

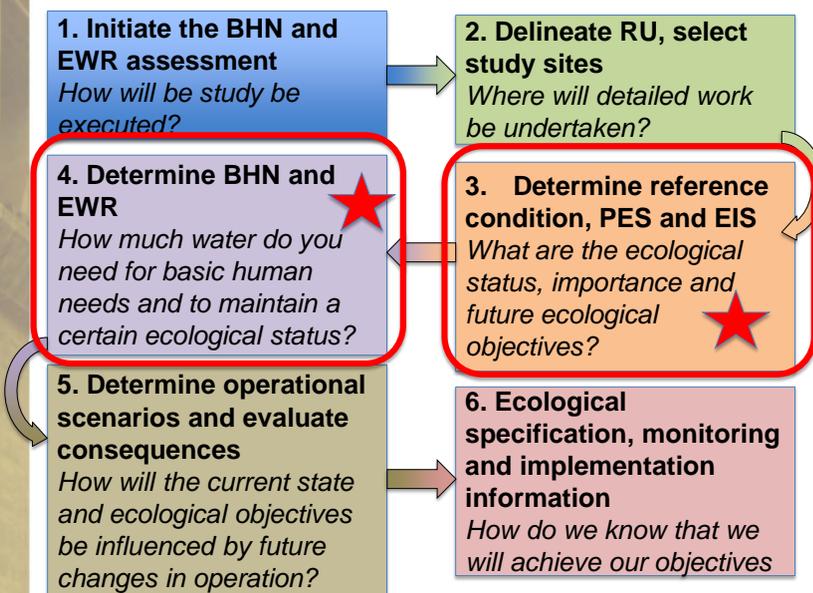
**Determination of Ecological Water Requirements for
 Surface Water (Rivers, Estuaries and Wetlands) and
 Groundwater in the Lower Orange WMA: WP10974**

16 November 2016

SMALL ESTUARIES OF THE LOWER ORANGE WMA

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EWR assessments: WHERE DOES IT FIT?



Study area

- Small estuaries – sensitive to change
- Open to sea on annual/decadal scales
- Surface water cause breaching
- Groundwater maintain salinity, water level, water quality, plants & animals
- Buffels & Spoeg brackish
- Swartlintjies, Groen & Sout hypersaline



The map shows the coastline of the study area with several estuaries highlighted in blue: Buffels, Swartlintjies, Spoeg, Groen, and Sout. Red arrows point from the land towards these estuaries, indicating the direction of water flow. The land is divided into numerous quaternary catchments, each labeled with a code (e.g., F1RC, F1RD, F1RE, etc.). Major towns are marked with black dots, and existing dams are marked with blue lightning bolt symbols. The Orange River is shown flowing into the sea from the north. A scale bar at the bottom indicates distances up to 100 km.

WATER IS LIFE - SANITATION IS DIGNITY

Buffels Estuary RU



This aerial photograph shows the Buffels Estuary and its surrounding area. A blue shaded region outlines the Resource Boundary of the Buffels Estuary. The estuary itself is filled with water, and the surrounding land is a mix of agricultural fields, roads, and residential areas. A legend in the top right corner identifies the blue shaded area as the 'Estuary Functional Zone'. A scale bar at the bottom right indicates a distance of 500 meters. The Google Earth logo is visible in the bottom left corner.

Buffels Estuary Pressures

- Loss of freshwater input from groundwater abstraction
- Mining activities
- Five roads cross the system
- Floodplain development e.g. golf course
- Run-off from the golf course encouraged reed growth
- Extensive stands of *Acacia cyclops* (rooikrans) occur in the water course of the upper reaches

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Buffels Present Ecological Status

Component Category	Buffels
Hydrology	D/E
Hydrodynamics	D
Water quality	D
Physical habitat alteration	D
Habitat health	D
Microalgae	D
Macrophytes	E
Invertebrates	D
Fish	E
Birds	D
Biotic health	D/E
PES	↓ D

Largely modified – Category D (negative trajectory)

Buffels Recommended Ecological Category

- Rare wetland along arid coast
- Not Protected or National Estuary Biodiversity Plan priority
- Low/Medium Estuarine Importance

**Recommended Ecological Category =
Maintain D**

But must address negative trajectory

Buffels Remedial actions

- Estuary Management Plan (in progress)
- Restore connectivity with sea during floods by the complete removal of the remnant mining road at mouth
- Decrease nutrient input from golf course (linked to fish kill)
- Control wind-blown dust and wastewater from mining.
- Improve estuarine connectivity / freshwater flow through removal of roads at bird hide and above golf course
- Remove alien invasive plant species (rooikrans) in upper estuary (ongoing process)
- No driving on the beach to facilitate sedimentary processes and protect bird life (ongoing process)

Swartlintjies Estuary RU



Swartlintjies Pressures

- Obstruction of freshwater flow
- Destruction of habitat such as sumps and alien vegetation.
- Nearby slime dams potentially introduce saline water and dust from the mine dumps.

Swartlintjies Present Ecological Status

Component Category	Swartlintjies
Hydrology	B
Hydrodynamics	B
Water quality	B
Physical habitat alteration	B
Habitat health	B
Microalgae	B
Macrophytes	C
Invertebrates	C/D
Fish	B
Birds	A/B
Biotic health	B/C
PES	B

Largely natural with few modifications – Category B

Swartlintjies Recommended Ecological Category

- Rare wetland along arid coast
- Not Protected or National Estuary Biodiversity Plan priority
- Low/medium Estuarine Importance

Recommended Ecological Category =

Maintain B

Swartlintjies Important issues for Estuary Management Plan

- Protect groundwater input
- Restore catchment connectivity (i.e. improve surface water flow) - increase culvert size / culverts at ground level in road crossings
- Estuary in the process of recovering from historical mining activities, allow this process to continue.
- Concern with future mining prospects

Spoeg Estuary RU



Spoeg Estuary Pressures

- Habitat loss due to access roads
- Mining in catchment
- Grazing in catchment
- Use of groundwater

- Future pressures include a planned escalation of mining activities in the national park, that can lead to:
 - **Loss of salinity gradient in soil and water body (fresh at top and saline in lower reaches);**
 - **Disruption of subsurface flow,**
 - **Wind blown sands that smother plants,**
 - **Increase sedimentation,**
 - **Possible leaching of heavy metals from mine dumps.**

Spoeg Present Ecological Status

Component Category	Spoeg
Hydrology	B/C
Hydrodynamics	B
Water quality	A/B
Physical habitat alteration	A/B
Habitat health	B
Microalgae	A/B
Macrophytes	A
Invertebrates	A
Fish	A
Birds	A
Biotic health	A
PES	A/B

Largely natural with few modifications – Category A/B

Spoeg Recommended Ecological Category

- Namaqualand National Park
- Medium/High Estuarine Importance
- Rare wetland along arid coast

Recommended Ecological Category should be an A

But: Impacts...

Best Attainable State: Category A/B

Spoeg Important issues:

- **Protect groundwater**
- **Allow regrowth of derelict roads crossing the upper reaches to continue**
- **Impacts of planned future mining in Namaqualand National Park: Loss of salinity gradient, wind blow sand, disrupted subsurface flow, sedimentation.**

Groen Estuary RU



Groen Estuary Pressures

- Habitat loss due to access roads in upper reaches
 - Use of groundwater impacting on salinity gradient and spring feeding the system
 - Grazing in catchment influencing sediment structure
 - Sewage signal from SANParks office in upper reaches
 - Mining in catchment
- **Impacts of planned future mining in Namaqualand National Park: Loss of salinity gradient, wind blow sand, disrupted subsurface flow, sedimentation.**

Groen Present Ecological Status

Component Category	Groen
Hydrology	C
Hydrodynamics	C
Water quality	B
Physical habitat alteration	A
Habitat health	B
Microalgae	B
Macrophytes	B
Invertebrates	C
Fish	B
Birds	B
Biotic health	B
PES	B

Largely natural with few modifications – Category B

Groen Recommended Ecological Category

Rare wetland along arid coast

High conservation status:

Namaqualand National Park

Recommended Ecological Category should be an A

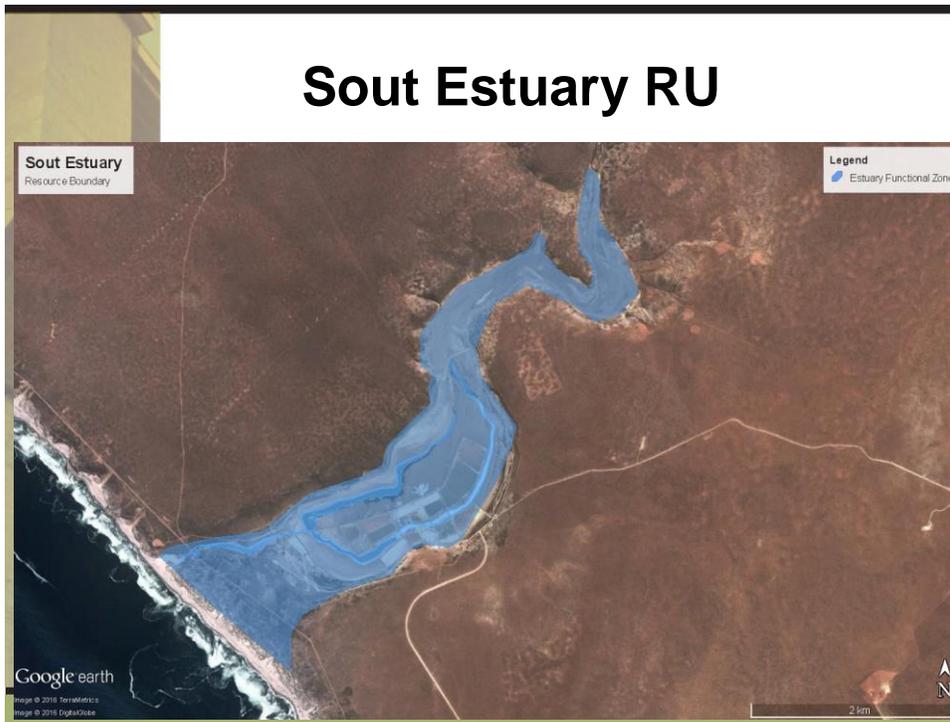
But: Impacts...

Best Attainable State: Category A/B

Groen Remedial actions required:

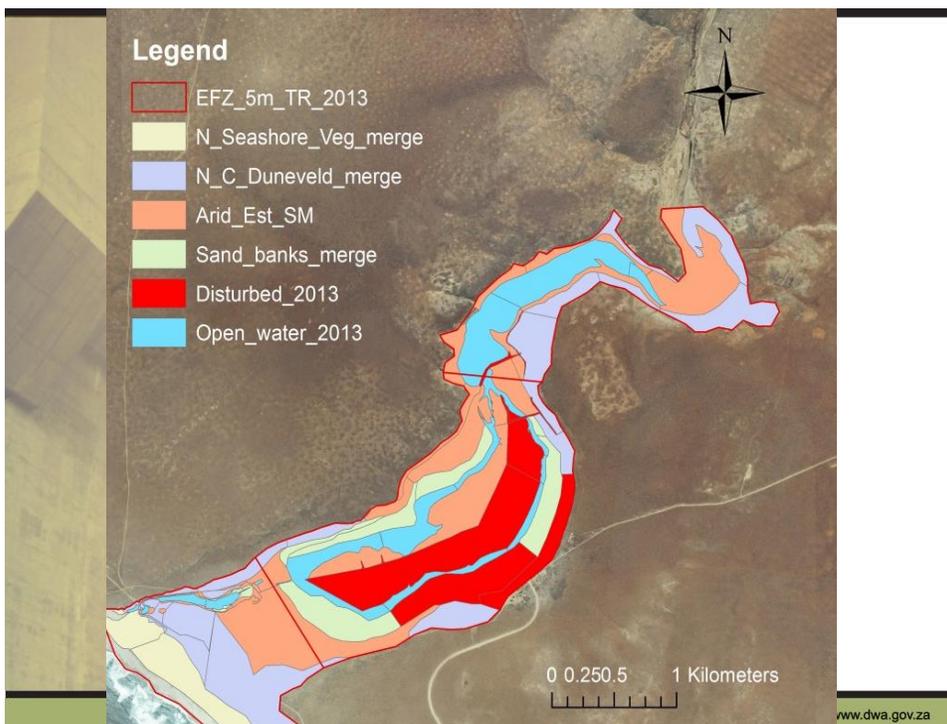
- Improve groundwater flow (+20%)
- Address sewage input from abolition facilities at the SANParks offices
- Future pressures include an escalation of mining activities in the national park and related disruption of subsurface flow.

Sout Estuary RU



Sout Estuary Pressures

- Habitat modification for saltpans,
 - Major diversion of the water course
 - Numerous artificial channels modifying hydrodynamics
 - Access roads
 - Pumping of sea water?
- Weir in upper reaches diverting/damming flow
- Birds not allowed to use upper pans? Is practise at other saltworks
- Grazing in catchment influencing sediment structure





Sout Present Ecological Status

Component Category	Sout
Hydrology	D/E
Hydrodynamics	E/F
Water quality	D
Physical habitat alteration	E
Habitat health	D/E
Microalgae	E
Macrophytes	E/F
Invertebrates	E
Fish	E/F
Birds	E
Biotic health	E
PES	E

Seriously modified – Category E

Sout Recommended Ecological Category

- Low/medium Estuarine Importance
- Rare wetland in desert

Recommended Ecological Category = D
But: Will require the partial removal of the saltworks. Near impossible to rehabilitate saltworks area to pristine as the brine residue remain in the soils for decades.

Best Attainable State = Might only be D/E
Needs to investigate to what degree circulation can be restore in parts of system

Sout Remedial actions required:

- Develop an Estuary Management Plan (Western Cape Government in the processes of prioritising this system for EMP) to evaluate to what extend functionality can be restored
- Improve circulation (e.g. culverts in roads)
- Restore connectivity with catchment, i.e. investigate if weir can be partially removed to allow connectivity with western arm of estuary

Summary

	Buffels	Swart-lintjies	Spoeg	Groen	Sout
Natural MAR (Mm ³ /a)	11.2	1.2	1.3	5.5	0.7
Natural GW discharge (Mm ³ /a)	0.23	0.63	0.36	0.13	1.24
Present GW discharge (Mm ³ /a)	-0.84	0.59	0.22	0.08	1.13
PES	↓ D	B	A/B	B	E
Estuarine Importance	Ave	Ave	Ave	Ave	Ave
Functional Importance	High	Medium	High	Medium	Medium
Namaqualand National Park			High	High	
REC	D	B	A/B	A/B	D
Surface water mitigations	↑ floods (roads)	↑ floods (roads)			↑ floods (weir)
Groundwater mitigations				↑ 20%	
Water Quality mitigations	x			x	
Non-Flow mitigations	x			x	x
Future development	No	No	No	No	No