RESOURCE QUALITY OBJECTIVES (RQOs)

Resource Quality Objectives (RQO) are numerical and/or descriptive statements about the biological, chemical and physical attributes that characterise a resource for the level of protection defined by its Class. The NWRS therefore stipulates that ñResource Quality Objectives might describe, among other things, the quantity, pattern and timing of instream flow; water quality; the character and condition of riparian habitat, and the characteristics and condition of the aquatic biotaò

The purpose of this document is to provide a summary of the narrative and numerical RQOs for the Letaba Catchment. The information in this document is summarised on powerpoint slides (available on the DWA website) and will also be produced as a technical report.

The section below provides the priority levels for each reach of river (called a Resource Unit) as well as the RQO for flow, biota and habitat. The water quality RQOs are attached as a separate section from page 36.

1. RESOURCE UNIT (RU) PRIORITY LEVELS FOR RQO

RU priority is based on the outcome of the hotspot assessment (Step 1 of the integrated steps for the NWRC and RQO determination) as well as available information and confidence in the information. There are three priority levels (see table below) each with the broad type and detail of RQOs indicated:

Table 1 RU priority level and associated RQO description

RU priority level	RU priority level	Associated RQO
Low (1)	1a	Flow RQO. Habitat RQO in terms of PES & REC (EcoStatus)
	1b	Habitat RQO in terms of PES & REC (EcoStatus). (Total river length in declared conservation areas.)
Moderate (2)	2	Flow RQO. Habitat and biota RQO (broad)
High (3)	3a	Forms part of RU represented by an EWR site.
	3b	EWR site. Flow RQO related to Sc 11. Detailed habitat and biota RQO (EcoSpecs)

The allocated priority level to each SQ represented by a node name is provided below:

Table 2 Priority level for RQO RUs

Node name	River	RU Priority
IUA 1		
B81A-00242	Broederstroom	2
B81A-00256		2
B81A-00263		2
B81A-00270	Broederstroom	2
B81B-00233	Mahitse	2
B81B-00234	Mahitse	1a
B81B-00251		1a
B81B-00246	Politsi	2
B81B-00269	Morudi	2
B81B-00227	Mahitse	2
B81B-00240	Politsi	2
B81B-00247	Great Letaba	3a
EWR 1	Great Letaba	3b
IUA 2		

Node name	River	RU Priority
B82H-00157	Nsama	2
B82H-00139	Magobe	1a
B82J-00197	Ka-Malilibone	1a
B82J-00153	Nalatsi	1b

Node name	River	RU Priority
B81D-00277	Thabina	2
B81D-00272	Letsitele	2
B81D-00280	Bobs	1a
B81D-00296	Mothlaka-Semeetse	1a
EWR 2	Letsitele	3b
IUA 3		
B81C-00245	Great Letaba	3a
B81E-00244	Great Letaba	3a
B81E-00213	Nwanedzi	2
IUA 4		
EWR 3	Great Letaba	3b
B81F-00212	Great Letaba	3a
B81F-00215	Great Letaba	3a
B81F-00218	Great Letaba	3a
B81F-00231	Great Letaba	3a
B81J-00209	Great Letaba	3a
EWR 4	Great Letaba	3b
IUA 5		
B81F-00228	Reshwele	1a
B81F-00232	Makwena	1a
IUA 6		
B81F-00189	Merekome	1a
B81F-00203	Lerwatlou	1a
B81G-00164	Molototsi	1a
B81H-00162	Metsemola	1a
B81J-00187	Mbhawula	1a
B81H-00171	Molototsi	2
IUA 7		
B82A-00168	Middel Letaba	1a
B82D-00163	Lebjelebore	1a
B82D-00154	Middel Letaba	1a
B82B-00173	Koedoes	2
B82D-00166	Mosukodutsi	2
B82C-00175	Brandboontjies	3
B82D-00146	Middel Letaba	3
IUA 8		
B82E-00149	Khwali	1
B82E-00150	Little Letaba	1
B82F-00141	Soeketse	1
B82F-00128	Little Letaba	2
B82F-00137	Little Letaba	2
IUA 9		
EWR 5	Little Letaba	3b
B82J-00165	Little Letaba	3a
B82J-00178	Little Letaba	3a
B82J-00201	Little Letaba	3a
B82J-00207	Little Letaba	3a
IUA 10		
B82H-00127	Nsama	2

Node name	River	RU Priority
IUA 12		
B83A-00238	Nharhweni	1a
B83A-00193	Shipikani	1b
B83A-00254	Ngwenyeni	1b
B83B-00161	Tsende	1b
B83D-00204	Manyeleti	1b
B83D-00208	Makhadzi	1b
B83D-00261	Nwanedzi	1b
B83D-00236	Makhadzi	1b

2. IUA 1: LETABA RIVERS UPSTREAM FROM TZANEEN DAM

Table 3 IUA 1 flow RQO

RU	REC (EWR)	nMAR[1] (MCM)	pMAR[2] (MCM)	Low flows (MCM[3])	Low flows (%nMAR)	Total flows (MCM)	Total (%nMAR)	Oct		Apr	
								90%	60%	90%	60%
B81A-00242	B (C)	23.8	15.2	3.3	13.9	5.22	21.9	0.07	0.07	0.1	0.25
B81A-00256	D	16.34	12.18	2.5	15.3	3.57	21.9	0.061	0.064	0.079	0.156
B81A-00263	D	5.75	4	0.87	15.1	1.26	21.9	0.012	0.021	0.03	0.055
B81A-00270	C	44.47	30	8.447	19	12.043	27.1	0.112	0.159	0.213	0.461
B81B-00233	C	2.69	2.08	0.5	18.6	0.738	27.4	0.004	0.1	0.009	0.29
B81B-00234	C	10.13	8.06	2.15	21.2	3.013	29.8	0.023	0.04	0.023	0.138
B81B-00246	C	36.3	20.8	3.6	10	6.4	17.7	0.008	0.015	0.04	0.32
B81B-00251	D	1.34	0.98	0.094	7	0.206	15.4	0	0	0.001	0.015
B81B-00269	B	1.95	1.95	0.47	23.9	0.68	34.6	0.002	0.005	0.005	0.03
B81B-00227	D	13.6	10.8	2.01	14.8	3.01	22.1	0.03	0.036	0.05	0.15
B81B-00240	C	39	22.8	4.5	11.4	7.5	19.1	0.015	0.03	0.07	0.34
EWR RU 1	C	99.84	53.1	10.81	10.8	20	20	0.116	0.141	0.182	0.263

Table 4 IUA 1 Habitat and Biota RQOs for Moderate priority RUs

INDICATOR	SUB-INDICATORS	NARRATIVE RQO	NUMERICAL RQO
B81A-00242			
Riparian vegetation	Riparian zone boundary	Forestry (areas formally planted with plantation species) should not encroach into the riparian zone or cross the riparian zone boundary.	Not Applicable (N/A).
	Aerial cover of alien plant species	Perennial alien plant species aerial cover within the riparian zone should conform to the REC (B).	Perennial alien plant species aerial cover should be less than 20% (requirement applicable to B category).
Fish	PES (Desktop FRAI = 16.2%, F)	PES of fish is critically modified (possibly in F) as a result of presence of predatory alien trout. Where applicable, alien species should be removed; not allowed to spread and indigenous fish should be reintroduced if possible.	Aim to achieve a PES of at least a Category D. Control and remove alien fish species where possible and prevent further introduction of alien species and construction of dams.
	Species richness	Aim to achieve an indigenous species richness of at least 3 species (reintroduction may be required).	Introduce at least the three expected indigenous species (AURA, BLIN, and BNEE) should alien fish be controlled, reduced or restricted.
	Primary indicator species (AURA)	Flows should be adequate to ensure suitable habitats for flow dependant species (AURA).	Ensure presence of AURA in reach and maintain a Frequency of Occurrence (FROC) at >5% of sites. To attain habitat conditions for AURA to fall in an EC of C, the following flows (maintenance (60%) and drought (90%) flow duration) and habitat suitability should at least be provided: Dry season maintenance flows: At least 0.69 m3/s to ensure 9% moderate or better habitat suitability and at least 0.061 m3/s during droughts to provide at least 7% moderate or better suitability. Ensure the presence of the secondary indicator species and do not allow reduction of their present FROC.

INDICATOR	SUB-INDICATORS	NARRATIVE RQO	NUMERICAL RQO
Macro-invertebrates	Elmidae	To maintain suitable conditions for this flow dependent species (moderate velocity: 0.3 - 0.6 m/s) in the Stones in Current (SIC) biotope.	
	Coenagrionidae	To maintain suitable conditions in the marginal vegetation for this key species.	
B81A-00256			
Riparian vegetation	Riparian zone boundary	Forestry (areas formally planted with plantation species) should not encroach into the riparian zone or cross the riparian zone boundary.	N/A.
	Aerial cover of alien plant species	Perennial alien plant species aerial cover within the riparian zone should conform to the REC D).	Perennial alien plant species aerial cover should be less than 50% (requirement applicable to D Category)
B81A-00263			
Riparian vegetation	Longitudinal riparian zone continuity	Longitudinal riparian zone fragmentation should not increase	Zero increase in riparian zone fragmentation (current % of longitudinal riparian zone axis that has woody cover should not decrease). Example of riparian zone fragmentation: González del Tánago and De Jalón. (2006).
	Riparian zone boundary	Forestry (areas formally planted with plantation species) should not encroach into the riparian zone or cross the riparian zone boundary.	Zero increase in forestry within the riparian zone.
	Aerial cover of alien plant species	Perennial alien plant species aerial cover within the riparian zone should conform to the desired Ecological Category (EC).	Perennial alien plant species aerial cover within the riparian zone should be less than 50% (requirement applicable to D Category). The relationship between % alien cover and EC is hypothesised and testable.
Fish	PES Desktop FRAI = 35.6%, E)	PES of fish is seriously modified (possibly in E EC) as a result of presence of predatory alien trout. Where applicable, alien species should be removed; not allowed to spread and indigenous fish should be reintroduced if possible.	Aim to achieve a PES of at least a category D. Control and remove alien fish species where possible and prevent further introduction of alien species and construction of dams.
	Species richness	Aim to achieve an indigenous species richness of at least 3 species (reintroduction may be required).	Introduce at least the three expected indigenous species (AURA, BLIN, and BNEE) should alien fish be controlled, reduced or restricted.
	Primary indicator species AURA	Flows should be adequate to ensure suitable habitats for flow dependant species (AURA).	Ensure presence of these species in reach and maintain a FROC at >5% of sites (in relevant geozones) for AURA.
Macro-invertebrates	Simuliidae	To maintain suitable conditions for this flow dependent species (rapid flows: > 0.6 m/s) in the SIC biotope.	
	Coenagrionidae	To maintain suitable conditions in the marginal vegetation for this key species.	
B81A-00270			
Riparian	Natal Ghost frog population	Ghost frog population viability should be maintained.	Possibly need to express numerical RQO for Natal Ghost Frog as density of animals.
	Riparian zone boundary	Forestry (areas formally planted with plantation species) should not encroach into the riparian zone or cross the riparian zone boundary.	Zero increase of forestry within the riparian zone.
	Aerial cover of alien plant species within the riparian zone	Perennial alien plant species aerial cover within the riparian zone should conform to the desired Ecological Category (EC).	Perennial alien plant species aerial cover within the riparian zone should be less than 30% (requirement applicable to C category). Note: The relationship between % alien cover and EC is hypothesised and testable.

INDICATOR	SUB-INDICATORS	NARRATIVE RQO	NUMERICAL RQO
Fish	PES Desktop FRAI = 41%, D/E	PES of fish is seriously modified (possibly in D/E) as a result of presence of predatory alien trout. Where applicable, alien species should be removed; not allowed to spread and indigenous fish should be reintroduced if possible.	Aim to achieve a PES of at least a Category D. Control and remove alien fish species where possible and prevent further introduction of alien species and construction of more instream dams.
	Species richness	Aim to achieve an indigenous species richness of at least 3 species (reintroduction may be required).	Introduce at least the three expected indigenous species (AURA, BLIN, and BNEE) should alien fish be controlled, reduced or restricted.
	Primary indicator species AURA	Flows should be adequate to ensure suitable habitats for flow dependant species (AURA).	Ensure presence of these species in reach and maintain a FROC at >5% of sites (in relevant geozones) for AURA.
Macro-invertebrates	Trichorythidae	To maintain suitable conditions for this flow dependent species (rapid flows: >0.6 m/s) in the SIC biotope.	
	Coenagrionidae	To maintain suitable conditions in the marginal vegetation for this key species.	
B81B-00233			
Riparian	Mountain Wagtail population	Mountain Wagtail population viability should be maintained.	No decrease in Mountain Wagtail density.
	Aerial cover of alien plant species	Perennial alien plant species aerial cover within the riparian zone should conform to the desired EC.	Perennial alien plant species aerial cover within the riparian zone should be less than 30% (requirement applicable to C Category). Note: The relationship between % alien cover and EC is hypothesised and testable.
	Longitudinal riparian zone continuity	Longitudinal riparian zone fragmentation should not increase	Zero expansion of existing agriculture within the riparian zone.
	Riparian zone boundary	Forestry (areas formally planted with plantation species) should not encroach into the riparian zone or cross the riparian zone boundary.	Zero increase of forestry within the riparian zone.
Fish	PES Desktop FRAI = 50.8%, D	Maintain PES of at least D.	Maintain the Fish PES in at least a D (FRAI Ó50%).
	Species richness (BNEE, PPHI, TSPA).	Maintain current fish species richness.	Maintain current species diversity of at least 3 species (BNEE, PPHI and TSPA) (do not allow more than 10% deviation from species estimated for SQ reach).
	Primary indicator species BNEE.	Flows should be adequate to ensure suitable habitats for BNEE.	Ensure presence of BNEE in reach and FROC should not decrease >10% from baseline value (to be established should monitoring be implemented).
Macro-invertebrate	Belostomatidae and Nepidae	To maintain suitable conditions in the marginal vegetation (wetland seeps) for these key species.	
B81B-00246			
Riparian	Natal ghost frog, Mountain wagtail and half collared kingfisher populations	Mountain wagtail, Natal ghost frog and half collared kingfisher population(s) viability should be maintained.	No decrease in Mountain wagtail or half collared kingfisher density. Possibly need to express numerical RQO for Natal ghost frog as density of animals.
	Riparian zone boundary	Forestry (areas formally planted with plantation species) and agriculture (orchard plantations) should not encroach into the riparian zone or cross the riparian zone boundary.	Zero increase of forestry or agriculture within the riparian zone.

INDICATOR	SUB-INDICATORS	NARRATIVE RQO	NUMERICAL RQO
	Aerial cover of alien plant species	Perennial alien plant species aerial cover within the riparian zone should conform to the desired EC.	Perennial alien plant species aerial cover within the riparian zone should be less than 30% (requirement applicable to C Category).
	Longitudinal riparian zone continuity	Longitudinal riparian zone fragmentation should not increase.	Zero increase in riparian zone longitudinal fragmentation.
Fish	PES Desktop FRAI = 51.4%, D	Maintain PES of at least D	Maintain the Fish PES in at least a D (FRAI Ó51%).
	Species richness (9 Species)	Maintain current fish species richness.	Maintain current estimated fish species richness (do not allow more than 10% deviation from 9 species estimated for SQ reach).
	Primary indicator species AURA	Flows should be adequate to ensure suitable habitats for flow dependant species (AURA).	Ensure presence of this species in reach and maintain a FROC at >10% of sites (in relevant geozones).
Macro-invertebrates	Perlidae and Hydropsychidae	To maintain suitable conditions for this flow dependent species (rapid flows: >0.6 m/s) in the SIC biotope.	
	Atyidae	To maintain suitable conditions in the marginal vegetation for this key species.	
B81B-00269			
Riparian	Riparian zone boundary	Forestry (areas formally planted with plantation species) should not encroach into the riparian zone or cross the riparian zone boundary.	N/A.
	Aerial cover of alien plant species	Perennial alien plant species aerial cover within the riparian zone should conform to a REC (B).	Perennial alien plant species aerial cover should be less than 20% (requirement applicable to B Category).
Fish	PES Desktop FRAI = 66.8%, C	Maintain PES of at least C.	Maintain the Fish PES in at least a C/D (FRAI Ó66%).
	Species richness 9 species	Maintain relatively high fish species richness.	Maintain relative high fish species diversity (do not allow more than 10% deviation from six species estimated for SQ reach).
	Primary indicator species: AURA/CPRE	Flows should be adequate to ensure suitable habitats for flow dependant species (AURA, CPRE).	Ensure presence of these species in reach and maintain a FROC at >10% of sites (in relevant geozones) for AURA and CPRE.
Macro-invertebrates	Philopotamidae and Hydropsychidae	To maintain suitable conditions for these flow dependent species (rapid velocities: > 0.6 m/s) in the SIC biotope.	
	Coenagrionidae	To maintain suitable conditions in the marginal vegetation for this key species.	
B81B-00227			
Riparian	Mountain wagtail and half collared kingfisher populations	Mountain wagtail and half collared kingfisher population(s) viability should be maintained.	No decrease in mountain wagtail or half collared kingfisher density.
	Riparian zone boundary	Forestry (areas formally planted with plantation species) should not encroach into the riparian zone or cross the riparian zone boundary.	N/A.
	Aerial cover of alien plant species in the riparian zone	Perennial alien plant species aerial cover within the riparian zone should conform to a REC (B).	Perennial alien plant species aerial cover should be less than 20% (requirement applicable to B Category).
Fish	PES Desktop FRAI = 50.2%, D	Maintain PES of at least D.	Maintain the Fish PES in at least a D (FRAI Ó50%).
	Species richness 16 species	Maintain current fish species richness.	Maintain current species diversity of an estimated 16 species (do not allow more than 10% deviation from species estimated for SQ reach).
	Primary indicator species	Flows should be adequate to ensure suitable habitats	Ensure presence of LMOL/BMAR in reach and FROC should not

INDICATOR	SUB-INDICATORS	NARRATIVE RQO	NUMERICAL RQO
	LMOL/BMAR	for LMOL/BMAR.	decrease >10% from baseline value (to be established should monitoring be implemented).
Macro-invertebrates	Perlidae and Hydropsychidae	To maintain suitable conditions for these flow dependent species (rapid velocities: > 0.6 m/s) in the SIC biotope.	
	Coenagrionidae and Atyidae	To maintain suitable conditions in the marginal vegetation for these key species.	
B81B-00240			
Riparian	Riparian zone boundary	Forestry (areas formally planted with plantation species) should not encroach into the riparian zone or cross the riparian zone boundary.	N/A.
	Longitudinal riparian zone continuity	Longitudinal riparian zone fragmentation should not increase.	N/A.
	Aerial cover of alien plant species in the riparian zone	Perennial alien plant species aerial cover within the riparian zone should conform to a REC (B).	Perennial alien plant species aerial cover should be less than 30% (requirement applicable to C Category).
Fish	PES Desktop FRAI = 49.5%, D	Maintain PES of at least D.	Maintain the Fish PES in at least a D (FRAI Ó49%).
	Species richness 18 species	Maintain relatively high fish species richness.	Maintain relative high fish species richness. Do not allow more than 10% deviation from baseline (estimated at 18 species) estimated for SQ reach.
	Primary indicator species AURA/CPRE	Flows should be adequate to ensure suitable habitats for flow dependant species (AURA, CPRE).	Ensure presence of these species in reach and maintain a FROC at baseline levels (>10% desktop estimate) of sites for AURA and CPRE.
Macro-Invertebrates	Perlidae and Hydropsychidae	To maintain suitable conditions for these flow dependent species (Rapid velocities: > 0.6 m/s) in the SIC biotope.	
	Coenagrionidae and Atyidae	To maintain suitable conditions in the marginal vegetation for these key species.	

Table 5 RU EWR 1: Fish EcoSpecs and TPCs

Metric	Indicator	EcoSpecs	TPC (Biotic)	TPC (Habitat)
Ecological status	PES	PES status of fish is in a C (62.3%) (DWA, 2013a).	Decrease of PES into a lower EC than PES.	Any deterioration in habitat that results in decrease in FROC of species.
Species richness	All indigenous species	20 of the expected 22 indigenous fish species estimated to be present in the reach under PES (to be verified).	20% decrease in species richness.	Loss in diversity, abundance and condition of velocity-depth categories and cover features that lead to a loss of species.
Requirement for flowing water	AURA CPRE	AURA and CPRE have a high requirement for flow during all life stages and are the most applicable indicator species for flow modification.	AURA and/or CPRE absent during any survey OR present at FROC[1] of < 3 for AURA and < 3 for CPRE. (DWAF, 2006b): A minimum of 5 AURA specimens should be sampled at 80% of sites during a survey of FS and FD, electrofishing for 20 minutes. A minimum of 20 CPRE specimens should be sampled at 100% of sites during a survey of Fast Shallow (FS) and FD, electrofishing for 20 minutes).	Reduced suitability (abundance and quality) of flowing habitats (i.e. decreased flows, increased zero flows, and altered seasonality).
Fast Deep (FD) habitats	AURA BEUT	AURA and BEUT have a high requirement for fast-deep habitats and are the most applicable indicator species for this velocity-depth category.	AURA and/or BEUT absent during any survey OR present at FROC of < 3 for AURA and < 3 for BEUT (DWAF, 2006b: AURA see "Requirement for flowing water", a minimum of 5 BEUT specimens should be	Reduced suitability (abundance and quality) of FD habitats (i.e. decreased flows, increased zero flows).

Metric	Indicator	EcoSpecs	TPC (Biotic)	TPC (Habitat)
			sampled at 25% of sites during a survey of marginal vegetation (MV) and substrate, electrofishing for 20 minutes/10 sweeps with 4m pole seine net.)	
Fast-Shallow (FS) habitats	CPRE LCYL	CPRE and LCYL have a high requirement for fast-deep habitats and are the most applicable indicator species for this velocity-depth category.	CPRE and/or LCYL absent during any survey OR present at FROC of < 3 for CPRE and < 3 for LCYL.	Reduced suitability (abundance and quality) of FS habitats (i.e. decreased flows, increased zero flows).
Substrate	AURA CPRE	CPRE and AURA have a high requirement for fast-deep habitats and are the most applicable indicator species for this habitat feature.	AMOS and/or AURA absent during any survey OR present at FROC of <3 for CPRE and <3 for AURA.	Increased sedimentation of riffle/rapid substrates, excessive algal growth on substrates. Increased sedimentation of riffle/rapid substrates, excessive algal growth on substrates.
Water quality intolerance	BEUT, AURA	BEUT and AURA have a high requirement for unmodified water quality and are the most applicable indicator species for water quality deterioration.	BEUT and/or AURA absent during any survey OR present at FROC of < 3 for BEUT and <3 for AURA.	Decreased water quality (especially flow related water quality variables such as oxygen).
Overhanging vegetation	PPHI, BPAU	PPHI and BPAU have a high requirement for overhanging vegetation and are the most applicable indicator species for this habitat feature.	PPHI and/or BPAU absent during any survey OR present at FROC of < 4.36 for PPHI and <3 for BPAU.	Significant change in overhanging vegetation habitats.
Instream vegetation	TREN BPAU	TREN and BPAU have a high requirement for instream (aquatic) vegetation and are the most applicable indicator species for this habitat feature.	TREN and/or BPAU absent during any survey OR present at FROC of < 3 for TREN and < 3 for BPAU.	Significant change in overhanging vegetation habitats (overgrazing, flow modification, use of herbicides, agriculture)
Undercut banks	PCAT BEUT	PCAT and BEUT have a high preference for undercut banks and rootwads and are the most applicable indicator species for this habitat feature.	PCAT and/or BEUT absent during any survey OR present at FROC of < 0 for PCAT and < 3 for BEUT.	Significant change in undercut bank and rootwads habitats (e.g. bank erosion, reduced flows).
Water column	MBRE BMAR	MBRE and BMAR have a high requirement for water column as habitat and are the most applicable indicator species for this habitat feature.	MBRE and/or BMAR absent during any survey OR present at FROC of < 3 for MBRE and < 3 for BMAR.	Reduction in suitability of water column (i.e. increased sedimentation of pools, reduced flows).
Slow Deep (SD) habitats	BUNI TREN	BUNI and TREN have a high requirement for slow-deep habitats and are the most applicable indicator species for this velocity depth category.	BUNI and/or TREN absent during any survey OR present at FROC of < 3 for BUNI and < 3 for TREN.	Significant change in SD habitat suitability (i.e. increased or decreased flows, altered seasonality, increased sedimentation of slow habitats).
Slow Shallow (SS) habitats	BVIV BUNI	BVIV and BUNI have a high requirement for slow-shallow habitats and are the most applicable indicator species for this velocity depth category.	BVIV and/or BUNI absent during any survey OR present at FROC of < 3 for BVIV and < 3 for BUNI.	Significant change in SS habitat suitability (i.e. increased flows, altered seasonality, increased sedimentation of slow habitats).
Migratory success[2]	AMOS BMAR	It is estimated that the catadromous[1] AMOS may still be present, as well as various potamodromous[1] species (including BMAR).	Loss or decreased FROC[2] of catadromous (such as AMOS) or potamodromous species (such as BMAR).	Alteration of longitudinal habitat through the creation of migration barriers (dams, weirs, zero flows, poor water quality causing chemical barriers).

Metric	Indicator	EcoSpecs	TPC (Biotic)	TPC (Habitat)
Alien fish species	presence of any alien/ introduced spp.	MSAL and OMYK known or expected to be present in the SQ reach.	Presence of any additional alien/introduced species or increase in abundance and distribution of existing species.	N/A.
Primary indicator species	**AURA (CPRE and BEUT)**	**AURA estimated to be present at > 25% of sites in SQ reach (DWA, 2013b) (to be verified).**	**See "requirement for flowing water" and "Fast-Deep" above.**	**See "requirement for flowing water" and "Fast-Deep" above.**

1 Migratory guilds:

Catadromous ï Fishes which spend most of their lives in freshwater and migrate to the sea (or saline reaches of estuaries) to breed as adults (e.g. eels) (Catchment scale migrations).

Potamodromous: Truly migratory species whose entire life cycle is completed within freshwater and that undertake migrations within freshwater zones (between SQ reaches) of rivers for a variety of reasons, such as for spawning, feeding, dispersion after spawning, colonisation after droughts, for over-wintering, etc.

2 Frequency of Occurrence:

0 = Absent 1 = Present at very few sites (<10%) 2 = Present at few sites (>10 - 25%) 3 = Present at about >25 - 50 % of sites
4 = Present at most sites (>50 - 75%) 5 = Present at almost all sites (>75%)

Table 6 RU EWR 1: Macro-invertebrate EcoSpecs and TPCs

EcoSpecs	TPCs
To ensure that the SASS5 scores and ASPT values occur in the following range: SASS5 score: > 120; Average Score Per Taxon (ASPT) value: > 6.0.	SASS5 scores less than 130 and an ASPT less than 6.0.
To ensure that the MIRAI score remains within the range of a C Category (62% ï 78%).	A MIRAI score of 70% or less.
To maintain suitable flow velocity (> 0.6 m/s) and to maintain clean, un-embedded surface area (cobbles) to support the following flow-dependent taxa: ▪ Hydropsychidae (Abundance A). ▪ Trichorythidae (Abundance A).	Any one of these two taxa missing in two consecutive surveys or any one of these two taxa present as a single individual in two consecutive surveys.
To maintain suitable flow velocity (0.3 ï 0.6 m/s) and to maintain clean, un-embedded surface area (cobbles) to support the following flow-dependent taxa: ▪ Elmidae (Abundance A). ▪ Heptageniidae (Abundance B).	Any one of these two taxa missing in two consecutive surveys or any one of these two taxa present as a single individual in two consecutive surveys.
To maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxa: ▪ Coenagrionidae (Abundance A). ▪ Dytiscidae (Abundance 1-A).	Any one of these two taxa missing in two consecutive surveys or any one of these two taxa present as a single individual in two consecutive surveys.
To maintain suitable conditions for the following five key taxa: ▪ Hydropsychidae, Trichorythidae ▪ Heptageniidae, Elmidae ▪ Coenagrionidae	Presence of less than four of the five key taxa listed in any survey.
Balanced community structure, i.e. majority of invertebrates at A abundance, certain taxa at B abundance (e.g. Simuliidae and Baetidae). To ensure that no group consistently dominates the fauna, defined as D abundance (>1000) over more than two consecutive surveys.	Any taxon occurring in an abundance of >1000 for two consecutive surveys.

Table 7 RU EWR 1: Riparian vegetation EcoSpecs and TPCs

Metric	Zone assessed	EcoSpecs (PES)	EcoSpecs (Sc 11)	TPC (for PES)
Vegetation Cover	Marginal	Maintain marginal hydrophyte fringe along the active channel.	Maintain marginal hydrophyte fringe along the active channel.	Marginal fringe absent.
	Lower	Maintain *B. salicina* and *Syzygium cordatum* cover.	Maintain *B. salicina* and cover	Measurable decrease in either population of 50% or more.
Species composition	Upper	Maintain riparian/terrestrial mix.	Maintain riparian/terrestrial mix.	When the proportion of terrestrial species reaches 50% of the total species count.
	Upper	Maintain *B. salicina, C. imberbe* and *P. violacea* populations.	Maintain *B. salicina, C. imberbe* and *P. violacea* populations.	Visible decrease in *B. salicina, C. imberbe* or *P. violacea* cover/abundance
Alien invasion	Riparian	Perennial alien plant species aerial cover less than 30%.	Perennial alien plant species aerial cover less than 30%.	An increase in alien perennial species cover above 30%.
Indigenous riparian woody cover	Marginal	Riparian woody species cover not less than 5% and not more than 70%.	Riparian woody species cover not less than 5% and not more than 70%.	An increase in riparian woody cover above 70% OR a decrease below 5%
	Lower	Riparian woody species cover not less than 5% and not more than 70%.	Riparian woody species cover not less than 5% and not more than 70%.	An increase in riparian woody cover above 70% OR a decrease below 5%.
	Upper	Riparian woody species cover not less than 20% and not more than 80%.	Riparian woody species cover not less than 20% and not more than 80%.	An increase in riparian woody cover above 80% OR a decrease below 20%.
Phragmites (reed) cover	Marginal	Reed cover not less than 20%.	Reed cover not less than 20%.	A decrease in reed cover below 20%.
	Lower	Reed cover between 10% and 90%.	Reed cover between 10% and 90%.	A decrease in reed cover below 10% OR and increase above 90%.
	Upper	Reeds cover less than 50%.	Reeds cover less than 50%.	An increase in reed cover above 50%.
Riparian zone integrity		Zero expansion of agriculture or forestry within the riparian zone.	Zero expansion of agriculture or forestry within the riparian zone.	An increase of the spatial extent of forestry or agriculture WITHIN the riparian zone.
Longitudinal riparian zone continuity		Zero increase in riparian zone longitudinal fragmentation.	Zero increase in riparian zone longitudinal fragmentation.	An increase in the longitudinal fragmentation of the riparian zone.

IUA 2: LETSITELE AND THABINA

Table 8 IUA 2 flow RQO

RU	REC (EWR)	nMAR[1] (MCM)	pMAR[2] (MCM)	Low flows (MCM[3])	Low flows (%nMAR)	Total flows (MCM)	Total (%nMAR)	Oct		Apr	
								90%	60%	90%	60%
B81D-00277	D	25.28	18.90	2.124	8.4	4.640	18.4	0.00	0.024	0.023	0.209
B81D-00280	B	18.50	13.95	3.647	19.7	5.417	29.3	0.065	0.069	0.085	0.186
B81D-00296	B	10.53	8.85	2.637	25.0	3.645	34.6	0.015	0.024	0.047	0.113
B81D-00271 (EWR 2)											
B81D-00272	C	91.27	27.51	13.288	14.6	20.084	22	0.066	0.1	0.245	0.855

Table 9 IUA 2 Habitat and Biota RQOs for Moderate priority RUs

INDICATOR	SUB-INDICATORS	NARRATIVE RQO	NUMERICAL RQO
B81D-00277			
Riparian	Aerial cover of alien plant species in the riparian zone	Perennial alien plant species aerial cover within the riparian zone should conform to the desired EC.	Perennial alien plant species aerial cover within the riparian zone should be less than 50% (requirement applicable to D EC). The relationship between % alien cover and EC is hypothesised & testable.
	Riparian zone boundary	Agricultural activities should not encroach into the riparian zone or cross the riparian zone boundary.	Zero increase of agricultural activities within the riparian zone. It is assumed that 80% cover for this particular region and particular vegetation unit is realistic (and functional).
	Vegetative cover along riparian zone banks	Vegetative cover along riparian zone banks should be maintained in order to provide bank stability and prevent erosion.	Vegetative cover along riparian zone banks should not be less than 80% (aerial cover).
Fish	PES: D Desktop FRAI = 50%,	Maintain PES of at least D.	Maintain the Fish PES in at least a D (FRAI Ó 50%).
	Species richness 16 species	Maintain current fish species richness.	Maintain current species diversity of an estimated 16 species (do not allow more than 10% deviation from species estimated for SQ reach).
	Primary indicator species LMOL/BMAR	Flows should be adequate to ensure suitable habitats for LMOL/BMAR.	Ensure presence of LMOL/BMAR in reach and FROC should not decrease > 10% from baseline value (to be established should monitoring be implemented).
Macro-Invertebrates	Hydropsychidae and Trichorythidae	To maintain suitable conditions for these flow dependent species (Rapid velocities: > 0.6 m/s) in the SIC biotope.	
	Coenagrionidae and Belostomatidae	To maintain suitable conditions in the marginal vegetation for these key species.	
B81D-00272			
Riparian	Aerial cover of alien plant species in the riparian zone	Perennial alien plant species aerial cover within the riparian zone should conform to the desired EC.	Perennial alien plant species aerial cover within the riparian zone should be less than 30% (requirement applicable to C category.
	Riparian zone boundary	Agricultural activities should not encroach into the riparian zone or cross the riparian zone boundary.	Zero increase of agricultural activities within the riparian zone.
	Vegetative cover along riparian zone banks	Vegetative cover along riparian zone banks should be maintained in order to provide bank stability and prevent erosion.	Vegetative cover along riparian zone banks should not be less than 80% (aerial cover).
Fish	PES Desktop FRAI = 61.9%, C/D	Maintain PES of at least C/D.	Maintain the Fish PES in at least a C/D (FRAI Ó 61%).
	Species richness	Maintain relatively high fish species richness.	Maintain relative high fish species diversity (do not allow more than 10% deviation from 25 species estimated for SQ reach).
	Primary indicator species AURA/CPRE	Flows should be adequate to ensure suitable habitats for flow dependant species (AURA, CPRE).	Ensure presence of these species in reach and maintain a FROC at >10% of sites (in relevant geozones) for AURA and CPRE.
Macro-invertebrates	Hydropsychidae and Psephenidae	To maintain suitable conditions for these flow dependent species (Rapid velocities: >0.6 m/s) in the SIC biotope.	
	Hydropsychidae and Heptageniidae	To maintain suitable conditions regarding the water quality for these key species.	

Table 10 RU EWR 2: Fish EcoSpecs and TPCs

Metric	Indicator	EcoSpecs	TPC (Biotic)	TPC (Habitat)
Ecological status	All indigenous species.	Present ecological status of fish is in a C/D (61.2%).	Decrease of PES into a lower EC than PES.	Any deterioration in habitat that results in decrease in FROC[1] of species.
Species richness	CPRE AURA	22 of the expected 24 indigenous fish species estimated to be present in the reach under PES (to be verified).	20% decrease in species richness.	Loss in diversity, abundance and condition of velocity-depth categories and cover features that lead to a loss of species.
Requirement for flowing water	AURA BEUT	CPRE and AURA have a high requirement for flow during all life stages and are the most applicable indicator species for flow modification.	CPRE and/or AURA absent during any survey OR present at FROC[1] of < 3 for CPRE and < 2 for AURA. (DWAF, 2006b: A minimum of 3 AURA specimens should be sampled at 20% of sites during a survey of FS and FD, electrofishing for minimum 20 minutes. A minimum of 20 CPRE specimens should be sampled at 100% of sites during a survey of FS and FD, electrofishing for minimum 20 minutes).	Reduced suitability (abundance and quality) of flowing habitats (i.e. decreased flows, increased zero flows, and altered seasonality).
FD habitats	CPRE LCYL	AURA and BEUT have a high requirement for fast-deep habitats and are the most applicable indicator species for this velocity-depth category.	AURA and/or BEUT absent during any survey OR present at FROC of < 2 for AURA and < 2 for BEUT. (DWAF, 2006b: AURA see "Requirement for flowing water", a minimum of 5 BEUT specimens should be sampled at 35% of sites during a survey of MV and substrate, electrofishing for minimum 20 minutes/10 sweeps with 4 m pole seine net.)	Reduced suitability (abundance and quality) of FD habitats (i.e. decreased flows, increased zero flows).
FS habitats	AURA CPRE	CPRE and LCYL have a high requirement for fast-deep habitats and are the most applicable indicator species for this velocity-depth category.	CPRE and/or LCYL absent during any survey OR present at FROC of < 3 for CPRE and < 4 for LCYL. (DWAF, 2006b: CPRE see above).	Reduced suitability (abundance and quality) of FS habitats (i.e. decreased flows, increased zero flows).
Substrate	BEUT AURA	AURA and CPRE have a high requirement for fast-deep habitats and are the most applicable indicator species for this habitat feature.	AURA and/or CPRE absent during any survey OR present at FROC of < 2 for AURA and < 3 for CPRE. (DWAF, 2006b: CPRE and AURA see above).	Increased sedimentation of riffle/rapid substrates, excessive algal growth on substrates, increased sedimentation of riffle/rapid substrates, excessive algal growth on substrates.
Water quality intolerance	PPHI BPAU	BEUT and AURA have a high requirement for unmodified water quality and are the most applicable indicator species for water quality deterioration.	BEUT and/or AURA absent during any survey OR present at FROC of < 2 for BEUT and < 2 for AURA. (DWAF, 2006b: BEUT and AURA see above)	Decreased water quality (especially flow related water quality variables such as oxygen).
Overhanging vegetation	TREN BPAU	PPHI and BPAU have a high requirement for overhanging vegetation and are the most applicable indicator species for this habitat feature.	PPHI and/or BPAU absent during any survey OR present at FROC of <5 for PPHI and <4 for BPAU.	Significant change in overhanging vegetation habitats.
Instream vegetation	MMAC BEUT	TREN and BPAU have a high requirement for instream (aquatic) vegetation and are the most applicable indicator species for this habitat feature.	TREN and/or BPAU absent during any survey OR present at FROC of < 5 for TREN and < 4 for BPAU.	Significant change in overhanging vegetation habitats (overgrazing, flow modification, use of herbicides, agriculture).

Metric	Indicator	EcoSpecs	TPC (Biotic)	TPC (Habitat)
Undercut banks	MBRE BMAR	MMAC and BEUT have a high preference for undercut banks and rootwads and are the most applicable indicator species for this habitat feature.	MMAC and/or BEUT absent during any survey OR present at FROC of < 2 for MMAC and < 2 for BEUT.	Significant change in undercut bank and rootwads habitats (e.g. bank erosion, reduced flows).
Water column	BUNI TREN	MBRE and BMAR have a high requirement for water column as habitat and are the most applicable indicator species for this habitat feature.	MBRE and/or BMAR absent during any survey OR present at FROC of < 3 for MBRE and < 4 for BMAR.	Reduction in suitability of water column (i.e. increased sedimentation of pools, reduced flows).
SD habitats	BVIV BLIN	BUNI and TREN have a high requirement for SD habitats and are the most applicable indicator species for this velocity depth category.	BUNI and/or TREN absent during any survey OR present at FROC of < 5 for BUNI and < 5 for TREN.	Significant change in SD habitat suitability (i.e. increased or decreased flows, altered seasonality, increased sedimentation of slow habitats).
SS habitats	AMOS BMAR	BVIV and BLIN have a high requirement for SS habitats and are the most applicable indicator species for this velocity depth category.	BVIV and/or BLIN absent during any survey OR present at FROC[1] of <4.5 for BVIV and <2 for BLIN. (DWAF, 2006b: A minimum of 20 BVIV specimens should be sampled at 50% of sites during a survey of MV and substrate, electrofishing for minimum 20 minutes/10 sweeps with 4m pole seine net).	Significant change in SS habitat suitability (i.e. increased flows, altered seasonality, increased sedimentation of slow habitats).
Migratory success[2]	Presence of any alien/ introduced spp.	It is estimated that the catadromous AMOS may still be present, as well as various potamadromous species (including BMAR).	Loss or decreased FROC[1] of catadromous (such as AMOS) or potamadromous species (such as BMAR).	Alteration of longitudinal habitat through the creation of migration barriers (dams, weirs, zero flows, poor water quality causing chemical barriers).
Alien fish species	AURA (CPRE, BEUT, BVIV)	No known or expected to be present in the SQ reach under PES.	Presence of any alien/introduced species.	N/A.
Primary indicator species	**All indigenous species**	**AURA estimated to be present at >25% of sites in SQ reach (DWA, 2013b) (to be verified).**	**See relevant sections above for detail.**	**See relevant sections above for detail.**

Table 11 RU EWR 2: Macro-invertebrate EcoSpecs and TPCs

EcoSpecs	TPCs
To ensure that the SASS 5 scores and ASPT values occur in the following range: SASS5 score: >100; ASPT value: >5.0.	SASS5 scores less than 110 and an ASPT less than 5.2.
To ensure that the MIRAI score remains within the range of a C Category (62% ï 78%).	A MIRAI score of 62% or less.
To maintain suitable flow velocity (>0.6m/s) and to maintain clean, un-embedded surface area (cobbles) to support the following flow-dependent taxa: ▪ Hydropsychidae (Abundance B). ▪ Trichorythidae (Abundance 1-A).	Any one of these two taxa missing in two consecutive surveys or any one of these two taxa present as a single individual in two consecutive surveys.
To maintain suitable flow velocity (0.3 ï 0.6 m/s) and to maintain clean, un-embedded surface area (cobbles) to support the following flow-dependent taxa: ▪ Libellulidae (Abundance 1-A).	This taxa missing in two consecutive surveys.

EcoSpecs	TPCs
To maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxa: ▪ Coenagrionidae (Abundance A). ▪ Dytiscidae (Abundance A).	Any one of these two taxa missing in two consecutive surveys or any one of these two taxa present as a single individual in two consecutive surveys.
To maintain sufficient quantity and quality of clean course sediment to support the following bottom-dwelling taxa: ▪ Gomphidae (Abundance A).	This taxa missing in two consecutive surveys or present as a single individual in two consecutive surveys.
To maintain suitable conditions for the following five key taxa: ▪ Hydropsychidae, Trichorythidae ▪ Libellulidae, Coenagrionidae ▪ Gomphidae	Presence of less than three of the five key taxa listed in any survey.
Balanced community structure, i.e. majority of invertebrates at A abundance, certain taxa at B abundance (e.g. Simuliidae, Hydropsychidae and Baetidae). To ensure that no group consistently dominates the fauna, defined as D abundance (>1000) over more than two consecutive surveys.	Any taxon occurring in an abundance of >1000 for two consecutive surveys.

Table 12 RU EWR 2: Riparian vegetation EcoSpecs and TPCs

Metric	Zone assessed	EcoSpecs (PES)	EcoSpecs (Sc 11)	TPC (for PES)
Non-woody cover	Riparian zone	Non-woody cover (excluding reeds) should not be less than 20%.	Non-woody cover (excluding reeds) should not be less than 20%.	A decrease in non-woody vegetation cover (excluding reeds) below 20%.
Species composition	Upper Zone	Maintain riparian/terrestrial mix.	Maintain riparian/terrestrial mix.	When the proportion of terrestrial species reaches 60% of the total species count.
	Upper Zone	Maintain *B. salicina, C. imberbe* and *P. violacea* populations.	Maintain *B. salicina, C. imberbe* and *P. violacea* populations.	Visible decrease in *B. salicina, C. imberbe* or *P. violacea* cover/abundance.
Alien invasion	Riparian zone	Perennial alien plant species aerial cover less than 50%.	Perennial alien plant species aerial cover less than 50%.	An increase in alien perennial species cover above 50%.
Indigenous riparian woody cover	Lower Zone	Riparian woody species cover not more than 80%.	Riparian woody species cover not more than 80%.	An increase in riparian woody cover above 80%.
	Upper Zone	Riparian woody species cover not less than 10%.	Riparian woody species cover not less than 10%.	An decrease in riparian woody cover below 10%.
Phragmites (reed) cover	Marginal Zone	Reed cover not absent.	Reed cover not absent.	An absence of reed cover.
	Lower Zone	Reed cover not absent.	Reed cover not absent.	An absence of reed cover.
	Upper Zone	Reeds cover more than 60%.	Reeds cover more than 60%.	An increase in reed cover above 60%.
Riparian zone integrity	Riparian zone	Zero expansion of agriculture activities within the riparian zone.	Zero expansion of agriculture activities within the riparian zone.	An increase of the spatial extent of forestry or agriculture WITHIN the riparian zone.
Longitudinal riparian zone continuity	Riparian zone	Zero increase in riparian zone longitudinal fragmentation.	Zero increase in riparian zone longitudinal fragmentation.	An increase in the longitudinal fragmentation of the riparian zone.

4. IUA 3: LETABA DOWNSTREAM OF TZANEEN TO PROPOSED NWAMITWA DAM

Table 13 IUA 3 Flow RQO

RU	REC (EWR)	nMAR[1] (MCM)	pMAR[2] (MCM)	Low flows (MCM[3])	Low flows (%nMAR)	Total flows (MCM)	Total (%nMAR)	Oct		Apr	
								90%	60%	90%	60%
B81C-00245*	N/a										
B81E-00213	C	17.28	11.31	0.302	1.7	1.392	8.1	0	0	0	0
B81E-00244*	N/a										

These SQs form part of RU EWR 3, which is situated largely in IUA 4.

Table 14 IUA 3 Habitat and Biota RQOs for Moderate priority RUs

INDICATOR	SUB-INDICATORS	NARRATIVE RQO	NUMERICAL RQO
B81E-00213			
Riparian	Aerial cover of alien plant species in the riparian zone	Perennial alien plant species aerial cover within the riparian zone should conform to the desired (EC).	Perennial alien plant species aerial cover within the riparian zone should be less than 30% (requirement applicable to C EC).
	Riparian zone boundary	Agricultural activities should not encroach into the riparian zone or cross the riparian zone boundary.	Zero increase of agricultural activities within the riparian zone.
Fish	PES (Desktop FRAI = 61.7%, C/D)	Maintain PES of at least C/D.	Maintain the Fish PES in at least a C/D (FRAI Ó61%).
	Species richness (15 Species)	Maintain relatively high fish species richness.	Maintain relative high fish species richness. Do not allow more than 10% deviation from baseline (estimated at 15 species) estimated for SQ reach.
	Primary indicator species BMAR	Flows should be adequate to ensure suitable habitats for BMAR.	Ensure presence of BMAR in reach and FROC should not decrease > 10% from baseline value (to be established should monitoring be implemented).
Macro-invertebrates	Elmidae	To maintain suitable conditions for this flow dependent species (Moderate velocities: 0.3 - 0.6 m/s) in the SIC biotope.	
	Baetidae and Atyidae	To maintain suitable conditions regarding the water quality for these key species.	

3. IUA 4: LETABA FROM PROPOSED NWAMITWA DAM TO KLEIN LETABA CONFLUENCE

Table 15 RU EWR 3: Flow RQO

nMAR (MCM)	Total flows (MCM)	Total (%nMAR)	Oct		Mar	
			90%	60%	90%	60%
394.91	173.42	43.9138	1.092	1.222	1.461	4.474

Table 16 RU EWR 3: Fish EcoSpecs and TPCs

Metric		PES			Recommended flow scenario (Scenario11)
	Indicator	EcoSpecs/RQOs	TPC (Biotic)	TPC (Habitat)	EcoSpecs/RQOs
Ecological status	PES	PES of fish is in a C (63.7%).	Decrease of PES into a lower EC than PES.	Any deterioration in habitat that results in decrease in FROC[1] of species.	A slight improvement in the ecological conditions is expected but the fish will still remain in a C (67.6%). An improvement in the FROC of BEUT, BIMB, CPRE, and CSWI can be expected under this scenario.
Species richness	All indigenous species	30 of the expected 33 indigenous fish species estimated to be present in the reach under PES (to be verified).	20% decrease in species richness.	Loss in diversity, abundance and condition of velocity-depth categories and cover features that lead to a loss of species.	
Requirement for flowing water.	CPRE CSWI	CPRE and CSWI have a high requirement for flow during all life stages and are the most applicable indicator species for flow modification.	CPRE and/or CSWI absent during any survey OR present at FROC[1] of < 3 for CPRE and < 1.25 for CSWI. (DWAF, 2006b: A minimum of 20 CPRE specimens should be sampled at 100% of sites during a survey of FS and FD, electrofishing for minimum 20 minutes).	Reduced suitability (abundance and quality) of flowing habitats (i.e. decreased flows, increased zero flows, and altered seasonality).	It is estimated that under the REC (Scenario (Sc) 10), improved condition may result in an increase in the FROC of CPRE (from 3 to 3.5) and CSWI (from 1.25 to 2). This species can therefore be expected to become slightly more widespread and abundant in the reach.
FD habitats	BEUT CPRE	BEUT and CPRE have a high requirement for fast-deep habitats and are the most applicable indicator species for this velocity-depth category.	BEUT and/or CPRE absent during any survey OR present at FROC of < 2 for BEUT and < 3 for CPRE.	Reduced suitability (abundance and quality) of FD habitats (i.e. decreased flows, increased zero flows).	It is estimated that under the REC (Sc 10), improved condition may result in an increase in the FROC of BEUT (from 2 to 3). This species can therefore be expected to become more widespread and abundant in the reach.
FS habitats	CPAR CPRE	CPAR and CPRE have a high requirement for fast-deep habitats and are the most applicable indicator species for this velocity-depth category.	CPAR and/or CPRE absent during any survey OR present at FROC of < 4 for CPAR and < 3 for CPRE. (DWAF, 2006b: A minimum of 20 CPRE and/or 10 CPAR specimens should be sampled at 100% of sites during a survey of FS and FD, electrofishing for minimum 20 minutes)	Reduced suitability (abundance and quality) of FS habitats (i.e. decreased flows, increased zero flows).	It is estimated that under the REC (scenario 10), improved condition may result in an increase in the FROC of CPRE (from 3 to 3.5). This species can therefore be expected to become slightly more widespread and abundant in the reach.
Substrate	LROS CPAR	LROS and CPAR have a high requirement for fast-deep habitats and are the most applicable indicator species for this habitat feature.	LROS and/or CPAR absent during any survey OR present at FROC of < 4 for LROS and < 4 for CPAR.	Increased sedimentation of riffle/rapid substrates, excessive algal growth on substrates, Increased sedimentation of riffle/rapid substrates, excessive algal growth on substrates.	
Water quality intolerance	CPRE MMAC	CPRE and MMAC have a high requirement for unmodified water quality and are the most applicable	CPRE and/or MMAC absent during any survey OR present at FROC of < 3 for CPRE and < 3 for MMAC.	Decreased water quality (especially flow related water quality variables such as	

Metric		PES			Recommended flow scenario (Scenario11)
	Indicator	EcoSpecs/RQOs	TPC (Biotic)	TPC (Habitat)	EcoSpecs/RQOs
		indicator species for water quality deterioration.		oxygen).	
Overhanging vegetation	PPHI BPAU	PPHI and BPAU have a high requirement for overhanging vegetation and are the most applicable indicator species for this habitat feature.	PPHI and/or BPAU absent during any survey OR present at FROC of < 5 for PPHI and < 4 for BPAU.	Significant change in overhanging vegetation habitats.	
Instream vegetation	TREN BVIV	TREN and BVIV have a high requirement for instream (aquatic) vegetation and are the most applicable indicator species for this habitat feature.	TREN and/or BVIV absent during any survey OR present at FROC of < 5 for TREN and < 4 for BVIV.	Significant change in overhanging vegetation habitats (overgrazing, flow modification, use of herbicides, agriculture)	
Undercut banks	MMAC BEUT	MMAC and BEUT have a high preference for undercut banks and rootwads and are the most applicable indicator species for this habitat feature.	MMAC and/or BEUT absent during any survey OR present at FROC of < 3 for MMAC and < 2 for BEUT.	Significant change in undercut bank and rootwads habitats (e.g. bank erosion, reduced flows).	
Water column	MBRE SINT	MBRE and SINT have a high requirement for water column as habitat and are the most applicable indicator species for this habitat feature.	MBRE and/or HVIT absent during any survey OR present at FROC of < 4 for MBRE and < 5 for SINT.	Reduction in suitability of water column (i.e. increased sedimentation of pools, reduced flows).	
SD habitats	BANN BUNI	BANN and BUNI have a high requirement for slow-deep habitats and are the most applicable indicator species for this velocity depth category.	BANN and/or BUNI absent during any survey OR present at FROC of <5 for BANN and <4 for BUNI.	Significant change in SD habitat suitability (i.e. increased or decreased flows, altered seasonality, increased sedimentation of slow habitats).	
SS habitats	BRAD BVIV	BRAD and BVIV have a high requirement for slow-shallow habitats and are the most applicable indicator species for this velocity depth category.	BRAD and/or BVIV absent during any survey OR present at FROC of <4 for BRAD and <4 for BVIV.	Significant change in SS habitat suitability (i.e. increased flows, altered seasonality, increased sedimentation of slow habitats).	
Migratory success[2]	AMOS BMAR	It is estimated that the catadromous AMOS may still be present, as well as various potamodromous species (including BMAR).	Loss or decreased FROC[1] of catadromous (such as AMOS) or potamodromous species (such as BMAR).	Alteration of longitudinal habitat through the creation of migration barriers (dams, weirs, zero flows, poor water quality causing chemical barriers).	
Alien fish species	Presence of any alien/ introduced	No alien/introduced species known or expected to be present in the SQ reach.	Presence of any additional alien/introduced species or increase in abundance and distribution of	N/A.	

Metric		PES			Recommended flow scenario (Scenario11)
	Indicator	EcoSpecs/RQOs	TPC (Biotic)	TPC (Habitat)	EcoSpecs/RQOs
	spp.		existing species.		
Primary indicator species	**CPRE (CPAR)**	**CPRE estimated to be present at >25% of sites in SQ reach (DWA, 2013b) (to be verified).**	**See relevant sections above for detail.**	**See relevant sections above for detail.**	

Table 17 RU EWR 3: Macro-invertebrate EcoSpecs and TPCs

EcoSpecs	TPCs
To ensure that the SASS 5 scores and ASPT values occur in the following range: SASS 5 score: > 120; ASPT value: > 5.5.	SASS5 scores less than 130 and an ASPT less than 5.5.
To ensure that the MIRAI score remains within the range of a C Category (62% ï 78%).	A MIRAI score of 62% or less.
To maintain suitable flow velocity (>0.6 m/s) and to maintain clean, un-embedded surface area (cobbles) to support the following flow-dependent taxa: ▪ Hydropsychidae (Abundance B). ▪ Trichorythidae (Abundance A).	Any one of these two taxa missing in two consecutive surveys or any one of these two taxa present as a single individual in two consecutive surveys.
To maintain suitable flow velocity (0.3 ï 0.6 m/s) and to maintain clean, un-embedded surface area (cobbles) to support the following flow-dependent taxa: ▪ Heptageniidae (Abundance A). ▪ Elmidae (Abundance A).	Any one of these two taxa missing in two consecutive surveys or any one of these two taxa present as a single individual in two consecutive surveys.
To maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxa: ▪ Atyidae (Abundance A). ▪ Coenagrionidae (Abundance A).	Any one of these two taxa missing in two consecutive surveys or any one of these two taxa present as a single individual in two consecutive surveys.
To maintain suitable conditions for the following six key taxa: ▪ Hydropsychidae ▪ Trichorythidae ▪ Heptageniidae ▪ Elmidae ▪ Atyidae ▪ Coenagrionidae	Presence of less than four of the six key taxa listed in any survey.
Balanced community structure, i.e. majority of invertebrates at A abundance, certain taxa at B abundance (e.g. Simuliidae, Hydropsychidae and Baetidae). To ensure that no group consistently dominates the fauna, defined as D abundance (> 1000) over more than two consecutive surveys.	Any taxon occurring in an abundance of >1000 for two consecutive surveys.

Table 18 RU EWR 3: Riparian vegetation EcoSpecs and TPCs

Metric	Zone assessed	EcoSpecs (PES)	EcoSpecs (Sc 11)	TPC (for PES)
Vegetation Cover	Marginal	Maintain marginal hydrophyte fringe and *Phragmites* along the active channel	Maintain marginal hydrophyte fringe and *Phragmites* along the active channel.	Marginal fringe absent; *Phragmites* fringe visibly (fixed photo) increasing in abundance/cover.
	Lower	Maintain *Ficus sycomorus* and *Cyperus* patches cover.	Maintain *F. sycomorus* and *Cyperus* patches cover.	Measurable decrease in either population.
Species composition	Upper	Maintain riparian/terrestrial mix.	Maintain riparian/terrestrial mix.	When the proportion of terrestrial species reaches 50% of the total species count.
	Upper	Maintain *Diospyros mespiliformis* population.	Maintain *D. mespiliformis* population.	Visible decrease in *D. mespiliformis* cover/abundance.
	Upper	Maintain *B. salicina, C. imberbe* and *P. violacea* populations.	Maintain *B. salicina*, *C. imberbe* and *P. violacea* populations.	Visible decrease in *B. salicina*, *C. imberbe* or *P. violacea* cover/abundance.
Alien invasion	Riparian	Perennial alien plant species aerial cover less than 30%.	Perennial alien plant species aerial cover less than 30%.	An increase in alien perennial species cover above 30%.
Indigenous riparian woody cover	Marginal	Riparian woody species cover not absent and not more than 80%.	Riparian woody species cover not absent and not more than 80%.	An increase in riparian woody cover above 80% OR an absence of woody riparian species.
	Lower	Riparian woody species cover not more than 80%.	Riparian woody species cover not less than 5% and not more than 70%.	An increase in riparian woody cover above 80%.
	Upper	Riparian woody species cover not less than 20% and not more than 80%.	Riparian woody species cover not less than 20% and not more than 80%.	An increase in riparian woody cover above 80% OR a decrease below 20%.
Phragmites (reed) cover	Marginal	Reed cover not less than 10%.	Reed cover not less than 10%.	A decrease in reed cover below 10%.
	Lower	Reed cover not absent.	Reed cover between 10% and 90%.	An absence of reed cover.
	Upper	Reeds cover less than 50%.	Reeds cover less than 50%.	An increase in reed cover above 50%.
Riparian zone integrity	Riparian	Zero expansion of agriculture within the riparian zone.	Zero expansion of agriculture within the riparian zone.	An increase of the spatial extent of agriculture WITHIN the riparian zone.
Longitudinal riparian zone continuity	Riparian	Zero increase in riparian zone longitudinal fragmentation.	Zero increase in riparian zone longitudinal fragmentation.	An increase in the longitudinal fragmentation of the riparian zone.

Table 19 RU EWR 4: Flow RQO

nMAR (MCM)	Total flows (MCM)	Total (%nMAR)	Oct		Mar	
			90%	60%	90%	60%
441.39	187.73	42.53155	0.523	0.554	0.788	3.781

Table 20 RU EWR 4: Fish EcoSpecs and TPCs

Metric		PES			Recommended flow scenario (Scenario 10/11)
	Indicator	EcoSpecs/RQOs	TPC (Biotic)	TPC (Habitat)	EcoSpecs/RQOs
Ecological status	PES	Present ecological status of fish is in a C (64.7%).	Decrease of PES into a lower EC than PES.	Any deterioration in habitat that results in decrease in FROC[1] of species.	A very slight deterioration in the ecological conditions is expected but the fish will still remain in a C (63.4%). A slight decrease is expected in the FROC of BANN, BEUT, BMAR, BPAU, BRAD, BTOP, BTRI, BUNI, BVIV, CGAR, CPRE, CPAR, LCYL, LMOL, MBRE, MMAC, PCAT and PPHI, while LROS and LRUD may increase slightly.
Species richness	All indigenous species	26 of the expected 34 indigenous fish species estimated to be present in the reach under PES (to be verified).	20% decrease in species richness.	Loss in diversity, abundance and condition of velocity-depth categories and cover features that lead to a loss of species.	
Requirement for flowing water.	CPRE BEUT	CPRE and BEUT have a high requirement for flow during all life stages and are the most applicable indicator species for flow modification.	CPRE and/or BEUT absent during any survey OR present at FROC# of <0.94 for CPRE and <0.5 for BEUT. (DWAF, 2006b: A minimum of 20 CPRE specimens should be sampled at 100% of sites during a survey of FS and FD, electrofishing for minimum 20 minutes).	Reduced suitability (abundance and quality) of flowing habitats (i.e. decreased flows, increased zero flows, and altered seasonality).	
FD habitats	CPAR BMAR	CPAR and BMAR have a high requirement for fast-deep habitats and are the most applicable indicator species for this velocity-depth category.	CPAR and/or BMAR absent during any survey OR present at FROC of < 4.5 for CPAR and < 4 for BMAR. (DWAF, 2006b: A minimum of 20 CPAR specimens should be sampled at 100% of sites during a survey of FS and FD, electrofishing for minimum 20 minutes).	Reduced suitability (abundance and quality) of FD habitats (i.e. decreased flows, increased zero flows).	
FS habitats	CPAR LCYL	CPAR and LCYL have a high requirement for fast-deep habitats and are the most applicable indicator species for this velocity-depth category.	CPAR and/or LCYL absent during any survey OR present at FROC of < 4.5 for CPAR and < 4 for LCYL. (DWAF, 2006b: A minimum of 20 CPAR specimens should be sampled at 100% of sites during a survey of FS and FD, electrofishing for minimum 20 minutes).	Reduced suitability (abundance and quality) of FS habitats (i.e. decreased flows, increased zero flows).	
Substrate	LROS CPAR	LROS and CPAR have a high requirement for fast-deep habitats and are the most applicable indicator species for this habitat feature.	LROS and/or CPAR absent during any survey OR present at FROC of < 4 for LROS and <4.5 for CPAR. (DWAF, 2006b: A minimum of 20 CPAR specimens should be sampled at 100% of sites during a survey of FS and FD, electrofishing for minimum 20 minutes)	Increased sedimentation of riffle/rapid substrates, excessive algal growth on substrates, Increased sedimentation of riffle/rapid substrates, excessive algal growth on substrates.	
Water quality intolerance	BEUT MMAC	BEUT and MMAC have a high requirement for unmodified water quality and are the most applicable indicator species for water quality deterioration.	BEUT and/or MMAC absent during any survey OR present at FROC of < 0.5 for BEUT and < 5 for MMAC.	Decreased water quality (especially flow related water quality variables such as oxygen).	
Overhanging vegetation	PPHI BPAU	PPHI and BPAU have a high requirement for overhanging vegetation and are the most applicable indicator species for this habitat feature.	PPHI and/or BPAU absent during any survey OR present at FROC of < 5 for PPHI and < 5 for BPAU.	Significant change in overhanging vegetation habitats.	

Metric		PES			Recommended flow scenario (Scenario 10/11)
	Indicator	EcoSpecs/RQOs	TPC (Biotic)	TPC (Habitat)	EcoSpecs/RQOs
Instream vegetation	TREN BPAU	TREN and BPAU have a high requirement for instream (aquatic) vegetation and are the most applicable indicator species for this habitat feature.	TREN and/or BPAU absent during any survey OR present at FROC of < 5 for TREN and < 5 for BPAU.	Significant change in overhanging vegetation habitats (overgrazing, flow modification, use of herbicides, agriculture)	
Undercut banks	MMAC BEUT	MMAC and BEUT have a high preference for undercut banks and rootwads and are the most applicable indicator species for this habitat feature.	MMAC and/or BEUT absent during any survey OR present at FROC of < 5 for MMAC and < 0.5 for BEUT.	Significant change in undercut bank and rootwads habitats (e.g. bank erosion, reduced flows).	
Water column	MBRE BANN	MBRE and BANN have a high requirement for water column as habitat and are the most applicable indicator species for this habitat feature.	MBRE and/or BANN absent during any survey OR present at FROC of < 5 for MBRE and < 5 for BANN.	Reduction in suitability of water column (i.e. increased sedimentation of pools, reduced flows).	
SD habitats	BANN BUNI	BANN and BUNI have a high requirement for slow-deep habitats and are the most applicable indicator species for this velocity depth category.	BANN and/or BUNI absent during any survey OR present at FROC of < 5 for BANN and < 5 for BUNI.	Significant change in SD habitat suitability (i.e. increased or decreased flows, altered seasonality, increased sedimentation of slow habitats).	
SS habitats	BRAD BVIV	BRAD and BVIV have a high requirement for slow-shallow habitats and are the most applicable indicator species for this velocity depth category.	BRAD and/or BVIV absent during any survey OR present at FROC of < 5 for BRAD and < 5 for BVIV.	Significant change in SS habitat suitability (i.e. increased flows, altered seasonality, increased sedimentation of slow habitats).	
Migratory success[2]	BMAR LCYL, etc.	It is estimated that the catadromous eels have been lost from this reach but various potamadromous species (including BMAR) is still present.	Loss or decreased FROC[1] of catadromous (such as AMOS) or potamadromous species (such as BMAR).	Alteration of longitudinal habitat through the creation of migration barriers (dams, weirs, zero flows, poor water quality causing chemical barriers).	
Alien fish species	Presence of any alien/ introduced spp.	No alien/introduced species known or expected to be present in the SQ reach.	Presence of any additional alien/introduced species or increase in abundance and distribution of existing species.	N/A.	
Primary indicator species	**CPRE (CPAR)**	**CPRE estimated to be present at >25% of sites in SQ reach (DWA, 2013b) (to be verified).**	**See relevant sections above for detail.**	**See relevant sections above for detail.**	

Table 21 RU EWR 4: Macro-invertebrate EcoSpecs and TPCs

EcoSpecs	TPCs	Recommended scenario: C/D EC
To ensure that the SASS5 scores and ASPT values occur in the following range: SASS5 score: > 120; ASPT value: > 5.0.	SASS5 scores less than 120 and an ASPT less than 5.2.	The lower flows during winter will have an impact on the macro-invertebrate habitat and water quality. This will impact on the species preferring flow velocity (>0.6 m/s) and species requiring high water quality parameters.
To ensure that the MIRAI score remains within the range of a C Category (62% ï 78%).	A MIRAI score of 62% or less.	The EcoSpecs will be downgraded to accommodate the lower MIRAI score of 57 - 62% (C/D).
To maintain suitable flow velocity (>0.6m/s) and to maintain clean, un-embedded surface area (cobbles) to support the following flow-dependent taxa: ▪ Hydropsychidae (Abundance B). ▪ Trichorythidae (Abundance A).	Any one of these two taxa missing in two consecutive surveys or any one of these two taxa present as a single individual in two consecutive surveys.	Since SIC habitat is restricted in the reach, Hydropsychidae and Trichorythidae might disappear from the system and the EcoSpec for the 0.3 ï 0.6 m/s flow velocity will take its place.
To maintain suitable flow velocity (0.3 ï 0.6 m/s) and to maintain clean, un-embedded surface area (cobbles) to support the following flow-dependent taxa: ▪ Heptageniidae (Abundance A). ▪ Elmidae (Abundance A).	Any one of these two taxa missing in two consecutive surveys or any one of these two taxa present as a single individual in two consecutive surveys.	Although these taxa will be stressed even more, it is not expected that they will disappear and this EcoSpec can still be used.
To maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxa: ▪ Atyidae (Abundance A). ▪ Coenagrionidae (Abundance A).	Any one of these two taxa missing in two consecutive surveys or any one of these two taxa present as a single individual in two consecutive surveys.	Although this habitat will be stressed even more, it is not expected that the indicator species will disappear and this EcoSpec can still be used.
To maintain suitable conditions for the following six key taxa: ▪ Hydropsychidae ▪ Trichorythidae ▪ Heptageniidae ▪ Elmidae ▪ Atyidae ▪ Coenagrionidae	Presence of less than four of the six key taxa listed in any survey.	Since Hydropsychidae and Trichorythidae might disappear during this scenario, the EcoSpecs might change as follows: To maintain suitable conditions for the following four key taxa: ▪ Heptageniidae ▪ Elmidae ▪ Atyidae ▪ Coenagrionidae
Balanced community structure, i.e. majority of invertebrates at A abundance, certain taxa at B abundance (e.g. Gomphidae, Corixidae and Baetidae). To ensure that no group consistently dominates the fauna, defined as D abundance (>1000) over more than two consecutive surveys.	Any taxon occurring in an abundance of >1000 for two consecutive surveys.	The EcoSpecs should not change: Any taxon occurring in an abundance of >1000 for two consecutive surveys.

Table 22 RU EWR 4: Riparian vegetation EcoSpecs and TPCs

Metric	Zone assessed	EcoSpecs (PES)	EcoSpecs (Sc 11)	TPC (for PES)	Note
Vegetation Cover	Marginal	Maintain marginal hydrophyte fringe and *Phragmites* along the active channel.	Maintain marginal hydrophyte fringe and *Phragmites* along the active channel.	Marginal fringe absent; *Phragmites* fringe visibly (fixed photo) increasing in abundance/cover.	Adapted from DWAF (2006b), fringe cover (either reeds or woody overhang) is important habitat for instream and riparian fauna.
	Lower	Maintain *Nuxia floribunda* and *Combretum erythrophyllum* cover.	Maintain *N. floribunda* and *C. erythrophyllum* cover.	Measurable decrease in either population; failure to recover following large floods.	Adapted from DWAF (2006b), active channel woody component is important habitat for instream and riparian fauna.
Species composition	Lower	Maintain at least 10 indigenous riparian tree species.	Maintain at least 10 indigenous riparian tree species.	Absence of any of the following: *N. floribunda, C. erythrophyllum, Phoenix reclinata, P. violace* or *B. salicina.*	Adapted from DWAF (2006b).
Alien invasion	Riparian	Perennial alien plant species aerial cover less than 30%.	Perennial alien plant species aerial cover less than 30%.	An increase in alien perennial species cover above 30%.	See hypothesis for Lowveld rivers (alien invasion) (electronic information).
Indigenous riparian woody cover	Marginal	Riparian woody species cover not less than 5% and not more than 70%.	Riparian woody species cover not absent or not more than 80%.	An increase in riparian woody cover above 70% OR a decrease below 5%.	See hypothesis for Lowveld rivers (woody vegetation) (electronic information).
	Lower	Riparian woody species cover not less than 5% and not more than 70%.	Riparian woody species cover not less than 5% and not more than 70%.	An increase in riparian woody cover above 70% OR a decrease below 5%.	See hypothesis for Lowveld rivers (woody vegetation) (electronic information).
	Upper	Riparian woody species cover not less than 30% and not more than 60%.	Riparian woody species cover not less than 30% and not more than 70%.	An increase in riparian woody cover above 60% OR a decrease below 30%.	See hypothesis for Lowveld rivers (woody vegetation) (electronic information).
Phragmites (reed) cover	Marginal	Reed cover not less than 20%.	Reed cover not less than 10%.	A decrease in reed cover below 20%.	See hypothesis for Lowveld rivers (reeds) (electronic information).
	Lower	Reed cover between 10% and 90%.	Reed cover between 10% and 90%.	A decrease in reed cover below 10% OR and increase above 90%.	See hypothesis for Lowveld rivers (reeds) (electronic information).
	Upper	Reeds cover less than 40%.	Reeds cover less than 40%.	An increase in reed cover above 40%.	See hypothesis for Lowveld rivers (reeds) (electronic information).

6. IUA 5: SOUTHERN TRIBUTARIES TO LETABA

Table 23 IUA 5 Flow RQO

RU	REC (EWR)	nMAR[1] (MCM)	pMAR[2] (MCM)	Low flows (MCM[3])	Low flows (%nMAR)	Total flows (MCM)	Total (%nMAR)	Oct		Apr	
								90%	60%	90%	60%
B81F-00228	B	3.53	2.87	0.03	0.8	0.322	9.1	0	0	0	0.004
B81F-00232	B	2.75	2.54	0.094	3.4	0.346	12.6	0	0	0	0

7. IUA 6 NORTHERN TRIBUTARIES TO LETABA

Table 24 IUA 6 Flow RQO

RU	REC (EWR)	nMAR[1] (MCM)	pMAR[2] (MCM)	Low flows (MCM[3])	Low flows (%nMAR)	Total flows (MCM)	Total (%nMAR)	Oct		Apr	
								90%	60%	90%	60%
B81F-00189	C	4.75	4.08	0.062	1.3	0.337	7.1	0	0	0	0.008
B81F-00203	C	3.74	3.08	0.071	1.9	0.328	8.8	0	0	0	0
B81G-00164	D	16.72	14.30	0.072	0.4	1.11	6.6	0	0	0	0.016
B81H-00162	C	0.64	0.59	0.012	1.8	0.063	9.8	0	0	0	0.016
B81H-00171	D	25.84	22.6	0.254	1.0	1.671	6.5	0	0	0	0.006

Table 25 IUA 6 Habitat and Biota RQOs for Moderate priority RUs

INDICATOR	SUB-INDICATORS	NARRATIVE RQO	NUMERICAL RQO
B81H-00171			
Riparian	Vegetative cover along riparian zone banks	Vegetative cover along riparian zone banks should be maintained in order to provide bank stability and prevent erosion.	Vegetative cover along riparian zone banks should not be less than 60% (aerial cover).

8. IUA 7: UPPER MIDDLE LETABA AND TRIBUTARIES US OF MIDDLE LETABA DAM

Table 26 IUA 7 Flow RQO

RU	REC (EWR)	nMAR[1] (MCM)	pMAR[2] (MCM)	Low flows (MCM[3])	Low flows (%nMAR)	Total flows (MCM)	Total (%nMAR)	Oct		Apr	
								90%	60%	90%	60%
B82A-00168	C	31.12	25.07	4.339	13.9	7.564	24.3	0.007	0.068	0.031	0.362
B82B-00173	D	23.13	15.76	1.377	6.0	2.848	12.3	0.007	0.012	0.013	0.081
B82C-00175	E	Water quality RQOs only									
B82D-00163	C	4.9	4.29	0.818	16.7	1.261	25.8	0.004	0.012	0.008	0.047
B82D-00154	D	40.53	32.96	3.527	8.7	7.025	17.3	0.015	0.071	0.021	0..432
B82D-00166	D	42.25	27.77	1.776	4.2	4.296	10.2	0	0.034	0	0.214
B82D-00146	E	Water quality RQOs only									

Table 27 IUA 7 Habitat and Biota RQOs for Moderate priority RUs

INDICATOR	SUB-INDICATORS	NARRATIVE RQO	NUMERICAL RQO
B82D-00166			
Riparian	Riparian zone boundary and integrity	Agricultural activities should not encroach into the riparian zone or cross the riparian zone boundary. Riparian zone fragmentation should not increase.	Zero increase of agricultural activities within the riparian zone. RQOs only applicable to riparian zone not associated with dam or backup areas related to dam.
	Vegetative cover along riparian zone banks	Vegetative cover along riparian zone banks should be maintained in order to provide bank stability and prevent erosion.	Vegetative cover along riparian zone banks should not be less than 60% (aerial cover). It is assumed that 60% cover for this particular region and particular vegetation unit is realistic (and functional) but the hypothesis is testable.
Fish	PES Desktop FRAI = 44.7%, D	Maintain PES of at least D.	Maintain the Fish PES in at least a D (FRAI Ó44%).
	Species richness 7 Species	Maintain fish species richness.	Maintain fish species richness. Do not allow more than 10% deviation from baseline (estimated at 7 species) for SQ reach.
	Primary indicator species BVIV/BTOP	Flows should be adequate to ensure suitable habitats for BVIV/BTOP.	Ensure presence of BVIV and BTOP in reach and FROC should not decrease >10% from baseline value (to be established should monitoring be implemented).
B82B-00173			
Riparian	Riparian zone boundary and integrity	Agricultural activities should not encroach into the riparian zone or cross the riparian zone boundary. Riparian zone fragmentation should not increase.	Zero increase of agricultural activities within the riparian zone.
Fish	PES Desktop FRAI = 52.4%, D	Maintain PES of at least D.	Maintain the Fish PES in at least a D (FRAI Ó52%).
	Species richness 7 Species	Maintain fish species richness.	Maintain fish species richness. Do not allow more than 10% deviation from baseline (estimated at 7 species) for SQ reach.
	Primary indicator species BVIV/BTOP	Flows should be adequate to ensure suitable habitats for BVIV/BTOP.	Ensure presence of BVIV and BTOP in reach and FROC should not decrease >10% from baseline value (to be established should monitoring be implemented).
	Secondary indicator species Water quality (BTOP/BVIV) Vegetation (BVIV/TREN).	Maintain adequate water quality, substrate of good quality and vegetation as cover for fish.	Ensure the presence of the secondary indicator species and do not allow reduction of their present FROC.
Macro-invertebrates	Hydropsychidae and Elmidae	To maintain suitable conditions for these flow dependent species (Moderate to rapid velocities: 0.3 - > 0.6 m/s) in the SIC biotope.	

9. IUA 8 KLEIN LETABA US FROM THE MIDDLE LETABA DAM

Table 28 IUA 8 Flow RQO

RU	REC (EWR)	nMAR[1] (MCM)	pMAR[2] (MCM)	Low flows (MCM[3])	Low flows (%nMAR)	Total flows (MCM)	Total (%nMAR)	Oct		Apr	
								90%	60%	90%	60%
B82E-00149	B	4.51	4.02	0.126	2.8	0.624	13.9	0	0.02	0	0
B82E-00150	C	3.48	3.08	0.037	1.1	0.558	16.1	0	0.038	0	0
B82F-00141	C	7.32	7.19	0.115	1.6	0.935	12.8	0	0	0.003	0.051
B82F-00128	C	32.13	30.26	1.595	5.0	4.962	15.4	0.004	0.016	0.017	0.428
B82F-00137	D	13.64	12.42	0.063	0.5	1.319	9.7	0	0	0.004	0.164

Table 29 IUA 8 Habitat and Biota RQOs for Moderate priority RUs

INDICATOR	SUB-INDICATORS	NARRATIVE RQO	NUMERICAL RQO
B82F-00128			
Riparian	Riparian boundary	Agricultural activities should not encroach into the riparian zone or cross the riparian zone boundary.	Zero increase of agricultural activities within the riparian zone. It is assumed that 60% cover for this particular region and particular vegetation unit is realistic (and functional) but the hypothesis is testable.
	Riparianlongitudinal continuity	Riparian zone fragmentation should not increase.	Zero increase in riparian zone fragmentation. The relationship between % alien cover and EC is hypothesised and testable.
	Vegetative cover along riparian zone banks	Vegetative cover along riparian zone banks should be maintained to provide bank stability & prevent erosion.	Vegetative cover along riparian zone banks should not be less than 60% (aerial cover).
	Aerial cover of alien plant species within the riparian zone	Perennial alien plant species aerial cover within the riparian zone should conform to the desired EC.	Perennial alien plant species aerial cover within the riparian zone should be less than 30% (requirement applicable to C Category).
Fish	PES D, Desktop FRAI = 51.22%	Maintain PES of at least D.	Maintain the Fish PES in at least a D (FRAI Ó51%).
	Species richness 10 species	Maintain fish species richness.	Maintain fish species richness. Do not allow more than 10% deviation from baseline (estimated at 10 species) estimated for SQ reach.
	Primary indicator species BMAR	Flows should be adequate to ensure suitable habitats for BMAR.	Ensure presence of BMAR in reach & FROC should not decrease >10% from baseline value (to be established during monitoring).
Macro-invertebrates	Hydropsychidae and Elmidae	To maintain suitable conditions for flow dependent species (moderate to rapid velocities: 0.3 - > 0.6 m/s) in the SIC biotope.	
	Coenagrionidae, Belostomatidae	To maintain suitable conditions in the marginal vegetation for these key species.	
B82F-00137			
Riparian	Riparian zone boundary	Agricultural activities should not encroach into the riparian zone or cross the riparian zone boundary.	Zero increase of agricultural activities within the riparian zone. It is assumed that 60% cover for this particular region and particular vegetation unit is realistic (and functional) but the hypothesis is testable.
	Riparian zone longitudinal continuity	Riparian zone fragmentation should not increase.	Zero increase in riparian zone fragmentation.
	Vegetative cover along riparian zone banks	Vegetative cover along riparian zone banks should be maintained in order to provide bank stability and prevent erosion.	Vegetative cover along riparian zone banks should not be less than 60% (aerial cover).

10. IUA 9: KLEIN LETABA DS FROM THE MIDDLE LETABA DAM

Table 30 IUA 9 Flow RQO

nMAR (MCM)	Total flows (MCM)	Total (%nMAR)	Oct		Mar	
			90%	60%	90%	60%
99.84	55.85	55.94	0.015	0.030	0.034	0.069

Table 31 RU EWR 5: Fish EcoSpecs and TPCs

Metric		PES			Recommended flow scenario (Scenario 10/11)
	Indicator	EcoSpecs/RQOs	TPC (Biotic)	TPC (Habitat)	EcoSpecs/RQOs
Ecological status	PES	Present ecological status of fish is in a C (68.7%).	Decrease of PES into a lower EC than PES.	Any deterioration in habitat that results in decrease in FROC[1] of species.	A slight deterioration in the ecological conditions is expected but the fish will still remain in a C (63.3%). Although flow and thus habitat abundance will be better during dry and most of wet season when compared to the PES, the lack of floods result in deterioration of substrate quality and loss of pools (due to sedimentation related to reduction in floods), leading to a slight decrease in the FROC of many species.
Species richness	All indigenous species	23 of the expected 23 indigenous fish species estimated to be present in the reach under PES (to be verified).	20% decrease in species richness.	Loss in diversity, abundance and condition of velocity-depth categories and cover features that lead to a loss of species.	
Requirement for flowing water.	CPAR BMAR	CPAR and BMAR have a high requirement for flow during all life stages and are the most applicable indicator species for flow modification.	CPAR and/or BMAR absent during any survey OR present at FROC[1] of < 3 for CPAR and <2 for BMAR. (DWAF, 2006b: A minimum of 5 CPAR specimens should be sampled at 20% of sites during a survey of FS and FD, electrofishing for minimum 20 minutes).	Reduced suitability (abundance and quality) of flowing habitats (i.e. decreased flows, increased zero flows, and altered seasonality).	
FD habitats	CPAR BMAR	CPAR and BMAR have a high requirement for fast-deep habitats and are the most applicable indicator species for this velocity-depth category.	CPAR and/or BMAR absent during any survey OR present at FROC of < 3 for CPAR and < 2 for BMAR.	Reduced suitability (abundance & quality) of FD habitats (i.e. decreased flows, increased zero flows).	
FS habitats	CPAR LCYL	CPAR and LCYL have a high requirement for fast-deep habitats and are the most applicable indicator species for this velocity-depth category.	CPAR and/or LCYL absent during any survey OR present at FROC of < 3 for CPAR and < 3 for LCYL.	Reduced suitability (abundance and quality) of FS habitats (i.e. decreased flows, increased zero flows).	
Substrate	LROS CPAR	LROS and CPAR have a high requirement for fast-deep habitats and are the most applicable indicator species for this habitat feature.	LROS and/or CPAR absent during any survey OR present at FROC of < 3 for LROS and < 3 for CPAR.	Increased sedimentation of riffle/rapid substrates, excessive algal growth on substrates, Increased sedimentation of riffle/rapid substrates, excessive algal growth on substrates.	

Metric		PES			Recommended flow scenario (Scenario 10/11)
	Indicator	EcoSpecs/RQOs	TPC (Biotic)	TPC (Habitat)	EcoSpecs/RQOs
Water quality intolerance	LMOL CPAR	LMOL and CPAR have a high requirement for unmodified water quality and are the most applicable indicator species for water quality deterioration.	LMOL and/or CPAR absent during any survey OR present at FROC of < 3 for LMOL and < 3 for CPAR.	Decreased water quality (especially flow related water quality variables such as oxygen).	
Overhanging vegetation	BVIV BRAD	BVIV and BRAD have a high requirement for overhanging vegetation and are the most applicable indicator species for this habitat feature.	BVIV and/or BRAD absent during any survey OR present at FROC of < 3.5 for BVIV and < 3.5 for BRAD. (DWAF, 2006b: A minimum of 20 BVIV specimens should be sampled at 85% of sites during a survey, electrofishing for minimum 20 minutes/10 sweeps with 4m pole seine net.).	Significant change in overhanging vegetation habitats.	
Instream vegetation	TREN BPAU	TREN and BPAU have a high requirement for instream (aquatic) vegetation and are the most applicable indicator species for this habitat feature.	TREN and/or BPAU absent during any survey OR present at FROC of < 3.5 for TREN and < 3.5 for BPAU.	Significant change in overhanging vegetation habitats (overgrazing, flow modification, use of herbicides, agriculture).	
Undercut banks	SZAM PPHI	SZAM and PPHI have a high preference for undercut banks and rootwads and are the most applicable indicator species for this habitat feature.	SZAM and/or PPHI absent during any survey OR present at FROC of < 2 for SZAM and < 3.5 for PPHI.	Significant change in undercut bank and rootwads habitats (e.g. bank erosion, reduced flows).	
Water column	MBRE BANN	MBRE and BANN have a high requirement for water column as habitat and are the most applicable indicator species for this habitat feature.	MBRE and/or BANN absent during any survey OR present at FROC of < 3.5 for MBRE and < 3.5 for BANN.	Reduction in suitability of water column (i.e. increased sedimentation of pools, reduced flows).	
SD habitats	BANN BUNI	BANN and BUNI have a high requirement for slow-deep habitats and are the most applicable indicator species for this velocity depth category.	BANN and/or BUNI absent during any survey OR present at FROC of < 3.5 for BANN and < 3.5 for BUNI. (DWAF, 2006b: A minimum of 10 BUNI specimens should be sampled at 60% of sites during a survey, electrofishing for minimum 20 minutes/10 sweeps with 4m pole seine net.	Significant change in SD habitat suitability (i.e. increased or decreased flows, altered seasonality, increased sedimentation of slow habitats).	
SS habitats	BRAD BVIV	BRAD and BVIV have a high requirement for slow-shallow habitats and are the most applicable indicator species for this velocity depth category.	BRAD and/or BVIV absent during any survey OR present at FROC of < 3.5 for BRAD and < 3.5 for BVIV.	Significant change in SS habitat suitability (i.e. increased flows, altered seasonality, increased sedimentation of slow habitats).	
Migratory success[2]	BMAR LMOL, etc.	It is estimated that the catadromous eels have been lost from this reach but various	Loss or decreased FROC potamodromous species (such as BMAR).	Alteration of longitudinal habitat through the creation of migration barriers (dams,	

Metric		PES			Recommended flow scenario (Scenario 10/11)
	Indicator	EcoSpecs/RQOs	TPC (Biotic)	TPC (Habitat)	EcoSpecs/RQOs
		potamodromous species (including BMAR) is still present.		weirs, zero flows, poor water quality causing chemical barriers).	
Alien fish species	presence of any alien/introduced spp.	No alien/introduced species known or expected to be present in the SQ reach.	Presence of any additional alien/introduced species or increase in abundance and distribution of existing species.	N/A	
Primary indicator species	**CPAR (BMAR)**	**CPAR estimated to be present at >25% of sites in SQ reach (DWA, 2013b) (to be verified).**	**See relevant sections above for detail.**	**See relevant sections above for detail.**	

Table 32 RU EWR 5: Macro-invertebrate EcoSpecs and TPCs

EcoSpecs	TPCs
To ensure that the SASS 5 scores and ASPT values occur in the following range: SASS 5 score: >100; ASPT value: > 5.0.	SASS 5 scores less than 110 and an ASPT less than 5.0.
To ensure that the MIRAI score remains within the range of a C/D category (57% ï 62%).	A MIRAI score of 58% or less.
To maintain suitable flow velocity (>0.6 m/s) and to maintain clean, un-embedded surface area (cobbles) to support the following flow-dependent taxa: ▪ Hydropsychidae (Abundance B), Trichorythidae (Abundance A).	Any one of these two taxa missing in two consecutive surveys or any one of these two taxa present as a single individual in two consecutive surveys.
To maintain suitable flow velocity (0.3 ï 0.6 m/s) and to maintain clean, un-embedded surface area (cobbles) to support the following flow-dependent taxa: ▪ Heptageniidae (Abundance A), Elmidae (Abundance A).	Any one of these two taxa missing in two consecutive surveys or any one of these two taxa present as a single individual in two consecutive surveys.
To maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxa: ▪ Atyidae (Abundance A), Coenagrionidae (Abundance A).	Any one of these two taxa missing in two consecutive surveys or any one of these two taxa present as a single individual in two consecutive surveys.
To maintain suitable conditions for the following six key taxa: ▪ Hydropsychidae, Trichorythidae, Heptageniidae, Elmidae, Atyidae, Coenagrionidae	Presence of less than four of the six key taxa listed in any survey.
Balanced community structure, i.e. majority of invertebrates at A abundance, certain taxa at B abundance (e.g. Gomphidae, Simulidae and Baetidae). To ensure that no group consistently dominates the fauna, defined as D abundance (> 1000) over more than two consecutive surveys.	Any taxon occurring in an abundance of > 1000 for two consecutive surveys.

Table 33 RU EWR 5: Riparian vegetation EcoSpecs and TPCs

Metric	Zone assessed	EcoSpecs (PES)	EcoSpecs (Sc 11)	TPC (for PES)
Vegetation Cover	Marginal Zone	Maintain marginal hydrophyte fringe and *Phragmites* along the active channel and *Cyperus marginatus* patches in places	Maintain marginal hydrophyte fringe and *Phragmites* along the active channel and *C. marginatus* patches in places.	Marginal fringe absent; *Phragmites* fringe visibly (fixed photo) increasing in abundance/cover; *C. marginatus* absent.

Metric	Zone assessed	EcoSpecs (PES)	EcoSpecs (Sc 11)	TPC (for PES)
	Secondary channels	Maintain between 25 and 50% marginal hydrophyte cover in secondary channels during summer	Maintain between 25% and 50% marginal hydrophyte cover in secondary channels during summer.	Marginal hydrophyte cover in secondary channels less than 25% OR more than 50% in summer.
	Lower Zone	Maintain *Ficus sycomorus* and *Combretum erythrophyllum* cover.	Maintain *F. sycomorus* and *C. erythrophyllum* cover.	Measurable decrease in either population; failure to recover following large floods.
Species composition	Lower Zone	Maintain at least 14 indigenous riparian tree species.	Maintain at least 14 indigenous riparian tree species.	Absence of any of the following: *Co. erythrophyllum* or *F. sycomorus*
	Upper zone	Maintain *Diospyros mespiliformis, B. salicina, C. imberbe, P. violace and Trichelia emetica* populations.	Maintain *D. mespiliformis, B. salicina, C. imberbe, P. violace* and *T. emetica* populations.	Visible decrease in *D. mespiliformis*, *B. salicina*, *C. imberbe*, *P. violace* and *T. emetica* cover/abundance.
Alien invasion	Riparian zone	Perennial alien plant species aerial cover less than 30%.	Perennial alien plant species aerial cover less than 30%.	An increase in alien perennial species cover above 30%.
Indigenous riparian woody cover	Marginal Zone	Riparian woody species cover not absent and not more than 80%.	Riparian woody species cover not absent and not more than 80%.	An increase in riparian woody cover above 80% OR an absence of woody riparian species.
	Lower Zone	Riparian woody species cover not less than 5% and not more than 70%.	Riparian woody species cover not less than 5% and not more than 80%.	An increase in riparian woody cover above 70% OR a decrease below 5%.
	Upper Zone	Riparian woody species cover not less than 20% and not more than 80%.	Riparian woody species cover not less than 20% and not more than 80%.	An increase in riparian woody cover above 80% OR a decrease below 20%.
Phragmites (reed) cover	Marginal Zone	Reed cover not less than 10%.	Reed cover not less than 10%.	A decrease in reed cover below 10%.
	Lower Zone	Reed cover between 10% and 90%.	Reed cover not absent.	A decrease in reed cover below 10% OR and increase above 90%.
	Upper Zone	Reeds cover less than 50%.	Reeds cover less than 50%.	An increase in reed cover above 50%.
Riparian zone integrity	Riparian zone	Zero expansion of agriculture within the riparian zone.	Zero expansion of agriculture within the riparian zone.	An increase of the spatial extent of agriculture WITHIN the riparian zone.
Longitudinal riparian zone continuity	Riparian zone	Zero increase in riparian zone longitudinal fragmentation.	Zero increase in riparian zone longitudinal fragmentation.	An increase in the longitudinal fragmentation of the riparian zone.

11. IUA 10 LOWER KLEIN LETABA TRIBUTARIES

Table 34 IUA 10 Flow RQO

RU	REC (EWR)	nMAR[1] (MCM)	pMAR[2] (MCM)	Low flows (MCM[3])	Low flows (%nMAR)	Total flows (MCM)	Total (%nMAR)	Oct		Apr	
								90%	60%	90%	60%
B82H-00127	C	6.91	4.42	0.07	1	0.73	10.6	River ephemeral - only flood requirements			
B82H-00139	B	3.1	3.1	0.021	0.7	0.463	14.9	River ephemeral - only flood requirements			
B82H-00157	B	11.72	9.21	0.202	1.7	1.683	14.4	0	0	0	0.004
B82J-00197	B	0.66	0.64	0.024	3.6	0.091	13.7	River ephemeral - only flood requirements			

Table 35 IUA 10 Habitat and Biota RQOs for Moderate priority RUs

INDICATOR	SUB-INDICATORS	NARRATIVE RQO	NUMERICAL RQO
B82H-00127			
Riparian	Riparian zone boundary	Agricultural activities should not encroach into the riparian zone or cross the riparian zone boundary.	Zero increase of agricultural activities within the riparian zone. It is assumed that 60% cover for this particular region and particular vegetation unit is realistic (and functional) but the hypothesis is testable.
	Riparian zone longitudinal continuity	Riparian zone fragmentation should not increase.	Zero increase in riparian zone fragmentation.
	Vegetative cover along riparian zone banks	Vegetative cover along riparian zone banks should be maintained in order to provide bank stability and prevent erosion.	Vegetative cover along riparian zone banks should not be less than 60% (aerial cover). The relationship between % alien cover and EC is hypothesised and testable.
	Aerial cover of alien plant species in the riparian zone	Perennial alien plant species aerial cover within the riparian zone should conform to the desired Ecological Category (EC).	Perennial alien plant species aerial cover within the riparian zone should be less than 30% (requirement applicable to C Category).
B82H-00157			
Riparian	Riparian zone boundary	Agricultural activities should not encroach into the riparian zone or cross the riparian zone boundary.	Zero increase of agricultural activities within the riparian zone. It is assumed that 80% cover for this particular region and particular vegetation unit is realistic (and functional) but the hypothesis is testable.
	Riparian zone longitudinal continuity	Riparian zone fragmentation should not increase.	Zero increase in riparian zone fragmentation.
	Vegetative cover along riparian zone banks	Vegetative cover along riparian zone banks should be maintained in order to provide bank stability and prevent erosion.	Vegetative cover along riparian zone banks should not be less than 60% (aerial cover) Note: It is assumed that 80% cover for this particular region and particular vegetation unit is realistic (and functional) but the hypothesis is testable.

12. IUA 11: LETABA MAIN STEM IN THE KNP

Table 36 IUA 11 Flow RQO

nMAR (MCM)	Total flows (MCM)	Total (%nMAR)	Oct		Mar	
			90%	60%	90%	60%
646	318.74	49.34	0.523	0.554	0.87	3.9

Table 37 RU EWR 7: Fish EcoSpecs and TPCs

Metric		PES			Recommended flow scenario (Scenario 11)
	Indicator	EcoSpecs/RQOs	TPC (Biotic)	TPC (Habitat)	EcoSpecs/RQOs
Ecological status	PES	Present ecological status of fish is in a C (64.4%).	Decrease of PES into a lower EC than PES.	Any deterioration in habitat that results in decrease in FROC[1] of species.	An notable deterioration in the ecological conditions are expected under this scenario with the fish decreasing from a C to a C/D. Although base flows will be suitable during wet and dry season, decrease in floods will result in loss of pools (sedimentation) and although riffle/rapid habitats are limited, the quality of these will also be reduced due to lack of flushing. A reduced FROC is expected for most of the fish species and especially those with a preference for flowing conditions.
Species richness	All indigenous species	29 of the expected 32 indigenous fish species estimated to be present in the reach under PES (to be verified).	20% decrease in species richness.	Loss in diversity, abundance and condition of velocity-depth categories and cover features that lead to a loss of species.	
Requirement for flowing water.	LCON LMOL	LCON and LMOL have a high requirement for flow during all life stages and are the most applicable indicator species for flow modification.	LCON and/or LMOL absent during any survey OR present at FROC[1] of < 3 for LCON and < 4.5 for LMOL.	Reduced suitability (abundance and quality) of flowing habitats (i.e. decreased flows, increased zero flows, and altered seasonality).	
FD habitats	LCON CPAR	LCON and CPAR have a high requirement for fast-deep habitats and are the most applicable indicator species for this velocity-depth category.	LCON and/or CPAR absent during any survey OR present at FROC of < 3 for LCON and < 3.5 for CPAR. (DWAF 2006b: A minimum of 10 CPAR specimens should be sampled at 70% of sites during a survey of FS and FD, electrofishing for minimum 20 minutes)	Reduced suitability (abundance and quality) of FD habitats (i.e. decreased flows, increased zero flows).	
FS habitats	CPAR LCYL	CPAR and LCYL have a high requirement for fast-deep habitats and are the most applicable indicator species for this velocity-depth category.	CPAR and/or LCYL absent during any survey OR present at FROC of < 3.5 for CPAR and < 4.5 for LCYL.	Reduced suitability (abundance and quality) of FS habitats (i.e. decreased flows, increased zero flows).	
Substrate	LCON LROS	LCON and LROS have a high requirement for fast-deep habitats and are the most applicable indicator species for this habitat feature.	LCON and/or LROS absent during any survey OR present at FROC of < 3 for LCON and < 3 for LROS.	Increased sedimentation of riffle/rapid substrates, excessive algal growth on substrates, Increased sedimentation of riffle/rapid substrates, excessive algal growth on substrates.	
Water quality intolerance	MMAC LMOL	MMAC and LMOL have a high requirement for unmodified water quality and are the most applicable indicator species for water quality deterioration.	MMAC and/or LMOL absent during any survey OR present at FROC of < 3 for MMAC and < 4.5 for LMOL.	Decreased water quality (especially flow related water quality variables such as oxygen).	
Overhanging vegetation	PPHI TREN	PPHI and TREN have a high requirement for overhanging vegetation and are the most applicable indicator species for this habitat feature.	PPHI and/or TREN absent during any survey OR present at FROC of < 3 for PPHI and < 5 for TREN.	Significant change in overhanging vegetation habitats.	
Instream	TREN	TREN and have a high	TREN and/or absent during any survey	Significant change in overhanging	

Metric		PES			Recommended flow scenario (Scenario 11)
	Indicator	EcoSpecs/RQOs	TPC (Biotic)	TPC (Habitat)	EcoSpecs/RQOs
vegetation		requirement for instream (aquatic) vegetation and are the most applicable indicator species for this habitat feature.	OR present at FROC of < 5 for TREN.	vegetation habitats (overgrazing, flow modification, use of herbicides, agriculture).	
Undercut banks	MMAC PCAT	MMAC and PCAT have a high preference for undercut banks and rootwads and are the most applicable indicator species for this habitat feature.	MMAC and/or PCAT absent during any survey OR present at FROC of < 3 for MMAC and < 3 for PCAT.	Significant change in undercut bank and rootwads habitats (e.g. bank erosion, reduced flows).	
Water column	MBRE HVIT	MBRE and HVIT have a high requirement for water column as habitat and are the most applicable indicator species for this habitat feature.	MBRE and/or HVIT absent during any survey OR present at FROC of <4 for MBRE and < 3.5 for HVIT. (DWAF 2006b: A minimum of 3 HVIT specimens should be sampled at 50% of sites during a survey using appropriate methods).	Reduction in suitability of water column (i.e. increased sedimentation of pools, reduced flows).	
SD habitats	BANN BUNI	BANN and BUNI have a high requirement for slow-deep habitats and are the most applicable indicator species for this velocity depth category.	BANN and/or BUNI absent during any survey OR present at FROC of < 3.5 for BANN and < 3.5 for BUNI.	Significant change in SD habitat suitability (i.e. increased or decreased flows, altered seasonality, increased sedimentation of slow habitats).	
SS habitats	BRAD BVIV	BRAD and BVIV have a high requirement for slow-shallow habitats and are the most applicable indicator species for this velocity depth category.	BRAD and/or BVIV absent during any survey OR present at FROC of < 3.5 for BRAD and < 3.5 for BVIV.	Significant change in SS habitat suitability (i.e. increased flows, altered seasonality, increased sedimentation of slow habitats).	
Migratory success[2]	BMAR LMOL, etc.	It is estimated that the catadromous eels have been lost from this reach but various potamodromous species (including BMAR) is still present.	Loss or decreased FROC potamodromous species (such as BMAR). (DWAF, 2006b: A minimum of 20 BMAR specimens should be sampled at 100% of sites during a survey, using appropriate methods).	Alteration of longitudinal habitat through the creation of migration barriers (dams, weirs, zero flows, poor water quality causing chemical barriers).	
Alien fish species	Presence of any alien/introduced spp.	No alien/introduced species known or expected to be present in the SQ reach.	Presence of any additional alien/introduced species or increase in abundance and distribution of existing species.	N/A.	
Primary indicator species	**CPAR (BMAR)**	**CPAR estimated to be present at > 25% of sites in SQ reach (2013) (to be verified).**	**See relevant sections above for detail.**	**See relevant sections above for detail.**	

Table 38 RU EWR 7: Macro-invertebrate EcoSpecs and TPCs

EcoSpecs	TPCs	Recommended scenario: C/D EC
To ensure that the SASS 5 scores and ASPT values occur in the following range: SASS 5 score: >70; ASPT value: >4.0.	SASS5 scores less than 75 and an ASPT less than 4.5.	The lower flows during winter will have an impact on the macro-invertebrate habitat and water quality. This will impact on the species preferring flow velocity (>0.6 m/s) and species requiring high water quality parameters.
To ensure that the MIRAI score remains within the range of a C Category (62% ï 78%).	A MIRAI score of 65% or less.	The EcoSpecs will reduce to accommodate the lower MIRAI score of 60% or less.
To maintain suitable flow velocity (>0.6 m/s) and to maintain clean, un-embedded surface area (cobbles) to support the following flow-dependent taxa: ▪ Hydropsychidae (Abundance A).	Hydropsychidae missing in two consecutive surveys or present as a single individual in two consecutive surveys where the SIC habitat is available.	Since stones-in-current habitat is restricted in the reach, Hydropsychidae might disappear from the system and the EcoSpec for the 0.3 ï 0.6 m/s flow velocity will take its place.
To maintain suitable flow velocity (0.3 ï 0.6 m/s) and to maintain clean, un-embedded surface area (cobbles) to support the following flow-dependent taxa: ▪ Libellulidae (Abundance A). ▪ Coenagrionidae (Abundance A).	Any one of these two taxa missing in two consecutive surveys or any one of these two taxa present as a single individual in two consecutive surveys.	Although these taxa will be stressed even more, it is not expected that they will disappear and this EcoSpec can still be used.
To maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxa: ▪ Atyidae (Abundance A). ▪ Coenagrionidae (Abundance A).	Any one of these two taxa missing in two consecutive surveys or any one of these two taxa present as a single individual in two consecutive surveys.	Although this habitat will be stressed even more, it is not expected that the indicator species will disappear and this EcoSpec can still be used.
To maintain suitable conditions for the following five key taxa: ▪ Hydropsychidae, Libellulidae ▪ Coenagrionidae, Atyidae ▪ Gomphidae	Presence of less than three of the five key taxa listed in any survey.	Since Hydropsychidae might disappear during this scenario, the EcoSpecs might change as follows: To maintain suitable conditions for the following four key taxa: ▪ Libellulidae, Coenagrionidae, Atyidae, Gomphidae
Balanced community structure, i.e. majority of invetebrates at A abundance, certain taxa at B abundance (e.g. Baetidae, Caenidae and Thiaridae). To ensure that no group consistently dominates the fauna, defined as D abundance (>1000) over than two consecutive surveys.	Any taxon occurring in an abundance of > 1000 for two consecutive surveys.	The EcoSpecs should not change: Any taxon occurring in an abundance of > 1000 for two consecutive surveys.

Table 39 EWR 7 Riparian vegetation EcoSpecs and TPC

Metric	Zone assessed	EcoSpecs (PES)	EcoSpecs (Sc 11)	TPC (for PES)
Vegetation Cover	Marginal Zone	Maintain marginal hydrophyte fringe and *Phragmites* along the active channel and *C. marginatus, Cynodon dactylon* and *Leersia hexandra* patches in places.	Maintain marginal hydrophyte fringe and *Phragmites* along the active channel and *C. marginatus, C. dactylon* and *L. hexandra* patches in places.	Marginal fringe largely absent; *Phragmites* fringe visibly (fixed photo) decreasing/increasing in abundance/cover; *C. marginatus, L. hexandra or C. dactylon* absent.

Metric	Zone assessed	EcoSpecs (PES)	EcoSpecs (Sc 11)	TPC (for PES)
	Lower Zone	Presence of some obligate riparian tree species	Presence of some obligate riparian tree species	Absence of obligate riparian trees OR failure to recover after large floods
	Upper Zone	Maintain *B. maughamii* subsp. *maughamii, B. salicina, C. imberbe, P. violace*, and C*ombretum microphyllum* populations.	Maintain *B. maughamii* subsp. *maughamii, B. salicina, C. imberbe, P. violace*, and C. *microphyllum* populations.	Visible decrease or absence of *B. maughamii* subsp. *maughamii, B. salicina, C. imberbe, P. violace, and C. microphyllum* cover /abundance; mortality of *C. imberbe* adults.
Alien Invasion	Riparian zone	Perennial alien plant species aerial cover less than 10%.	Perennial alien plant species aerial cover less than 10%.	An increase in alien perennial species cover above 10%.
Indigenous Riparian Woody Cover	Marginal Zone	Riparian woody species cover not absent and not more than 80% (goal for marginal zone in Category C).	Riparian woody species cover not less than 5% and not more than 70% (goal for marginal zone in Category B/C).	An increase in riparian woody cover above 80% OR an absence of woody riparian species.
	Lower Zone	Riparian woody species cover not less than 5% and not more than 70%.	Riparian woody species cover not less than 5% and not more than 70%.	An increase in riparian woody cover above 70% OR a decrease below 5%.
	Upper Zone	Riparian woody species cover not less than 30% and not more than 60%.	Riparian woody species cover not less than 20% and not more than 80%.	An increase in riparian woody cover above 60% OR a decrease below 30%.
Phragmites (reed) cover	Marginal Zone	Reed cover not less than 10%.	Reed cover not less than 20%.	A decrease in reed cover below 10%.
	Lower Zone	Reed cover between 10% and 90%.	Reed cover between 10% and 90%.	A decrease in reed cover below 10% OR and increase above 90%.
	Upper Zone	Reeds cover less than 40%.	Reeds cover less than 50%.	An increase in reed cover above 40%.
Riparian zone integrity	Riparian zone	Zero expansion of agriculture or forestry within the riparian zone.	Zero expansion of agriculture or forestry within the riparian zone.	An increase of the spatial extent of forestry or agriculture WITHIN the riparian zone.
Longitudinal riparian zone continuity	Riparian zone	Zero increase in riparian zone longitudinal fragmentation.	Zero increase in riparian zone longitudinal fragmentation.	An increase in the longitudinal fragmentation of the riparian zone.

13. IUA 12: LETABA TRIBUTARIES IN THE KNP

Table 40 Habitat RQOs provided as the REC

RU (SQ)	River	Level of Impacts	PES	REC
B83A-00193	Shipikani	**SMALL:** Crossings low water, inundation, roads, small dams (farm), vegetation removal.	A	A
B83A-00238	Nharhweni	**SMALL:** Inundation, roads, small dams (farm), vegetation removal. **MODERATE:** Recreation.	A	A
B83A-00254	Ngwenyeni	**SMALL:** Crossings low water, roads, vegetation removal.	A	A
B83B-00161	Tsende	**SMALL:** Inundation, large dams, roads, grazing/trampling, vegetation removal.	B	B
B83D-00204	Manyeleti	**SMALL:** Inundation, Small dams (farm), vegetation removal.	A	A
B83D-00208	Makhadzi	**SMALL:** Crossings low water, roads, grazing/trampling, vegetation removal.	A	A
B83D-00261	Nwanedzi	**SMALL:** Crossings low water, erosion, roads, grazing/trampling, vegetation removal.	A	A
B83D-00236	Makhadzi	**SMALL:** Crossings low water, inundation, roads, vegetation removal.	A	A

SUMMARY OF WATER QUALITY RESOURCE QUALITY OBJECTIVES

The water quality information is presented as follows:

- Per IUA and identified river reach or node:
  - Key user
  - Water quality issue
  - Water quality narrative RQO for main drivers; i.e. UserSpecs and/or EcoSpecs
  - Water quality numerical RQO for main drivers; i.e. UserSpecs and/or EcoSpecs
- Per EWR site:
  - EcoSpecs, i.e. detailed water quality objectives for the aquatic ecosystem from the Reserve study
  - Thresholds or Potential Concern (TPCs), i.e. for the aquatic ecosystem from the Reserve study

IUA 1: LETABA UPSTREAM OF TZANEEN DAM

- **EWR 1, Letaba (B81B-00264)**

Key user: Forestry and some irrigation

Water quality issue: Slight nutrient elevations are the main water quality issue.

Water quality narrative RQO	Water quality numerical RQO
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than 0.015 mg/L PO_4-P (aquatic ecosystems: driver)
Ensure water quality state maintains biotic requirements as specified by RQOs for biota.	See specified biota requirements

EWR 1 (Appel) reach, Letaba River: EcoSpecs (water quality)

River: Letaba		
Monitoring site: B8H014Q01		
EWR Site: 1		
Water quality metrics		**Ecospecs**
Inorganic salts[(a)]	$MgSO_4$	The 95th percentile of the data must be Ò16 mg/L
	Na_2SO_4	The 95th percentile of the data must be Ò20 mg/L
	$MgCl_2$	The 95th percentile of the data must be Ò15 mg/L
	$CaCl_2$	The 95th percentile of the data must be Ò21 mg/L
	NaCl	The 95th percentile of the data must be Ò45 mg/L
	$CaSO_4$	The 95th percentile of the data must be Ò351 mg/L
Physical variables	EC	The 95th percentile of the data must be Ò30 mS/m
	pH	The 5th and 95th percentile of the data must be between 6.5 to 8.0
	Temperature	Small deviation from the natural temperature range
	Dissolved oxygen[(b)]	The 5th percentile of the data must be Ó8 mg/L
	Turbidity[(b)]	Vary by a small amount from the natural turbidity range; minor silting of instream habitats acceptable
Nutrients	TIN	The 50th percentile of the data must be Ò0.25 mg/L
	PO_4-P	The 50th percentile of the data must be Ò0.015 mg/L
Response variables	Chl-*a* phytoplankton [(b)]	The 50th percentile of the data must be Ò15 mg/m^2
	Chl-*a* periphyton	The 50th percentile of the data must be Ò21 mg/m^2
Toxics	Toxics listed in DWA (2008)	The 95th percentile of the data must be within the A category boundaries
	Other	The 95th percentile of the data must be within the Target Water Quality Range (TWQR) as stated in DWAF (1996)

[(a)] To be generated using TEACHA when the TPC for EC is exceeded or salt pollution expected.

[(b)] No data were available for this assessment. All EcoSpecs and TPCs need verification as based on expert judgement.

EWR 1 (Appel) reach, Letaba River: Thresholds of Potential Concern (water quality)

River: Letaba		
Monitoring site: B8H014Q01		
EWR Site: 1		
Water quality metrics		**TPC**
Inorganic salts[(a)]	$MgSO_4$	The 95th percentile of the data must be between 13 - 16 mg/L
	Na_2SO_4	The 95th percentile of the data must be between 16 ï 20 mg/L
	$MgCl_2$	The 95th percentile of the data must be between 12 ï 15 mg/L
	$CaCl_2$	The 95th percentile of the data must be between 17 ï 21 mg/L
	NaCl	The 95th percentile of the data must be between 36 ï 45 mg/L
	$CaSO_4$	The 95th percentile of the data must be between 281 ï 351 mg/L
Physical variables	EC	The 95th percentile of the data must be between 24 ï 30 mS/m
	pH	5th percentile of the data must not be less than 6.7 95th percentile of the data must not be greater than 7.6
	Temperature	Small deviation from the natural temperature range. Initiate baseline monitoring.
	Dissolved oxygen	5th percentile of the data must be 6.4 ï 8.0 mg/L. Initiate baseline monitoring for this variable.
	Turbidity	Small deviation from the natural conditions. Initiate baseline monitoring.
Nutrients	TIN	The 50th percentile of the data must be between 0.2 ï 0.25 mg/L
	PO_4-P	The 50th percentile of the data must be between 0.012 ï 0.015 mg/L
Response variables	Chl-*a* phytoplankton	The 50th percentile of the data must be between 12 ï 15 ɛg/L
	Chl-*a* periphyton	The 50th percentile of the data must be between 17 ï 21 mg/m^2
Toxics	Toxics listed in DWA (2008)	The 95th percentile of the data must be within the A category boundaries
	Other	An impact is expected if the 95th percentile of the data exceeds the Chronic Effects Value (CEV) as stated in DWAF (1996)

[(a)] To be generated using TEACHA when the TPC for EC is exceeded or salt pollution expected

IUA 2: LETSITELE AND THABINA

- **Thabina (B81D-00277)**

Key user: Agriculture

Water quality issue: Elevated nutrient levels, primarily due to Lenyenye WWTW.

Water quality narrative RQOs	Water quality numerical RQOs
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than or equal to 0.025 mg/L PO_4-P (Agriculture - irrigation: driver)
Meet faecal coliform targets for recreational (full contact) use	Meet the TWQR of 0-130 counts per 100 ml (DWAF, 1996a)
Ensure water quality state maintains biotic requirements as specified by RQOs for biota.	See specified biota requirements

- **EWR 2, Letsitele (B81D-00271)**

Key user: Citrus plantations and irrigation

Water quality issue: Main water quality issues are elevated nutrients, salts and potential toxics.

Water quality narrative RQOs	Water quality numerical RQOs
Ensure that nutrient levels are within Tolerable limits.	50th percentile of the data must be less than or equal to 0.025 mg/L PO_4-P (Agriculture - irrigation: driver)
Ensure that electrical conductivity (salt) levels are within Ideal limits.	75th percentile of the data must be less than or equal to 30 mS/m (Aquatic ecosystems: driver)
Meet faecal coliform targets for recreational (full contact) use	Meet the TWQR of 0-130 counts per 100 ml (DWAF, 1996a)
Ensure that toxics are within Ideal limits or A categories.	75th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996b)

Water quality narrative RQOs	Water quality numerical RQOs
	and DWAF (2008).
Ensure water quality state maintains biotic requirements as specified by RQOs for biota.	See specified biota requirements

- **Letsitele (B81D-00272)**

Key user: Citrus plantations and irrigation

Water quality issue: Main water quality issues are elevated nutrients, salts and potential toxics.

Water quality narrative RQOs	Water quality numerical RQOs
Ensure that nutrient levels are within Tolerable limits.	50th percentile of the data must be less than or equal to 0.025 mg/L PO_4-P (Agriculture - irrigation: driver)
Ensure that electrical conductivity (salt) levels are within Ideal limits.	75th percentile of the data must be less than or equal to 30 mS/m (Aquatic ecosystems: driver)
Ensure that toxics are within Ideal limits or A categories.	75th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
Ensure water quality state maintains biotic requirements as specified by RQOs for biota.	See specified biota requirements

As land-use and impacts change along the Letsitele RU, it was divided into two Water Quality Sub-Units (WQSUs). However, only one suitable DWA water quality monitoring point exists, i.e. B8H010Q01near Letsitele Tank at EWR 2. **WQSUs 8 and 9 were therefore combined for the PES evaluation. EcoSpec and TPC tables are therefore valid for B81D-00271 (containing EWR2) and B81D-00272, i.e the length of the Letsitele River.**

Letsitele River: EcoSpecs (water quality)

River: Letsitele		
Monitoring site: B8H010Q01		
EWR Site: 2		
Water quality metrics		**Ecospecs**
Inorganic salts[(a)]	$MgSO_4$	The 95th percentile of the data must be Ò16 mg/L
	Na_2SO_4	The 95th percentile of the data must be Ò20 mg/L
	$MgCl_2$	The 95th percentile of the data must be Ò15 mg/L
	$CaCl_2$	The 95th percentile of the data must be Ò21 mg/L
	NaCl	The 95th percentile of the data must be Ò45 mg/L
	$CaSO_4$	The 95th percentile of the data must be Ò351 mg/L
Physical variables	EC	The 95th percentile of the data must be Ò30 mS/m
	pH	The 5th and 95th percentiles of the data must be between 6.5 to 8.0
	Temperature	Moderate and infrequent deviation from the natural temperature range. Vary by no more than 2°C.
	Dissolved oxygen[(b)]	The 5th percentile of the data must be Ó7 mg/L
	Turbidity[(b)]	Moderate changes with temporary high sediment loads and turbidity during runoff events.
Nutrients	TIN	The 50th percentile of the data must be Ò0.7 mg/L
	PO_4-P	The 50th percentile of the data must be Ò0.025 mg/L
Response variables	Chl-*a* phytoplankton [(b)]	The 50th percentile of the data must be Ò20 mg/m^2
	Chl-*a* periphyton	The 50th percentile of the data must be Ò21 mg/m^2
Toxics	Toxics listed in DWA (2008)	The 95th percentile of the data must be within the A category boundaries
	Other	The 95th percentile of the data must be within the Target Water Quality Range (TWQR) as stated in DWAF (1996)

[(a)] To be generated using TEACHA when the TPC for EC is exceeded or salt pollution expected.

[(b)] No data were available for this assessment. All EcoSpecs and TPCs need verification as based on expert judgement.

Letsitele River: Thresholds of Potential Concern(water quality)

River: Letsitele		
Monitoring site: B8H010Q01		
EWR Site: 2		
Water quality metrics		**TPC**
Inorganic salts[(a)]	$MgSO_4$	The 95th percentile of the data must be between 13 - 16 mg/L
	Na_2SO_4	The 95th percentile of the data must be between 16 ï 20 mg/L
	$MgCl_2$	The 95th percentile of the data must be between 12 ï 15 mg/L
	$CaCl_2$	The 95th percentile of the data must be between 17 ï 21 mg/L
	NaCl	The 95th percentile of the data must be between 36 ï 45 mg/L
	$CaSO_4$	The 95th percentile of the data must be between 281 ï 351 mg/L
Physical variables	EC	The 95th percentile of the data must be between 24 ï 30 mS/m
	pH	5th percentile of the data must not be less than 6.7 95th percentile of the data must not be greater than 7.6
	Temperature	Unnatural deviation from the natural temperature range. Initiate baseline monitoring.
	Dissolved oxygen	5th percentile of the data must be 7.2 ï 7.0 mg/L. Initiate baseline monitoring for this variable.
	Turbidity	Small deviation from the natural conditions. Initiate baseline monitoring.
Nutrients	TIN	The 50th percentile of the data must be between 0.55 ï 0.7 mg/L
	PO_4-P	The 50th percentile of the data must be between 0.02 ï 0.025 mg/L
Response variables	Chl-*a* phytoplankton	The 50th percentile of the data must be between 16 ï 20 εg/L
	Chl-*a* periphyton	The 50th percentile of the data must be between 17 ï 21 mg/m^2
Toxics	Toxics listed in DWA (2008)	The 95th percentile of the data must be within the A category boundaries
	Other	An impact is expected if the 95th percentile of the data exceeds the Chronic Effects Value (CEV) as stated in DWAF (1996)

[(a)] To be generated using TEACHA when the TPC for EC is exceeded or salt pollution expected

IUA 3: LETABA DOWNSTREAM OF TZANEEN TO PROPOSED NWAMITWA DAM

- **Nwanedzi (B81E-00213)**

Key user: Agriculture

Water quality issue: Elevated nutrient levels.

Water quality narrative RQOs	Water quality numerical RQOs
Ensure that nutrient levels are within Tolerable limits.	50th percentile of the data must be less than or equal to 0.025 mg/L PO_4-P (Agriculture - irrigation: driver)
Ensure that electrical conductivity (salt) levels are within Ideal limits.	75th percentile of the data must be less than or equal to 30 mS/m (Aquatic ecosystems: driver)
Ensure that toxics are within Ideal limits or A categories.	75th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
Ensure water quality state maintains biotic requirements as specified by RQOs for biota.	See specified biota requirements

IUA 4: LETABA FROM PROPOSED NWAMITWA DAM TO KLEIN LETABA CONFLUENCE

- **EWR 3, Letaba (B81F-00200)**

Key user: Irrigation agriculture, particularly for citrus plantations (e.g. Nagude Farm Estate).

Water quality issue: The use of pesticides and herbicides, and expected elevated levels of periphyton, nitrogen and phosphates.

Water quality narrative RQOs	Water quality numerical RQOs
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than or equal to 0.015 mg/L PO_4-P (Aquatic ecosystems: driver)
Ensure that electrical conductivity (salt) levels are within Ideal limits.	75th percentile of the data must be less than or equal to 30 mS/m (Industry Cat 3: driver)
Ensure that pH stays within Ideal limits.	5th and 95th percentiles of pH data must be between 6.5 and 8.0 (Aquatic ecosystems: driver)
Ensure that toxics are within Ideal limits or A categories.	75th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996b) and DWAF (2008).
Ensure water quality state maintains biotic requirements as specified by RQOs for biota.	See specified biota requirements

EWR 3 (Prieska Weir) reach, Letaba River: EcoSpecs (water quality)

River: Groot Letaba		
Monitoring site: B8H009Q01		
EWR Site: 3		
Water quality metrics		**Ecospecs**
Inorganic salts[(a)]	$MgSO_4$	The 95th percentile of the data must be Ò23 mg/L
	Na_2SO_4	The 95th percentile of the data must be Ò20 mg/L
	$MgCl_2$	The 95th percentile of the data must be Ò15 mg/L
	$CaCl_2$	The 95th percentile of the data must be Ò21 mg/L
	NaCl	The 95th percentile of the data must be Ò191 mg/L
	$CaSO_4$	The 95th percentile of the data must be Ò351 mg/L
Physical variables	EC	The 95th percentile of the data must be Ò55 mS/m
	pH	The 5th and 95th percentiles of the data must be between 6.5 to 8.0
	Temperature	Moderate and infrequent deviation from the natural temperature range. Vary by no more than 2°C.
	Dissolved oxygen[(b)]	The 5th percentile of the data must be Ó7 mg/L
	Turbidity[(b)]	Moderate changes with temporary high sediment loads and turbidity during runoff events.
Nutrients	TIN	The 50th percentile of the data must be Ò0.7 mg/L
	PO_4-P	The 50th percentile of the data must be Ò0.015 mg/L
Response variables	Chl-*a* phytoplankton [(b)]	The 50th percentile of the data must be Ò20 mg/m^2
	Chl-*a* periphyton	The 50th percentile of the data must be Ò21 mg/m^2
Toxics	Toxics listed in DWA (2008)	The 95th percentile of the data must be within the A category boundaries
	Other	The 95th percentile of the data must be within the Target Water Quality Range (TWQR) as stated in DWAF (1996)

[(a)] To be generated using TEACHA when the TPC for EC is exceeded or salt pollution expected.

[(b)] No data were available for this assessment. All EcoSpecs and TPCs need verification as based on expert judgement.

EWR 3 (Prieska Weir) reach, Letaba River: Thresholds of Potential Concern (water quality)

River: Groot Letaba		
Monitoring site: B8H009Q01		
EWR Site: 3		
Water quality metrics		**TPC**
Inorganic salts[(a)]	$MgSO_4$	The 95th percentile of the data must be between 18 - 23 mg/L

	Na_2SO_4	The 95th percentile of the data must be between 16 ï 20 mg/L
	$MgCl_2$	The 95th percentile of the data must be between 12 ï 15 mg/L
	$CaCl_2$	The 95th percentile of the data must be between 17 ï 21 mg/L
	NaCl	The 95th percentile of the data must be between 153 ï 191 mg/L
	$CaSO_4$	The 95th percentile of the data must be between 281 ï 351 mg/L
Physical variables	EC	The 95th percentile of the data must be between 44 ï 55 mS/m
	pH	5th percentile of the data must not be less than 6.7 95th percentile of the data must not be greater than 7.6
	Temperature	Unnatural deviation from the natural temperature range. Initiate baseline monitoring.
	Dissolved oxygen	5th percentile of the data must be 7.2 ï 7.0 mg/L. Initiate baseline monitoring for this variable.
	Turbidity	Small deviation from the natural conditions. Initiate baseline monitoring.
Nutrients	TIN	The 50th percentile of the data must be between 0.55 ï 0.7 mg/L
	PO_4-P	The 50th percentile of the data must be between 0.012 ï 0.015 mg/L
Response variables	Chl-*a* phytoplankton	The 50th percentile of the data must be between 16 ï 20 εg/L
	Chl-*a* periphyton	The 50th percentile of the data must be between 17 ï 21 mg/m^2
Toxics	Toxics listed in DWA (2008)	The 95th percentile of the data must be within the A category boundaries
	Other	An impact is expected if the 95th percentile of the data exceeds the Chronic Effects Value (CEV) as stated in DWAF (1996)

[(a)] To be generated using TEACHA when the TPC for EC is exceeded or salt pollution expected

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- **EWR 4, Letaba (B81J-00219)**

Key user: Limited cultivated lands and subsistence agriculture and livestock.

Water quality issue: Issues are linked primarily to nutrient elevations and increased turbidities related to subsistence land use and settlements in the area.

Water quality narrative RQOs	Water quality numerical RQOs
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than or equal to 0.025 mg/L PO_4-P (Aquatic ecosystems: driver)
Ensure that electrical conductivity (salt) levels are within Ideal limits.	75th percentile of the data must be less than or equal to 30 mS/m (Industry Cat 3: driver)
Ensure that pH stays within Acceptable limits.	5th and 95th percentiles of pH data must be between 6.5 and 8.4 (Industry Cat 3: driver)
Ensure that turbidity or clarity levels stay within Acceptable limits.	A moderate change from present with temporary high sediment loads and turbidity during runoff events. (Aquatic ecosystems: driver)
Ensure that toxics are within Ideal limits or A categories.	75th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996b) and DWAF (2008).
Ensure water quality state maintains biotic requirements as specified by RQOs for biota.	See specified biota requirements

EWR 4 (Letaba Ranch) reach, Letaba River: EcoSpecs (water quality)

River: Groot Letaba	
Monitoring site: B8H008Q01	
EWR Site: 4	
Water quality metrics	**Ecospecs**

Inorganic salts[a]	$MgSO_4$	The 95th percentile of the data must be Ò16 mg/L
	Na_2SO_4	The 95th percentile of the data must be Ò20 mg/L
	$MgCl_2$	The 95th percentile of the data must be Ò15 mg/L
	$CaCl_2$	The 95th percentile of the data must be Ò21 mg/L
	NaCl	The 95th percentile of the data must be Ò191 mg/L
	$CaSO_4$	The 95th percentile of the data must be Ò351 mg/L
Physical variables	EC	The 95th percentile of the data must be Ò55 mS/m
	pH	The 5th percentile of the data must be between 5.9 to 6.5, and the 95th percentile between 8.0 to 8.8
	Temperature	Moderate and infrequent deviation from the natural temperature range. Vary by no more than 2°C.
	Dissolved oxygen[b]	The 5th percentile of the data must be Ó7 mg/L
	Turbidity[b]	Moderate changes with temporary high sediment loads and turbidity during runoff events.
Nutrients	TIN	The 50th percentile of the data must be Ò0.25 mg/L
	PO_4-P	The 50th percentile of the data must be Ò0.025 mg/L
Response variables	Chl-*a* phytoplankton [b]	The 50th percentile of the data must be Ò15 mg/m^2
	Chl-*a* periphyton	The 50th percentile of the data must be Ò12 mg/m^2
Toxics	Toxics listed in DWA (2008)	The 95th percentile of the data must be within the A category boundaries
	Other	The 95th percentile of the data must be within the Target Water Quality Range (TWQR) as stated in DWAF (1996)

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

[b] No data were available for this assessment. All EcoSpecs and TPCs need verification as based on expert judgement.

EWR 4 (Letaba Ranch) reach, Letaba River: Thresholds of Potential Concern (water quality)

River: Groot Letaba		
Monitoring site: B8H008Q01		
EWR Site: 4		
Water quality metrics		**TPC**
Inorganic salts[a]	$MgSO_4$	The 95th percentile of the data must be between 13 - 16 mg/L
	Na_2SO_4	The 95th percentile of the data must be between 16 ï 20 mg/L
	$MgCl_2$	The 95th percentile of the data must be between 12 ï 15 mg/L
	$CaCl_2$	The 95th percentile of the data must be between 17 ï 21 mg/L
	NaCl	The 95th percentile of the data must be between 153 ï 191 mg/L
	$CaSO_4$	The 95th percentile of the data must be between 281 ï 351 mg/L
Physical variables	EC	The 95th percentile of the data must be between 44 ï 55 mS/m
	pH	5th percentile of the data must not be less than 6.1. 95th percentile of the data must not be greater than 8.6.
	Temperature	Unnatural deviation from the natural temperature range. Initiate baseline monitoring.
	Dissolved oxygen	5th percentile of the data must be 7.2 ï 7.0 mg/L. Initiate baseline monitoring for this variable.
	Turbidity	Small deviation from the natural conditions. Initiate baseline monitoring.
Nutrients	TIN	The 50th percentile of the data must be between 0.2 ï 0.25 mg/L
	PO_4-P	The 50th percentile of the data must be between 0.02 ï 0.025 mg/L
Response variables	Chl-*a* phytoplankton	The 50th percentile of the data must be between 12 ï 15 εg/L
	Chl-*a* periphyton	The 50th percentile of the data must be between 10 ï 12 mg/m^2
Toxics	Toxics listed in DWA (2008)	The 95th percentile of the data must be within the A category boundaries
	Other	An impact is expected if the 95th percentile of the data exceeds the Chronic Effects Value (CEV) as stated in DWAF (1996)

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

IUA 6: NORTHERN TRIBUTARIES TO LETABA

- **Molototsi (B81G-00164)**

Key user: Settlements

Water quality issue: Elevated nutrient levels primarily due to Ga-Kgapene WWTW.

Water quality narrative RQOs	Water quality numerical RQOs
Ensure that nutrient levels are within Tolerable limits.	50th percentile of the data must be less than or equal to 0.025 mg/L PO_4-P (Aquatic ecosystem: driver)
Meet faecal coliform targets for recreational (full contact) use	Meet the TWQR of 0-130 counts per 100 ml (DWAF, 1996a)
Ensure that toxics are within Ideal limits or A categories.	75th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996b) and DWAF (2008).
Ensure water quality state maintains biotic requirements as specified by RQOs for biota.	See specified biota requirements

IUA 7: UPPER MIDDLE LETABA AND TRIBUTARIES UPSTREAM OF MIDDLE LETABA DAM

- **Koedoes (B82B-00173)**

Key user: Agricultural activities, including commercial tomato producers ZZ2 at Mooketsi.

Water quality issue: Elevated nutrient levels and potential toxics from fertilizer use.

Water quality narrative RQO	Water quality numerical RQO
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than or equal to 0.015 mg/L PO_4-P (Aquatic ecosystems / Agriculture - Irrigation: drivers)
Ensure that toxics are within Ideal limits or A categories.	75th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996b) and DWAF (2008).
Ensure water quality state maintains biotic requirements as specified by RQOs for biota.	See specified biota requirements

- **Mosukodutsi (B82D-00166)**

Key user: Agricultural activities

Water quality issue: Elevated nutrient levels

Water quality narrative RQO	Water quality numerical RQO
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than or equal to 0.015 mg/L PO_4-P (Aquatic ecosystems / Agriculture - Irrigation: drivers)
Ensure that toxics are within Ideal limits or A categories.	75th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996b) and DWAF (2008).
Ensure water quality state maintains biotic requirements as specified by RQOs for biota.	See specified biota requirements

- **Brandboontjies (B82C-00175)**

Key user: Agricultural activities

Water quality issue: Elevated nutrient levels are primarily due to the Modjadjiskoof-Duiwelskloof WWTW.

Water quality narrative RQO	Water quality numerical RQO
Ensure that nutrient levels are within Tolerable limits.	50th percentile of the data must be less than or equal to 0.125 mg/L PO_4-P (Aquatic ecosystems / Agriculture - Irrigation: drivers).

Water quality narrative RQO	Water quality numerical RQO
	50th percentile of the data must be less than or equal to 1.0 mg/L TIN-N (Aquatic ecosystems: driver).
Ensure that electrical conductivity (salt) levels are within Acceptable limits.	75th percentile of the data must be less than or equal to 55 mS/m (Aquatic ecosystems: driver)
Meet faecal coliform targets for recreational (full contact) use	Meet the TWQR of 0-130 counts per 100 ml (DWAF, 1996a)
Ensure that toxics are within Ideal limits or A categories.	
Ensure water quality state maintains biotic requirements as specified by RQOs for biota.	See specified biota requirements

- **Middel Letaba (B82D-00146)**

Key user: Agricultural activities

Water quality issue: Elevated nutrient levels due to agricultural activities.

Water quality narrative RQO	Water quality numerical RQO
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than or equal to 0.015 mg/L PO_4-P (Aquatic ecosystems / Agriculture - Irrigation: drivers)
Ensure that toxics are within Ideal limits or A categories.	75th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996b) and DWAF (2008).
Ensure water quality state maintains biotic requirements as specified by RQOs for biota.	See specified biota requirements

IUA 8 AND PART OF IUA 9: KLEIN LETABA

No water quality data are available for this area. Historical flow data are only available from B8H015, i.e. Klein Letaba at Rossbach (1970 ï 1972). Due to similarities in land-use, this WQSU (WQSU 12, i.e. SQs B82F-00128 and B82F-00137) will be combined with WQSU 13 (i.e. part of B82G-00135), i.e. **up to Giyani**. **As WQSUs 12 and 13 were combined for the PES evaluation, EcoSpec and TPC tables are therefore valid for B82F-00128, B82F-00137 and B82G-00135 up to Giyani.**

Key user: Informal settlements and subsistence irrigation

Water quality issue: Elevated nutrients and turbidities

Water quality narrative RQOs	Water quality numerical RQOs
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than or equal to 0.015 mg/L PO_4-P (Aquatic ecosystems: driver)
Meet faecal coliform targets for recreational (full contact) use	Meet the TWQR of 0-130 counts per 100 ml (DWAF, 1996a)
Ensure that turbidity or clarity levels stay within Acceptable limits.	A moderate change from present with temporary high sediment loads and turbidity during runoff events. (Aquatic ecosystems: driver)
Ensure that toxics are within Ideal limits or A categories.	75th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
Ensure water quality state maintains biotic requirements as specified by RQOs for biota.	See specified biota requirements

B82F-00128, B82F-00137 and EWR up to Giyani, Klein Letaba River: EcoSpecs (water quality)

River: Klein Letaba
Monitoring site: B8H033Q01
EWR Site: 5

Water quality metrics		**Ecospecs**
Inorganic salts[(a)]	$MgSO_4$	The 95th percentile of the data must be Ò23 mg/L
	Na_2SO_4	The 95th percentile of the data must be Ò20 mg/L
	$MgCl_2$	The 95th percentile of the data must be Ò15 mg/L
	$CaCl_2$	The 95th percentile of the data must be Ò21 mg/L
	NaCl	The 95th percentile of the data must be Ò191 mg/L
	$CaSO_4$	The 95th percentile of the data must be Ò351 mg/L
Physical variables	EC	The 95th percentile of the data must be Ò55 mS/m
	pH	The 5th percentile of the data must be between 5.9 to 6.5, and the 95th percentile between 8.0 to 8.8
	Temperature	Moderate and infrequent deviation from the natural temperature range. Vary by no more than 2°C.
	Dissolved oxygen[(b)]	The 5th percentile of the data must be Ó7 mg/L
	Turbidity[(b)]	Moderate changes with temporary high sediment loads and turbidity during runoff events.
Nutrients	TIN	The 50th percentile of the data must be Ò0.25 mg/L
	PO_4-P	The 50th percentile of the data must be Ò0.075 mg/L
Response variables	Chl-*a* phytoplankton [(b)]	The 50th percentile of the data must be Ò20 mg/m^2
	Chl-*a* periphyton	The 50th percentile of the data must be Ò52.5 mg/m^2
Toxics	Toxics listed in DWA (2008)	The 95th percentile of the data must be within the A category boundaries
	Other	The 95th percentile of the data must be within the Target Water Quality Range (TWQR) as stated in DWAF (1996)

[(a)] To be generated using TEACHA when the TPC for EC is exceeded or salt pollution expected.

[(b)] No data were available for this assessment. All EcoSpecs and TPCs need verification as based on expert judgement.

B82F-00128, B82F-00137 and EWR 5 up to Giyani, Klein Letaba River: Thresholds of Potential Concern (water quality)

River: Klein Letaba		
Monitoring site: B8H033Q01		
EWR Site: 5		
Water quality metrics		**TPC**
Inorganic salts[(a)]	$MgSO_4$	The 95th percentile of the data must be between 18.5 - 23 mg/L
	Na_2SO_4	The 95th percentile of the data must be between 16 ï 20 mg/L
	$MgCl_2$	The 95th percentile of the data must be between 12 ï 15 mg/L
	$CaCl_2$	The 95th percentile of the data must be between 17 ï 21 mg/L
	NaCl	The 95th percentile of the data must be between 153 ï 191 mg/L
	$CaSO_4$	The 95th percentile of the data must be between 281 ï 351 mg/L
Physical variables	EC	The 95th percentile of the data must be between 44 ï 55 mS/m
	pH	5th percentile of the data must not be less than 6.1. 95th percentile of the data must not be greater than 8.6.
	Temperature	Unnatural deviation from the natural temperature range. Initiate baseline monitoring.
	Dissolved oxygen	5th percentile of the data must be 7.2 ï 7.0 mg/L. Initiate baseline monitoring for this variable.
	Turbidity	Small deviation from the natural conditions. Initiate baseline monitoring.
Nutrients	TIN	The 50th percentile of the data must be between 0.2 ï 0.25 mg/L
	PO_4-P	The 50th percentile of the data must be between 0.06 ï 0.075 mg/L
Response variables	Chl-*a* phytoplankton	The 50th percentile of the data must be between 16 ï 20 ɛg/L
	Chl-*a* periphyton	The 50th percentile of the data must be between 42 ï 52.5 mg/m^2
Toxics	Toxics listed in DWA (2008)	The 95th percentile of the data must be within the A category boundaries
	Other	An impact is expected if the 95th percentile of the data exceeds the Chronic Effects Value (CEV) as stated in DWAF (1996)

[(a)] To be generated using TEACHA when the TPC for EC is exceeded or salt pollution expected

PART OF IUA 9: KLEIN LETABA DOWNSTREAM FROM GIYANI TO CONFLUENCE

Key user: The main land-use is dense urban settlements (e.g. Giyani) and informal settlements (i.e. limited subsistence and cultivated agriculture, with livestock).
Water quality issue: Elevated nutrients; urban effluents; increased turbidities

Water quality narrative RQO	Water quality numerical RQO
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than or equal to 0.025 mg/L PO_4-P (Aquatic ecosystems: driver).
Ensure that electrical conductivity (salt) levels are within Acceptable limits.	75th percentile of the data must be less than or equal to 55 mS/m (Aquatic ecosystems: driver)
Ensure that turbidity or clarity levels stay within Acceptable limits.	A moderate change from present with temporary high sediment loads and turbidity during runoff events. (Aquatic ecosystems: driver)
Meet faecal coliform targets for recreational (full contact) use	Meet the TWQR of 0-130 counts per 100 ml (DWAF, 1996a)
Ensure that toxics are within Ideal limits or A categories.	75th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
Ensure water quality state maintains biotic requirements as specified by RQOs for biota.	See specified biota requirements

Klein Letaba River downstream Giyani to confluence: EcoSpecs (water quality)

River: Klein Letaba d/s Giyani		
Monitoring site: B8H033Q01		
EWR Site: -		
Water quality metrics		**Ecospecs**
Inorganic salts[(a)]	$MgSO_4$	The 95th percentile of the data must be Ò23 mg/L
	Na_2SO_4	The 95th percentile of the data must be Ò20 mg/L
	$MgCl_2$	The 95th percentile of the data must be Ò15 mg/L
	$CaCl_2$	The 95th percentile of the data must be Ò21 mg/L
	NaCl	The 95th percentile of the data must be Ò191 mg/L
	$CaSO_4$	The 95th percentile of the data must be Ò351 mg/L
Physical variables	EC	The 95th percentile of the data must be Ò55 mS/m
	pH	The 5th percentile of the data must be between 5.9 to 6.5, and the 95th percentile between 8.8 to 9.2
	Temperature	Moderate and infrequent deviation from the natural temperature range. Vary by no more than 2°C.
	Dissolved oxygen[(b)]	The 5th percentile of the data must be Ó7 mg/L
	Turbidity[(b)]	Moderate changes with temporary high sediment loads and turbidity during runoff events.
Nutrients	TIN	The 50th percentile of the data must be Ò0.7 mg/L
	PO_4-P[(c)]	The 50th percentile of the data must be Ò0.125 mg/L
Response variables	Chl-*a* phytoplankton [(b)]	The 50th percentile of the data must be Ò20 mg/m^2
	Chl-*a* periphyton	The 50th percentile of the data must be Ò84 mg/m^2
Toxics	Toxics listed in DWA (2008)	The 95th percentile of the data must be within the A category boundaries
	Other	The 95th percentile of the data must be within the Target Water Quality Range (TWQR) as stated in DWAF (1996)

[(a)] To be generated using TEACHA when the TPC for EC is exceeded or salt pollution expected.

[(b)] No data were available for this assessment. All EcoSpecs and TPCs need verification as based on expert judgement.

Klein Letaba River downstream Giyani to confluence: Thresholds of Potential Concern (water quality)

River: Klein Letaba d/s Giyani		
Monitoring site: B8H033Q01		
EWR Site: -		
Water quality metrics		**TPC**
Inorganic salts[(a)]	$MgSO_4$	The 95th percentile of the data must be between 18.5 - 23 mg/L
	Na_2SO_4	The 95th percentile of the data must be between 16 ï 20 mg/L
	$MgCl_2$	The 95th percentile of the data must be between 12 ï 15 mg/L
	$CaCl_2$	The 95th percentile of the data must be between 17 ï 21 mg/L
	NaCl	The 95th percentile of the data must be between 153 ï 191 mg/L
	$CaSO_4$	The 95th percentile of the data must be between 281 ï 351 mg/L
Physical variables	EC	The 95th percentile of the data must be between 44 ï 55 mS/m
	pH	5th percentile of the data must not be less than 6.1. 95th percentile of the data must not be greater than 9.0.
	Temperature	Unnatural deviation from the natural temperature range. Initiate baseline monitoring.
	Dissolved oxygen	5th percentile of the data must be 7.2 ï 7.0 mg/L. Initiate baseline monitoring for this variable.
	Turbidity	Small deviation from the natural conditions. Initiate baseline monitoring.
Nutrients	TIN[(b)]	The 50th percentile of the data must be between 0.55 ï 0.7 mg/L
	PO_4-P[(b)]	The 50th percentile of the data must be between 0.1 ï 0.125 mg/L
Response variables	Chl-*a* phytoplankton	The 50th percentile of the data must be between 16 ï 20 ɛg/L
	Chl-*a* periphyton	The 50th percentile of the data must be between 67 ï 84 mg/m^2
Toxics	Toxics listed in DWA (2008)	The 95th percentile of the data must be within the A category boundaries
	Other	An impact is expected if the 95th percentile of the data exceeds the Chronic Effects Value (CEV) as stated in DWAF (1996)

[(a)] To be generated using TEACHA when the TPC for EC is exceeded or salt pollution expected

[(b)] TPC is exceeded in parts of the catchment.

IUA 11: LETABA MAIN STEM IN THE KNP

- **EWR 7, Letaba River (B83D-00255)**

Key user: Land-use is protected land or conservation area, i.e. the Kruger National Park.
Water quality issue: Nutrient and salt elevations and parameters such as increased turbidity linked to land use (i.e. irrigation and settlements) outside of the KNP.

Water quality narrative RQO	Water quality numerical RQO
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than or equal to 0.025 mg/L PO_4-P (Aquatic ecosystems: driver).
Ensure that electrical conductivity (salt) levels are within Acceptable limits.	75th percentile of the data must be less than or equal to 55 mS/m (Aquatic ecosystems: driver)
Ensure that turbidity or clarity levels stay within Ideal limits.	A small change from natural state (Aquatic ecosystems: driver)
Ensure that toxics are within Ideal limits or A categories.	75th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
Ensure water quality state maintains biotic requirements as specified by RQOs for biota.	See specified biota requirements

EWR 7 reach, Letaba River: EcoSpecs (water quality)

River: Letaba		
Monitoring site: B8H028Q01		
EWR Site: 7		
Water quality metrics		**Ecospecs**
Inorganic salts[(a)]	$MgSO_4$	The 95th percentile of the data must be Ò23 mg/L
	Na_2SO_4	The 95th percentile of the data must be Ò20 mg/L
	$MgCl_2$	The 95th percentile of the data must be Ò30 mg/L
	$CaCl_2$	The 95th percentile of the data must be Ò57 mg/L
	NaCl	The 95th percentile of the data must be Ò191 mg/L
	$CaSO_4$	The 95th percentile of the data must be Ò351 mg/L
Physical variables	EC	The 95th percentile of the data must be Ò55 mS/m
	pH	The 5th percentile of the data must be between 6.5 to 8.0, and the 95th percentile between 8.0 to 8.8
	Temperature	Moderate and infrequent deviation from the natural temperature range. Vary by no more than 2°C.
	Dissolved oxygen[(b)]	The 5th percentile of the data must be Ó7 mg/L
	Turbidity[(b)]	Small deviation from natural conditions.
Nutrients	TIN	The 50th percentile of the data must be Ò0.25 mg/L
	PO_4-P	The 50th percentile of the data must be Ò0.025 mg/L
Response variables	Chl-*a* phytoplankton[(b)]	The 50th percentile of the data must be Ò15 mg/m^2
	Chl-*a* periphyton	The 50th percentile of the data must be Ò21 mg/m^2
Toxics	Toxics listed in DWA (2008)	The 95th percentile of the data must be within the A category boundaries
	Other	The 95th percentile of the data must be within the Target Water Quality Range (TWQR) as stated in DWAF (1996)

[(a)] To be generated using TEACHA when the TPC for EC is exceeded or salt pollution expected.

[(b)] No data were available for this assessment. All EcoSpecs and TPCs need verification as based on expert judgement.

EWR 7 reach, Letaba River: Thresholds of Potential Concern (water quality)

River: Letaba		
Monitoring site: B8H028Q01		
EWR Site: 7		
Water quality metrics		**TPC**
Inorganic salts[(a)]	$MgSO_4$	The 95th percentile of the data must be between 18.5 - 23 mg/L
	Na_2SO_4	The 95th percentile of the data must be between 16 ï 20 mg/L
	$MgCl_2$	The 95th percentile of the data must be between 24 ï 30 mg/L
	$CaCl_2$	The 95th percentile of the data must be between 46 ï 57 mg/L
	NaCl	The 95th percentile of the data must be between 153 ï 191 mg/L
	$CaSO_4$	The 95th percentile of the data must be between 281 ï 351 mg/L
Physical variables	EC	The 95th percentile of the data must be between 44 ï 55 mS/m
	pH	5th percentile of the data must not be less than 6.7. 95th percentile of the data must not be greater than 8.6.
	Temperature	Unnatural deviation from the natural temperature range. Initiate baseline monitoring.
	Dissolved oxygen	5th percentile of the data must be 7.2 ï 7.0 mg/L. Initiate baseline monitoring for this variable.
	Turbidity	Small deviation from the natural conditions. Initiate baseline monitoring.
Nutrients	TIN	The 50th percentile of the data must be between 0.2 ï 0.25 mg/L
	PO_4-P	The 50th percentile of the data must be between 0.02 ï 0.025 mg/L
Response variables	Chl-*a* phytoplankton	The 50th percentile of the data must be between 12 ï 15 εg/L
	Chl-*a* periphyton	The 50th percentile of the data must be between 17 ï 21 mg/m^2
Toxics	Toxics listed in DWA (2008)	The 95th percentile of the data must be within the A category boundaries
	Other	An impact is expected if the 95th percentile of the data exceeds the Chronic Effects Value (CEV) as stated in DWAF (1996)

[(a)] To be generated using TEACHA when the TPC for EC is exceeded or salt pollution expected