CLASSIFICATION OF SIGNIFICANT WATER RESOURCES AND DETERMINATION OF RESOURCE QUALITY OBJECTIVES FOR WATER RESOURCES IN THE USUTU TO MHLATHUZE CATCHMENTS (WP11387)

ESTUARY RESOURCE QUALITY OBJECTIVES

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Date: PSC meeting 5, Richards Bay, 19 September 2023

WATER IS LIFE - SANITATION IS DIGNITY

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

1

aMatigulu/iNyoni Estuary

PES:	B/C ↓	REC:	B	TEC:	B

Components that require interventions to halting downwards trajectory and achieving TEC:

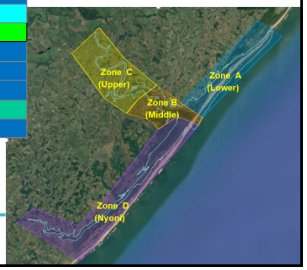
The following non-flow interventions will result in restoration of estuarine floodplain and reduce agriculture impacts in the supratidal area of the system.

- **Curb illegal fishing activities** (i.e. gill netting) to improve nursery function and prawn abundance (by catch).
- **Curb recreational activities in the lower reaches through zonation** and improved compliance (i.e. development of Estuary Management Plan).
- **Control/manage harvesting of *Juncus* and *Phragmites*** (currently managed through a plan)
- **Improve protection levels through Contracted Conservation on the North Bank**. (Part of DFFE 30 x 30 Estuary Protection Priorities which include expanding uThukela MPA).
- **Promote tourism (e.g. bird guides)** to reduce impacts and provide benefits to community.
- **Create interventions within catchment (agricultural best practise & farm Plans)** and institute a buffer zone along river to improve the nutrient status and help with sedimentation issues.
- **Remove invasive alien plants** to improve baseflows to the estuary.

2

aMatigulu/Inyoni Estuary

Component/ indicator	Target EC
Hydrology	C
Hydrodynamics	B
Physical habitat (sediments)	B
Water quality (salinity)	A
Water quality (general)	C
Microalgae	B
Macrophytes	B
Invertebrates	B
Fish	B/C
Birds	B



3

uMlalazi Estuary

PES:	B/C ↓	REC:	B	TEC:	B

Components that require interventions to halt the negative trajectory and achieve TEC:

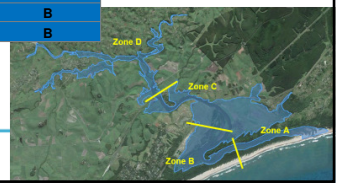
The following non-flow interventions will result in the restoration of the estuarine floodplain and reduce agriculture impacts in the supratidal area of the system.

- **Deteriorating water quality represents a significant threat** to the ecological functioning of the system, the risk is especially high during the closed state. **No wastewater should be discharged into the system** and agricultural best practices (farm plans) should be implemented **to reduce nutrient-rich agriculture return flow. Address diffuse runoff from housing not on reticulation (incorporate into Provincial Growth and Development Strategy).**
- **Create interventions within a 500 m buffer zone** to improve the nutrient status and reduce sediment inputs.
- **Curb illegal fishing (gill netting of targeted species, seine & cast netting) impacting nursery function** and prawns.
- **Undertake restoration of the uMlalazi EFZ** and **reduce agriculture impacts** in the supratidal area of the system. Rewild banks and restore gentle slopes where possible along the banks of estuary (investigate the option to remove hard structures of aquaculture facilities).
- **Manage/control the harvesting of Juncus and Phragmites** (plan in place)
- **Curb recreational activities** in lower reaches through zonation & compliance (i.e. Estuary Management Plan).
- **Realign the protected area delineation with the EFZ** to increase protection levels, including options for Stewardship/Contracted Conservation being undertaken on the North Bank. DFFE 30 x 30 Priority –
- **Manage disturbance to birds** (e.g. closed areas, boating controls such as speed zones, control of vehicle access at the mouth) and promoting tourism (bird guides etc.) to reduce impacts & ensure benefits to the community.
- **Remove/prevent sand-mining in the upper reaches.**
- **Maintain hydrological connectivity by ensuring that roads and bridges do** not impact tidal and river flows.
- **Remove invasive aliens in the catchment** to safeguard base flows to prevent mouth closure for periods longer than six to eight weeks and also prevent the water levels from going beyond 4m mean sea level.

4

uMlalazi Estuary

Component/ indicator	Target EC
Hydrology	C
Hydrodynamics	B/C
Physical habitat (sediments)	B
Water quality (salinity)	B
Water quality (general)	C
Microalgae	C
Macrophytes	B/C
Invertebrates	B
Fish	B
Birds	B



5

iSiyaya Estuary

PES:	D/E ↓	REC:	C	TEC:	D (Short term) C (Long-term

Restoration project needed to restore functionality and address the negative trajectory:

Short-term (<5 years): Mechanical interventions are needed to restore estuarine functionality:

- **Remove accumulated organic sludge** through dredging of bottom substrate to improve water quality;
- **Mechanical removal of reeds in lower reaches** to increase open water area;
- Revegetate the dune at the mouth; and
- Develop an **Estuary Mouth/Maintenance Management Plan**, that considers **mechanical removal of sediment that build-up at the mouth** to allow for overwash recruitment when closed for long periods. This may require **deepening the estuarine channel and /or bringing the open water area forward** by removing marine sand at the mouth. (Also consider the natural northwards migration of mouth and the risk this entails for the submarine communications cables). Will require EIA approval.

Long-term (5-10 years) Catchment-to-coast approach to:

- **Restore the upstream riparian zone and remove alien vegetation** to assist with restoring baseflows and act as turbidity and nutrient filters.
- Mitigate the impacts of **mining by ensuring a 1 km buffer zone of riparian vegetation** around the estuary where not buildup to reduce the turbidity signal and sediment input from mining. (Forestry in and around the EFZ has removed the natural buffer capacity riparian vegetation provides.
- Reduce the **direct impact of forestry on the estuary by instituting buffer zones** around the estuary (e.g. 1 km zone), while over longer time scales baseflows should be restored by an overall reduction in forested areas in the catchment.
- Pioneer **different footpaths** to the beach further north to reduce the disturbance of birds.
- **Increase fishing compliance** as fishing pressure will escalate if fish communities recover.

6

iSiyaya Estuary

Component/ indicator	Target EC
Hydrology	B/C
Hydrodynamics	D↑
Physical habitat (sediments)	B
Water quality (salinity)	B
Water quality (general)	D↑
Microalgae	C
Macrophytes	D→C
Invertebrates	D→C
Fish	D→C
Birds	D→C

7

uMhlathuze Estuary

PES:	D↓	REC:	D	TEC:	D

The following non-flow interventions will result in halting downwards trajectory and maintaining TEC:

Short term (<5 years): Key interventions needed to restore/protect this important nursery area (e.g. sharks, rays & economically important fish species):

- **Reduce very high fishing pressure** (poaching and illegal gillnetting) by increasing compliance.
- Increase connectivity between lakes and downstream waters by reinstalling/installing functional fishways.
- **Identify and protect areas in which the seagrass *Zostera capensis*** reestablishment is occurring, and reestablish/restore this important habitat near the near yacht terminal.
- **Improve access to uMhlatuze Estuary** to allow for increased compliance, monitoring and research.

Long term (5-10 years):

- **Develop bird tourism** (will also improve access) that could provide livelihoods for local communities (e.g. Zululand Birding Route.)
- **Halt/restore declining water quality by instituting formal reticulation** for urban development and implementing agricultural best practices (farm plans) to reduce nutrient enrichment to estuary, lakes and port (align with **Provincial Growth and Development Strategy).**

8

uMhlathuze Estuary

Component/ indicator	Target EC
Hydrology	C
Hydrodynamics	D/E
Physical habitat (sediments)	D
Water quality (salinity)	C/D
Water quality (general)	D
Microalgae	D
Macrophytes	D
Invertebrates	E→D
Fish	D
Birds	C

9

iNhlabane Estuary

PES:	E	REC:	D	TEC:	D

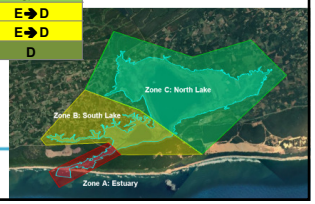
The following non-flow interventions will result in halting the negative trajectory and maintaining TEC:

- Develop an **Estuary Management Plan** (requirement of the ICM Act) to coordinate restoration efforts.
- Develop an **Estuary Mouth/Maintenance Management Plan** (EIA regulations) to facilitate artificial breaching of the high berm at the mouth with earth-moving equipment.
- **Remove accumulated organic sludge with earth-moving equipment/dredging** from the bottom strata to improve water quality (i.e. oxygen levels) in the system.
- **Prevent disturbance of riparian vegetation**, including trampling, cattle, fire, & removal of alien vegetation.
- **Ensure connectivity between the estuary and the lakes**. Fishways not functional. Increase connectivity between the estuary and lakes by flow releases from the weir & reengineering of fishway. Flow releases will also result in variable lake levels which will also benefit water birds in the lakes. Drawdown of lakes should not separate North and South Lakes.
- **Deteriorating water quality represents a significant threat**, especially high during the closed state. **No wastewater should be discharged** into the system & **agricultural best practices (e.g. reduce fertilizer farm plans)** implemented to reduce return flow. **Address diffuse runoff from housing not on formal reticulation systems** (e.g. artificial reed beds). **Proactive strategic planning of development & incorporate into Provincial Growth and Development Strategy** to reduce the impact of future developments. **Waste cannot run into estuaries and lakes.**
- **Increase freshwater runoff to estuary and lakes** through management/removal of wood lots guided by a groundwater study (ensure alternative livelihoods).

10

iNhlabane Estuary

Component/ indicator	Target EC
Hydrology	D
Hydrodynamics	C/D
Physical habitat (sediments)	E→D
Water quality (salinity)	E→D
Water quality (general)	D
Microalgae	D
Macrophytes	C/D
Invertebrates	E→D
Fish	E→D
Birds	D



11

uMgobezeleni Estuary

PES:	B↓	REC:	A	TEC:	A/B

In addition to capping the groundwater utilisation, especially during drought conditions, the following non-flow interventions will result in halting downwards trajectory and achieving TEC:

- Urgent action is needed to **create awareness of the importance of mangroves** and protect this threatened ecosystem types (e.g., road through mangroves).
- **Eradicate illegal gillnets in the lakes.**
- **Eradicate and monitor occurrence of alien invasive species**, e.g. spotted bass *Micropterus punctulatus*
- **Prevent land use clearing in the estuary functional zone.**
- **Prevent removal of bark from mangroves** and other trees.
- **Maintain hydrological connectivity** by ensuring that roads and bridges (in lower reaches near mouth) do not impact tidal and river flows.
- **Prevent undue disturbance of birds.**
- **Ensure protection of swamp forest that ensure water quality.**
- **Deteriorating water quality represents a significant threat**, especially high during the closed state. **No wastewater should be discharged** into the system & **agricultural best practices (e.g. reduce fertilizer farm plans)** implemented to reduce return flow. **Address diffuse runoff from housing not on formal reticulation systems** (e.g. artificial reed beds). **Proactive strategic planning of development & incorporate into Provincial Growth and Development Strategy** to reduce the impact of future developments. **Waste cannot run into estuaries and lakes.**
- **Create interventions within a 500 m buffer zone** to improve the nutrient status & reduce sediment inputs.
- **Increase protection of the lakes** (e.g. OECM) to ensure water quality and riparian buffers is maintained

12

uMgobezeleni Estuary

Component/ indicator	Target EC
Hydrology	B
Hydrodynamics	B
Physical habitat (sediments)	A/B
Water quality (salinity)	A/B
Water quality (general)	B
Microalgae	B
Macrophytes	B
Invertebrates	A/B
Fish	B
Birds	A

13

Kosi Estuary

PES:	A/B	REC:	A	TEC:	A

In addition to capping the groundwater utilisation, especially during drought conditions, the following non-flow interventions will result in halting downwards trajectory and achieving TEC:

- **Reducing plantations**, that decrease the winter freshwater input;
- **Maintaining the traditional subsistence fishery using traditional methods at sustainable levels** (traditional methods refer to the back-facing traps and exclude gear such as diving masks and spear guns augmented baskets (lined with nets) and gill nets);
- **Control and monitor crab harvesting** (presently uncontrolled and sold in Durban);
- **Control resource utilisation of reeds, sedges, and mangroves** through the introduction of rest areas;
- **Control the burning of the flood plain, swamp forest and mangroves, e.g. education programme;**
- **Prevent land-use change and control the clearing and draining of the peatlands for gardening**;
- **Control the usage of DDT, herbicides and pesticides in the catchment** (growing concern that the use of DDT and organic phosphates is having an impact because of their long resident time and vulnerability of the lake system); and

14

Kosi Estuary

Component/ indicator	Target EC
Hydrology	A
Hydrodynamics	A
Physical habitat (sediments)	A
Water quality (salinity)	A
Water quality (general)	A/B↑
Microalgae	A
Macrophytes	A/B
Invertebrates	B↑
Fish	B↑
Birds	A/B

15

St Lucia/uMfolozi Estuary

PES:	D↓↑	REC:	B	TEC:	C (Short term) B (Long-term

Restoration project needed to restore functionality and address the negative trajectory:

- Cap minimum discharge in the Mfolozi at 3 m^3/s to maintain an open mouth.
- Improve the water quality coming from the Mkuze catchment.

Non-Flow interventions include:

- **St Lucia/uMfolozi should have a single mouth and manipulation of the mouth (artificial breaching or closing) kept to a minimum**;
- **Restore low-lying areas of the iMfolozi floodplain** to natural vegetation to allow for natural processes (e.g. carbon sequestration, mouth closure) focusing on the low-lying areas that was exposed during drought and now cultivated).
- **Reduce sediment input from catchment** (improve agricultural practises & facilitating inundation of low-lying areas on floodplain exposed during drought and now cultivated).
- **Remove alien vegetation around the Lake**, estuaries and rivers;
- **Limit further natural deforestation such as in the Dukuduku Forest**;
- **Eradicate illegal gillnetting** from the system to improve nursery function (export fish to coastal fishery (recreational and artisanal);
- **Eradicate and monitor occurrence of alien invasive species** (plants, inverts and fish);
- Prevent urbanization in the catchments feeding directly into the Lake and the Narrows;
- **Reduce commercial forestation in the lake catchments** to increase low flows as much as possible;
- In the **uMfolozi River catchment, land care practices should focus** on the most critical sub-catchment areas to limit future erosion and land degradation which could further reduce low flows;
- **Illegal river abstractions on especially the Mkuze and uMfolozi Rivers must be eliminated.**

16

St Lucia/uMfolozi Estuary

Component/ indicator	Target EC
Hydrology	C
Hydrodynamics	C
Physical habitat (sediments)	C
Water quality (salinity)	D↑
Water quality (general)	D↑
Microalgae	D↑
Macrophytes	B
Invertebrates	D
Fish	C
Birds	C

17

RQOs for recreational use

CATEGORY	ESTIMATED RISK PER EXPOSURE	ENTEROCOCCI (Count per 100 ml)	E. coli (Count per 100 ml)
Excellent	2.9% gastrointestinal (GI) illness risk	≤ 100 (95 percentile)	≤ 250 (95 percentile)
Good	5% GI illness risk	≤ 200 (95percentile)	≤ 500 (95 percentile)
Sufficient or Fair (minimum requirement)	**8.5% GI illness risk**	**≤ 185 (90 percentile)**	**≤ 500 (90 percentile)**
Poor (unacceptable)	>8.5% GI illness risk	> 185 (90 percentile)	> 500 (90 percentile)

RQOs for recreational use in estuaries is specified as risk-based ranges for intestinal enterococci and E. coli (microbiological indicator organisms) (DEA, 2012)

18

Examples

Hydrology	C	Maintain Target EC (> 63%). Protect the flow regime to create the required habitat for birds, fish, macrophytes, microalgae and water quality: • River inflow distribution patterns differ by more than 5% from that of the Present State (i.e. approved flow scenario for the aMatigulu/iNyoni). • Monthly river inflow < 0.75 m^3/s for more than 17% of the time. • Monthly river inflow < 10.0 m^3/s for more than 65% of the time. River inflow distribution patterns (flood components) differ by more than 10% (in terms of magnitude, timing and variability) from that of the Present State (2015).
Hydrodynamics	B	Maintain Target EC (> 78%). Maintain mouth conditions to protect estuarine ecosystems and the associated habitat for birds, fish, macrophytes, microalgae and water quality: • Mouth closure occurs more than 6 - 8 weeks in a year. • Mouth closure occurs for more than 3 - 4 years out of ten. • Mouth closure occurs between September and March. • Changes in tidal amplitude at the tidal amplitude of < 20% from Present State (2015) (mouth in the northern position, if mouth moves south the average tidal amplitude is expected to increase by 30-50%.

19

Examples

Water quality (general)	C	Maintain the TEC category (> 63%). Water quality to be suitable for maintaining the TEC for dependent biotic components. Water quality of river inflow: • 7.5 < pH > 8.5 consistently over 2 months. • DO >6 mg/ℓ. • Turbidity <15NTU (low flow). • Turbidity high flows naturally turbid River inflow (flows < $5m^3/s$): • NO_3-N <200 µg/ℓ over 2 months • NH_3-N<30 µg/ℓ over 2 months • PO_4-P < 50 µg/ℓ over 2 months River inflow (flows > $5m^3/s$): • Average DIN <300 µg/ℓ • Average DIP <0 µg/ℓ Estuary in situ water quality: • Average turbidity >10 NTU (low flow). • Turbidity high flow, naturally turbid. • 6.0 < pH > 8.5 in a sampling survey (to be verified by sampling) • Average DO >6 mg/ℓ in a sampling survey. Estuary (river flows < $5m^3/s$): • Average NO_3-N < 200 µg/ℓ in a sampling survey • Average NH_3-N < 30 µg/ℓ in a sampling survey • Average PO_4-P < 50 µg/ℓ in a sampling survey Estuary (river flows > $5m^3/s$): • Average NO_3-N < 300 µg/ℓ in a sampling survey • Average NH_3-N < 20 µg/ℓ in a sampling survey • Average PO_4-P < 50 µg/ℓ in a sampling survey (Data could be reviewed depending on the results of the baseline study)

20

Examples

Macrophytes	B	Maintain the Target EC (> 78%) through: • Maintain the distribution of macrophyte habitats to present baseline, particularly the large Swamp Forest stands (> 300 ha) and presence of submerged macrophytes. (refer to DWS, 2023) • < 10 % change in the area covered by different macrophyte habitats, especially swamp forest and submerged macrophytes. • Invasive plants (e.g. syringa berry, Brazilian pepper tree, lantana, Chromolaena, Opuntia) largely absent from the riparian zone. • Unvegetated, cleared areas along the banks. • Floating invasive aquatics observed in the upper estuary reaches. Macroalgae cover < 20% of estuarine water surface area. • Sugarcane is present in the estuarine functional zone. Extensive land cover change in the iNyoni and aMatigulu catchments and EFZ.
Fish	a/c	Maintain the Target EC category (> 73%) through: • < 20% decline in abundance (to be defined as an average with prediction limits) of marine estuarine-opportunist species and estuarine-dependent species as juveniles. • All zones of the estuary should function as high value nursery habitat to a diversity of marine estuarine-dependent species with all of the following species occuring in the estuary in two consecutive years: *Leiognathus equula*, *Acanthopagrus vagus*, *Pomadasys commersonnii*, *Terapon jarbua*, *Rhabdosargus sarba*, *Rhabdosargus holubi*, *Caranx sp.*). • Permanent populations of estuarine resident species should occur throughout the system. *Ambassis ambassis* (or *Ambassis natalensis*) and *Glossogobius callidus* is present and abundant in the estuary (except during floods). • Mullet occur throughout the system (all zones). Following mullet species should occur in the system, *Pseudomyxus capensis*, *Mugil cephalus*, *Osteomugil cunnesius*, *Planiliza macrolepis*, *Chelon dumerili* at a full array of size classes. • Marine estuarine-opportunist species should occur throughout Zone A and into the lower reaches at least of Zones B and D. • The species assemblage should comprise indigenous species only. No non-indigenous fishes should occur. • A good trophic basis must exists for predatory (piscivorous) marine estuarine-dependant and opportunist species (e.g. *Agyrosomus japohicus*, *Caranx* spp.). • *Oreochromis mossambicus* should be the most abundantly occurring freshwater species and is limited to the Zone C and the upper reaches of Zones b and D in the low flow period. • *Croilia mossambica* occur in the estuary.

21