ 62%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% to <40%
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 62%

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
		Spring Grove Dam/ Means Weir **V20D**	**7.4**	Quantity	Dam level	Update and review operating rules to sustain optimal dam levels to support users and downstream aquatic ecosystem. The dam level must be managed to protect ecosystem function as well as downstream users.	Minimal operating level required in the dam.	
				Quality	Nutrients	Concentration of total nitrate must be maintained to sustain ecosystem health and the water quality requirements of water users. The dam must be maintained as an oligo-mesotrophic system.	Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤0.5 milligrams per Litre (mg/L) (50^{th} percentile)
							Ortho-phosphate (PO_4^-) as Phosphorus	≤0.01 milligrams per Litre (mg/L) (50^{th} percentile)
					Salts	The salinity in the dam must be maintained to support ecosystem health and the water quality requirements of the downstream users. Good current state to be maintained.	Total Dissolved Solids	≤100 milligrams per Litre (mg/L) (95^{th} percentile)
					System variables	The water must be acceptable for recreational use.	pH	6.5 – 9.0 (5^{th} and 95^{th} percentile)
						Increased clarity with reading. Must not deviate more than 10% from background levels	Turbidity	
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)
				Biota	Periphyton/ phytoplankton	The Chlorophyll-*a* concentrations must be maintained as an oligo-mesotrophic system. Aesthetic quality of the dam must be managed by control of phytoplankton/periphyton growth.	Chlorophyll-*a*	11-20 micrograms per Litre (µg/L) (50^{th} percentile)
		Downstream Spring Grove Dam to outlet of V20G **V20D (lower) and V20E,**	**7.5 (a)***	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Mooi River at the EWR site Thukela_EWR11 (-29.116, 30.135) in V20G NMAR = 301.14 x$10^6 m^3$ Target Ecological Category (TEC) of a C/D.	Maintenance and drought flows required for the Mooi River in the short term until the uMWP-1 transfer to the Mooi/ Mngeni is in operation, then Target Ecological Category (TEC) of a B/C requirement for compliance Monitoring of flows at V2H004	

	Maintenance low flows (m^3/s)	Drought flows (m^3/s)
Oct	0.898	0.350
Nov	1.054	0.440
Dec	1.270	0.650
Jan	1.578	0.800
Feb	1.982	0.960
Mar	1.847	0.900

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure				
		portion of V20G (Thukela_ EWR11) **(***Note: *Current before Umkomaas transfer***)**				The maintenance low flows and drought flows must be attained to support the upstream aquatic ecosystem of the Mooi River to the confluence with the Mnyamvubu River.		Apr	1.741		0.720	
								May	1.359		0.600	
								Jun	1.112		0.450	
								Jul	0.944		0.350	
								Aug	0.850		0.250	
								Sep	0.878		0.280	
					High flows	Ecological Water Requirements (EWR) freshets/ floods to be released from Spring Grove Dam	Freshets/ floods required for the Mooi River Monitoring of flows at V2H004		Freshet (m^3/s)	Days	Flood (m^3/s)	Days
								Nov	6	2		
								Dec	6	2	15	3
								Jan	15	3	20	3
								Feb	6	2	30	6
								Mar	15	3	14	3
				Quality	Nutrients	Nutrient levels should not deteriorate and should support aquatic ecosystem and sustain the Target Ecological Category (TEC) of a C/D	Orthophosphate as P	≤0.01 milligrams per Litre (mg/L) (50th percentile)				
							Total Inorganic Nitrogen as TIN	≤0.5 milligrams per Litre (mg/L) (50th percentile)				
					Salts	Salinity concentrations must be maintained to sustain good water quality state and ecological condition.	Total Dissolved Solids	≤350 milligrams per Litre (mg/L) (95th percentile)				
					System variables	pH must be maintained within the prescribed range.	pH	6.5 (5th percentile) – 9.0 (95th percentile)				
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)				
				Habitat	Instream	Natural flow pattern must be maintained or improved to a C/D Ecological Category.	Index of Habitat Integrity (IHI): Instream	IHI ≥ 52%				
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a C/D. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C/D ecological category. Ensure all flow habitat classes are present for the following species: BNAT, BANO	Fish Response Assessment Index (FRAI) *Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT) *Labeo molybdinus* (LMOL)	FRAI ≥ 52%				

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to maintain or improved to a Target Ecological Category (TEC) of a C/D.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae 2 spp Leptophlebiiidae Heptageniidae Hydropsychidae 2spp Elmidae	3 biotopes sampled: assemblages to be A to B abundances. SASS 5 score: ≥80 – 100 Average Score per Taxon (ASPT): ≥4.5 MIRAI ≥ 52%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% to <40%
					Riparian habitat	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C/D Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 52%
		Downstream Spring Grove Dam to outlet of V20G **V20D (lower) and V20E, portion of V20G** **(Thukela_ EWR11)** **(***Note: **long term, after Umkomaas transfer is implemented and transfers out of the system are reduced***)**	**7.5 (b)****	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Mooi River at the EWR site Thukela_EWR11 (-29.116, 30.135) in V20G NMAR = 301.14 x10⁶m³ Target Ecological Category (TEC) of a of a B/C category The maintenance low flows and drought flows must be attained to support the upstream aquatic ecosystem of the Mooi River to the confluence with the Mnyamvubu River.	Maintenance and drought flows required for the Mooi River in the medium to long term when the uMWP-1 transfer to the Mooi/ Mngeni is operational Monitoring of flows at V2H004	
								Oct: Maintenance low flows (m³/s) 1.539; Drought flows (m³/s) 0.350
								Nov: 1.835; 0.440
								Dec: 2.260; 0.650
								Jan: 2.858; 0.800
								Feb: 4.554; 1.208
								Mar: 3.379; 0.900
								Apr: 3.166; 0.720
								May: 2.433; 0.600
								Jun: 1.947; 0.450
								Jul: 1.627; 0.350
								Aug: 1.446; 0.250
								Sep: 1.494; 0.280
					High Flows	Ecological Water Requirements (EWR) freshets/ floods to be released from Spring Grove Dam	Freshets/ floods required for the Mooi River Monitoring of flows at V2H004	Oct: Freshet (m³/s) 6; Days 2
								Nov: 6; 2
								Dec: 15; 3; Flood (m³/s) 25; Days 3
								Jan: 21; 3; 25; 3
								Feb: 15; 3; 35; 6
								Mar: 15; 3; 25; 3
								Apr: 6; 2
				Quality	Nutrients	Instream concentration of nutrients as specified must be	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.06 milligrams per Litre (mg/L) (50th percentile)

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
						attained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤2.0 milligrams per Litre (mg/L) (50^{th} percentile)
					Salts	Instream salinity levels as specified must be attained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Total Dissolved Solids	≤250 milligrams per Litre (mg/L) (95^{th} percentile)
					System variables	pH must be maintained within the prescribed range	pH	6.5 (5^{th} percentile) and 9.0 (95^{th} percentile)
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)
					Toxic substances	The concentrations of toxic substances must pose no risk to aquatic organisms and to human health.	Atrazine	≤0.08 milligrams per Litre (mg/L)
							Mancozeb	≤0.009 milligrams per Litre (mg/L)
				Habitat	Instream	Natural flow pattern must be improved to a Target Ecological Category (TEC)of a B/C.	Index of Habitat Integrity (IHI): Instream	Instream Habitat Integrity (class B/C) Ecological Category (≥ 72%)
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a B/C. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed B/C ecological category.	Fish Response Assessment Index (FRAI) *Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT) *Anguilla mossambica* (AMOS) *Anguilla bengalensis* (ALAB) *Barbus (Enteromius) viviparus* (BVIV) *Labeo rubromaculatus* (LRUB) *Labeo molybdinus* (LMOL) *Barbus (Enteromius) pallidus* (BPAL)	FRAI ≥ 72% Ensure all flow habitat classes are present for the following species: BNAT, BANO, BVIV, BPAL – 3 of the 4 vegetation/ cover representatives. 1 of following AMOS, ALAB, LRUB as flow dependent and depth class representatives.
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to maintain or improved to a Target Ecological Category (TEC) of a B/C.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae 2 spp Leptophlebiiidae Trichorythidae Heptageniidae	3 biotopes sampled: assemblages to be A to B abundances. SASS 5 score: ≥150 Average Score per Taxon (ASPT): ≥5.5 MIRAI ≥ 72%

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
							Hydropsychidae 2spp Elmidae Psephenidae Perlidae Oligoneuridae	
					Diatoms	Ecological category should be maintained as B.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 15 - 17 %PTV: <20%
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ B/C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 72%
		Joubertsvlei to confluence with Mooi **V20E**	**7.6**	Quality	Nutrients	Nutrient levels attained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.02 milligrams per Litre (mg/L) (50^{th} percentile)
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤1.0 milligrams per Litre (mg/L) (50^{th} percentile)
					Salts	Salinity concentrations must be maintained to support water user requirements and sustain the ecological state	Total Dissolved Solids	≤195 milligrams per Litre (mg/L) (95^{th} percentile)
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)
					Toxic substances	The concentrations of toxic substances must pose no risk to aquatic organisms and to human health.	Atrazine	≤0.08 milligrams per Litre (mg/L)
							Mancozeb	≤0.009 milligrams per Litre (mg/L)
							Glyphosate	≤0.7 milligrams per Litre (mg/L)
				Biota	Diatoms	Ecological category should be maintained as D.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 8 - 10 %PTV: 40% - 60%

Table 9: Resource Quality Objectives for RIVERS AND DAMS in priority Resource Units in the Integrated Unit of Analysis 8 – MIDDLE/ LOWER MOOI RIVER

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit
IUA 8: Middle/	**III**	Craigieburn Dam **V20F**	**8.2**	Quantity	Dam level	Update and review operating rules to sustain optimal dam levels to support users and downstream aquatic ecosystem. The dam level must be managed to protect	Minimal operating level required in the dam.	

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit		
						ecosystem function as well as downstream users.				
				Quality	Nutrients	The nutrients levels must be maintained to sustain ecosystem health and the water quality requirements of water users. The dam must be maintained as an oligo-mesotrophic system	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.02 milligrams per Litre (mg/L) (50th percentile)		
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤1.0 milligrams per Litre (mg/L) (50th percentile)		
					Salts	The salinity in the dam must be maintained to support ecosystem health and the water quality requirements of the downstream users.	Total Dissolved Solids	≤195 milligrams per Litre (mg/L) (95th percentile)		
					System variables	The water must be acceptable for recreational use.	pH	≥6.5 (5th percentile) and ≤9.0 (95th percentile)		
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)		
				Biota	Periphyton/ phytoplankton	The Chlorophyll-*a* concentrations must be maintained in a mesotrophic state.	Chlorophyll-*a*	11-20 micrograms per Litre (µg/L) (50th percentile)		
		Mnyamvubu downstream dam to confluence with Mooi **V20G** **(THU_EWR21)**	**8.3**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Mnyamvubu River at the EWR site THU_EWR 21 (-29.1610, 30.2884) in V20G NMAR = 31.71 x10^{6}m^3 (Target Ecological Category (TEC) of a C category. The maintenance low flows and drought flows must be attained to support the downstream aquatic ecosystem to the Mooi River confluence.	Maintenance and drought flows required for the Mnyamvubu River downstream Craigieburn Dam. Monitoring of flows at V2H016		Maintenance low flows (m^3/s)	Drought flows (m^3/s)
								Oct	0.101	0.052
								Nov	0.126	0.064
								Dec	0.15	0.075
								Jan	0.189	0.094
								Feb	0.224	0.111
								Mar	0.207	0.103
								Apr	0.178	0.089
								May	0.116	0.06
								Jun	0.084	0.044
								Jul	0.07	0.037
								Aug	0.069	0.037
								Sep	0.085	0.045
				Quality	Nutrients	Nutrient levels must be maintained to support aquatic ecosystem and the good water quality condition. Water quality deterioration must be prevented.	Ortho-phosphate as P	≤0.01 milligrams per Litre (mg/L) (50th percentile)		
							Total Inorganic Nitrogen as TIN	≤0.5 milligrams per Litre (mg/L) (50th percentile)		
					Salts	Salinity concentrations must be maintained to sustain good water	Total Dissolved Solids	≤120 milligrams per Litre (mg/L) (95th percentile)		

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit
						quality state and ecological condition.		
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)
				Habitat	Instream	Natural flow pattern must be maintained to a Target Ecological Category (TEC) of a C.	Index of Habitat Integrity (IHI): Instream	IHI Instream (class C) Ecological Category (≥ 62%)
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a C. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category	Fish Response Assessment Index (FRAI) *Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT) *Anguilla mossambica* (AMOS) *Labeo molybdinus* (LMOL) *Barbus (Enteromius) pallidus* (BPAL) *Tilapia sparrmanii* (TSPA)	FRAI ≥ 62% Ensure all flow habitat classes are present for the following species: BNAT, BANO, BVIV, BPAL – 3 of the 4 vegetation/ cover representatives. 1 of following AMOS, ALAB, LRUB as flow dependent and depth class representatives
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained in a Target Ecological Category (TEC) of a C.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae >2 spp Leptophlebiiidae Trichorythidae Hydropsychidae >2spp Atydae Hydracarina	3 biotopes sampled: assemblages to be A to B abundances. SASS 5 score: ≥120 Average Score per Taxon (ASPT): ≥4.8 MIRAI ≥ 62%
					Diatoms	Ecological category should be maintained as B.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 15 - 17 %PTV: <20%
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 62%

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit				
		Mooi from Mnyamvubu to Thukela confluence **V20H, J (THU_EWR 12A)**	**8.6**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Mooi River at the EWR site THU_ EWR12A (-29.9193, 30.4189) in V20H NMAR = 361.85 x10^{6}m^{3} Target Ecological Category (TEC) of a category. The maintenance low flows and drought flows must be attained to support the downstream aquatic ecosystem of the Mooi River to the confluence with the Thukela River.	Maintenance and drought flows required for the Mooi River Monitoring of flows at V2H008		Maintenance Low flows (m^3/s)		Drought Low flows (m^3/s)	
								Oct	1.647		0.849	
								Nov	2.095		0.914	
								Dec	2.586		1.287	
								Jan	3.48		1.704	
								Feb	4.196		2.046	
								Mar	3.819		1.862	
								Apr	3.266		1.607	
								May	2.233		1.122	
								Jun	1.621		0.839	
								Jul	1.351		0.711	
								Aug	1.284		0.679	
								Sep	1.503		0.784	
					High Flows	Ecological Water Requirements (EWR) freshets/ floods to be released from Spring Grove and Craigieburn Dams	Freshets/ floods required for the Mooi River Monitoring of flows at V2H008		Freshet (m^3/s)	Days	Flood (m^3/s)	Days
								Sep	6	2		
								Oct	8	2		
								Nov	8	2		
								Dec	8	2	20	3
								Jan	15	3	33	3
								Feb	15	2	40	6
								Mar	15	3	20	3
								Apr	8	2		
				Quality	Nutrients	Instream levels of nutrients must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.02 milligrams per Litre (mg/L) (50th percentile)				
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤1.0 milligrams per Litre (mg/L) (50th percentile)				
					Salts	Salinity concentrations must be attained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Total Dissolved Solids	≤350 milligrams per Litre (mg/L) (95th percentile)				
					System variables	The water must be acceptable for recreational use.	pH	6.5 (5th percentile) and 9.0 (95th percentile)				
					Toxic substances	The concentrations of toxic substances must pose no risk to	Atrazine	≤0.08 milligrams per Litre (mg/L)				
							Mancozeb	≤0.009 milligrams per Litre (mg/L)				

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit
						aquatic organisms and to human health.	Glyphosate	≤0.7 milligrams per Litre (mg/L)
				Habitat	Instream	Natural flow pattern must be improved to a Target Ecological Category (TEC) of a C.	Index of Habitat Integrity (IHI): Instream	IHI ≥62%
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a C. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category	Fish Response Assessment Index (FRAI) *Anguilla mossambica* (AMOS) *Labeobarbus natalensis* (BNAT) *Barbus (Enteromius) viviparus* (BVIV) *Clarias gariepinus* (CGAR) *Labeo molybdinus* (LMOL) *Barbus (Enteromius) pallidus* (BPAL) *Tilapia sparrmanii* (TSPA) *Amphilius natalensis* (ANAT)	FRAI ≥ 62% Ensure all flow habitat classes are present for the following species: BNAT, BVIV, BPAL and TSPA – 3 of the 4 vegetation/ cover representatives. 1 of following AMOS, and LMOL as flow dependent and depth class representatives.
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained or improved to a Target Ecological Category (TEC) of a C.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae >2 spp Leptophlebiiidae Atydae Aeshnidae Hydropsychidae >2spp	3 biotopes sampled: assemblages to be A to B abundances SASS 5 score: 124 - 200 Average Score per Taxon (ASPT): 5.4 - 7.5 MIRAI ≥ 62%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% - < 40%
					Riparian habitat	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 62%

Table 10: Resource Quality Objectives for RIVERS AND DAMS in priority Resource Units in the Integrated Unit of Analysis 9: MIDDLE/ LOWER BUSHMAN'S RIVER

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit
IUA 9: MIDDLE/	**III**	Wagendrift Dam	**9.2**	Quantity	Dam level	Update and review operating rules to sustain optimal dam levels to support users and downstream aquatic ecosystem. The dam level must be managed to protect	Minimal operating level based on the operating rules required in the dam.	

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit
		V70C				ecosystem function as well as downstream users.		
				Quality	Nutrients	Nutrients levels must be maintained to sustain ecosystem health and the water quality requirements of water users. The dam must be maintained as a mesotrophic system or better.	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.01 milligrams per Litre (mg/L) (50th percentile)
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤1.0 milligrams per Litre (mg/L) (50th percentile)
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)
				Biota	Periphyton/ phytoplankton	The Chlorophyll-*a* concentrations must be maintained in a mesotrophic state.	Chlorophyll-*a*	11-20 micrograms per Litre (µg/L) (50th percentile)
		Little Bushman's to confluence with Bushman's **V70D**	**9.3**	Quality	Nutrients	Nutrient levels must be maintained to the support aquatic ecosystem and sustain the ecological state. Improvement in levels is required.	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.06 milligrams per Litre (mg/L) (50th percentile)
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤2.0 mg/L (50th percentile)
					Salts	Salinity concentrations must be maintained to support aquatic ecosystem and sustain the ecological state	Total Dissolved Solids	≤300 mg/L (95th percentile)
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5th percentile) and ≤9.0 (95th percentile)
				Habitat	Instream	Natural flow pattern must be maintained or improved to a Target Ecological Category (TEC) of C.	Index of Habitat Integrity (IHI): Instream	IHI ≥62%
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a C.	Fish Response Assessment Index (FRAI) *Anguilla mossambica* (AMOS) *Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT)	Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category FRAI ≥ 62% Ensure all flow habitat classes are present for the following species: BNAT, BANO – 5 specimens of each.

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit
								AMOS, 1 -2 specimens as flow dependent and depth class representatives.
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained or improved to a Target Ecological Category (TEC) of a C.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae 2 spp Leptophlebiidae Hydropsychidae 2spp Heptageniidae Elmidae	3 biotopes sampled: assemblages to be A to B abundances SASS 5 score: ≥120 Average Score per Taxon (ASPT): ≥4.8 MIRAI ≥ 62%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% - < 40%
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 62%
		Bushman's from Wagendrift Dam to confluence with Rens-burgspruit downstream of Estcourt **V70E, V70F, (Upper portion) V70G**	**9.4**	Quality	Nutrients	Nutrient levels must be maintained to the support aquatic ecosystem and sustain the ecological state. Improvement in levels is required.	Orthophosphate (PO_4^-) as Phosphorus	≤0.06 milligrams per Litre (mg/L) (50th percentile)
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤2.0 milligrams per Litre (mg/L) (50th percentile)
					Salts	Salinity concentrations must be maintained to support aquatic ecosystem and sustain the ecological state	Total Dissolved Solids	≤350 milligrams per Litre (mg/L) (95th percentile)
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5th percentile) and ≤9.0 (95th percentile)
					Toxic substances	The concentrations of toxic substances must pose no risk to aquatic organisms and to human health.	Ammonia as N	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)
							Atrazine	≤0.08 milligrams per Litre (mg/L)
							Mancozeb	≤0.009 milligrams per Litre (mg/L)

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit				
							Glyphosate	≤0.7 milligrams per Litre (mg/L)				
		Bushman's from Rensburgspruit Dam to outlet of V70F **V70F (lower)** **(Thukela_ EWR 5)**	**9.5 (a)**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Bushman's River at the EWR site Thukela_ EWR5 (-28.897, 30.035) in V70F NMAR = 281.45 x10^{6}m^3 Target Ecological Category (TEC) of a C. The maintenance low flows and drought flows must be attained to support the aquatic ecosystem of the Bushman's River downstream of Wagendrift Dam to the EWR site.	Maintenance and drought flows required for the Bushman's River		Maintenance Low flows (m^3/s)		Drought Low flows (m^3/s)	
								Oct	0.959		0.472	
								Nov	1.204		0.544	
								Dec	1.496		0.710	
								Jan	1.881		0.881	
								Feb	2.315		1.078	
								Mar	2.154		1.002	
								Apr	2.006		0.938	
								May	1.495		0.71	
								Jun	1.144		0.556	
								Jul	0.895		0.444	
								Aug	0.800		0.402	
								Sep	0.849		0.425	
					High Flows	Ecological Water Requirements (EWR) freshets/ floods to be released from Wagendrift Dam (short terms and Mielietuin Dam (long term)	Freshets/ floods required for the Bushman's River Monitoring of flows at V7H020		Freshet (m^3/s)	Days	Flood (m^3/s)	days
								Oct	6	3		
								Nov	16	3		
								Dec	18	4	20	4
								Jan	20	4	25	4
								Feb	16	3	40	6
								Mar	16	3	20	5
				Quality	Nutrients	Nutrient levels must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.058 milligrams per Litre (mg/L) (50th percentile)				
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤2.0 milligrams per Litre (mg/L) (50th percentile)				
					Salts	Salinity concentrations must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Total Dissolved Solids	≤350 milligrams per Litre (mg/L) (95th percentile)				
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5th percentile) and ≤9.0 (95th percentile)				
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)				
					Toxic substances	The concentrations of toxic substances must pose no risk to	Ammonia as N	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)				
							Atrazine	≤0.08 milligrams per Litre (mg/L)				

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit
						aquatic organisms and to human health	Mancozeb	≤0.009 milligrams per Litre (mg/L)
							Glyphosate	≤0.7 milligrams per Litre (mg/L)
				Habitat	Instream	Natural flow pattern must be improved to a Target Ecological Category (TEC) of a C.	Index of Habitat Integrity (IHI): Instream	IHI ≥62%
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a C. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category.	Fish Response Assessment Index (FRAI) *Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT) **–** *Barbus (Enteromius) trimaculatus* (BTRI) *Barbus (Enteromius) viviparus* (BVIV) *Anguilla mossambica* (AMOS) *Labeo rubromaculatus* (LRUB) *Tilapia sparrmanii* (TSPA)	FRAI ≥ 62% Ensure all flow habitat classes are present for the following species: BNAT, BVIV, BANO and TSPA – 3 of the 4 vegetation/ cover representatives. 1 of following AMOS, and LRUB as flow dependent and depth class representatives.
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained or improved to a Target Ecological Category (TEC) of a C.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae 2 spp Leptophlebiidae Heptageniidae Hydropsychidae 2spp Perlidae* Elmidae* Trichorythidae*	3 biotopes sampled: assemblages to be A to B abundances. SASS 5 score: ≥120 Average Score per Taxon (ASPT): ≥4.8 MIRAI ≥ 62%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% - < 40%
					Riparian habitat	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥62%
		Bushman's from outlet of V70F to confluence with Thukela	**9.5 (b)**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Bushman's River at the EWR site THU_EWR6A (-28.8483, 30.1496) in V70G NMAR = 298.37 x10^{6}m^{3}	Maintenance and drought flows required for the lower Bushman's River	

	Maintenance low flows (m^3/s)	Drought flows (m^3/s)
Oct	1.816	0.488
Nov	2.246	0.565
Dec	2.759	0.728
Jan	3.473	0.910

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit				
		V70G **(THU_EWR 6A)**				Target Ecological Category (TEC) of a C/D. The maintenance low flows and drought flows must be attained to support the downstream aquatic ecosystem of the Bushman's River to the confluence with the Thukela River.		Feb	4.238		1.108	
								Mar	3.931		1.027	
								Apr	3.665		0.96	
								May	2.747		0.725	
								Jun	2.121		0.567	
								Jul	1.682		0.454	
								Aug	1.519		0.413	
								Sep	1.625		0.440	
					High Flows	Ecological Water Requirements (EWR) freshets/ floods to be released from Wagendrift Dam (short terms and Mielietuin Dam (long term)	Freshets/ floods required for the Bushman's River Monitoring of flows at V7H020		Freshet (m^3/s)	Days	Flood (m^3/s)	days
								Sep	4	2		
								Oct	6	3		
								Nov	10	3		
								Dec	10	3	20	4
								Jan	20	3	35	4
								Feb	20	4	40	6
				Quality	Nutrients	Nutrient levels must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.06 milligrams per Litre (mg/L) (50th percentile)				
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤2.0 milligrams per Litre (mg/L) (50th percentile)				
					Salts	Salinity concentrations must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Total Dissolved Solids	≤350 milligrams per Litre (mg/L) (95th percentile)				
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5th percentile) and ≤9.0 (95th percentile)				
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)				
					Toxic substances	The concentrations of toxic substances must pose no risk to aquatic organisms and to human health.	Ammonia s N	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)				
							Atrazine	≤0.08 milligrams per Litre (mg/L)				
							Mancozeb	≤0.009 milligrams per Litre (mg/L)				
							Glyphosate	≤0.7 milligrams per Litre (mg/L)				
				Habitat	Instream	Natural flow pattern must be improved to a Target Ecological Category (TEC) of C/D Ecological Category.	Index of Habitat Integrity (IHI): Instream	IHI ≥52%				

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a C/D. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category.	Fish Response Assessment Index (FRAI) *Anguilla mossambica* (AMOS) *Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT) *Barbus (Enteromius) trimaculatus* (BTRI) *Barbus (Enteromius) viviparus* (BVIV) *Clarias gariepinus* (CGAR) *Labeo molybdinus* (LMOL) *Barbus (Enteromius) pallidus* (BPAL) *Tilapia sparrmanii* (TSPA) *Amphilius natalensis* (ANAT)	FRAI ≥ 52% Ensure all flow habitat classes are present for the following species: BNAT, BVIV, BPAL and TSPA – 3 of the 4 vegetation/ cover representatives. 1 of following AMOS, and LMOL as flow dependent and depth class representatives.
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained for a Target Ecological Category (TEC) of a C/D.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae >2 spp Leptophlebiiidae Heptageniidae Hydropsychidae 2spp	At least 2 biotopes sampled: assemblages to be A to B abundances SASS 5 score: 80 - 180 Average Score per Taxon (ASPT): 5.7 - 7.5 MIRAI ≥ 52%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% - < 40%
					Riparian habitat	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C/D Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥52%

Table 11: Resource Quality Objectives for RIVERS AND DAMS in priority Resource Units in the Integrated Unit of Analysis 10: UPPER THUKELA RIVER

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
IUA 10:	**III**	Thukela, Putterill, Majaneni,	**10.1**	Quality	Nutrients	Nutrient levels must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Orthophosphate (PO_4^-) as Phosphorus	≤0.1 milligrams per Litre (mg/L) (50^{th} percentile)
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤2.0 milligrams per Litre (mg/L) (50^{th} percentile)

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
		Khombe tributary catchments **V11A (lower portion), V11C, V11D**			System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5th percentile) and ≤9.0 (95th percentile)
						Instream salinity levels must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Electrical Conductivity	≤ 55 milli Siemens per metre (mS/m) (95th percentile)
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)
					Toxic substances	The concentrations of toxic substances must not pose a risk to aquatic organisms and to human health.	Ammonia as N	≤ 0.0725 milligrams per Litre (mg/L) (95th percentile)
							Atrazine	≤0.08 milligrams per Litre (mg/L)
							Mancozeb	≤0.009 milligrams per Litre (mg/L)
							Glyphosate	≤0.7 milligrams per Litre (mg/L)
				Habitat	Instream	Natural flow pattern must be maintained and/or improved to a Target Ecological Category (TEC) of a B/C.	Index of Habitat Integrity (IHI): Instream	IHI ≥ 72%
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a B/C. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed B/C ecological category	Fish Response Assessment Index (FRAI) *Anguilla mossambica* (AMOS) *Amphilius natalensis* (ANAT) *Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT) *Labeo rubromaculatus* (LRUB)	FRAI ≥ 72% Ensure all flow habitat classes are present for the following species: ANAT, BANO and BNAT – 2 of the 3 vegetation/ cover representatives. 1 of the following AMOS, mature BNAT and LRUB as flow dependent and depth class representatives.
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained for a Target Ecological Category (TEC) of a B/C.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae 2 spp Leptophlebiiidae Heptageniidae Hydropsychidae 2spp Psephidae	At least 2 biotopes sampled: assemblages to be A to B abundances. SASS5: ≥150 Average Score per Taxon (ASPT): ≥15.5 MIRAI ≥ 72%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI)	SPI: 12 – 14 %PTV: 20% - < 40%

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
							Percentage pollution tolerant values (%PTV)	
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ B/C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 72%
		Woodstock Dam **V11D, V11E**	**10.3**	Quantity	Dam level	Update and review operating rules to sustain optimal dam levels to support users and downstream aquatic ecosystem. The dam level must be managed to protect ecosystem function as well as downstream users.	Minimal operating level required in the dam.	
				Quality	Nutrients	Concentration of nutrients must be maintained to sustain ecosystem health and the water quality requirements of water users.	Total Inorganic Nitrogen as TIN	≤0.7 milligrams per Litre (mg/L) (50th percentile)
							Ortho-phosphate as P	≤0.010 milligrams per Litre (mg/L) (50th percentile)
					Salts	The salinity in the dam must be maintained to support ecosystem health and the water quality requirements of the downstream users. The good water quality condition must be maintained.	Total Dissolved Solids	≤100 milligrams per Litre (mg/L) (95th percentile)
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)
				Biota	Periphyton/ phytoplankton	The dam must be maintained as mesotrophic system	Chlorophyll-*a*	11-20 micrograms per Litre (µg/L) 50th percentile
		Sandspruit tributary catchment **V11F**	**10.4**	Quality	Nutrients	Nutrient levels must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Orthophosphate (PO_4^-) as Phosphorus	≤0.06 milligrams per Litre (mg/L) (50th percentile)
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤1.0 milligrams per Litre (mg/L) (50th percentile)
					Salts	Salinity concentrations must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Total Dissolved Solids	≤350 milligrams per Litre (mg/L) (95th percentile)
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range≥	≥6.5 (5th percentile) and ≤9.0 (95th percentile)
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)
					Toxic substances	The concentrations of toxic substances must not pose a risk to aquatic organisms and to human health.	Ammonia as N	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)
							Atrazine	≤0.08 milligrams per Litre (mg/L)
							Mancozeb	≤0.009 milligrams per Litre (mg/L)

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
							Glyphosate	≤0.7 milligrams per Litre (mg/L)
				Habitat	Instream	Natural flow pattern must be maintained and/or improved to a Target Ecological Category (TEC) of C.	Index of Habitat Integrity (IHI): Instream	IHI ≥ 62%
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a C. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category	Fish Response Assessment Index (FRAI) *Anguilla mossambica* (AMOS) *Amphilius natalensis* (ANAT) *Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT)	FRAI ≥ 62% Ensure all flow habitat classes are present for the following species: ANAT, BANO and BNAT – 2 of the 3 vegetation/ cover representatives. 1 of the following AMOS and mature BNAT as flow dependent and depth class representatives.
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained for a Target Ecological Category (TEC) of a C.	South African Scoring System 5 (SASS5) (not measured within this RU but to be achieved) Macroinvertebrate Response Assessment Index (MIRAI) Baetidae 2 spp Leptophlebiidae Heptageniidae Hydropsychidae 2spp Elmidae	At least 2 biotopes sampled; assemblages to be A to B abundances SASS 5 score: ≥120 Average Score per Taxon (ASPT): ≥4.8 MIRAI ≥ 62%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% - < 40%
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI C Ecological Category (≥ 62%)
		Spioenkop Dam **V11L**	**10.8**	Quantity	Dam level	Update and review operating rules to sustain optimal dam levels to support users and downstream aquatic ecosystem. The dam level must be managed to protect ecosystem function as well as downstream users.	Minimal operating level required in the dam.	
				Quality	Nutrients	Concentration of nutrients must be maintained to sustain ecosystem	Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤0.7 milligrams per Litre (mg/L) (50^{th} percentile)

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
						health and the water quality requirements of water users. The good water condition must be protected.	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.01 milligrams per Litre (mg/L) (50th percentile)
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)
				Biota	Periphyton/ phytoplankton	The dam must be maintained as a mesotrophic system	Chlorophyll-*a*	11-20 micrograms per Litre (µg/L) (50th percentile)
		Spioenkop Dam to Little Thukela confluence **V11M** **EWR 2**	**10.9**	Quantity	Low flows	Base flow pattern must be maintained for drought and maintenance flows	Base Flow	Maintenance Low flows (m^3/s) / Drought Low flows (m^3/s) Oct: 1.800 / 0.560 Nov: 2.200 / 0.750 Dec: 3.200 / 1.000 Jan: 3.600 / 1.400 Feb: 4.200 / 2.000 Mar: 4.000 / 1.850 Apr: 3.800 / 1.600 May: 3.000 / 1.200 Jun: 2.500 / 0.900 Jul: 2.000 / 0.650 Aug: 1.800 / 0.520 Sep: 1.800 / 0.510
					High Flows	Ecological Water Requirements (EWR) freshets/ floods to be released from Spioenkop Dam	Freshets/ floods required for the Thukela River Monitoring of flows at V1H057	Freshet (m^3/s) / Days / Flood (m^3/s) / days Sep: 7 / 3 / / Oct: 7 / 3 / / Nov: 10 / 5 / / Dec: 15 / 5 / 30 / 5 Jan: 24 / 5 / 35 / 6 Feb: 30 / 5 / 35 / 7 Mar: 20 / 5 / 25 / 6 Apr: 7 / 3 / /
				Quality	Nutrients	Nutrient levels must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.02 milligrams per Litre (mg/L) (50th percentile)
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤1.0 milligrams per Litre (mg/L) (50th percentile)
					Toxic substances	The concentrations of toxic substances must not pose a risk to aquatic organisms and to human health.	Ammonia as N	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)
							Atrazine	≤0.08 milligrams per Litre (mg/L)
							Mancozeb	≤0.009 milligrams per Litre (mg/L)

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
							Glyphosate	≤0.7 milligrams per Litre (mg/L)
				Habitat	Instream	Natural flow pattern must be improved to a Target Ecological Category (TEC) of a C/D.	Index of Habitat Integrity (IHI): Instream	IHI ≥ 52%
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a C/D. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C/D ecological category	Fish Response Assessment Index (FRAI) *Anguilla mossambica* (AMOS) *Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT) *Labeo rubromaculatus* (LRUB) *Oreochromis mossambicus* (OMOS)	FRAI ≥ 52% Ensure all flow habitat classes are present for the following species: BNAT, BANO and OMOS – 2 of the 3 vegetation/ cover representatives. 1 of the following AMOS, and LRUB as flow dependent and depth class representatives.
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained for a Target Ecological Category (TEC) of a C/D.	South African Scoring System 5 (SASS5) (not measured within this RU but to be achieved) Macroinvertebrate Response Assessment Index (MIRAI) Baetidae 2 spp Leptophlebiiidae Heptageniidae Hydropsychidae 2spp	At least 2 biotopes sampled: assemblages to be A to B abundances. SASS 5 score: ≥80 – 100 Average Score per Taxon (ASPT): ≥4.5 MIRAI ≥ 52%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% - < 40%
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C/D Ecological Category.	Vegetation Response Assessment Index (VEGRAI) Index of Habitat Integrity (IHI): Riparian	VEGRAI survey every 5 years. VEGRAI ≥ 52%
		Sterkspruit, Situlwane tributary catchment **V13B, V13D**	**10.10**	Quality	Nutrients	Nutrient levels must be maintained to the support aquatic ecosystem and sustain the ecological state.	Orthophosphate (PO_4^-) as Phosphorus	≤0.02 milligrams per Litres (mg/L) (50th percentile)
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤1.0 milligrams per Litres (mg/L) (50th percentile)
					Toxic substances	The concentrations of toxic substances must not pose a risk to aquatic organisms and to human health.	Ammonia as N	≤ 0.07 milligrams per Litres (mg/L) (95th percentile)
							Atrazine	≤0.08 milligrams per Litres (mg/L)
							Mancozeb	≤0.009 milligrams per Litres (mg/L)
							Glyphosate	≤0.7 milligrams per Litres (mg/L)

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
				Habitat	Instream	Natural flow pattern must be maintained and/or improved to a Target Ecological Category (TEC) of a B/C.	Index of Habitat Integrity (IHI): Instream	IHI ≥ 72%		
				Biota	Fish	Flow and water quality sensitive fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a B/C. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed B/C ecological category	Fish Response Assessment Index (FRAI) *Anguilla mossambica* (AMOS) *Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT) *Clarias gariepinus* (CGAR) *Labeo rubromaculatus* (LRUB) *Oreochromis mossambicus* (OMOS) *Amphilius natalensis* (ANAT)	FRAI ≥ 72% Ensure all flow habitat classes are present for the following species: BNAT, BANO, OMOS and ANAT – 3 of the 4 vegetation/ cover representatives. CGAR present. 2 of the following AMOS, mature BNAT and LRUB as flow dependent and depth class representatives.		
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained for a Target Ecological Category (TEC) of a B/C.	South African Scoring System 5 (SASS5) (not measured within this RU but to be achieved) Macroinvertebrate Response Assessment Index (MIRAI) Baetidae >2 spp Leptophlebiiidae Heptageniidae Tricorythidae Hydropsychidae 2spp Elmidae Psepheniidae Dixidae	3 biotopes to be sampled: assemblages to be A to B abundances. SASS 5 score: ≥150 Average Score per Taxon (ASPT): ≥5.5 MIRAI ≥ 72%		
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% - < 40%		
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ B/C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 72%		
		Little Tugela from IUA14 outlet to	**10.11**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Little Thukela River at the EWR	Maintenance and drought flows required for the Little Thukela River		Maintenance low flows (m^3/s)	Drought flows (m^3/s)
								Oct	0.510	0.200

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
		confluence with Thukela River **V13A (lower portion), V13C, V13E** **(Thukela_ EWR 3)**				site Thukela_EWR3 (-28.383, 29.616) in V13E NMAR = 285.20 x10^{6}m^3 Target Ecological Category (TEC) of a C/D. The maintenance low flows and drought flows must be attained to support the upstream aquatic ecosystem of the Little Thukela River.		Nov	0.700	0.300
								Dec	0.970	0.400
								Jan	1.400	0.930
								Feb	1.920	1.300
								Mar	1.830	1.230
								Apr	1.500	1.030
								May	1.100	0.700
								Jun	0.750	0.400
								Jul	0.550	0.200
								Aug	0.450	0.150
								Sep	0.450	0.150
				Quality	Nutrients	Nutrient levels must be maintained to the support aquatic ecosystem and sustain the ecological state. Deterioration must be prevented	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.02 milligrams per Litre (mg/L) (50th percentile)		
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤2.0 milligrams per Litre (mg/L) (50th percentile)		
					Salts	Salinity concentrations must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Total Dissolved Solids	≤350 milligrams per Litre (mg/L) (95th percentile)		
					Toxic substances	The concentrations of toxic substances must not pose a risk to aquatic organisms and to human health.	Ammonia as N	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)		
							Atrazine	≤0.08 milligrams per Litre (mg/L)		
							Mancozeb	≤0.009 milligrams per Litre (mg/L)		
							Glyphosate	≤0.7 milligrams per Litre (mg/L)		
				Habitat	Instream	Natural flow pattern must be maintained and/or improved to a Target Ecological Category (TEC) of a C/D.	Index of Habitat Integrity (IHI): Instream	IHI ≥52%		
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a C/D. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C/D ecological category.	Fish Response Assessment Index (FRAI) *Anguilla mossambica* (AMOS) *Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT) *Labeo rubromaculatus* (LRUB) *Amphilius natalensis* (ANAT) *Labeo molybdinus* (LMOL)	FRAI ≥ 52% Ensure all flow habitat classes are present for the following species: BNAT, BANO and ANAT – 2 of the 3 vegetation/ cover representatives. 1 of the following AMOS, mature BNAT and LMOL as flow dependent and depth class representatives.		

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained for a Target Ecological Category (TEC) of a C/D.	South African Scoring System 5 (SASS5) (not measured within this RU but to be achieved) Macroinvertebrate Response Assessment Index (MIRAI) Baetidae >2 spp Leptophlebiiidae Heptageniidae Oligoneuridae Tricorythidae Hydropsychidae 1spp Polycentropodidae Elmidae Psephenidae	At least 2 biotopes sampled: assemblages to be A to B abundances. SASS 5 score: ≥80 - 100 Average Score per Taxon (ASPT): ≥4.5 MIRAI ≥ 52%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% - < 40%
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C/D Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 52%
		Tugela from Little Tugela confluence to proposed Jana Dam/ Klip River confluence **V14A, V14B**	**10.12**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Thukela River at the confluence of the Klip River in V14B NMAR = 1145.20 x10^{6}m^3 Target Ecological Category (TEC) of a C/D. The maintenance low flows and drought flows must be attained to support the upstream aquatic ecosystem to the Thukela River.	Maintenance and drought flows required for the Thukela River Monitoring of flows at V1H001	
								Maintenance Low flows (m^3/s) / Drought Low flows (m^3/s)
								Oct: 2.274 / 0.883
								Nov: 2.949 / 1.131
								Dec: 3.784 / 1.435
								Jan: 5.260 / 1.974
								Feb: 7.202 / 2.690
								Mar: 6.744 / 2.517
								Apr: 5.892 / 2.207
								May: 4.350 / 1.641
								Jun: 3.288 / 1.255
								Jul: 2.538 / 0.979
								Aug: 2.157 / 0.840
								Sep: 2.155 / 0.841
				Quality	Nutrients	Nutrient levels should not deteriorate and should support aquatic ecosystem and sustain the present ecological state (PES B)	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.10 milligrams per Litre (mg/L) (50th percentile)
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤2.0 milligrams per Litre (mg/L) (50th percentile)
					Salts	Total Dissolved Solids needs to be maintained to support aquatic	Total Dissolved Solids	≤350 milligrams per Litre (mg/L) (95th percentile)

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
						ecosystem and sustain the present ecological state (PES B)		
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)
					Toxic substances	The concentrations of toxic substances must not pose a risk to aquatic organisms and to human health.	Ammonia as N	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)
							Atrazine	≤0.08 milligrams per Litre (mg/L)
							Mancozeb	≤0.009 milligrams per Litre (mg/L)
							Glyphosate	≤0.7 milligrams per Litre (mg/L)
				Habitat	Instream	Natural flow pattern must be maintained and/or improved to a Target Ecological Category (TEC) of a C/D.	Index of Habitat Integrity (IHI): Instream	IHI ≥ 52%
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a C/D. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C/D ecological category	Fish Response Assessment Index (FRAI) *Anguilla mossambica* (AMOS) *Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT) *Labeo rubromaculatus* (LRUB) *Amphilius natalensis* (ANAT)	FRAI ≥ 52% Ensure all flow habitat classes are present for the following species: BNAT, BANO and ANAT – 2 of the 3 vegetation/ cover representatives. 1 of the following AMOS, mature BNAT and LRUB as flow dependent and depth class representatives.
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained for a Target Ecological Category (TEC) of a C/D.	South African Scoring System 5 (SASS5) (not measured within this RU but to be achieved) Macroinvertebrate Response Assessment Index (MIRAI) Baetidae >2 spp Leptophlebiidae Heptageniidae Oligoneuridae Tricorythidae Hydropsychidae 1spp Polycentropodidae Elmidae Psephenidae	At least 2 biotopes sampled: assemblages to be A to B abundances. SASS 5 score: ≥80 - 100 Average Score per Taxon (ASPT): ≥4.5 MIRAI ≥ 52%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI)	SPI: 12 - 14

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
							Percentage pollution tolerant values (%PTV)	%PTV: 20% - < 40%
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C/D Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 52%

Table 12: Resource Quality Objectives for RIVERS AND DAMS in priority Resource Units in the Integrated Unit of Analysis 11: KLIP RIVER

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
IUA 11: KLIP RIVER	**III**	Sandspruit and tributaries **V12D, V12E and V12F**	**11.1**	Quality	Nutrients	Nutrient levels must be maintained to the support aquatic ecosystem and sustain the ecological state. Deterioration must be prevented	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.058 milligrams per Litre (mg/L) (50^{th} percentile)
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤2.0 milligrams per Litre (mg/L) (50^{th} percentile)
					Salts	Salinity concentrations must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Total Dissolved Solids	≤350 milligrams per Litre (mg/L) (95^{th} percentile)
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)
				Habitat	Instream	Natural flow pattern must be maintained and/or improved to a Target Ecological Category (TEC) of a C/D.	Index of Habitat Integrity (IHI): Instream	IHI ≥ 52%
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a C/D. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C/D ecological category.	Fish Response Assessment Index (FRAI) *Anguilla mossambica* (AMOS) *Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT) *Labeo rubromaculatus* (LRUB) *Clarias gariepinus* (CGAR) *Amphilius natalensis* (ANAT)	FRAI ≥ 52% Ensure all flow habitat classes are present for the following species: BNAT, BANO, CGAR (juvenile) and ANAT – 3 of the 4 vegetation/ cover representatives. 2 of the following AMOS, mature BNAT and LRUB as flow dependent and depth class representatives.
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained for a Target	SASS 5 (not measured within this RU but to be achieved) MIRAI Baetidae 2 spp	At least 2 biotopes sampled: assemblages to be A to B abundances. SASS 5 score: ≥80 – 100

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
						Ecological Category (TEC) of a C/D.	Leptophlebiiidae Heptageniidae Tricorythidae Elmidae	Average Score per Taxon (ASPT): ≥4.5 MIRAI ≥ 52%		
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% - < 40%		
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C/D Ecological Category	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 52%		
		Klip, Braamhoek, Tatana, Ngoga, Mhlwane, catchments **V12A, V12B, V12C** **(THU_ EWR 22)**	**11.2**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Klip River at the EWR site THU_ EWR22 (-28.3952, 29.7197) in V12A NMAR = 52.44 x$10^6$$m^3$ Target Ecological Category (TEC) of a C category The maintenance low flows and drought flows must be attained to support the upstream and downstream aquatic ecosystem of the Klip River.	Maintenance and drought flows required for the Klip River.		Maintenance low flows (m^3/s)	Drought flows (m^3/s)
								Oct	0.129	0.050
								Nov	0.180	0.028
								Dec	0.227	0.012
								Jan	0.376	0.146
								Feb	0.529	0.298
								Mar	0.407	0.231
								Apr	0.294	0.152
								May	0.174	0.055
								Jun	0.114	0.044
								Jul	0.089	0.047
								Aug	0.087	0.047
								Sep	0.113	0.043
				Quality	Nutrients	Nutrient levels must be maintained to the support aquatic ecosystem and sustain the ecological state. Deterioration must be prevented.	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.06 milligrams per Litre (mg/L) (50^{th} percentile)		
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤2.0 milligrams per Litre (mg/L) (50^{th} percentile)		
					Salts	Salinity concentrations must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Total Dissolved Solids	≤350 milligrams per Litre (mg/L) (95^{th} percentile)		
				Habitat	Instream	Natural flow pattern must be maintained at a Target Ecological Category (TEC) of a C.	Index of Habitat Integrity (IHI): Instream	IHI ≥ 62%		

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a C. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category.	Fish Response Assessment Index (FRAI) *Anguilla mossambica* (AMOS) *Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT) *Labeo rubromaculatus* (LRUB) *Clarias gariepinus* (CGAR) *Amphilius natalensis* (ANAT)	FRAI ≥ 62% Ensure all flow habitat classes are present for the following species: BNAT, ANAT, BANO and juvenile CGAR – 3 of the 4 vegetation/ cover representatives. 2 of the following AMOS, mature BNAT, mature CGAR and LRUB as flow dependent and depth class representatives.		
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained for a Target Ecological Category (TEC) of a C.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Hydracarina Perlidae Baetidae > 2 sp Heptageniidae Leptophlebiidae Aeshnidae Crambidae Ecnomidae Elmidae Psephenidae	3 biotopes sampled: assemblages to be A to B abundances. SASS 5 score: 213 – 220 Average Score per Taxon (ASPT): 5.9 - 7.5 MIRAI ≥ 62%		
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% - < 40%		
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 62%		
		Klip from Ladysmith to confluence with Thukela **V12G**	**11.3**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Klip River at the confluence with the Thukela River in V12G NMAR = 253.09 x$10^6$$m^3$ Target Ecological Category (TEC) of a C. The maintenance low flows and drought flows must be attained to	Maintenance and drought flows required for the Klip River.		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
								Oct	0.623	0.240
								Nov	0.868	0.132
								Dec	1.103	0.078
								Jan	1.816	0.733
								Feb	2.534	1.384
								Mar	1.986	1.088
								Apr	1.435	0.736

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
						support the upstream aquatic ecosystem of the Klip River.		May	0.844	0.270
								Jun	0.550	0.228
								Jul	0.430	0.228
								Aug	0.422	0.239
								Sep	0.547	0.207
				Quality	Nutrients	Nutrient levels must be maintained to the support aquatic ecosystem and sustain the ecological state. Improvement in levels are required	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.06 milligrams per Litre (mg/L) (50th percentile)		
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤2.0 milligrams per Litre (mg/L) (50th percentile)		
					Salts	Salinity concentrations must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met. Improvement in salinity levels required.	Total Dissolved Solids	≤500 milligrams per Litre (mg/L) (95th percentile)		
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5th percentile) and ≤9.0 (95th percentile)		
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)		
					Toxic substances	The concentrations of toxic substances must not pose a risk to aquatic organisms and to human health.	Ammonia as N	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)		
							Aluminium (Al)	≤ 0.1 milligrams per Litre (mg/L) (95th percentile)		
							Cadmium (Cd) soft	≤ 0.001 milligrams per Litre (mg/L) (95th percentile)		
							Manganese (Mn)	≤ 0.2 milligrams per Litre (mg/L) (95th percentile)		
							Iron (Fe)	≤ 0.1 milligrams per Litre (mg/L) (95th percentile)		
							Lead (Pb) hard	≤ 0.009 milligrams per Litre (mg/L) (95th percentile)		
							Copper (Cu) hard	≤ 0.007 milligrams per Litre (mg/L) (95th percentile)		
							Nickel (Ni)	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)		
							Cobalt (Co)	≤ 0.05 milligrams per Litre (mg/L) (95th percentile)		
							Zinc (Zn)	≤ 0.002 milligrams per Litre (mg/L) (95th percentile)		
				Habitat	Instream	Natural flow pattern must be maintained and/or improved to a Target Ecological Category (TEC) of a C.	Index of Habitat Integrity (IHI): Instream	IHI Instream to be maintained and/or improved in a Class C Ecological Category (60%- 79%)		

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a C. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category.	Fish Response Assessment Index (FRAI) *Anguilla mossambica* (AMOS) *Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT) *Labeo rubromaculatus* (LRUB) *Clarias gariepinus* (CGAR) *Amphilius natalensis* (ANAT)	FRAI ≥ 62% Ensure all flow habitat classes are present for the following species: BNAT, BANO, ANAT and juvenile CGAR – 3 of the 4 vegetation/ cover representatives. 2of following AMOS, mature CGAR, mature BNAT and LRUB as flow dependent and depth class representatives.
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained for a Target Ecological Category (TEC) of a C.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae 2 spp Leptophlebiiidae Heptageniidae Hydropsychidae 2spp Elmidae	At least 2 biotopes sampled: assemblages to be A to B abundances. SASS 5 score: ≥120 Average Score per Taxon (ASPT): ≥4.8 MIRAI ≥ 62%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% - < 40%
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 62%

Table 13: Resource Quality Objectives for RIVERS AND DAMS in priority Resource Units in the Integrated Unit of Analysis 12: MIDDLE THUKELA RIVER

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
IUA 12: MIDDLE THUKELA RIVER	**III**	Thukela From Klip confluence to Bushman's confluence	**12.2**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Thukela River at the EWR site Thukela_EWR4B (-28.747, 30.145) in V14E NMAR = 1 423.83 x10^{6}m^3 Target Ecological Category	Maintenance and drought flows required for the Thukela River		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
								Oct	2.278	2.100
								Nov	3.023	2.261
								Dec	3.914	2.065
								Jan	5.650	4.294
								Feb	7.750	5.842

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
		V14E (Thukela_ EWR 4B)				(TEC) of a C. The maintenance low flows and drought flows must be attained to support the aquatic ecosystem of the Thukela River downstream of Klip River to the confluence with the Bushman's River.		Mar 7.001 5.277 Apr 5.949 4.518 May 4.272 3.292 Jun 3.123 2.462 Jul 2.388 2.000 Aug 2.042 2.000 Sep 2.121 2.000
					High Flows	Ecological Water Requirements (EWR) freshets/ floods from Spioenkop Dam and Klip River in the short and medium term and to be released from Jana Dam in the long term	Freshets/ floods required for the Thukela River	Freshet (m^3/s) / Days / Flood (m^3/s) / Days Sep 15 4 Oct 15 4 Nov 55 4 90 6 Dec 55 4 90 6 Jan 90 6 120 7 Feb 55 4 250 8 Mar 55 4 90 6
				Habitat	Instream	Natural flow pattern must be improved to a Target Ecological Category (TEC) of a C.	Index of Habitat Integrity (IHI): Instream	IHI ≥ 62%
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a C. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category	Fish Response Assessment Index (FRAI) *Anguilla mossambica* (AMOS) *Amphilius natalensis* (ANAT) *Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT) *Labeo molybdinus* (LMOL) *Labeo rubromaculatus* (LRUB) *Clarias gariepinus* (CGAR) *Barbus (Enteromius) trimaculatus* (BTRI) *Barbus (Enteromius) viviparus* (BVIV) *Pseudocrenilabrus philander* (PPHI)	FRAI ≥ 62% Ensure all flow habitat classes are present for the following species: BNAT, BVIV, BANO, BTRI and PPHI – 4 of the 5 vegetation/ cover representatives. 4 of the following AMOS, ANAT, mature BNAT, CGAR, LRUB and LMOL as flow dependent and depth class representatives.
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained for a Target Ecological Category (TEC) of a C.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Atyidae Baetidae > 2 sp	3 biotopes sampled: assemblages to be A to B abundances. SASS 5 score: 145 - 200 Average Score per Taxon (ASPT): 6.0 – 7.6

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
							Heptageniidae Leptophlebiidae Chlorocyphidae Crambidae Elmidae	MIRAI ≥ 62%		
					Diatoms	Ecological category should be maintained as B.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 15 - 17 %PTV: < 20%		
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 62%		
		Thukela from Bushman's confluence to d/s Mooi confluence **V60G, V60H, V60J, V60K** **(Thukela _EWR 9)**	**12.4**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Thukela River at the EWR site Thukela_ EWR9 (-28.769, 30.515) in V60J NMAR = 2 050.76 x$10^6$$m^3$ Target Ecological Category (TEC) of a D category The maintenance low flows and drought flows must be attained to support the aquatic ecosystem of the Thukela River from the Bushman's River to the Mooi River confluence.	Maintenance and drought flows required for the Thukela River Monitoring of flows at V6H002		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
								Oct	2.800	1.400
								Nov	3.500	1.700
								Dec	3.800	2.200
								Jan	4.800	3.100
								Feb	6.200	4.000
								Mar	5.800	3.600
								Apr	4.900	3.200
								May	4.700	2.200
								Jun	3.500	1.500
								Jul	2.750	1.300
								Aug	2.450	1.200
								Sep	2.600	1 200
				Quality	Nutrients	Nutrient levels must be maintained to the support aquatic ecosystem and sustain the ecological state.	Orthophosphate (PO_4^-) as Phosphorus	≤0.1 milligrams per Litre (mg/L) (50^{th} percentile)		
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤2.0 milligrams per Litre (mg/L) (50^{th} percentile)		
					Salts	Salinity concentrations must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Total Dissolved Solids	≤500 milligrams per Litre (mg/L) (95^{th} percentile)		
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)		
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5^{th} percentile) and ≤9.0 (95^{th} percentile)		

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
					Toxic substances	The concentrations of toxic substances must not pose a risk to aquatic organisms and to human health	Ammonia as N	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)
				Habitat	Instream	Natural flow pattern must be maintained and/or improved to a Target Ecological Category (TEC) of a D.	Index of Habitat Integrity (IHI): Instream	IHI ≥ 42%
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a D. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed D ecological category.	Fish Response Assessment Index (FRAI) *Anguilla mossambica* (AMOS) *Amphilius natalensis* (ANAT) *Enteromius (Barbus) anoplus* (BANO) *Labeobarbus natalensis* (BNAT) *Labeo molybdinus* (LMOL) *Clarias gariepinus* (CGAR) *Barbus (Enteromius) trimaculatus* (BTRI) *Tilapia sparrmanii* (TSPA)	FRAI ≥ 42% Ensure all flow habitat classes are present for the following species: BNAT, BTRI, juvenile CGAR and TSPA – 3 of the 4 vegetation/ cover representatives. 1 of following AMOS, mature CGAR and LMOL as flow dependent and depth class representatives.
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained for a Target Ecological Category (TEC) of a D.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae >2 spp Leptophlebiiidae Heptageniidae Elmidae Psephenidae	At least 2 biotopes sampled: assemblages to be A to B abundances. SASS 5 score: ≥60 Average Score per Taxon (ASPT): ≥4.0 MIRAI ≥ 42%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% - < 40%
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ D Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 42%

Table 14: Resource Quality Objectives for RIVERS AND DAMS in priority Resource Units in the Integrated Unit of Analysis 13: LOWER THUKELA RIVER

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
IUA 13: LOWER THUKELA RIVER	II	Thukela from d/s Mooi confluence to Middeldrift transfer **V40A, V40B** **(Thukela_ EWR 15)**	**13.2**	Quantity	Low flows	Base flow pattern must be maintained for drought and maintenance flows	Base Flow		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
								Oct	9.100	3.200
								Nov	10.500	4.500
								Dec	14.500	5.500
								Jan	19.000	8.500
								Feb	25.000	10.500
								Mar	21.500	9.200
								Apr	19.000	8.800
								May	14.300	6.500
								Jun	10.400	4.200
								Jul	8.300	3.000
								Aug	7.400	2.000
								Sep	8.100	2.100
				Quality	Nutrients	Nutrient levels must be maintained to the support aquatic ecosystem and sustain the ecological state.	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.06 milligrams per Litre (mg/L) (50^{th} percentile)		
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤2.0 milligrams per Litre (mg/L) (50^{th} percentile)		
					Salts	Salinity concentrations must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Total Dissolved Solids	≤350 milligrams per Litre (mg/L) (95^{th} percentile)		
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)		
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5^{th} percentile) and ≤9.0 (95^{th} percentile)		
					Toxic substances	The concentrations of toxic substances must not pose a risk to aquatic organisms and to human health	Ammonia as N	≤ 0.07 milligrams per Litre (mg/L) (95^{th} percentile)		
				Habitat	Instream	Natural flow pattern must be maintained and/or improved to a Target Ecological Category (TEC) of a C.	Index of Habitat Integrity (IHI): Instream	IHI ≥ 62%		

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to to a Target Ecological Category (TEC) of a C. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category.	Fish Response Assessment Index (FRAI) *Anguilla mossambica* (AMOS) *Labeobarbus natalensis* (BNAT) *Barbus (Enteromius) trimaculatus* (BTRI) *Barbus (Enteromius) viviparus* (BVIV) *Clarias gariepinus* (CGAR) *Labeo molybdinus* (LMOL) *Tilapia sparrmanii* (TSPA) *Amphilius natalensis* (ANAT)	FRAI ≥ 62% Ensure all flow habitat classes are present for the following species: BNAT, BVIV, juvenile CGAR, and TSPA – 3 of the 4 vegetation/ cover representatives. 1 of the following AMOS, CGAR and LMOL as flow dependent and depth class representatives.
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained for to a Target Ecological Category (TEC) of a C/D.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Baetidae 2 spp Leptophlebiiidae Heptageniidae Perlidae Elmidae Psephenidae Hydropsychidae 2spp	At least 2 biotopes sampled: assemblages to be A to B abundances. SASS 5 score: ≥120 Average Score per Taxon (ASPT): ≥4.8 MIRAI ≥ 62%
					Riparian haitat	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 62%
		Thukela from Middeldrift to Mandini Transfer (Mgeni) weir in V50D **V40E, V50A, V59B, V50C, V50D (upper reach)**	**13.5**	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Thukela River at the EWR site THU_ EWR16 (-29.1603, 31.3373) in V50C NMAR = 3 679.97 x$10^6$$m^3$ Target Ecological Category (TEC) of a C. The maintenance low flows and drought flows must be attained to support the aquatic ecosystem of the Thukela River downstream of Middledrift to the Estuary.	Maintenance and drought flows required for the Thukela River	

	Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
Oct	13.845	6.918
Nov	18.278	6.547
Dec	22.633	9.517
Jan	30.119	16.111
Feb	39.352	20.914
Mar	36.166	19.209
Apr	31.073	16.623
May	21.173	11.528
Jun	14.859	8.316
Jul	11.874	6.764
Aug	10.805	6.217
Sep	11.964	5.610

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
		(THU_ EWR 16)			High Flows	Ecological Water Requirements (EWR) freshets/ floods for the lower reaches of the Thukela River	Freshets/ floods required for the Thukela River. Additional to the freshets specified in the table, large annual floods of 450m^3/s for 6 day duration in Dec, Jan and Feb are also required.	
								Freshet (m^3/s) / Days / Flood (m^3/s) / days
								Sep: 60 / 5 / /
								Oct: 60 / 5 / /
								Nov: 60 / 5 / 250 / 8
								Dec: 60 / 5 / 120 / 5
								Jan: 60 / 5 / 250 / 8
								Feb: 60 / 5 / 250 / 8
								Mar: 60 / 5 / 250 / 8
								Apr: 60 / 5 / /
				Quality	Salts	Salinity concentrations must be maintained to sustain aquatic ecosystem health and user requirements and ensure the prescribed ecological category is met.	Total Dissolved Solids	≤350 milligrams per Litre (mg/L) (95th percentile)
				Habitat	Instream	Natural flow pattern must be maintained and/or improved to a Target Ecological Category (TEC) of a C.	Index of Habitat Integrity (IHI): Instream	IHI ≥ 62%
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a C. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category	Fish Response Assessment Index (FRAI) *Anguilla mossambica* (AMOS) *Labeobarbus natalensis* (BNAT) *Barbus (Enteromius) trimaculatus* (BTRI) *Clarias gariepinus* (CGAR) *Labeo molybdinus* (LMOL) *Labeo rubromaculatus* (LRUB)	FRAI ≥ 62% Ensure all flow habitat classes are present for the following species: BNAT, BTRI and juvenile CGAR – 2 of the 3 vegetation/ cover representatives. 2 of the following AMOS, LRUB and LMOL as flow dependent and depth class representatives.
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained for a Target Ecological Category (TEC) of a C.	Macroinvertebrate Response Assessment Index (MIRAI) South African Scoring System Version 5 (SASS5) Baetidae >2 spp Heptageniidae Perlidae Oligoneuridae	At least 2 biotopes sampled: assemblages to be A to B abundances. SASS 5 score: ≥120 Average Score per Taxon (ASPT): ≥4.8

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
							Tricorythidae Prosopistomatidae Elmidae Hydropsychidae 2spp	MIRAI ≥ 62%
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% - < 40%
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 62%

Table 15: Resource Quality Objectives for RIVERS AND DAMS in priority Resource Units in the Integrated Unit of Analysis 14: ESCARPMENT

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
IUA 14: ESCARPMENT	I	Upper reaches of Thukela River **V11A**	**14.1**	Quantity	Low flows, freshets and floods	Ecological Water Requirements (EWR) maintenance low and drought flows: Little Thukela River in V13A NMAR = 82.32 x10^{6}m^3 Target Ecological Category (TEC) of a B. The maintenance low flows and drought flows must be attained to support the aquatic ecosystem of the upper Little Thukela River	Maintenance and drought flows required for the Little Thukela River. The natural flooding regime should be maintained as the upstream river is part of the Strategic Water Source Areas (SWSA).		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
								Oct	0.345	0.109
								Nov	0.451	0.144
								Dec	0.574	0.159
								Jan	0.786	0.239
								Feb	1.076	0.321
								Mar	1.013	0.302
								Apr	0.901	0.272
								May	0.719	0.221
								Jun	0.565	0.180
								Jul	0.426	0.141
								Aug	0.345	0.119
								Sep	0.33	0.116
		Thukela from source to confluence of Sithene and Thonyelana Rivers (Sithene River; Thonyelana-	**14.2**	Quantity	Low flows, freshets and floods	Ecological Water Requirements (EWR) maintenance low and drought flows: Mnweni River in V11B NMAR = 142.69 x10^{6}m^3 Target Ecological Category (TEC) of a B category The maintenance low flows and drought flows must be attained to	Maintenance and drought flows required for the Mnweni River. The natural flooding regime should be maintained as the upstream river is part of the Strategic Water Source Areas (SWSA).		Maintenance Low flows (m^3/s	Drought Low flows (m^3/s)
								Oct	0.736	0.233
								Nov	0.962	0.307
								Dec	1.224	0.340
								Jan	1.676	0.511
								Feb	2.294	0.685
								Mar	2.162	0.643

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
		Mpumalanga River) **V11B**				support the aquatic ecosystem of the Mnweni River		Apr	1.922	0.580
								May	1.534	0.472
								Jun	1.206	0.384
								Jul	0.908	0.301
								Aug	0.737	0.254
								Sep	0.703	0.247
		Source to confluence of Mlambonja and Mhlwazini Rivers (Mlambonja River (upper); Mhlwazini River; Ndedema River; Ndumeni River; Thuthumi River) **V11G**	**14.3**	Quantity	Low flows, freshets and floods	Ecological Water Requirements (EWR) maintenance low and drought flows: Mlambonja River in V11G NMAR = 191.99 x10^{6}m^{3} Target Ecological Category (TEC) of a B category The maintenance low flows and drought flows must be attained to support the aquatic ecosystem of the upper Mlambonja River	Maintenance and drought flows required for the Mlambonja River. The natural flooding regime should be maintained as the upstream river is part of the Strategic Water Source Areas (SWSA).		Maintenance Low flows (m^{3}/s	Drought Low flows (m^{3}/s)
								Oct	0.944	0.316
								Nov	1.287	0.313
								Dec	1.684	0.319
								Jan	2.260	0.687
								Feb	3.052	0.911
								Mar	2.928	0.87
								Apr	2.625	0.789
								May	2.043	0.628
								Jun	1.541	0.492
								Jul	1.134	0.378
								Aug	0.926	0.321
								Sep	0.890	0.313
		Upper reaches of Little Thukela River **V11B**	**14.4**	Quantity	Low flows, freshets and floods	Ecological Water Requirements (EWR) maintenance low and drought flows: Little Thukela River in V13A NMAR = 82.32 x10^{6}m^{3} Target Ecological Category (TEC) of a B category The maintenance low flows and drought flows must be attained to support the aquatic ecosystem of the upper Little Thukela River.	Maintenance and drought flows required for the Little Thukela River. The natural flooding regime should be maintained as the upstream river is part of the Strategic Water Source Areas (SWSA).		Maintenance Low flows (m^{3}/s	Drought Low flows (m^{3}/s)
								Oct	0.323	0.119
								Nov	0.449	0.115
								Dec	0.628	0.115
								Jan	0.910	0.318
								Feb	1.288	0.442
								Mar	1.240	0.423
								Apr	1.048	0.363
								May	0.705	0.252
								Jun	0.487	0.183
								Jul	0.361	0.142
								Aug	0.301	0.123

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
								Sep	0.299	0.123
		Upper reaches of Boesmans River **V70A**	**14.5**	Quantity	Low flows, freshets and floods	Ecological Water Requirements (EWR) maintenance low and drought flows: Bushman's River in V70A NMAR = 113.46 x10^{6}m^3 Target Ecological Category (TEC) of a B category The maintenance low flows and drought flows must be attained to support the aquatic ecosystem of the upper Bushman's River	Maintenance and drought flows required for the Bushman's River. The natural flooding regime should be maintained as the upstream river is part of the Strategic Water Source Areas (SWSA).		Maintenance Low flows (m^3/s	Drought Low flows (m^3/s)
								Oct	0.591	0.171
								Nov	0.778	0.206
								Dec	0.994	0.34
								Jan	1.258	0.419
								Feb	1.562	0.515
								Mar	1.461	0.480
								Apr	1.355	0.450
								May	0.987	0.337
								Jun	0.724	0.26
								Jul	0.547	0.205
								Aug	0.477	0.184
								Sep	0.504	0.194
		Ncibidwana source to outlet of V70B **V70B**	**14.6**	Quantity	Low flows, freshets and floods	Ecological Water Requirements (EWR) maintenance low and drought flows: Ncibidwana River in V70B NMAR = 44.16 x10^{6}m^3 Target Ecological Category (TEC) of a B category The maintenance low flows and drought flows must be attained to support the aquatic ecosystem of the upper Ncibidwana River	Maintenance and drought flows required for the Ncibidwana River. The natural flooding regime should be maintained as the upstream river is part of the Strategic Water Source Areas (SWSA).		Maintenance Low flows (m^3/s	Drought Low flows (m^3/s)
								Oct	0.230	0.066
								Nov	0.303	0.080
								Dec	0.387	0.132
								Jan	0.490	0.163
								Feb	0.608	0.200
								Mar	0.569	0.187
								Apr	0.527	0.175
								May	0.384	0.131
								Jun	0.282	0.101
								Jul	0.213	0.080
								Aug	0.186	0.072
								Sep	0.196	0.075
		Upper reaches of Mooi River **V20A**	**14.7**	Quantity	Low flows, freshets and floods	Ecological Water Requirements (EWR) maintenance low and drought flows: Mooi River in V20A NMAR = 42.90 x10^{6}m^3 Target Ecological Category (TEC) of a B category	Maintenance and drought flows required for the Mooi River. The natural flooding regime should be maintained as the upstream river is part of the Strategic Water Source Areas (SWSA).		Maintenance Low flows (m^3/s	Drought Low flows (m^3/s)
								Oct	0.203	0.079
								Nov	0.283	0.087
								Dec	0.368	0.132

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure		
						The maintenance low flows and drought flows must be attained to support the aquatic ecosystem of the upper Mooi River		Jan	0.492	0.172
								Feb	0.603	0.209
								Mar	0.559	0.193
								Apr	0.48	0.168
								May	0.298	0.109
								Jun	0.196	0.077
								Jul	0.157	0.064
								Aug	0.149	0.062
								Sep	0.169	0.068
		Upper reaches of Little Mooi River **V20B**	**14.8**	Quantity	Low flows, freshets and floods	Ecological Water Requirements (EWR) maintenance low and drought flows: Little Mooi River in V20B NMAR = 10.32 x10^{6}m^{3} Target Ecological Category (TEC) of a B/C category The maintenance low flows and drought flows must be attained to support the aquatic ecosystem of the upper Little Mooi River	Maintenance and drought flows required for the Little Mooi River. The natural flooding regime should be maintained as the upstream river is part of the Strategic Water Source Areas (SWSA).		Maintenance Low flows (m^3/s	Drought Low flows (m^3/s)
								Oct	0.041	0.019
								Nov	0.056	0.025
								Dec	0.071	0.031
								Jan	0.096	0.041
								Feb	0.115	0.048
								Mar	0.103	0.043
								Apr	0.083	0.036
								May	0.059	0.026
								Jun	0.044	0.02
								Jul	0.037	0.017
								Aug	0.034	0.016
								Sep	0.038	0.018

Table 16: Resource Quality Objectives for RIVERS AND DAMS in priority Resource Units in the Integrated Unit of Analysis 15: THUKELA ESTUARY and UPSTREAM THUKELA

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
IUA 15: THUKELA ESTUARY	**II**	Thukela from Mandini Transfer (Mngeni) weir to upstream Estuary, including	**15.1**	Quality	Nutrients	Nutrient levels must be maintained to the support estuarine ecosystem and sustain the ecological state	Orthophosphate (PO_4^-) as Phosphorus	≤0.1 milligrams per Litre (mg/L) (50th percentile) (Thukela River only)
								≤0.1 milligrams per Litre (mg/L) (50th percentile) (Mandini Stream only)
							Total Inorganic Nitrogen (TIN) as Nitrogen	≤2.0 milligrams per Litre (mg/L) (percentile) (Thukela River and Mandini Stream)

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
		Mandini Stream **V50D (Upper Portions Quaternary catchment V50D)** **(EWR 17)**			Salts	Salinity concentrations must be maintained to sustain estuarine ecosystem and ensure the prescribed ecological category is met.	Total Dissolved Solids	≤500 milligrams per Litre (mg/L) (95th percentile) (Thukela River and Mandini Stream)
							Chloride	≤175 milligrams per Litre (mg/L) (95th percentile) Mandini Stream
							Sodium	≤115 milligrams per Litre (mg/L) (95th percentile) (Mandini Stream only)
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL) (Thukela River and Mandini Stream)
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH	6.5 – 8.9 with <5% of measurements outside of this during a given year (Thukela River and Mandini Stream)
						Water clarity to be maintained to support the estuarine ecosystem. Must not deviate more than 10% from background levels.	Turbidity	
						Temperature ranges must be maintained to support aquatic biota	Temperature	17°C (10th percentile) and 30°C (90th percentile) with <5% of measurements outside of this range within a given year (Thukela River and Mandini Stream)
						Dissolved oxygen concentration must be maintained to support the aquatic and estuarine ecosystem	Dissolved oxygen	≥ 6 milligrams per Litre (mg/L) (Thukela River and Mandini Stream)
					Toxic substances	The concentrations of toxic substances must not pose a risk to aquatic organisms and to human health	Ammonia as N	≤ 0.1 milligrams per Litre (mg/L) (95th percentile) (Thukela River and Mandini Stream)
							Aluminium (Al)	≤ 0.10 milligrams per Litre (mg/L) (95th percentile) (Thukela River and Mandini Stream)
							Manganese (Mn)	≤ 0.2 milligrams per Litre (mg/L) (95th percentile) (Thukela River and Mandini Stream)
							Iron (Fe)	≤ 0.1 milligrams per Litre (mg/L) (95th percentile) (Thukela River and Mandini Stream)
							Lead (Pb) hard	≤ 0.009 milligrams per Litre (mg/L) (95th percentile) (Thukela River and Mandini Stream)
							Copper (Cu) hard	≤ 0.007 milligrams per Litre (mg/L) (95th percentile) (Thukela River and Mandini Stream)

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
							Nickel (Ni)	≤ 0.07 milligrams per Litre (mg/L) (95th percentile) (Thukela River and Mandini Stream)
							Cobalt (Co)	≤ 0.05 milligrams per Litre (mg/L) (95th percentile) (Thukela River and Mandini Stream)
							Zinc (Zn)	≤ 0.002 milligrams per Litre (mg/L) (95th percentile) (Thukela River and Mandini Stream)
				Habitat	Instream	Natural flow pattern must be improved and/or maintained at a Target Ecological Category (TEC) of a C.	Index of Habitat Integrity (IHI): Instream	IHI ≥ 62% (Thukela River)
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained and/or improved to a Target Ecological Category (TEC) of a C. Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category.	Fish Response Assessment Index (FRAI) *Anguilla spp.* *Glossogobius spp.* *Awaous aeneofuscus* (AAEN) *Barbus (Enteromius) trimaculatus (*BTRI) *Labeobarbus natalensis (*BNAT) *Labeo molybdinus* (LMOL) *Labeo rubromaculatus* (LRUB) *Oreochromis mossambicus (*OMOS)	FRAI ≥ 62% (Thukela River) Ensure all flow habitat classes are present for the following species: *Glossogobius spp.,* BNAT, BTRI and juvenile OMOS – 3 of the 4 vegetation/ cover representatives. 2 of the following *Anguilla spp.* (elvers), mature BNAT, LMOL and LRUB as flow dependent and depth class representatives.
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages to be maintained for a Target Ecological Category (TEC) of a C.	Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) Perlidae Baetidae > 2 sp Heptageniidae Leptophlebiidae Oligoneuridae Prosopistomatidae Elmidae Hydropsychidae 2spp	3 biotopes sampled: assemblages to be A to B abundances. SASS 5 score: 100 – 120 Average Score per Taxon (ASPT): 5.5 - 6.5 MIRAI ≥ 62% (Thukela River)
					Diatoms	Ecological category should be maintained as C.	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: 12 - 14 %PTV: 20% - < 40% (Thukela River)

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
					Riparian	The riparian vegetation must be improved and/or maintained at VEGRAI ≥ C Ecological Category.	Vegetation Response Assessment Index (VEGRAI)	VEGRAI survey every 5 years. VEGRAI ≥ 62% (Thukela River)

Table 17: Resource Quality Objectives for PRIORITY WETLAND CLUSTERS AND SYSTEMS in selected Resource Units in the THUKELA CATCHMENTS

IUA	Resource Unit	Wetland/Site	Component prioritised	Narrative RQO	Indicator	Numerical Limit/ measure		
IUA 1: UPPER BUFFALO RIVER	1.1 and marginally into 1.2	Wakkerstroom	Quantity	<u>River RQO applies</u> Ecological Water Requirements (EWR) maintenance low and drought flows: Slang River at V3R003 in V31A NMAR = 97.065 x10^{6}m3 Target Ecological Category (TEC) of a B. The maintenance low flows and drought flows must be attained to support the upstream aquatic ecosystem. A constant baseflow must be maintained that ensures that the system remains perennial, and the peatland is permanently saturated.	Maintenance and drought flows - specifically required for wetlands upstream of the Zaaihoek Dam (V3R003). Monitoring of flows at V3R003.		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
						Oct	0.221	0.007
						Nov	0.418	0.081
						Dec	0.610	0.075
						Jan	0.83	0.180
						Feb	1.069	0.231
						Mar	0.812	0.176
						Apr	0.576	0.127
						May	0.319	0.004
						Jun	0.185	0.039
						Jul	0.142	0.036
						Aug	0.121	0.032
						Sep	0.137	0.035
				Maintain a minimum water level to ensure the peat remains saturated.	Water level.			
			Quality	<u>River RQO applies</u> Nutrient levels should not deteriorate and should support aquatic ecosystem and sustain the present ecological state (PES B).	Ortho-phosphate as P	≤0.01 milligrams per Litre (mg/L) (50th percentile)		
					Total Inorganic Nitrogen (TIN)	≤0.5 milligrams per Litre (mg/L) (50th percentile)		
				Total Dissolved Solids needs to be maintained to support aquatic		≤120 milligrams per Litre (mg/L) (95th percentile)		

IUA	Resource Unit	Wetland/Site	Component prioritised	Narrative RQO	Indicator	Numerical Limit/ measure
				ecosystem and sustain the present ecological state (PES B).		
				The presence of pathogens should not pose a risk to human health.	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)
			Habitat	Maintain or improve current PES category. As a minimum undertake a WET-Health Level 1a PES assessment (as per the method described by Macfarlane *et al*., 2020). For the PES assessment the latest available National or Provincial Land Cover datasets should be utilised for the wetland catchment, while detailed manual digitising of land cover within the wetland should be undertaken off latest available aerial imagery and supplemented through field verification by an experienced wetland specialist. Repeat as soon as new National or Provincial land cover data is available but at least every 5 years if possible and report on this with a view to assess if there have been any changes in the state of the system.	Present Ecological State (PES) Category	PES score above 70%
				Peat depth and humification should be constant over time. Determine using an appropriate sampling and analysis method at selected points in the wetland to determine depth and humification of the peat. Determine baseline and repeat every 5 years.	Peat depth and humification	Less than 10% reduction in peat profile depth and quality/humification from the baseline measurements at each sampling site.
			Biota	Overall diversity and populations of aquatic/wetland dependent bird species must be maintained. Report on this every year.	SABAP 2 reporting rates for aquatic/wetland dependent Red Data bird species: • White-Winged Flufftail • Grey Crowned Crane • African Marsh Harrier • African Grass Owl • Blue Crane • Maccoa Duck • Greater Flamingo • Lesser Flamingo • Half-Collared Kingfisher	Over the next 5 years the reporting rate for each species must not decline from the SABAP2 reporting rates (as at 15 April 2021): • White-Winged Flufftail (~0.3%) • Grey Crowned Crane (~59.6%) • African Marsh Harrier (~49.1%) • African Grass Owl (~0.5%) • Blue Crane (~12.2%) • Maccoa Duck (~1.6%) • Greater Flamingo (~1.1%)

IUA	Resource Unit	Wetland/Site	Component prioritised	Narrative RQO	Indicator	Numerical Limit/ measure
					• Greater Painted Snipe	• Lesser Flamingo (~0.3%) • Half-Collared Kingfisher (~4.5%) • Greater Painted Snipe (~0.1%)
	1.1	Groenvlei	Quantity	The relationship between the extent, depth and frequency of flooding to rainfall in the catchment must be maintained.	Floods are necessary to inundate the floodplain thereby providing the wetting regime and sediment required for supporting the floodplain morphology and ecosystem, including vegetation. Measure water level at selected points in the floodplain to monitor frequency, depth and extent of flooding. Establish/determine a historical relationship between rainfall and flooding extent by using suitable remote imagery coinciding with larger rainfall events. Compare the ratio of rainfall to flooding going forward against the historical relationship. Repeat annually.	The relationship between the extent, depth and frequency of flooding to rainfall in the catchment must not on average indicate a negative trend (reduction in flooding extent in relation to rainfall events).
				<u>River RQO applies</u> Ecological Water Requirements (EWR) maintenance low and drought flows: Slang River at V3R003 in V31A NMAR = 97.065 x10⁶m3 Target Ecological Category (TEC) of a B. The maintenance low flows and drought flows must be attained to support the upstream aquatic ecosystem.	Maintenance and drought flows - specifically required for wetlands upstream of the Zaaihoek Dam (V3R003). Monitoring of flows at V3R003.	Oct: Maintenance Low flows (m^3/s) 0.221; Drought Low flows (m^3/s) 0.007 Nov: 0.418; 0.081 Dec: 0.610; 0.075 Jan: 0.83; 0.180 Feb: 1.069; 0.231 Mar: 0.812; 0.176 Apr: 0.576; 0.127 May: 0.319; 0.004 Jun: 0.185; 0.039 Jul: 0.142; 0.036 Aug: 0.121; 0.032 Sep: 0.137; 0.035
			Quality	<u>River RQO applies</u> Nutrient levels should not deteriorate and should support aquatic ecosystem and sustain the present ecological state (PES B).	Ortho-phosphate as P	≤0.01 milligrams per Litre (mg/L) (50th percentile)
					Total Inorganic Nitrogen (TIN)	≤0.5 milligrams per Litre (mg/L) (50th percentile)
				Total Dissolved Solids needs to be maintained to support aquatic ecosystem and sustain the present ecological state (PES B).	Total Dissolved Solids	≤120 milligrams per Litre (mg/L) (95th percentile)

IUA	Resource Unit	Wetland/Site	Component prioritised	Narrative RQO	Indicator	Numerical Limit/ measure
				The presence of pathogens should not pose a risk to human health.	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)
			Habitat	Maintain or improve current PES category. As a minimum undertake a WET-Health Level 1a PES assessment (as per the method described by Macfarlane *et al*., 2020). For the PES assessment the latest available National or Provincial Land Cover datasets should be utilised for the wetland catchment, while detailed manual digitising of land cover within the wetland should be undertaken off latest available aerial imagery and supplemented through field verification by an experienced wetland specialist. Repeat as soon as new National or Provincial land cover data is available but at least every 5 years if possible and report on this with a view to assess if there have been any changes in the state of the system.	Present Ecological State (PES) Category	PES score above 70%
IUA 3: MIDDLE BUFFALO RIVER	3.1 and marginally into 3.5	Boschoffsvlei	Quantity	The relationship between the extent, depth, and frequency of flooding to rainfall in the catchment must be maintained. **Repeat annually.**	Floods are necessary to inundate the floodplain thereby providing the wetting regime and sediment required for supporting the floodplain morphology and ecosystem, including vegetation. Measure water level at selected points in the floodplain to monitor frequency, depth, and extent of flooding. Establish/ determine a historical relationship between rainfall and flooding extent by using suitable remote imagery coinciding with larger rainfall events. Compare the ratio of rainfall to flooding going forward against the historical relationship.	The relationship between the extent, depth, and frequency of flooding to rainfall in the catchment must not on average indicate a negative trend (reduction in flooding extent in relation to rainfall events).
			Quality	<u>River RQO applies</u> Nutrient levels should not deteriorate and should support aquatic ecosystem and sustain the	Ortho-phosphate (PO_4^-) as Phosphorus	≤ 0.02 milligrams per Litre (mg/L) (50^{th} percentile)
					Total Inorganic Nitrogen (TIN)	≤1.0 milligrams per Litre (mg/L) (50^{th} percentile)

IUA	Resource Unit	Wetland/Site	Component prioritised	Narrative RQO	Indicator	Numerical Limit/ measure
				ecological state (B ecological category).		
				Salinity levels must be maintained to support aquatic ecosystem and sustain the ecological state (B ecological category).	Total Dissolved Solids	≤200 milligrams per Litre (mg/L) (95th percentile)
				The presence of pathogens should not pose a risk to human health.	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL) (95th percentile)
			Habitat	Maintain or improve current PES category. As a minimum undertake a WET-Health Level 1a PES assessment (as per the method described by Macfarlane *et al*., 2020). For the PES assessment the latest available National or Provincial Land Cover datasets should be utilised for the wetland catchment, while detailed manual digitising of land cover within the wetland should be undertaken off latest available aerial imagery and supplemented through field verification by an experienced wetland specialist. Repeat as soon as new National or Provincial land cover data is available but at least every 5 years if possible and report on this with a view to assess if there have been any changes in the state of the system.	Present Ecological State (PES) Category	PES score above 75%
		Boschoffsvlei pan complex	Quantity	The relationship between the extent, depth and frequency of inundation to local rainfall must be maintained. Repeat annually	Water quantity impacts must be managed so as not to undermine the ecological value of the pans. In particular, abstraction or artificial water inputs should be limited in the pans so that the depth and duration of inundation is maintained within the normal range for high, average and low rainfall years. Map the inundation extent at the end of the summer season (end of April) to establish/determine a relationship between antecedent summer rainfall (September to April) and inundation extent using suitable remote imagery. Compare the ratio of rainfall to inundation extent going forward.	The relationship between the extent, depth and frequency of inundation to local rainfall must not on average indicate a negative trend (reduction in inundation extent in relation to antecedent summer rainfall [September to April]).

IUA	Resource Unit	Wetland/Site	Component prioritised	Narrative RQO	Indicator	Numerical Limit/ measure
					Repeat annually.	
			Quality	Water quality impacts to the pan systems must be restricted to ensure that the water and sediment chemistry remain within an acceptable normal range (anion and cation concentration to pan volume relationship) for the particular water chemistry pan type applicable to each pan. Sample February every year and February and July every 3 years.	pH, Electrical Conductivity, Total Dissolved Solids, Total Alkalinity as CaCO3, Sodium, Calcium, Magnesium, Sulphate, Iron, Chloride, Potassium, Magnesium, Manganese, Aluminium, Phosphorous, Silica, Fluoride Ammonia, Nitrate and Fluoride.	Maintain the water chemistry pan type applicable for each pan.
			Habitat	Maintain or improve current PES category. As a minimum undertake a WET-Health Level 1a PES assessment (as per the method described by Macfarlane *et al*., 2020). For the PES assessment the latest available National or Provincial Land Cover datasets should be utilised for the wetland catchment, while detailed manual digitising of land cover within the wetland should be undertaken off latest available aerial imagery and supplemented through field verification by an experienced wetland specialist. Repeat as soon as new National or Provincial land cover data is available but at least every 5 years if possible and report on this with a view to assess if there have been any changes in the state of the system.	Present Ecological State (PES) Category	PES score above 85% for each pan.
IUA 5: BLOOD RIVER	5.1 and marginally into 3.1	Upper Blood River	Habitat	Maintain or improve current PES category. As a minimum undertake a WET-Health Level 1a PES assessment (as per the method described by Macfarlane *et al*., 2020). For the PES assessment the latest available National or Provincial Land Cover datasets should be utilised for the wetland catchment,	Present Ecological State (PES) Category -	PES score above 90% for the northern cluster and above 80% for the southern cluster.

IUA	Resource Unit	Wetland/Site	Component prioritised	Narrative RQO	Indicator	Numerical Limit/ measure
				while detailed manual digitising of land cover within the wetland should be undertaken off latest available aerial imagery and supplemented through field verification by an experienced wetland specialist. Repeat as soon as new National or Provincial land cover data is available but at least every 5 years if possible and report on this with a view to assess if there have been any changes in the state of the system.		
	5.1 and 5.2	Blood River Vlei	Quantity	Existing water inputs to the wetland from its catchment must be maintained, with no increase in direct abstraction from the wetland.	Extent of dams and Surface Flow Reduction (SFR) activities (e.g., irrigated cultivation, plantations, etc.).	No increase from current extent of dams and SFR activities within the catchment.
				The relationship between the extent, depth and frequency of flooding to rainfall in the catchment must be maintained. Repeat annually.	Floods are necessary to inundate the floodplain thereby providing the wetting regime and sediment required for supporting the floodplain morphology and ecosystem, including vegetation. Measure water level at selected points in the floodplain to monitor frequency, depth and extent of flooding. Establish/determine a historical relationship between rainfall and flooding extent by using suitable remote imagery coinciding with larger rainfall events. Compare the ratio of rainfall to flooding going forward against the historical relationship.	The relationship between the extent, depth and frequency of flooding to rainfall in the catchment must not on average indicate a negative trend (reduction in flooding extent in relation to rainfall events).
			Quality	<u>River RQO applies</u> Nutrient levels must be maintained to support aquatic ecosystem and sustain the present ecological state (B ecological category).	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.02 milligrams per Litre (mg/L) (50^{th} percentile)
					Total Inorganic Nitrogen (TIN)	≤1.0 milligrams per Litre (mg/L) (50^{th} percentile)
				Salinity concentrations must be maintained to support aquatic ecosystem and sustain the present ecological state (B ecological category).	Total Dissolved Solids	≤200 milligrams per Litre (mg/L) (95^{th} percentile)
			Habitat	Maintain or improve current PES category.	Present Ecological State (PES) Category	PES score above 70% north of R34 crossing and PES score above 55% south of R34 crossing.

IUA	Resource Unit	Wetland/Site	Component prioritised	Narrative RQO	Indicator	Numerical Limit/ measure		
				As a minimum undertake a WET-Health Level 1a PES assessment (as per the method described by Macfarlane *et al*., 2020). For the PES assessment the latest available National or Provincial Land Cover datasets should be utilised for the wetland catchment, while detailed manual digitising of land cover within the wetland should be undertaken off latest available aerial imagery and supplemented through field verification by an experienced wetland specialist. Repeat as soon as new National or Provincial land cover data is available but at least every 5 years if possible and report on this with a view to assess if there have been any changes in the state of the system.				
IUA 6: SUNDAYS RIVER	6.2	Boschbergvlei	Quantity	The relationship between the extent, depth and frequency of flooding to rainfall in the catchment must be maintained. Repeat annually.	Floods are necessary to inundate the floodplain thereby providing the wetting regime and sediment required for supporting the floodplain morphology and ecosystem, including vegetation. Measure water level at selected points in the floodplain to monitor frequency, depth and extent of flooding. Establish/ determine a historical relationship between rainfall and flooding extent by using suitable remote imagery coinciding with larger rainfall events. Compare the ratio of rainfall to flooding going forward against the historical relationship.	The relationship between the extent, depth and frequency of flooding to rainfall in the catchment must not on average indicate a negative trend (reduction in flooding extent in relation to rainfall events).		
				<u>River RQO applies</u> Ecological Water Requirements (EWR) maintenance low and drought flows: Sundays River at the EWR site Thukela_EWR7 (-28.458, 30.053) in V60C NMAR = 90.26 x10^{6}m^{3}	Maintenance and drought flows required for the Sundays River. Monitoring of flows at V6H004.		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
						Oct	0.180	0.120
						Nov	0.240	0.140
						Dec	0.350	0.105
						Jan	0.500	0.220
						Feb	0.700	0.280
						Mar	0.520	0.240

IUA	Resource Unit	Wetland/Site	Component prioritised	Narrative RQO	Indicator	Numerical Limit/ measure		
				Target Ecological Category (TEC) of a C/D category The maintenance low flows and drought flows must be attained to support the upstream aquatic ecosystem.		Apr	0.350	0.210
						May	0.260	0.160
						Jun	0.200	0.140
						Jul	0.160	0.120
						Aug	0.150	0.120
						Sep	0.160	0.110
			Quality	River RQO applies Nutrient levels must be maintained to the support aquatic ecosystem and sustain the ecological state.	Ortho-phosphate (PO_4^-) as Phosphorus	≤0.06 milligrams per Litre (mg/L) (50th percentile)		
					Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤1.0 milligrams per Litre (mg/L) (50th percentile)		
				Salinity concentrations must be maintained to support aquatic ecosystem and sustain the ecological state.	Total Dissolved Solids	≤200 milligrams per Litre (mg/L) (95th percentile)		
				The presence of pathogens should not pose a risk to human health.	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)		
				pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5th percentile) and ≤9.0 (95th percentile)		
				Baseline clarity must be maintained.	Turbidity	A 10% variation from background concentration. Limits must be determined.		
			Habitat	Maintain or improve current PES category. As a minimum undertake a Whole Effluent Toxicity (WET)-Health Level 1a PES assessment (as per the method described by Macfarlane *et al*., 2020). For the PES assessment the latest available National or Provincial Land Cover datasets should be utilised for the wetland catchment, while detailed manual digitising of land cover within the wetland should be undertaken off latest available aerial imagery and supplemented through field verification by an experienced wetland specialist. Repeat as soon as new National or Provincial land cover data is available but at least every 5 years if possible and report	Present Ecological State (PES) Category	PES score above 75%		

IUA	Resource Unit	Wetland/Site	Component prioritised	Narrative RQO	Indicator	Numerical Limit/ measure
				on this with a view to assess if there have been any changes in the state of the system.		
	6.3	Paddavlei	Habitat	Maintain or improve current PES category. As a minimum undertake a Whole Effluent Toxicity (WET)-Health Level 1a PES assessment (as per the method described by Macfarlane *et al*., 2020). For the PES assessment the latest available National or Provincial Land Cover datasets should be utilised for the wetland catchment, while detailed manual digitising of land cover within the wetland should be undertaken off latest available aerial imagery and supplemented through field verification by an experienced wetland specialist. Repeat as soon as new National or Provincial land cover data is available but at least every 5 years if possible and report on this with a view to assess if there have been any changes in the state of the system.	Present Ecological State (PES) Category	PES score above 70%
			Biota	Maintain a presence of Wattled Crane in the wetland.	Presence of Critically Endangered Wattled Crane.	Continued presence of Wattled Crane.
IUA 7: UPPER MOOI RIVER (and portion of IUA 14: ESCARPMENT)	7.2	Hlatikulu	Quantity	Existing water inputs to the wetland from its catchment must be maintained, with no increase in direct abstraction from the wetland.	Extent of dams and Surface Flow Reduction (SFR) activities (e.g., irrigated cultivation, plantations, etc.).	No increase from current extent of dams and SFR activities within the catchment.
				<u>River RQO applies</u> Ecological Water Requirements (EWR) maintenance low and drought flows: Nsonge River at the EWR site THU_EWR20 (-29.2377, 29.7853) in V20C NMAR = 27.136 x10^{6}m^{3} Target Ecological Category (TEC) of a B/C category	Maintenance and drought flows required for the Nsonge River. Monitoring of flows at V2H007.	

	Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
Oct	0.109	0.063
Nov	0.148	0.082
Dec	0.188	0.102
Jan	0.253	0.134
Feb	0.302	0.159
Mar	0.271	0.143
Apr	0.219	0.118
May	0.155	0.086
Jun	0.115	0.066
Jul	0.097	0.057

IUA	Resource Unit	Wetland/Site	Component prioritised	Narrative RQO	Indicator	Numerical Limit/ measure		
				The maintenance low flows and drought flows must be attained to support the upstream aquatic ecosystem.		Aug	0.090	0.054
						Sep	0.101	0.060
			Quality	River RQO applies Nutrient levels must be maintained to support aquatic ecosystem and good water quality condition.	Ortho-phosphate (PO4-) as Phosphorus	≤0.01 milligrams per Litre (mg/L) (50th percentile)		
					Total Inorganic Nitrogen (TIN-) as Nitrogen	≤0.5 milligrams per Litre (mg/L) (50th percentile)		
				Salinity concentrations must be maintained to sustain good water quality state and ecological condition.	Total Dissolved Solids	≤120 milligrams per Litre (mg/L) (95th percentile)		
				pH must be maintained within the prescribed range.	pH	6.5 (5th percentile) and 9.0 (95th percentile)		
				The presence of pathogens should not pose a risk to human health.	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)		
				The concentrations of toxic substances must pose no risk to aquatic organisms and to human health.	Ammonia as N	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)		
					Atrazine	≤0.078 milligrams per Litre (mg/L)		
					Mancozeb	≤0.009 milligrams per Litre (mg/L)		
					Glyphosate	≤0.7 milligrams per Litre (mg/L)		
			Habitat	Maintain or improve current PES category. As a minimum undertake a WET-Health Level 1a PES assessment (as per the method described by Macfarlane *et al*., 2020). For the PES assessment the latest available National or Provincial Land Cover datasets should be utilised for the wetland catchment, while detailed manual digitising of land cover within the wetland should be undertaken off latest available aerial imagery and supplemented through field verification by an experienced wetland specialist. Repeat as soon as new National or Provincial land cover data is available but at least every 5 years if possible and report on this with a view to assess if there have been any changes in the state of the system.	Present Ecological State (PES) Category	PES score above 65%		

IUA	Resource Unit	Wetland/Site	Component prioritised	Narrative RQO	Indicator	Numerical Limit/ measure		
			Biota	Overall diversity and populations of aquatic/wetland dependent bird species must be maintained. Report on this every year..	South African Bird Atlas Project 2 (SABAP 2) reporting rates for aquatic/wetland dependent Red Data bird species: • Wattled Crane • Grey Crowned Crane • African Marsh Harrier • African Grass Owl • Blue Crane • Half-Collared Kingfisher Verify from monitoring records and recorded sightings from available avifaunal reporting data.	Over the next 5 years the reporting rate for each species must not decline from the SABAP2 reporting rates (as at 15 April 2021): • Wattled Crane (~19.6%) • Grey Crowned Crane (~43.5%) • African Marsh Harrier (~15.2%) • African Grass Owl (~2.2%) • Blue Crane (~21.7%) • Half-Collared Kingfisher (~13.0%).		
IUA 7: UPPER MOOI RIVER	7.3	Stillerust	Quantity	River RQO applies Mooi River upstream of Spring Grove Dam in V20D NMAR = 92.98 x10^{6}m3 Target Ecological Category (TEC) of a C. The maintenance low flows and drought flows must be attained to support the upstream aquatic ecosystem of the Mooi River.	Maintenance and drought flows required for the Mooi River. Monitoring of flows at V2H005.		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
						Oct	0.265	0.227
						Nov	0.361	0.188
						Dec	0.461	0.329
						Jan	0.609	0.496
						Feb	0.743	0.602
						Mar	0.689	0.558
						Apr	0.595	0.486
						May	0.378	0.315
						Jun	0.258	0.216
						Jul	0.211	0.14
						Aug	0.201	0.134
						Sep	0.225	0.173
			Quality	River RQO applies Nutrient levels must be maintained to support aquatic ecosystem and good water quality condition.	Ortho-phosphate (PO4-) as Phosphorus	≤0.01 milligrams per Litre (mg/L) (50th percentile)		
					Total Inorganic Nitrogen (TIN-) as Nitrogen	≤0.5 milligrams per Litre (mg/L) (50th percentile)		
				Salinity concentrations must be maintained to sustain good water quality state and ecological condition.	Total Dissolved Solids	≤120 milligrams per Litre (mg/L) (95th percentile)		
				The presence of pathogens should not pose a risk to human health.	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)		
				The concentrations of toxic substances must pose no risk to aquatic organisms and to human health.	Ammonia as N	≤ 0.07 milligrams per Litre (mg/L) (95th percentile)		
					Atrazine	≤0.08 milligrams per Litre (mg/L)		
					Mancozeb	≤0.009 milligrams per Litre (mg/L)		
					Glyphosate	≤0.7 milligrams per Litre (mg/L)		

IUA	Resource Unit	Wetland/Site	Component prioritised	Narrative RQO	Indicator	Numerical Limit/ measure
			Habitat	Maintain current PES category. As a minimum undertake a WET-Health Level 1a PES assessment (as per the method described by Macfarlane *et al*., 2020). For the PES assessment the latest available National or Provincial Land Cover datasets should be utilised for the wetland catchment, while detailed manual digitising of land cover within the wetland should be undertaken off latest available aerial imagery and supplemented through field verification by an experienced wetland specialist. Repeat as soon as new National or Provincial land cover data is available but at least every 5 years if possible and report on this with a view to assess if there have been any changes in the state of the system.	Present Ecological State (PES) Category	PES score above 90%
			Biota	Overall diversity and populations of aquatic/wetland dependent bird species must be maintained. Report on this every year.	South African Bird Atlas Project 2 (SABAP 2) reporting rates for aquatic/wetland dependent Red Data bird species: • Wattled Crane • Grey Crowned Crane • African Marsh Harrier • Blue Crane Verify from monitoring records and recorded sightings from available avifaunal reporting data.	Over the next 5 years the reporting rate for each species must not decline from the SABAP2 reporting rates (as at 15 April 2021): • Wattled Crane (~27.6%) • Grey Crowned Crane (~37.9%) • African Marsh Harrier (~6.9%) • Blue Crane (~3.4%).
				The continued presence of at least 1 breeding pair of Wattled Cranes must be maintained	The continued presence of breeding Wattled Cranes. Wattled Crane monitoring, including breeding success monitoring	At least 1 breeding pair of Wattled Cranes
IUA 8: MIDDLE/ LOWER MOOI RIVER	8.1	Melmoth	Habitat	Maintain the current PES category. As a minimum undertake a WET-Health Level 1a PES assessment (as per the method described by Macfarlane *et al*., 2020). For the PES assessment the latest available National or Provincial Land Cover datasets should be	Present Ecological State (PES) Category	PES score above 90%

IUA	Resource Unit	Wetland/Site	Component prioritised	Narrative RQO	Indicator	Numerical Limit/ measure
				utilised for the wetland catchment, while detailed manual digitising of land cover within the wetland should be undertaken off latest available aerial imagery and supplemented through field verification by an experienced wetland specialist. Repeat as soon as new National or Provincial land cover data is available but at least every 5 years if possible and report on this with a view to assess if there have been any changes in the state of the system.		
			Biota	Overall diversity and populations of aquatic/wetland dependent bird species must be maintained. Report on this every year.	South African Bird Atlas Project 2 (SABAP 2) reporting rates for aquatic/wetland dependent Red Data bird species: • Wattled Crane • Grey Crowned Crane • African Marsh Harrier • Blue Crane Verify from monitoring records and recorded sightings from available avifaunal reporting data.	Over the next 5 years the reporting rate for each species must not decline from the SABAP2 reporting rates (as at 15 April 2021): • Wattled Crane (~21.1%) • Grey Crowned Crane (~28.9%) • African Marsh Harrier (~7.9%) • Blue Crane (~34.2%).
		Dartmoor	Habitat	Maintain the current PES category. As a minimum undertake a WET-Health Level 1a PES assessment (as per the method described by Macfarlane *et al*., 2020). For the PES assessment the latest available National or Provincial Land Cover datasets should be utilised for the wetland catchment, while detailed manual digitising of land cover within the wetland should be undertaken off latest available aerial imagery and supplemented through field verification by an experienced wetland specialist. Repeat as soon as new National or Provincial land cover data is available but at least	Present Ecological State (PES) Category	PES score above 90%

IUA	Resource Unit	Wetland/Site	Component prioritised	Narrative RQO	Indicator	Numerical Limit/ measure
				every 5 years if possible and report on this with a view to assess if there have been any changes in the state of the system.		
			Biota	Overall diversity and populations of aquatic/wetland dependent bird species must be maintained. Report on this every year.	South African Bird Atlas Project 2 (SABAP 2) reporting rates for aquatic/wetland dependent Red Data bird species: • Wattled Crane • Grey Crowned Crane • African Marsh Harrier • Blue Crane Verify from monitoring records and recorded sightings from available avifaunal reporting data.	Over the next 5 years the reporting rate for each species must not decline from the SABAP2 reporting rates (as at 15 April 2021): • Wattled Crane (~21.1%) • Grey Crowned Crane (~28.9%) • African Marsh Harrier (~7.9%) • Blue Crane (~34.2%).
		Scawby	Quantity	Existing water inputs to the wetland from its catchment must be maintained, with no increase in direct abstraction from the wetland.	Extent of dams and Surface Flow Reduction (SFR) activities (e.g., irrigated cultivation and plantations)	No increase from current extent of dams and SFR activities within the catchment.
			Habitat	Maintain the current PES category. As a minimum undertake a WET-Health Level 1a PES assessment (as per the method described by Macfarlane *et al*., 2020). For the PES assessment the latest available National or Provincial Land Cover datasets should be utilised for the wetland catchment, while detailed manual digitising of land cover within the wetland should be undertaken off latest available aerial imagery and supplemented through field verification by an experienced wetland specialist. Repeat as soon as new National or Provincial land cover data is available but at least every 5 years if possible and report on this with a view to assess if there have been any changes in the state of the system.	Present Ecological State (PES) Category	PES score above 75%
			Biota	Overall diversity and populations of aquatic/wetland dependent bird species must be maintained.	South African Bird Atlas Project 2 (SABAP 2) reporting rates for aquatic/wetland dependent Red Data bird species:	Over the next 5 years the reporting rate for each species must not decline from the

IUA	Resource Unit	Wetland/Site	Component prioritised	Narrative RQO	Indicator	Numerical Limit/ measure
				Report on this every year.	• Wattled Crane • Grey Crowned Crane • African Marsh Harrier • Blue Crane Verify from monitoring records and recorded sightings from available avifaunal reporting data.	SABAP2 reporting rates (as at 15 April 2021): • Wattled Crane (~21.1%) • Grey Crowned Crane (~28.9%) • African Marsh Harrier (~7.9%) • Blue Crane (~34.2%).
IUA 9: MIDDLE/ LOWER BUSHMAN'S RIVER	9.3	Ntabamhlope	Quantity	Existing water inputs to the wetland from its catchment must be maintained, with no increase in direct abstraction from the wetland.	Extent of dams and Surface Flow Reduction (SFR) activities (e.g., irrigated cultivation, plantations).	No increase from current extent of dams and SFR activities within the catchment.
			Quality	River RQO applies Nutrient levels must be maintained to the support aquatic ecosystem and sustain the ecological state. Improvement in levels is required.	Ortho-phosphate (PO4-) as Phosphorus	≤0.06 milligrams per Litre (mg/L) (50th percentile)
					Total Inorganic Nitrogen (TIN-) as Nitrogen	≤2.0 milligrams per Litre (mg/L) (50th percentile)
				Salinity concentrations must be maintained to support aquatic ecosystem and sustain the ecological state.	Total Dissolved Solids	≤300 milligrams per Litre (mg/L) (95th percentile)
				The presence of pathogens should not pose a risk to human health.	*Escherichia coli*	≤130 Counts per 100 millilitres (counts/ 100 mL)
				pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	≥6.5 (5th percentile) and ≤9.0 (95th percentile)
			Habitat	Maintain the current PES category. As a minimum undertake a WET-Health Level 1a PES assessment (as per the method described by Macfarlane *et al*., 2020). For the PES assessment the latest available National or Provincial Land Cover datasets should be utilised for the wetland catchment, while detailed manual digitising of land cover within the wetland should be undertaken off latest available aerial imagery and supplemented through field verification by an experienced	Present Ecological State (PES) Category	PES score above 70%

IUA	Resource Unit	Wetland/Site	Component prioritised	Narrative RQO	Indicator	Numerical Limit/ measure
				wetland specialist. Repeat as soon as new National or Provincial land cover data is available but at least every 5 years if possible and report on this with a view to assess if there have been any changes in the state of the system.		
IUA 14: ESCARPMENT	14.8	Highmoor	Habitat	Maintain or improve the current PES category. As a minimum undertake a WET-Health Level 1a PES assessment (as per the method described by Macfarlane *et al*., 2020). For the PES assessment the latest available National or Provincial Land Cover datasets should be utilised for the wetland catchment, while detailed manual digitising of land cover within the wetland should be undertaken off latest available aerial imagery and supplemented through field verification by an experienced wetland specialist. Repeat as soon as new National or Provincial land cover data is available but at least every 5 years if possible and report on this with a view to assess if there have been any changes in the state of the system.	Present Ecological State (PES) Category	PES score above 90% for southern cluster and PES score above 75% for northern cluster.
			Biota	Overall diversity and populations of aquatic/wetland dependent bird species must be maintained. Report on this every year.	South Africa Bird Atlas Project 2 (SABAP 2) reporting rates for aquatic/wetland dependent Red Data bird species: • Wattled Crane • Grey Crowned Crane • African Marsh Harrier • Blue Crane Verify from monitoring records and recorded sightings from available avifaunal reporting data.	Over the next 5 years the reporting rate for each species must not decline from the SABAP2 reporting rates (as at 15 April 2021): • Wattled Crane (~17.9%) • Grey Crowned Crane (~10.7%) • African Marsh Harrier (~3.69%) • Blue Crane (~10.7%).

IUA	Resource Unit	Wetland/Site	Component prioritised	Narrative RQO	Indicator	Numerical Limit/ measure
		Natal Drakensberg Park	Habitat	Maintain the current PES category. Compile a wetland inventory for the Ramsar site through desktop identification and mapping of wetlands. Select a representative sample of wetlands to undertake PES assessments and monitoring. As a minimum undertake a Whole Effluent Toxicity (WET)-Health Level 1a PES assessment (as per the method described by Macfarlane *et al*., 2020). For the PES assessment the latest available National or Provincial Land Cover datasets should be utilised for the wetland catchment, while detailed manual digitising of land cover within the wetland should be undertaken off latest available aerial imagery and supplemented through field verification by an experienced wetland specialist. Repeat as soon as new National or Provincial land cover data is available but at least every 5 years if possible and report on this with a view to assess if there have been any changes in the state of the system.	Present Ecological State (PES) Category	Maintain current PES for selected representative wetlands. PES to be determined.

Table 18: Regional and Resource Unit specific Resource Quality Objectives for GROUNDWATER in priority Groundwater Resource Units in the Integrated Unit of Analysis 1: UPPER BUFFALO RIVER

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
IUA1: UPPER BUFFALO RIVER	**GRU-1**	Quantity	Stress Index	Annual calculation of Stress Index (SI) (Aquifer Unit Use divided by Aquifer Unit Recharge) expressed as a percentage.	Groundwater abstraction must be sustainably managed.	Annual abstraction should not be larger than 65% of average annual recharge (i.e., SI of 0.65 as upper limit). Upper SI limit to be approximately 51% (2021 SI plus 50%).

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
			Water depth	Quarterly "rest" water level depth in "metre below collar level". Water table conditions at main wetland site (Wakkerstroom Wetland)	Aquifer water level (table) depth must be maintained to allow sustainable use.	Annual water level depletion should not drop to 5 metres (m) above the "main water strike" depth in wellfield production boreholes. Wetlands: annual water level depths at control monitoring sites in main wetland area (Wakkerstroom Wetland) should not drop more than 0.5 m.
		Quality	System variables	pH range	Groundwater water quality must not deteriorate further, to safeguard human health (Quarterly analyses required and individual concentrations should be Good water quality).	pH range: >5.5 to <9.5 pH units.
				Total Alkalinity		Total Alkalinity: dominant anion hydrochemical constituent – should remain <300 milligrams per Litre (mg/L).
			Salinity	Total Dissolved Solids		Total Dissolved Solids ≤ 450 milligrams per Litre (mg/L)
				Sodium		Sodium: <65 milligrams per Litre (mg/L). Long-term trend should not approach +10% (72 mg/L)
				Chloride		Chloride: <90 milligrams per Litre (mg/L). Long-term trend should not approach+10% (100 mg/L)
				Sulphate		Sulphate: <180 milligrams per Litre (mg/L). Long-term trend should not approach+10% (200mg/L).
			Nutrients	Nítrate		Nitrate ≤10 milligrams per Litre (mg/L);
			Toxic substances	Fluoride		Fluoride ≤1.0 milligrams per Litre (mg/L)
				Arsenic		Arsenic ≤ 0.05 milligrams per Litre (mg/L)
				Dissolved Iron		Dissolved Iron ≤ 0.2 milligrams per Litre (mg/L)
				Dissolved Manganese		Dissolved Manganese ≤ 0.4 milligrams per Litre (mg/L)
		Protection Criteria	Level trends	Annual positive or negative water level trend (time series dataset) – water level recession rate (meters per annum (m/a))	Aquifer water level trends must not show significant annual change over time	Water level >8 metres below ground level (mbgl) - Water level recession rate must be less than 0.5 metres per annum (m/a). If negative trend is observed, abstraction yield (litres per second) (L/s) should be decreased by 25%. Dedicated groundwater monitoring programme required for main Wakkerstroom Wetland.
			Water quality trends	Time series trends of Total Dissolved Solids obtained from quarterly water quality analyses.	Hydrochemical trends must not show deterioration of water quality over time	Medium-term trend (5-year cycle) increases should not approach +50%.
				Time series trends of nutrients and toxic dissolved elements.		Nitrate: Long-term trend should not approach + 10% (>10 milligrams per Litre (mg/L)). Fluoride: Long-term trend should not approach +10% (1.1 mg/L).

Table 19: Regional and Resource Unit specific Resource Quality Objectives for GROUNDWATER in priority Groundwater Resource Units in the Integrated Unit of Analysis 2: NGAGANE RIVER

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
IUA2: NGAGANE RIVER	**GRU-2**	**Quantity**	Stress Index	Annual calculation of Stress Index (SI) (Aquifer Unit Use divided by Aquifer Unit Recharge) expressed as a percentage.	Groundwater abstraction must be sustainably managed.	Annual abstraction should not be larger than 65% of average annual recharge (i.e., SI of 0.65 as upper limit). Upper SI limit to be approximately 45% (2021 SI plus 55%).
			Water depth	Quarterly "rest" water level depth in "metre below collar level".	Aquifer water level (table) depth must be maintained to allow sustainable use.	Annual water level depletion should not drop to 5 m above the "main water strike" depth.
		Quality	System variables	pH range	Groundwater water quality must not deteriorate further, to safeguard human health (Quarterly analyses required and individual concentrations should be Good water quality).	pH range: >5.5 to <9.5 pH units
				Total Alkalinity		Total Alkalinity: dominant anion hydrochemical constituent – should remain <300 milligrams per Litre (mg/L).
			Salinity	Total Dissolved Solids		Total Dissolved Solids ≤ 450 milligrams per Litre (mg/L)
				Sodium		Sodium: <65 milligrams per Litre (mg/L). Long-term trend should not approach +10% (72 mg/L)
				Chloride		Chloride: <100 milligrams per Litre (mg/L). Long-term trend should not approach+10% (110 mg/L)
				Sulphate		Sulphate: <200 milligrams per Litre (mg/L) L. Long-term trend should not approach+10% (220mg/L).
			Nutrients	Nitrate		Nitrate ≤10 milligrams per Litre (mg/L)
			Toxic substances	Fluoride		Fluoride ≤1.0 milligrams per Litre (mg/L)
				Arsenic		Arsenic ≤ 0.05 milligrams per Litre (mg/L)
				Dissolved Iron		Dissolved Iron ≤ 0.2 milligrams per Litre (mg/L)
				Dissolved Manganese		Dissolved Manganese ≤ 0.4 milligrams per Litre (mg/L)
		Protection Criteria	Level trends	Annual positive or negative water level trend (time series dataset) – water level recession rate (meters per annum (m/a))	Aquifer water level trends must not show significant annual change over time	(Water Level >8 metres below ground level (mbgl) - Water level in wellfield area(s) should remain +5 m above the main water strike (MWS). Note: Scattered areas where water level is <1 m above MWS

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
						If negative trend is observed, abstraction yield (litres per second) (L/s) should be decreased by 25%.
			Water quality trends	Time series trends of Total Dissolved Solids obtained from quarterly water quality analyses.	Hydrochemical trends must not show deterioration of water quality over time	Medium-term trend (5-year cycle) increases should not approach +50%.
				Time series trends of nutrients (nitrate) and toxic dissolved elements (fluoride).		Nitrate: Long-term trend should not approach + 10% (>10 milligrams per Litre (mg/L)). Fluoride: Long-term trend should not approach +10% (1.1 milligrams per Litre (mg/L)).

Table 20: Regional and Resource Unit specific Resource Quality Objectives for GROUNDWATER in priority Groundwater Resource Units in the Integrated Unit of Analysis 3: MIDDLE BUFFALO RIVER

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
IUA3: MIDDLE BUFFALO RIVER	**GRU-3**	**Quantity**	Stress Index	Annual calculation of Stress Index (SI) (Aquifer Unit Use divided by Aquifer Unit Recharge) expressed as a percentage.	Groundwater abstraction must be sustainably managed.	Annual abstraction should not be larger than 65% of average annual recharge (i.e., SI of 0.65 as upper limit). Upper SI limit to be approximately 47% (2021 SI plus 55%).
			Water depth	Quarterly "rest" water level depth in "metre below collar level".	Aquifer water level (table) depth must be maintained to allow sustainable use.	Aquifers: Annual water level depletion should not drop to 5 m above the "main water strike" depth. Wetlands: Annual water level depths at control monitoring sites in main wetland area should not drop >0.5 m.
		Quality	System variables	pH range	Groundwater water quality must not deteriorate further, to safeguard human health (Quarterly analyses required and individual concentrations should be Good water quality).	pH range: >5.5 to <9.5 pH units.
				Total Alkalinity		Total Alkalinity: dominant anion hydrochemical constituent – should remain <300 milligrams per Litre (mg/L).
			Salinity	Total Dissolved Solids		Total Dissolved Solids ≤ 450 milligrams per Litre (mg/L)
				Sodium		Sodium: <58 milligrams per Litre (mg/L). Long-term trend should not approach +10% (64 mg/L)
				Chloride		Chloride: <90 milligrams per Litre (mg/L). Long-term trend should not approach+10% (100 mg/L)
				Sulphate		Sulphate: <180 mgSO_4/L. Long-term trend should not approach+10% (200mg/L)

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
			Nutrients	Nítrate		Nitrate ≤10 milligrams per Litre (mg/L) L
			Toxic substances	Fluoride		Fluoride ≤1.0 milligrams per Litre (mg/L)
				Arsenic		Arsenic ≤ 0.05 milligrams per Litre (mg/L)
				Dissolved Iron		Dissolved Iron ≤ 0.2 milligrams per Litre (mg/L)
				Dissolved Manganese		Dissolved Manganese ≤ 0.4 milligrams per Litre (mg/L)
		Protection Criteria	Level trends	Annual positive or negative water level trend (time series dataset) – water level recession rate (meters per annum (m/a))	Aquifer water level trends must not show significant annual change over time	(Water Level >13 metres below ground level (mbgl)) - Water level recession rate must be less than 1.0 m/a. Note: Scattered areas where water level is <1 m and approximately 3 m above Main Water \strike in the northern half and southern half respectively. If negative trend is observed, abstraction yield (litres per second) (L/s) should be decreased by 25%.
			Water quality trends	Time series trends of Total Dissolved Solids obtained from quarterly water quality analyses.	Hydrochemical trends must not show deterioration of water quality over time	Medium-term trend (5-year cycle) increases should not approach +50%.
				Time series trends of nutrients and toxic dissolved elements.		Nitrate: Long-term trend should not approach + 10% (>10 milligrams per Litre (mg/L)). Fluoride: Long-term trend should not approach +10% (1.1 milligrams per Litre (mg/L)).

Table 21: Regional and Resource Unit specific Resource Quality Objectives for GROUNDWATER in priority Groundwater Resource Units in the Integrated Unit of Analysis 4: LOWER BUFFALO RIVER

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
IUA4: LOWER BUFFALO RIVER	**GRU-4**	**Quantity**	Stress Index	Annual calculation of Stress Index (SI) (Aquifer Unit Use divided by Aquifer Unit Recharge) expressed as a percentage.	Groundwater abstraction must be sustainably managed.	Annual abstraction should not be larger than 65% of average annual recharge (i.e., SI of 0.65 as upper limit). Upper SI limit to be approximately 55% (2021 SI plus 55%).

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
			Water depth	Quarterly "rest" water level depth in "metre below collar level".	Aquifer water level (table) depth must be maintained to allow sustainable use.	Aquifers: Annual water level depletion should not drop to 5 metres (m) above the "main water strike" depth.
		Quality	System variables	pH range	Groundwater water quality must not deteriorate further, to safeguard human health (Quarterly analyses required and individual concentrations should be Good water quality).	pH range: >5.5 to <9.5 pH units.
				Total Alkalinity		Total Alkalinity: dominant anion hydrochemical constituent – should remain <300 milligrams per Litre (mg/L).
			Salinity	Total Dissolved Solids		Total Dissolved Solids ≤ 600 milligrams per Litre (mg/L)
				Sodium		Sodium: <58 milligrams per Litre (mg/L). Long-term trend should not approach +10% (64 mg/L)
				Chloride		Chloride: <90 milligrams per Litre (mg/L). Long-term trend should not approach+10% (100 mg/L)
				Sulphate		Sulphate: <180 milligrams per Litre (mg/L). Long-term trend should not approach+10% (200mg/L)
			Nutrients	Nítrate		Nitrate ≤10 milligrams per Litre (mg/L)
			Toxic substances	Fluoride		Fluoride ≤1.0 milligrams per Litre (mg/L)
				Arsenic		Arsenic ≤ 0.05 milligrams per Litre (mg/L)
				Dissolved Iron		Dissolved Iron ≤ 0.2 milligrams per Litre (mg/L)
				Dissolved Manganese		Dissolved Manganese ≤ 0.4 milligrams per Litre (mg/L)
		Protection Criteria	Level trends	Annual positive or negative water level trend (time series dataset) – water level recession rate (milligrams per Litre (mg/L) (m/a))	Aquifer water level trends must not show significant annual change over time	(Water Level >8 metres below ground level (mbgl) - Water level recession rate must be less than 1.0 metres per annum (m/a). Note: Scattered areas where water level is <1 m above MWS (main water strike) specifically in QC V32A and should be regarded as a "Hotspot" site. If negative trend is observed, abstraction yield (litres per second) (L/s) should be decreased by 25%.
			Water quality trends	Time series trends of Total Dissolved Solids obtained from quarterly water quality analyses.	Hydrochemical trends must not show deterioration of water quality over time	Medium-term trend (5-year cycle) increases should not approach +50%.
				Time series trends of nutrients and toxic dissolved elements.		Nitrate: Long-term trend should not approach + 10% (>10 milligrams per Litre (mg/L)). Fluoride: Long-term trend should not approach +10% (1.1 milligrams per Litre (mg/L)).

Table 22: Regional and Resource Unit specific Resource Quality Objectives for GROUNDWATER in priority Groundwater Resource Units in the Integrated Unit of Analysis 5: BLOOD RIVER

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
IUA5: LOWER BUFFALO RIVER	**GRU-5**	**Quantity**	Stress Index	Annual calculation of Stress Index (SI) (Aquifer Unit Use divided by Aquifer Unit Recharge) expressed as a percentage.	Groundwater abstraction must be sustainably managed.	Annual abstraction should not be larger than 65% of average annual recharge (i.e., SI of 0.65 as upper limit). Upper SI limit to be approximately 38% (2021 SI plus 50%).
			Water depth	Quarterly "rest" water level depth in "metre below collar level".	Aquifer water level (table) depth must be maintained to allow sustainable use.	Annual water level depletion should not drop to 5 metres (m) above the "main water strike" depth. Wetlands: Water level recession should be limited to 0.5 m in the surrounding wetlands buffer zone.
		Quality	System variables	pH range	Groundwater water quality must not deteriorate further, to safeguard human health (Quarterly analyses required and individual concentrations should be Good water quality).	pH range: >5.5 to <9.5 pH units.
				Total Alkalinity		Total Alkalinity: dominant anion hydrochemical constituent – should remain <400 milligrams per Litre (mg/L).
			Salinity	Total Dissolved Solids		Total Dissolved Solids ≤ 600 milligrams per Litre (mg/L)
				Sodium		Sodium: <60 milligrams per Litre (mg/L). Long-term trend should not approach +10% (64 mg/L)
				Chloride		Chloride: <90 milligrams per Litre (mg/L). Long-term trend should not approach+10% (100 mg/L)
				Sulphate		Sulphate: <180 milligrams per Litre (mg/L). Long-term trend should not approach+10% (200mg/L)
			Nutrients	Nítrate		Nitrate ≤10 milligrams per Litre (mg/L) L
			Toxic substances	Fluoride		Fluoride ≤1.0 milligrams per Litre (mg/L)
				Arsenic		Arsenic ≤ 0.05 milligrams per Litre (mg/L)
				Dissolved Iron		Dissolved Iron ≤ 0.2 milligrams per Litre (mg/L)
				Dissolved Manganese		Dissolved Manganese ≤ 0.4 milligrams per Litre (mg/L)

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
		Protection Criteria	Level trends	Annual positive or negative water level trend (time series dataset) – water level recession rate (meters per annum (m/a))	Aquifer water level trends must not show significant annual change over time	Water Level >6 metres below ground level (mbgl) - Water level recession rate must be less than 1.0 metres per annum (m/a). If negative trend is observed, abstraction yield (litres per second) (L/s) should be decreased by 25%.
			Water quality trends	Time series trends of Total Dissolved Solids obtained from quarterly water quality analyses.	Hydrochemical trends must not show deterioration of water quality over time	Medium-term trend (5-year cycle) increases should not approach 45%.
				Time series trends of nutrients and toxic dissolved elements.		Nitrate: Long-term trend should not approach + 10% (>10 milligrams per Litre (mg/L)). Fluoride: Long-term trend should not approach +10% (1.1 milligrams per Litre (mg/L)).

Table 23: Regional and Resource Unit specific Resource Quality Objectives for GROUNDWATER in priority Groundwater Resource Units in the Integrated Unit of Analysis 6: SUNDAYS RIVER

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
IUA6: SUNDAYS RIVER	**GRU-6**	**Quantity**	Stress Index	Annual calculation of Stress Index (SI) (Aquifer Unit Use divided by Aquifer Unit Recharge) expressed as a percentage.	Groundwater abstraction must be sustainably managed.	Annual abstraction should not be larger than 65% of average annual recharge (i.e., SI of 0.65 as upper limit). Upper SI limit to be approximately 65% (2021 SI plus 50%).
			Water depth	Quarterly “rest” water level depth in “metre below collar level”.	Aquifer water level (table) depth must be maintained to allow sustainable use.	Annual water level depletion should not drop to 5 metres (m) above the “main water strike” depth. Wetlands: Water level recession should be limited to 0.5 m in the surrounding wetlands buffer zone.
		Quality	System variables	pH range	Groundwater water quality must not deteriorate further, to safeguard human health (Quarterly analyses required and individual concentrations should be Good water quality).	pH range: >5.5 to <9.5 pH units.
				Total Alkalinity		Total Alkalinity: dominant anion hydrochemical constituent – should remain <400 milligrams per Litre (mg/L).
			Salinity	Total Dissolved Solids		Total Dissolved Solids ≤ 500 milligrams per Litre (mg/L)
				Sodium		Sodium: <58 milligrams per Litre (mg/L). Long-term trend should not approach +10% (64 mg/L)

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
				Chloride		Chloride: <90 milligrams per Litre (mg/L). Long-term trend should not approach+10% (100 mg/L)
				Sulphate		Sulphate: <360 milligrams per Litre (mg/L). Long-term trend should not approach+10% (200mg/L)
			Nutrients	Nítrate		Nitrate ≤10 milligrams per Litre (mg/L)
			Toxic substances	Fluoride		Fluoride ≤1.0 milligrams per Litre (mg/L)
				Arsenic		Arsenic ≤ 0.05 milligrams per Litre (mg/L)
				Dissolved Iron		Dissolved Iron ≤ 0.2 milligrams per Litre (mg/L)
				Dissolved Manganese		Dissolved Manganese ≤ 0.4 milligrams per Litre (mg/L)
		Protection Criteria	Level trends	Annual positive or negative water level trend (time series dataset) – water level recession rate (meters per annum (m/a))	Aquifer water level trends must not show significant annual change over time	Water Level >10 metres below ground level (mbgl) - Water level recession rate must be less than 1.0 m/a. If negative trend is observed, abstraction yield (litres per second) (L/s) should be decreased by 35%.
			Water quality trends	Time series trends of Total Dissolved Solids obtained from quarterly water quality analyses.	Hydrochemical trends must not show deterioration of water quality over time	Medium-term trend (5-year cycle) increases should not approach 50%.
				Time series trends of nutrients and toxic dissolved elements.		Nitrate: Long-term trend should not approach + 10% (>10 milligrams per Litre (mg/L)). Fluoride: Long-term trend should not approach +10% (1.1 milligrams per Litre (mg/L)).

Table 24: Regional and Resource Unit specific Resource Quality Objectives for GROUNDWATER in priority Groundwater Resource Units in the Integrated Unit of Analysis 7: UPPER MOOI RIVER

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
IUA7: UPPER MOOI RIVER	**GRU-7**	**Quantity**	Stress Index	Annual calculation of Stress Index (SI) (Aquifer Unit Use divided by Aquifer Unit Recharge) expressed as a percentage.	Groundwater abstraction must be sustainably managed.	Annual abstraction should not be larger than 65% of average annual recharge (i.e., SI of 0.65 as upper limit). Upper SI limit to be approximately 45% (2021 SI plus 50%).

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
			Water depth	Quarterly "rest" water level depth in "metre below collar level".	Aquifer water level (table) depth must be maintained to allow sustainable use.	Annual water level depletion should not drop to 5 metres (m) above the "main water strike" depth. Wetlands: Water level recession should be limited to 0.5 m in the surrounding wetlands buffer zone.
		Quality	System variables	pH range	Groundwater water quality must not deteriorate further, to safeguard human health (Quarterly analyses required and individual concentrations should be Good water quality).	pH range: >5.5 to <9.5 pH units.
				Total Alkalinity		Total Alkalinity: dominant anion hydrochemical constituent – should remain <250 milligrams per Litre (mg/L).
			Salinity	Total Dissolved Solids		Total Dissolved Solids ≤ 900 milligrams per Litre (mg/L)
				Sodium		Sodium: <100 milligrams per Litre (mg/L). Long-term trend should not approach +10% (64 mg/L)
				Chloride		Chloride: <100 milligrams per Litre (mg/L). Long-term trend should not approach+10% (100 mg/L)
				Sulphate		Sulphate: <200 milligrams per Litre (mg/L). Long-term trend should not approach+10% (200mg/L)
			Nutrients	Nítrate		Nitrate ≤10 milligrams per Litre (mg/L)
			Toxic substances	Fluoride		Fluoride ≤1.0 milligrams per Litre (mg/L)
				Arsenic		Arsenic ≤ 0.05 milligrams per Litre (mg/L)
				Dissolved Iron		Dissolved Iron ≤ 0.2 milligrams per Litre (mg/L)
				Dissolved Manganese		Dissolved Manganese ≤ 0.4 milligrams per Litre (mg/L)
		Protection Criteria	Level trends	Annual positive or negative water level trend (time series dataset) – water level recession rate (meters per annum (m/a))	Aquifer water level trends must not show significant annual change over time	Water Level >5 metres below ground level (mbgl) - Water level recession rate must be less than 1.0 metre per annum (m/a). If negative trend is observed, abstraction yield (litres per second) (L/s) should be decreased by 50%.
			Water quality trends	Time series trends of Total Dissolved Solids obtained from quarterly water quality analyses.	Hydrochemical trends must not show deterioration of water quality over time	Medium-term trend (5-year cycle) increases should not approach 10%.
				Time series trends of nutrients and toxic dissolved elements.		Nitrate: Long-term trend should not approach + 10% (>10 milligrams per Litre (mg/L)). Fluoride: Long-term trend should not approach +10% (1.1 milligrams per Litre (mg/L)).

Table 25: Regional and Resource Unit specific Resource Quality Objectives for GROUNDWATER in priority Groundwater Resource Units in the Integrated Unit of Analysis 8: MIDDLE/ LOWER MOOI RIVER

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
IUA8: MIDDLE/ LOWER MOOI RIVER	**GRU-8**	**Quantity**	Stress Index	Annual calculation of Stress Index (SI) (Aquifer Unit Use divided by Aquifer Unit Recharge) expressed as a percentage.	Groundwater abstraction must be sustainably managed.	Annual abstraction should not be larger than 65% of average annual recharge (i.e., SI of 0.65 as upper limit). Upper SI limit to be approximately 45% (2021 SI plus 50%).
			Water depth	Quarterly "rest" water level depth in "metre below collar level".	Aquifer water level (table) depth must be maintained to allow sustainable use.	Aquifers: Annual water level depletion should not drop to 5 metres (m) above the "main water strike" depth. Wetlands: Water level recession should be limited to 0.5 m in the surrounding wetlands buffer zone.
		Quality	System variables	pH range	Groundwater water quality must not deteriorate further, to safeguard human health (Quarterly analyses required and individual concentrations should be Good water quality).	pH range: >5.5 to <9.5 pH units.
				Total Alkalinity		Total Alkalinity: dominant anion hydrochemical constituent – should remain <370 milligrams per Litre (mg/L). Long-term trend should not approach 390 mg/L
			Salinity	Total Dissolved Solids		Total Dissolved Solids ≤ 2 160 milligrams per Litre (mg/L)
				Sodium		Sodium: <230 milligrams per Litre (mg/L). Long-term trend should not approach +10% (250mg/L)
				Chloride		Chloride: <200 milligrams per Litre (mg/L). Long-term trend should not approach+10% (220 mg/L)
				Sulphate		Sulphate: <200 milligrams per Litre (mg/L). Long-term trend should not approach+10% (220mg/L)
			Nutrients	Nítrate		Nitrate ≤10 milligrams per Litre (mg/L)
			Toxic substances	Fluoride		Fluoride ≤1.0 milligrams per Litre (mg/L)
				Arsenic		Arsenic ≤ 0.05 milligrams per Litre (mg/L)
				Dissolved Iron		Dissolved Iron ≤ 0.2 milligrams per Litre (mg/L)
				Dissolved Manganese		Dissolved Manganese ≤ 0.4 milligrams per Litre (mg/L)

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
		Protection Criteria	Level trends	Annual positive or negative water level trend (time series dataset) – water level recession rate (meters per annum (m/a))	Aquifer water level trends must not show significant annual change over time	Water Level >5 metres below ground level (mbgl) - Water level recession rate must be less than 1.0 metres per annum (m/a). If negative trend is observed, abstraction yield (litres per second) (L/s) should be decreased by 50%.
			Water quality trends	Time series trends of Total Dissolved Solids obtained from quarterly water quality analyses.	Hydrochemical trends must not show deterioration of water quality over time	Medium-term trend (5-year cycle) increases should not approach 10%.
				Time series trends of nutrients and toxic dissolved elements.		Nitrate: Long-term trend should not approach + 10% (>10 milligrams per Litre (mg/L)). Fluoride: Long-term trend should not approach +10% (1.1 milligrams per Litre (mg/L)).

Table 26: Regional and Resource Unit specific Resource Quality Objectives for GROUNDWATER in priority Groundwater Resource Units in the Integrated Unit of Analysis 9: MIDDLE/ LOWER BUSHMAN'S RIVER

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
IUA9: MIDDLE/ LOWER BUSHMAN'S RIVER	**GRU-9**	**Quantity**	Stress Index	Annual calculation of Stress Index (SI) (Aquifer Unit Use divided by Aquifer Unit Recharge) expressed as a percentage.	Groundwater abstraction must be sustainably managed.	Annual abstraction should not be larger than 65% of average annual recharge (i.e., SI of 0.65 as upper limit). Upper SI limit to be approximately 59% (2021 SI plus 50%).
			Water depth	Quarterly "rest" water level depth in "metre below collar level".	Aquifer water level (table) depth must be maintained to allow sustainable use.	Aquifers: Annual water level depletion should not drop to 5 metres (m) above the "main water strike" depth. Wetlands: Water level recession should be limited to 0.5 m in the surrounding wetlands buffer zone.
		Quality	System variables	pH range	Groundwater water quality must not deteriorate further, to safeguard human health (Quarterly analyses required and individual concentrations should be Good water quality).	pH range: >5.5 to <9.5 pH units.
				Total Alkalinity		Total Alkalinity: dominant anion hydrochemical constituent – should remain <370 milligrams per Litre (mg/L). Long-term trend should not approach 390 mg/L.
			Salinity	Total Dissolved Solids		Total Dissolved Solids ≤ 1 000 milligrams per Litre (mg/L)

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
				Sodium		Sodium: <130 milligrams per Litre (mg/L). Long-term trend should not approach +10% (145mg/L)
				Chloride		Chloride: <200 milligrams per Litre (mg/L). Long-term trend should not approach+10% (220 mg/L)
				Sulphate		Sulphate: <200 milligrams per Litre (mg/L) L. Long-term trend should not approach+10% (220mg/L)
			Nutrients	Nítrate		Nitrate ≤10 milligrams per Litre (mg/L)
			Toxic substances	Fluoride		Fluoride ≤1.0 milligrams per Litre (mg/L)
				Arsenic		Arsenic ≤ 0.05 milligrams per Litre (mg/L)
				Dissolved Iron		Dissolved Iron ≤ 0.2 milligrams per Litre (mg/L)
				Dissolved Manganese		Dissolved Manganese ≤ 0.4 milligrams per Litre (mg/L)
		Protection Criteria	Level trends	Annual positive or negative water level trend (time series dataset) – water level recession rate (meters per annum (m/a))	Aquifer water level trends must not show significant annual change over time	Water Level >5 metres below ground level (mbgl) - Water level recession rate must be less than 1.0 metres per annum (m/a). If negative trend is observed, abstraction yield (litres per second) (L/s) should be decreased by 50%.
			Water quality trends	Time series trends of Total Dissolved Solids obtained from quarterly water quality analyses.	Hydrochemical trends must not show deterioration of water quality over time	Medium-term trend (5-year cycle) increases should not approach 10%.
				Time series trends of nutrients and toxic dissolved elements.		Nitrate: Long-term trend should not approach + 10% (>10 milligrams per Litre (mg/L)). Fluoride: Long-term trend should not approach +10% (1.1 milligrams per Litre (mg/L)).

Table 27: Regional and Resource Unit specific Resource Quality Objectives for GROUNDWATER in priority Groundwater Resource Units in the Integrated Unit of Analysis 10: UPPER THUKELA RIVER

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
IUA10: UPPER	**GRU-10**	**Quantity**	Stress Index	Annual calculation of Stress Index (SI) (Aquifer Unit Use divided by	Groundwater abstraction must be sustainably managed.	Annual abstraction should not be larger than 65% of average annual recharge (i.e., SI of 0.65 as upper limit).

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
THUKELA RIVER				Aquifer Unit Recharge) expressed as a percentage.		Upper SI limit to be approximately 59% (2021 SI plus 27%).
			Water depth	Quarterly "rest" water level depth in "metre below collar level".	Aquifer water level (table) depth must be maintained to allow sustainable use.	Aquifers: Annual water level depletion should not drop to 5 metres (m) above the "main water strike" depth.
		Quality	System variables	pH range	Groundwater water quality must not deteriorate further, to safeguard human health (Quarterly analyses required and individual concentrations should be Good water quality).	pH range: >5.5 to <9.5 pH units.
				Total Alkalinity		Total Alkalinity: dominant anion hydrochemical constituent – should remain <300 milligrams per Litre (mg/L). Long-term trend should not approach 330 mgHCO_3/L.
			Salinity	Total Dissolved Solids		Total Dissolved Solids ≤ 900 milligrams per Litre (mg/L)
				Sodium		Sodium: <180 milligrams per Litre (mg/L). Long-term trend should not approach +10% (200mg/L)
				Chloride		Chloride: <180 milligrams per Litre (mg/L). Long-term trend should not approach+10% (200 mg/L)
				Sulphate		Sulphate: <300 milligrams per Litre (mg/L). Long-term trend should not approach+10% (330mg/L)
			Nutrients	Nítrate		Nitrate ≤10 milligrams per Litre (mg/L)
			Toxic substances	Fluoride		Fluoride ≤1.0 milligrams per Litre (mg/L)
				Arsenic		Arsenic ≤ 0.05 milligrams per Litre (mg/L)
				Dissolved Iron		Dissolved Iron ≤ 0.2 milligrams per Litre (mg/L)
				Dissolved Manganese		Dissolved Manganese ≤ 0.4 milligrams per litre (mg/L)
		Protection Criteria	Level trends	Annual positive or negative water level trend (time series dataset) – water level recession rate (meters per annum (m/a))	Aquifer water level trends must not show significant annual change over time	Water Level >3 metres below ground level (mbgl) - Water level recession rate must be less than 1.0 metre per annum (m/a). If negative trend is observed, abstraction yield (litres per second) (L/s) should be decreased by 25%.
			Water quality trends	Time series trends of Total Dissolved Solids obtained from quarterly water quality analyses.	Hydrochemical trends must not show deterioration of water quality over time	Medium-term trend (5-year cycle) increases should not approach 10%.
				Time series trends of nutrients and toxic dissolved elements.		Nitrate: Long-term trend should not approach + 10% (>10 milligrams per Litre (mg/L)). Fluoride: Long-term trend should not approach +10% (1.1 milligrams per Litre (mg/L)).

Table 28: Regional and Resource Unit specific Resource Quality Objectives for GROUNDWATER in priority Groundwater Resource Units in the Integrated Unit of Analysis 11: KLIP RIVER

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
IUA11: KLIP RIVER	**GRU-11**	**Quantity**	Stress Index	Annual calculation of Stress Index (SI) (Aquifer Unit Use divided by Aquifer Unit Recharge) expressed as a percentage.	Groundwater abstraction must be sustainably managed.	Annual abstraction should not be larger than 65% of average annual recharge (i.e., SI of 0.65 as upper limit). Upper SI limit to be approximately 45% (2021 SI plus 32%).
			Water depth	Quarterly "rest" water level depth in "metre below collar level".	Aquifer water level (table) depth must be maintained to allow sustainable use.	Aquifers: Annual water level depletion should not drop to 5 m above the "main water strike" depth. Wetlands: Water level recession should be limited to 0.5 m in the surrounding wetlands buffer zone.
		Quality	System variables	pH range	Groundwater water quality must not deteriorate further, to safeguard human health (Quarterly analyses required and individual concentrations should be Good water quality).	pH range: >5.5 to <9.5 pH units.
				Total Alkalinity		Total Alkalinity: dominant anion hydrochemical constituent – should remain <300 milligrams per Litre (mg/L). Long-term trend should not approach 330 mgHCO_3/L.
			Salinity	Total Dissolved Solids		Total Dissolved Solids ≤ 1 000 milligrams per Litre (mg/L)
				Sodium		Sodium: <53 milligrams per Litre (mg/L). Long-term trend should not approach +10% (60 mg/L)
				Chloride		Chloride: <180 milligrams per Litre (mg/L). Long-term trend should not approach+10% (200 mg/L)
				Sulphate		Sulphate: <360 milligrams per Litre (mg/L). Long-term trend should not approach+10% (400 mg/L)
			Nutrients	Nítrate		Nitrate ≤10 milligrams per Litre (mg/L)
			Toxic substances	Fluoride		Fluoride ≤1.0 milligrams per Litre (mg/L)
				Arsenic		Arsenic ≤ 0.05 milligrams per Litre (mg/L)
				Dissolved Iron		Dissolved Iron ≤ 0.2 milligrams per Litre (mg/L)
				Dissolved Manganese		Dissolved Manganese ≤ 0.4 milligrams per Litre (mg/L)

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
		Protection Criteria	Level trends	Annual positive or negative water level trend (time series dataset) – water level recession rate (meters per annum (m/a))	Aquifer water level trends must not show significant annual change over time	Water Level >5 metres below ground level (mbgl) - Water level recession rate must be less than 1.0 metres per annum (m/a). If negative trend is observed, abstraction yield (litres per second) (L/s) should be decreased by 25%.
			Water quality trends	Time series trends of Total Dissolved Solids obtained from quarterly water quality analyses.	Hydrochemical trends must not show deterioration of water quality over time	Medium-term trend (5-year cycle) increases should not approach 10%.
				Time series trends of nutrients and toxic dissolved elements.		Nitrate: Long-term trend should not approach + 10% (>10 milligrams per Litre (mg/L)). Fluoride: Long-term trend should not approach +10% (1.1 milligrams per Litre (mg/L)).

Table 29: Regional and Resource Unit specific Resource Quality Objectives for GROUNDWATER in priority Groundwater Resource Units in the Integrated Unit of Analysis 12: MIDDLE THUKELA RIVER

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
IUA12: MIDDLE THUKELA RIVER	**GRU-12**	**Quantity**	Stress Index	Annual calculation of Stress Index (SI) (Aquifer Unit Use divided by Aquifer Unit Recharge) expressed as a percentage.	Groundwater abstraction must be sustainably managed and new water use allocations should be limited.	Annual abstraction should not be larger than 65% of average annual recharge (i.e., SI of 0.65 as upper limit). Upper SI limit to be approximately 65%.
			Water depth	Quarterly "rest" water level depth in "metre below collar level".	Aquifer water level (table) depth must be maintained to allow sustainable use.	Aquifers: Annual water level depletion should not drop to 5 metres (m) above the "main water strike" depth.
		Quality	System variables	pH range	Groundwater water quality must not deteriorate further, to safeguard human health (Quarterly analyses required and individual concentrations should be Good water quality).	pH range: >5.5 to <9.5 pH units.
				Total Alkalinity		Total Alkalinity: dominant anion hydrochemical constituent – should remain <300 milligrams per Litre (mg/L). Long-term trend should not approach 330 mgHCO_3/L.
			Salinity	Total Dissolved Solids		Total Dissolved Solids ≤ 770 milligrams per Litre (mg/L)
				Sodium		Sodium: <73 milligrams per Litre (mg/L). Long-term trend should not approach +10% (85 mg/L)
				Chloride		Chloride: <180 milligrams per Litre (mg/L). Long-term trend should not approach+10% (200 mg/L)

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
				Sulphate		Sulphate: <200 milligrams per Litre (mg/L). Long-term trend should not approach+10% (220 mg/L)
			Nutrients	Nítrate		Nitrate ≤9 milligrams per Litre (mg/L). Long-term trend should not approach +10% (10.0 mg/L)
			Toxic substances	Fluoride		Fluoride ≤ 0.9 milligrams per Litre (mg/L)
				Arsenic		Arsenic ≤ 0.05 milligrams per Litre (mg/L)
				Dissolved Iron		Dissolved Iron ≤ 0.2 milligrams per Litre (mg/L)
				Dissolved Manganese		Dissolved Manganese ≤ 0.4 milligrams per Litre (mg/L)
		Protection Criteria	Level trends	Annual positive or negative water level trend (time series dataset) – water level recession rate (meters per annum (m/a))	Aquifer water level trends must not show significant annual change over time	Water Level >8 metres below ground level (mbgl) - Water level recession rate must be less than 1.0 metres per annum (m/a).
			Water quality trends	Time series trends of Total Dissolved Solids obtained from quarterly water quality analyses.	Hydrochemical trends must not show deterioration of water quality over time	Medium-term trend (5-year cycle) increases should not approach 15%.
				Time series trends of nutrients and toxic dissolved elements.		Nitrate: Long-term trend should not approach + 10% (>10 milligrams per Litre (mg/L)). Fluoride: Long-term trend should not approach +10% (1.1 milligrams per Litre (mg/L)).

Table 30: Regional and Resource Unit specific Resource Quality Objectives for GROUNDWATER in priority Groundwater Resource Units in the Integrated Unit of Analysis 13: LOWER THUKELA RIVER

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
IUA13: MIDDLE THUKELA RIVER	**GRU-13**	**Quantity**	Stress Index	Annual calculation of Stress Index (SI) (Aquifer Unit Use divided by Aquifer Unit Recharge) expressed as a percentage.	Groundwater abstraction must be sustainably managed and new water use allocations should be limited.	Annual abstraction should not be larger than 65% of average annual recharge (i.e., SI of 0.65 as upper limit). Upper SI limit to be approximately 65%.
			Water depth	Quarterly “rest” water level depth in “metre below collar level”.	Aquifer water level (table) depth must be maintained to allow sustainable use.	Aquifers: Annual water level depletion should not drop to 5 m above the “main water strike” depth.
		Quality		pH range		pH range: >5.5 to <9.5 pH units.

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
			System variables	Total Alkalinity	Groundwater water quality must not deteriorate further, to safeguard human health (Quarterly analyses required and individual concentrations should be Good water quality).	Total Alkalinity: dominant anion hydrochemical constituent – should remain <300 milligrams per Litre (mg/L). Long-term trend should not approach 330 mgHCO_3/L.
			Salinity	Total Dissolved Solids		Total Dissolved Solids ≤ 900 milligrams per Litre (mg/L)
				Sodium		Sodium: <83 milligrams per Litre (mg/L). Long-term trend should not approach +10% (91 mg/L)
				Chloride		Chloride: <100 milligrams per Litre (mg/L). Long-term trend should not approach+10% (110 mg/L)
				Sulphate		Sulphate: <100 milligrams per Litre (mg/L). Long-term trend should not approach+10% (110 mg/L)
			Nutrients	Nítrate		Nitrate ≤9 milligrams per Litre (mg/L). Long-term trend should not approach +10% (10.0 mg/L)
			Toxic substances	Fluoride		Fluoride ≤ 0.9 milligrams per Litre (mg/L)
				Arsenic		Arsenic ≤ 0.05 milligrams per Litre (mg/L)
				Dissolved Iron		Dissolved Iron ≤ 0.2 milligrams per Litre (mg/L)
				Dissolved Manganese		Dissolved Manganese ≤ 0.4 milligrams per Litre (mg/L)
		Protection Criteria	Level trends	Annual positive or negative water level trend (time series dataset) – water level recession rate (meters per annum (m/a))	Aquifer water level trends must not show significant annual change over time	Water Level >8 metres below ground level (mbgl) - Water level recession rate must be less than 1.0 metres per annum (m/a).
			Water quality trends	Time series trends of Total Dissolved Solids obtained from quarterly water quality analyses.	Hydrochemical trends must not show deterioration of water quality over time	Medium-term trend (5-year cycle) increases should not approach 10%.
				Time series trends of nutrients and toxic dissolved elements.		Nitrate: Long-term trend should not approach + 10% (>10 milligrams per Litre (mg/L)). Fluoride: Long-term trend should not approach +10% (1.1 milligrams per Litre (mg/L)).

Table 31: Regional and Resource Unit specific Resource Quality Objectives for GROUNDWATER in priority Groundwater Resource Units in the Integrated Unit of Analysis 14: ESCARPMENT

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
IUA14: ESCARPMENT	**GRU-14**	**Quantity**	Stress Index	Annual calculation of Stress Index (SI) (Aquifer Unit Use divided by Aquifer Unit Recharge) expressed as a percentage.	Groundwater abstraction must be sustainably managed and new water use allocations should be limited.	Annual abstraction should not be larger than 65% of average annual recharge (i.e., SI of 0.65 as upper limit). Upper SI limit to be approximately 65%. Wetlands: Groundwater abstraction from all wetland's terrains should be limited to Schedule 1 water use category.
			Water depth	Quarterly "rest" water level depth in "metre below collar level".	Aquifer water level (table) depth must be maintained to allow sustainable use.	Aquifers: Annual water level depletion should not drop to 5 metres (m) above the "main water strike" depth. Wetlands: Water level recession should be limited to 0.5 m in the surrounding wetlands buffer zone.
		Quality	System variables	pH range	Groundwater water quality must not deteriorate further, to safeguard human health (Quarterly analyses required and individual concentrations should be Good water quality).	pH range: >5.5 to <9.5 pH units.
				Total Alkalinity		Total Alkalinity: dominant anion hydrochemical constituent – should remain <250 milligrams per Litre (mg/L)
			Salinity	Total Dissolved Solids		Total Dissolved Solids ≤ 450 milligrams per Litre (mg/L)
				Sodium		Sodium: ≤ 100 milligrams per Litre (mg/L)
				Chloride		Chloride: ≤ 100 milligrams per Litre (mg/L)
				Sulphate		Sulphate: ≤ 200 milligrams per Litre (mg/L)
			Nutrients	Nítrate		Nitrate ≤ 6 milligrams per Litre (mg/L)
			Toxic substances	Fluoride		Fluoride ≤ 0.7 milligrams per Litre (mg/L)
				Arsenic		Arsenic ≤ 0.05 milligrams per Litre (mg/L)
				Dissolved Iron		Dissolved Iron ≤ 0.2 milligrams per Litre (mg/L)
				Dissolved Manganese		Dissolved Manganese ≤ 0.4 milligrams per Litre (mg/L)
		Protection Criteria	Level trends	Annual positive or negative water level trend (time series dataset) – water level recession rate (meters per annum (m/a))	Aquifer water level trends must not show significant annual change over time	Water Level >4 metres below ground level (mbgl) - Water level recession rate must be less than 1.0 metre per annum (m/a).
			Water quality trends	Time series trends of Total Dissolved Solids obtained from quarterly water quality analyses.	Hydrochemical trends must not show deterioration of water quality over time	Medium-term trend (5-year cycle) increases should not approach 10%.
				Time series trends of nutrients and toxic dissolved elements.		Nitrate: Long-term trend should not approach + 10% (>10 milligrams per Litre (mg/L)).

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
						Fluoride: Long-term trend should not approach +10% (1.1 milligrams per Litre (mg/L)).

Table 32: Regional and Resource Unit specific Resource Quality Objectives for GROUNDWATER in priority Groundwater Resource Units in the Integrated Unit of Analysis 15: ESTUARY and UPSTREAM THUKELA REACH

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
IUA15: ESTUARY and UPSTREAM THUKELA REACH	**GRU-15 (Resource Unit 15.1 in upstream Thukela reach)**	**Quantity**	Stress Index	Annual calculation of Stress Index (SI) (Aquifer Unit Use divided by Aquifer Unit Recharge) expressed as a percentage.	Groundwater abstraction must be sustainably managed and new water use allocations should be limited.	Annual abstraction should not be larger than 65% of average annual recharge (i.e., SI of 0.65 as upper limit). Upper SI limit to be approximately 65%.
			Water depth	Quarterly "rest" water level depth in "metre below collar level".	Aquifer water level (table) depth must be maintained to allow sustainable use.	Aquifers: Annual water level depletion should not drop to 5 metres (m) above the "main water strike" depth.
		Quality	System variables	pH range	Groundwater quality must not deteriorate further.	pH range: >5.5 to <9.5 pH units.
				Total Alkalinity		Total Alkalinity: ≤ 250 milligrams per Litre (mg/L)
			Salinity	Total Dissolved Solids		Total Dissolved Solids ≤ 900 milligrams per Litre (mg/L)
				Sodium		Sodium: ≤ 100 milligrams per Litre (mg/L)
				Chloride		Chloride: ≤ 100 milligrams per Litre (mg/L)
				Sulphate		Sulphate: ≤ 200 milligrams per Litre (mg/L)
			Nutrients	Nítrate		Nitrate ≤ 6 milligrams per Litre (mg/L)
			Toxic substances	Fluoride		Fluoride ≤ 0.7 milligrams per Litre (mg/L)
				Arsenic		Arsenic ≤ 0.05 milligrams per Litre (mg/L)
				Dissolved Iron		Dissolved Iron ≤ 0.2 milligrams per Litre (mg/L)
				Dissolved Manganese		Dissolved Manganese ≤ 0.4 milligrams per Litre (mg/L)

IUA	Groundwater Resource Unit	Component	Sub-component	Indicator(s)	Narrative RQO	Measure/Numerical Limit
		Protection Criteria	Level trends	Annual positive or negative water level trend (time series dataset) – water level recession rate (meters per annum (m/a))	Aquifer water level trends must not show significant annual change over time	Water Level >7 metres below ground level (mbgl) - Water level recession rate must be less than 1.0 metre per annum (m/a).
			Water quality trends	Time series trends of Total Dissolved Solids obtained from quarterly water quality analyses.	Hydrochemical trends must not show deterioration of water quality over time	Medium-term trend (5-year cycle) increases should not approach 10%.
				Time series trends of nutrients and toxic dissolved elements.		Nitrate: Long-term trend should not approach + 10% (>10 milligrams per Litre (mg/L)). Fluoride: Long-term trend should not approach +10% (1.1 milligrams per Litre (mg/L)).

Table 33: Resource Quality Objectives for THUKELA ESTUARY in priority Resource Units in the Integrated Unit of Analysis IUA 15: ESTUARY and UPSTREAM THUKELA REACH

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
IUA 15: ESTUARY and UPSTREAM THUKELA REACH	II	Thukela Estuary (8.5 km upstream) **V50D**	**15.2**	Hydrology	Low Flows – Flows < 30 m^3/s (States 1, 2 and 3).	Maintain % similarity in period of river low flows. Protect the flow regimes to maintain open mouth of the estuary to create necessary habitat for physico-chemical properties, microalgae, macrophytes, invertebrates, fish and birds.	River flow at Mandini Weir (V2H005).	Maintain TEC = A/B (83%)
					High Flows (floods) – Based on recurrence of major floods (1-in-X years); 1000 m^3/s (2), 4500 m^3/s (10), 6800 m^3/s (20) and 11000 m^3/s (50).	Protect the flow regimes to maintain open mouth of the estuary to create necessary habitat for physico-chemical properties, microalgae, macrophytes, invertebrates, fish and birds. Maintain high flows	River flow at Mandini Weir (V2H005).	Maintain TEC = B/C (73%)
				Hydrodynamics	Mouth Condition	Maintain open estuary mouth to protect estuarine ecosystems, diversity of habitats for physico-chemical conditions, microalgae, macrophytes, invertebrates, fish and birds, and maintain river, estuary and KwaZulu-Natal Bight interlinkages. Water level should be within tidal range (Exceeds 2.5 m when closed).	Mouth condition – Open	Maintain TEC = A (100%):
					Abiotic states	Estuary is in State 4 (river-dominated) for 7 months annually and in State 3 (mouth open, saline penetration <6 km) for remaining 5 months.	River discharge Longitudinal salinity profile	Maintain hydrology TEC = B (>79%)
				Water quality	Salinity	Instream salinity levels as specified must be maintained to protect the aquatic ecosystem health and ensure the prescribed ecological category is met.	Vertical and longitudinal salinity patterns.	Maintain TEC = B (>83%)
					Dissolved inorganic nitrogen	Instream concentration of nutrients as specified maintained to protect the aquatic ecosystem health and ensure the prescribed ecological category is	Total Oxidised Nitrogen (Nitrate + nitrite; NOx) plus ammonium = Dissolved Inorganic Nitrogen (DIN)	Maintain TEC = C (>70%)

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
					Dissolved inorganic phosphorus	met. TON concentrations in marine water < 0.05 mg-N/L and <1.40 mg-N/L in river water; average concentrations in estuary related to salinity gradients (7 months State 4 and 5 months (State 3). Average NH_4^+ <0.05 mg-N/L. DIP <0.05 mg-P/L in marine water and <0.20 mg-P/L in fresh water; average concentrations associated with salinity gradients.	Orthophosphate; Dissolved Inorganic Phosphorus (DIP)	Maintain TEC = C (>70%)
					Nutrients		DIN + DIP	Maintain TEC = C (>70%)
					Water Clarity	The river and estuary are naturally turbid, so it is necessary to maintain the turbidity within a range that is suitable for the TEC. A moderate change from natural with temporary high sediment loads and turbidity during runoff events.	Total Suspended Solids (TSS), Secchi depth, and/ or turbidimeter	Maintain TEC = D (>50%)
					Dissolved Oxygen	Estuary should be well-oxygenated throughout; average >6 mg/L.	Dissolved oxygen (mg/L)	Maintain TEC = B (>80%)
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements. The pH is likely to remain within 7-8 range during all four states.	pH	Maintain TEC = A (100%)
					Toxic substances	Toxic substances in water and sediments not to exceed target values as per SA Water Quality Guidelines and Western Indian Ocean Regional guidelines, respectively.	Organic and inorganic constituents, and pathogens.	Maintain TEC = A (100%)
					Pathogens	For recreational use areas (DEA 2012): Enterococci < 185 Counts per 100 millilitres (90^{th} percentile) *Escherichia coli* < 500 Counts per 100 millilitres (90^{th} percentile)	*Escherichia coli*	Ensure bacterial counts are within Target Water Quality Range (DEA 2021)
				Physical Habitat	Intertidal habitat	Area of intertidal habitat to be maintained to support dependent biota.	Area of tidally exposed sediments (GIS mapping). Tidal exchange present: Tidal range 0.3 m (neap) - 1.5 m (spring) above MSL. Intertidal area estimated at 20.55 ha.	Maintain TEC = C/D (60%)
					Subtidal habitat	Maintain depth, bed or channel morphology. Area of subtidal habitat to be maintained to support dependent biota.	Area of permanently inundated sediments (GIS mapping), estimated at 72.47 ha.	Maintain TEC = B/C (75%)
					Substrate type	Maintain % similarity in sand fraction.	Sediment particle size	Maintain TEC = C/D (60%)

IUA	Class	River	Resource Unit	Component	Sub-component	Narrative RQO	Indicator	Numerical Limit/ measure
				Biota	Microalgae	Maintain benthic microalgal and phytoplankton species richness, abundance and community compositions.	Biomass using Chlorophyll-*a* as an index. Community structure and species richness using phytoplankton groups and benthic diatoms.	Maintain TEC = C (65%)
					Macrophytes	Distribution of plant communities to be maintained in relevant proportions and alien species to be limited.	Community structure using botanical survey and mapping (including alien invasive species).	Maintain TEC = C (64%)
					Invertebrates	Invertebrate community structure to be maintained.	Community structure. Macrobenthos: Eckman sediment grab sampling and sieving. Zooplankton: Night collection using Bongo nets. Macrocrustacea: Beam trawls and prawn traps.	Maintain TEC = C (65%)
					Fish	Estuaries to be maintained as nursery areas for estuary-dependent fish, habitat for stenohaline marine and euryhaline freshwater fish, and conduits for Anguillid eel larvae.	Fish Recruitment Index (FRI) Community structure (seine net collection)	Maintain TEC = C (70%)
					Birds	Three major groups of estuarine dependent birds to be maintained; summer (incl. palaearctic migrants) and winter fauna that use the estuary for feeding, and birds that use the estuary to roost and mostly feed offshore.	Winter and summer bird counts	Maintain TEC = C (70%)