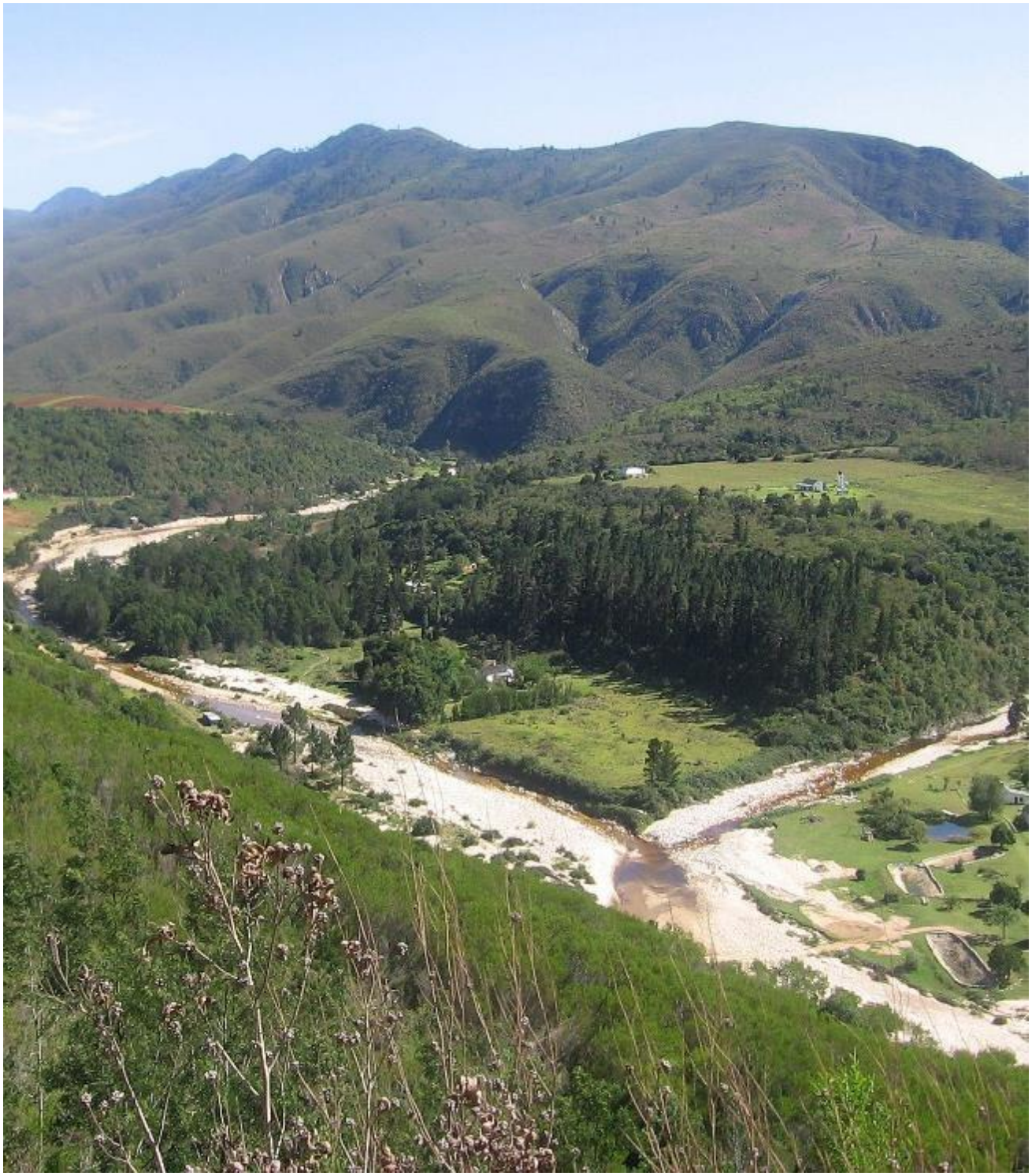

Determination of Water Resources Classes and Resource Quality Objectives in the Breede-Gouritz WMA

June 2018

Revision: Final

Resource Unit Prioritisation Report

No: RDM/WMA8/00/CON/CLA/0517

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

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This report is to be cited as:

Department of Water and Sanitation, South Africa. 2018. Determination of Water Resources Classes and Resource Quality Objectives in the Breede-Gouritz Water Management Area: Resource Unit Prioritisation Report. Report No: RDM/WMA8/00/CON/CLA/0517

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Title:	*Resource Unit Prioritisation Report*
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Project Name:	*Determination of Water Resources Classes and Resource Quality Objectives in the Breede-Gouritz Water Management Area*
DWS Report No:	*RDM/WMA8/00/CON/CLA/0517*
Status of Report:	*Draft*
First Issue:	*January 2018*
Final Issue:	*June 2018*

Professional Service Providers: Aurecon South Africa (Pty) Ltd, Southern Waters Ecological Research and Consulting cc, Anchor Environmental Consulting (Pty) Ltd and Delta-H Water Systems Modelling

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Document Index

Reports that will be produced as part of this Study are indicated below.

Bold type indicates this Report.

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List of Abbreviations

BGCMA	Breede-Gouritz Catchment Management Agency
BGCMS	Breede-Gouritz Catchment Management Strategy
CBA	Critical Biodiversity Area
DWA	(Previous) Department of Water Affairs
DWAF	(Previous) Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EC	Ecological Category (A to E based on Kleynhans *et al*, 1996)
EGSA	Ecosystem Goods, Services and Attributes
EIS	Ecological Importance and Sensitivity
ESA	Ecological Support Area
EWR	Ecological Water Requirements
FEPA	Freshwater Ecosystem Priority Area
GW	Groundwater
GWBF	Groundwater Contribution to Base Flow
IUA	Integrated Unit of Analysis
NFEPA	National Freshwater Ecosystem Priority Area
nMAR	Natural Mean Annual Runoff
NWA	National Water Act
PES	Present Ecological Status
REC	Recommended Ecological Condition
RQOs	Resource Quality Objectives
RU	Resource Unit
RUPT	Resource Unit Prioritisation Tool
SANBI	South African National Biodiversity Institute
SW	Surface Water
TEC	Target Ecological Condition
WMA	Water Management Area
WRC	Water Resource Classes
WRCS	Water Resources Classification System

Executive Summary

The Chief Directorate: Water Ecosystems of the Department of Water and Sanitation (DWS) has commissioned a study to determine Water Resource Classes (WRC) and associated Resource Quality Objectives (RQOs) for all significant water resources in the Breede-Gouritz Water Management Area (WMA).

The Water Resources Classification procedure have been completed in in the Breede-Gouritz and the determination of the RQOs follows on from this process. The 7-step procedure established by the Department of Water Affairs in 2011 (DWA, 2011) is being applied to determine the Resource Quality Objectives (RQOs) for river, estuary, wetland, dam and groundwater resources in the Breede-Gouritz WMA. These procedural steps to determine RQOs in the Breede-Gouritz WMA include the following:

- Step 1. Delineate the Integrated Units of Analysis (IUAs) and define the Resource Units (RUs)
- Step 2. Establish a vision for the catchment and key elements for the IUAs
- Step 3. Prioritise and select preliminary Resource Units for RQO determination
- Step 4. Prioritise sub-components for RQO determination, select indicators for monitoring and propose the direction of change
- Step 5. Develop draft RQOs and Numerical Limits
- Step 6. Agree Resource Units, RQOs and Numerical Limits with stakeholders
- Step 7. Finalise and Gazette RQOs.

In terms of the RQO determination process, Step 1 (Delineation) and Step 2 (Visioning) have been completed as part of the Classification phase of this study. This report documents the approach adopted and the outcomes of the implementation of Step 3 of the RQO determination procedure.

The Resource Unit Prioritisation (Step 3) comprises an iterative process of prioritising the RUs within the study area, based on levels of threat in relation to conservation and socio-economic importance. To guide this selection process, and to facilitate the standard selection of prioritised resource units/sub-quaternaries, a decision support tool, named the Resource Unit Prioritisation Tool (RUPT), has been developed, using an MS Office Excel spreadsheet (DWA 2011). This tool, incorporates a multi criteria decision analyses approach to assess the importance of monitoring each RU, as part of management operations, to identify important RUs and it is used for the Resource Unit Prioritisation step.

The Resource Unit Prioritisation Tool focusses on the prioritisation of RUs for rivers, wetlands and estuaries. However, for the wetland prioritisation process, the application of a standardised prioritisation tool has been particularly difficult for wetlands, due to the cumbersome and time-consuming process involved in using the tool (INR, 2017). A different method was thus followed for this study, using a procedure for determining wetland RQOs that is under development as part of a concurrent study being undertaken through the Water Research Commission (INR, 2017) which intends to address the limitations of current wetland prioritisation methodologies. For the dam and groundwater prioritisation processes there was a need to adopt a different set of criteria and sub-criteria appropriate to these resources, which intends to address the limitations of current methodologies.

A summary of the priority resource units (RUs) for rivers, estuaries, dams, wetlands and groundwater resource units are presented below. These represent the list of proposed RUs for which RQOs should be developed. The prioritised RUs for determining RQOs have been identified using the following criteria:

- The top 17 river priority RUs in the Breede and Overberg IUAs and the top 20 river priority RUs in the Gouritz and Coastal IUAs
- Estuaries with a priority weighting of ≥ 0.5
- Dams determined from prioritisation process with a priority weighting of > 0.5
- Wetlands RUs as determined from the prioritisation process
- Groundwater RUs with a priority level of 3.

Table 0.1 Summary of results of the prioritisation process for the Breede and Overberg IUAs

IUA	Prioritised Resource Units (RUs)				
	River	Estuary	Dam	Wetland	Groundwater
A1 Upper Breede Tributaries	nviii1 Breede nvii2 Molenaars		Ceres Koekedouw	Strategic Water Source wetlands	BB-1 (H10A) BB-1 (H10B) BB-1 (H10C) BB-3 (H10F) BB-3 (H10J) BB-2 (H20B) BB-2 (H20C)
A2 Breede Working Tributaries	nvii7 Hex		Greater Brandvlei	East Coast Shale Renosterveld Channelled Floodplain (Papenkuils)	BB-3 (H10G) BB-3 (H10H) BB-3 (H10L) BB-2 (H20A) BB-2 (H20F) BB-5 (H20H) BB-6 (H30B) BB-4 (H40B) BB-5 (H40C) BB-7 (H40J)
A3 Middle Breede Renosterveld	nvii8 Breede ni2 Breede			East Coast Shale Renosterveld Floodplain (Breede)	BB-7 (H40K)
B4 Riviersonderend Theewaterskloof	nvii10 Du Toits nv7 Riviersonderend niv28 Baviaans nv9 Riviersonderend		Theewaterskloof	Strategic Water Source wetlands	BR-1 (H60A) BR-1 (H60B) BR-1 (H60C)
F9 Lower Riviersonderend	ni3 Riviersonderend				
B5 Overberg West	piii1 Palmiet piii2 Palmiet piii3 Palmiet	Palmiet	Eikenhof Kogelberg Arieskraal No.2	Strategic Water Source wetlands (Palmiet)	BO-1 (G40C) BO-1 (G40D)
H16 Overberg West Coastal		Buffels Rooiels Bot Onrus		Southwest Sand Fynbos Channelled Valley Bottom (Kleinmond) Strategic Water Source wetlands	BO-2 (G40H)
F10 Overberg East Renosterveld	nv23 Klein			Southwest Ferricrete Fynbos Floodplain (Kars)	BO-3 (G50D)
H17 Overberg East Fynbos	ni4 Nuwejaar nv24 Kars	Klein Uilkraal Ratel Heuningnes Klipdrifsfontein		Southwest Ferricrete Fynbos Flat, Depression and Floodplain (Agulhas Wetland System) East Coast Shale Renosterveld Floodplain (De Hoop) East Coast Shale Renosterveld Floodplain (Heuningnes)	BO-3 (G50B) BO-3 (G50E)
F11 Lower Breede Renosterveld	niii4 Breede	Breede		East Coast Shale Renosterveld Floodplain (Breede)	
TOTALS	**17**	**11**	**6**	**12**	**27**

Table 0.2 Summary of results of the prioritisation process for the Gouritz and Coastal IUAs

IUA	Prioritised Resource Units (RUs)				
	River	Estuary	Dam	Wetland	Groundwater
C6 Gamka Buffels				Upper Nama Karoo Depression Lower Nama Karoo Depression	GGr-3 (J11E) GGa-2a, 2b and 2c (J21A) GGa-2a, 2b and 2c (J21B) GGa-2a, 2b and 2c (J23A) GGa-1 (J24B)
E8 Touws	gviii1 Doring gv5 Touws gv4 Buffels gv6 Groot gii3 Groot				GGr-1 (J12C) GGr-1 (J12D)
D7 Gouritz-Olifants	giv20 Gamka giii2 Olifants gv36 Kammanassie		Stompdrift		GO-4 (J35B)
F13 Lower Gouritz	gi4 Gouritz	Gouritz		Albany Thicket Floodplain (Gouritz)	GGo-1 (J40C) GGo-1 (J40D)
F12 Duiwenhoks	giii8 Duiwenhoks	Duiwenhoks		East Coast Shale Renosterveld Channelled Valley Bottom and Floodplain (Goukou) East Coast Shale Renosterveld Channelled Valley Bottom and Floodplain (Duiwenhoks)	
I18 Hessequa	giii7 Goukou	Goukou			GGo-2A and 2B (H90E)
G14 Groot-Brak	gviii2 Groot-Brak	Klein Brak Groot Brak Blinde Tweekuilen Gericke Hartenbos	Wolwedans		GC-1 (K20A)
G15 Coastal	gvii9 Malgas gvii11 Kaaimans giii10 Diep gvii13 Karatara gviii9 Goukamma gvii14 Knysna gviii11 Gouna giv6 Keurbooms	Maalgate Gwaing Kaaimans Wilderness Swartvlei Goukamma Knysna Noetsie Piesang Keurbooms Matjies Sout (Oos) Groot (Wes) Bloukrans		Freshwater Lake (Groenvlei) Freshwater Lake (Wilderness Lakes) Strategic Water Source wetlands	GC-2 (K40D) GC-3 (K70A)
TOTALS	**20**	**23**	**2**	**8**	**14**

There are key limitations and uncertainties which may influence the confidence of the outcomes of the RU prioritisation process. These are discussed for each significant water resource.

The next step of the RQO determination process, Step 4, consists of prioritising sub-components for RQO determination and the selection of indicators for monitoring. Each of the prioritised RUs identified during Step 3, and indicated in this report, will be analysed in more detail, to identify which sub-components present in these RUs should be protected, in order to support water resource dependent activities and/or to maintain the integrity and ecological functioning of the water resource. This analysis will be done using the RU Evaluation Tool where applicable.

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1 Introduction

1.1 Background

Chapter 3 of the National Water Act prescribes a series of measures which are jointly intended to ensure protection of water resources. In accordance with these measures, the Department of Water and Sanitation (DWS), in line with Section 12 of the National Water Act (NWA), established a Water Resources Classification System that is formally prescribed by Regulations 810, dated 17 September 2010.

The Water Resources Classification System (WRCS) (DWAF, 2007a; DWA, 2011) provides guidelines and procedures for determining Water Resource Classes, Reserves and Resource Quality Objectives (RQOs).

Section 13 of the NWA states that "as soon as reasonably practicable after the Minister prescribed a system for classifying water resources, the Minister must, subject to subsection (4), by notice in the Gazette, determine for all or part of every significant water resource-

a) A class in accordance with the prescribed classification system; and

b) Resource quality objectives based on the class determined in terms of paragraph (a)."

In this context, the Chief Directorate: Water Ecosystems has commissioned the current study to determine Water Resource Classes and associated Resource Quality Objectives for all significant water resources in the Breede-Gouritz Water Management Area (WMA). Hitherto, the 7-step Water Resource Classification procedure described in the WRCS Overview Report (DWAF, 2007a) has been completed for the Breede-Gouritz WMA and has resulted in the delineation of 18 integrated units of analysis (IUAs), as well as a recommended Water Resource Class for each IUA or part thereof.

The three Water Resource Classes are defined as:

- *Class I: Minimally used*: The configuration of ecological categories of the water resources within a catchment results in an overall water resource condition that is minimally altered from its pre-development condition.
- *Class II: Moderately used*: The configuration of ecological categories of the water resources within a catchment results in an overall water resource condition that is moderately altered from its pre-development condition.
- *Class III: Heavily used*: The configuration of ecological categories of the water resources within a catchment results in an overall water resource condition that is significantly altered from its pre-development condition.

With the Classification phase of this study completed, the current next phase of the study comprises the 7-step procedure (DWA, 2011) towards determination of RQOs for all significant water resources in the Breede-Gouritz WMA.

Along with the above prescribed methodology, previous RQO determination studies were reviewed to determine an appropriate approach for the current study. Reports of relevant previous studies that are referred to are the RQO determination reports for the Crocodile (West), Marico, Mokolo and Matlabas catchments (DWS, 2015), for the Olifants WMA (DWS, 2014) and the Upper Vaal WMA (DWS, 2014).

1.2 Scope of this phase of the study

The main objective of this study is to determine Resource Quality Objectives (RQOs) for all significant water resources in the Breede-Gouritz WMA that must give effect to the Water Resources Classes that have been determined in the previous phase of the study. To this end, the 7-step process for determining RQOs, described in DWA (2011) and depicted in Figure 1.1, is being implemented.

Once gazetting has been finalised, implementation, monitoring and review would then follow.

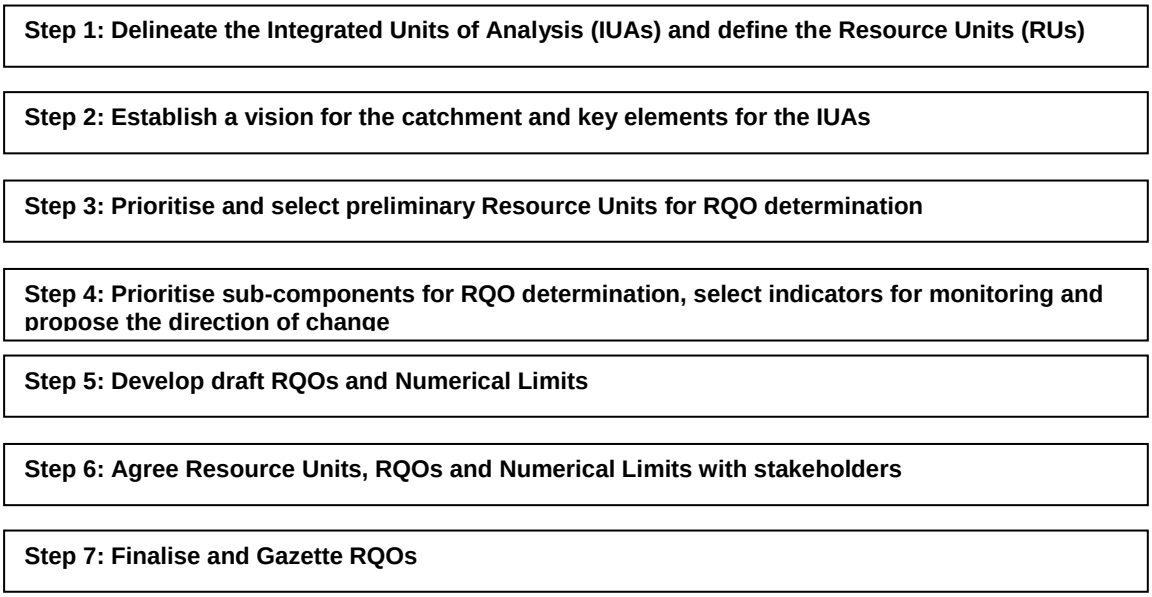

Figure 1.1The seven-step process for RQO determination (DWA, 2011)

In terms of the RQO process outlined in Figure 1.1, Step 1 (Delineation) and Step 2 (Visioning) have been completed as part of the Classification phase of this study. This report documents the approach adopted and the outcomes of the implementation of Step 3 of the above RQO determination procedure.

1.3 Study area, RUs and IUAs

The study area covers all significant water resources of the Breede-Gouritz WMA. The catchments of the Breede River and Gouritz River and their primary tributaries, the Riviersonderend, Groot, Gamka and Olifants rivers, dominate the study area, but it also includes numerous smaller coastal catchments.

During the Classification phase of the study, resource units for rivers, wetlands, dams, groundwater and estuaries as well as a total of 18 Integrated Units of Analysis (IUAs) were delineated in the Breede-Gouritz WMA. The IUAs approximate socio-economic boundaries, delineated to facilitate the integration of ecological and socio-economic aspects required for the evaluation of scenarios during the Classification phase of the study (DWS, 2017). The delineation of the Resource Units and the IUAs is described in the *Resource Unit and Integrated Units of Analysis Delineation Report* (DWS, 2016b).

1.3.1 Breede River Catchment and Overberg Area

Ten IUAs were delineated and a total of 114 biophysical and allocation nodes were identified in the Breede River catchment and Overberg area. Figure 1.2 depicts the locations of the IUAs and the recommended Class of each, as well as the nodes. The RUs delineated in the Breede River catchment and Overberg area comprise the following: 17 River RUs; 11 Estuary RUs, 6 Dam RUs; 12 Wetland RUs and 27 Groundwater RUs.

1.3.2 Gouritz River Catchment and Coastal Area

Eight IUAs were delineated and a total of 148 biophysical and allocation nodes were identified in the Gouritz River catchment and Coastal area. Figure 1.3 depicts the locations of the IUAs and the recommended Class of each, as well as the nodes. The RUs delineated in the Gouritz River catchment and Coastal area comprise the following: 20 River RUs; 23 Estuary RUs; 2 Dam RUs; 8 Wetland RUs; and 14 Groundwater RUs.

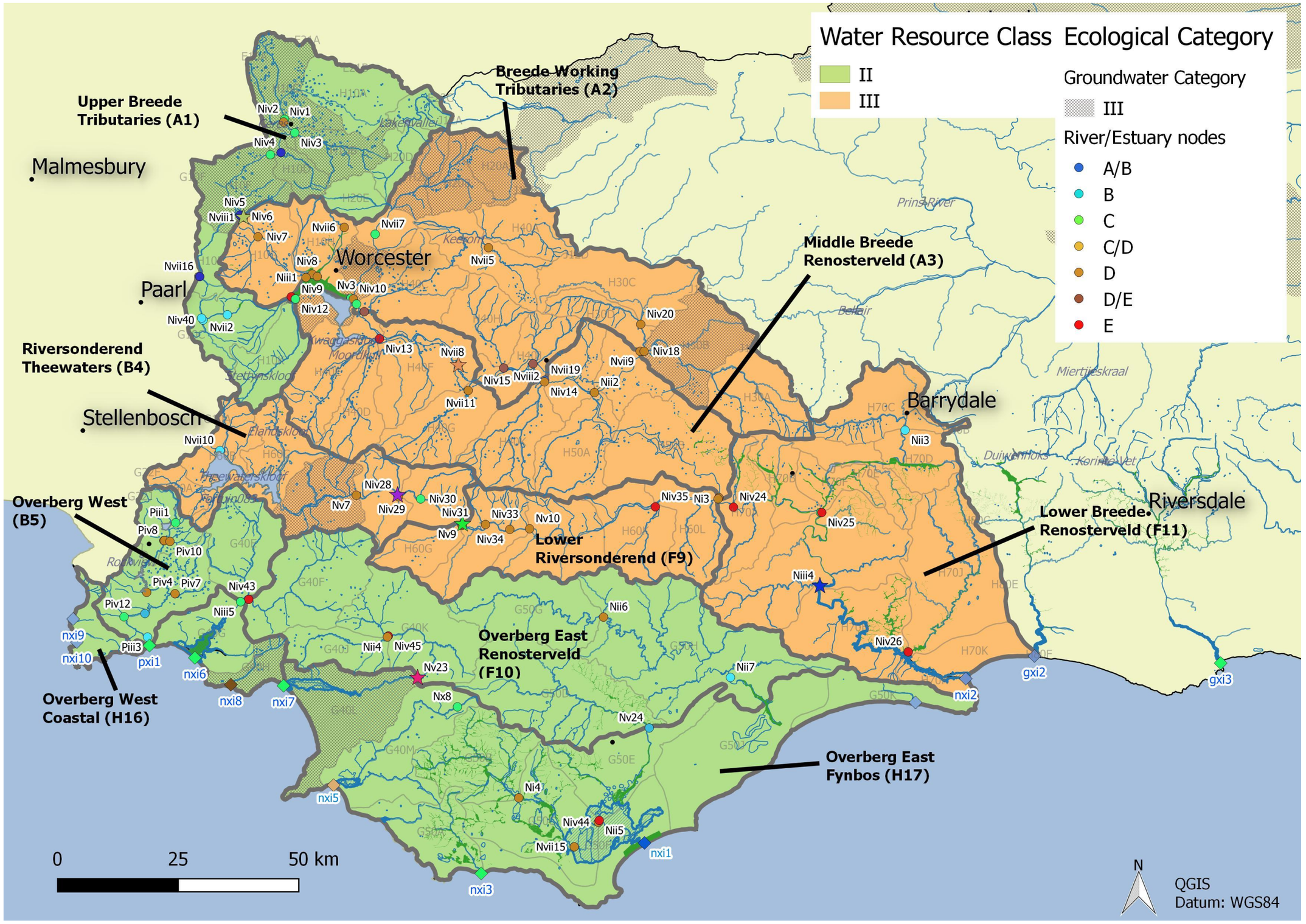

Figure 1.2 Locations of IUAs (with their recommended Class) and biophysical/ allocation nodes in the Breede River catchment and Overberg area

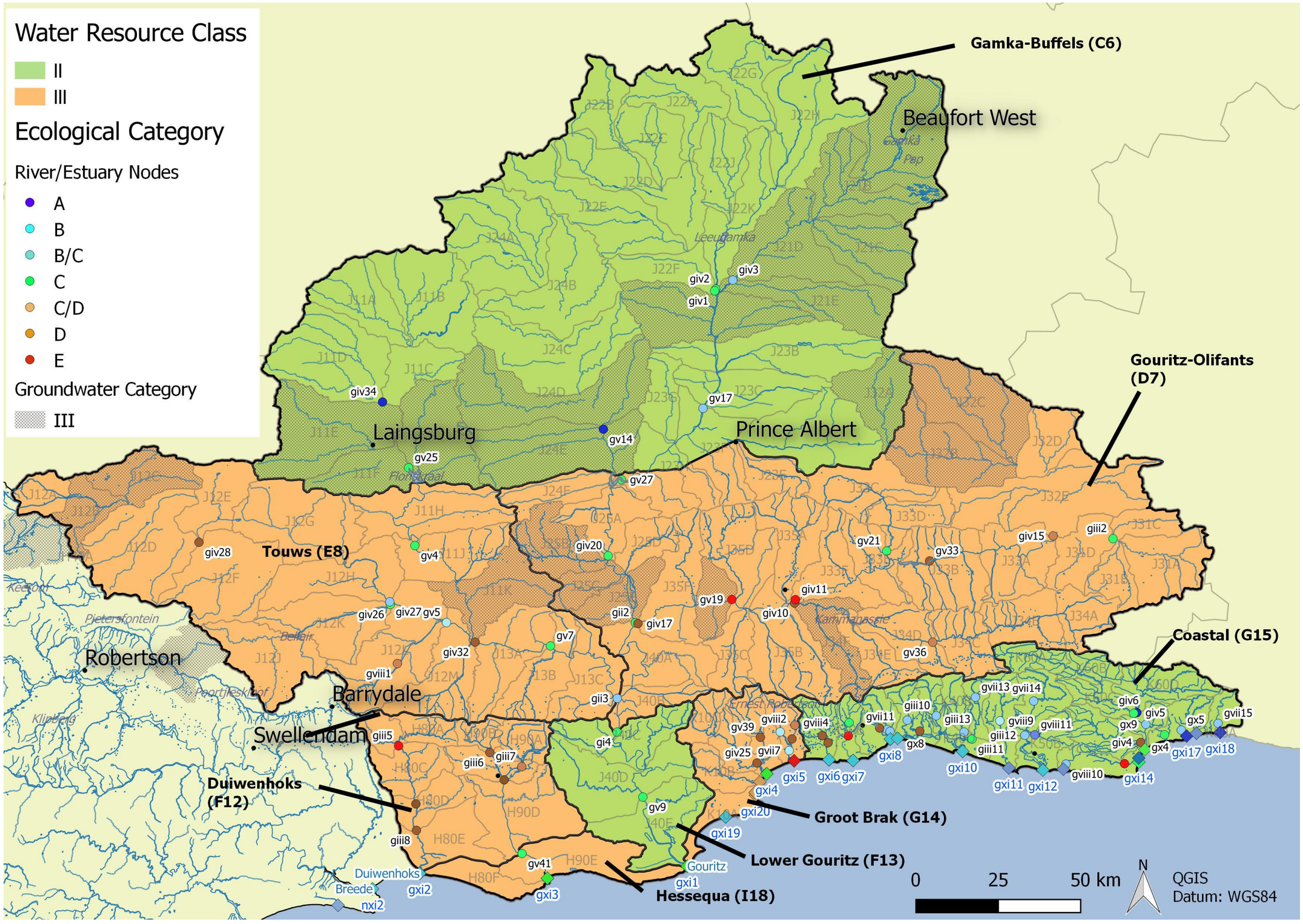

Figure 1.3 **Locations of IUAs (with their recommended Class) and biophysical/ allocation nodes in the Gouritz River catchment and Coastal area**

2 Approach

2.1 Resource Quality Objectives process overview

For the determination and implementation of RQOs, a seven-step procedure was established (DWA, 2011). This process is interlinked with the Water Resources Classification System and forms part of an Adaptive Management Cycle that is used as an improved water resources management practice. Overall the Adaptive Management Cycle process consists of delineating the resource units (RU), setting a vision for the catchment, prioritise, select and evaluate RUs for RQOs, drafting RQOs and numerical limits, and agreeing these with the stakeholders to finalise and Gazette the RQOs, and finally moving to implementing, monitoring and reviewing before restarting the process for corrections and improvements.

Due to the large number of Resource Units within the Breede-Gouritz WMA, it is necessary to prioritise the most useful Resource Units for RQO determination. In terms of the seven-step RQO determination process, Step 1 (Delineation) and Step 2 (Visioning) have been explained and completed as part of the Classification phase of this study (Figure 2.1). The purpose of Step 3 of the Procedure to Determine and Implement Resource Quality Objectives (DWA, 2011) is to select and prioritise preliminary Resource Units using the RU prioritisation tool for RQO determination. The evaluation of the RU priority ratings for selection are then done (Step 4), and the RQOs and numerical limits are drafted (Step 5). These will then be discussed and agreed at the stakeholder engagement workshops (Step 6). This process will allow for the selection of at least one RU to represent each IUA that will then be monitored after the gazetting of the RQOs (Step 7).

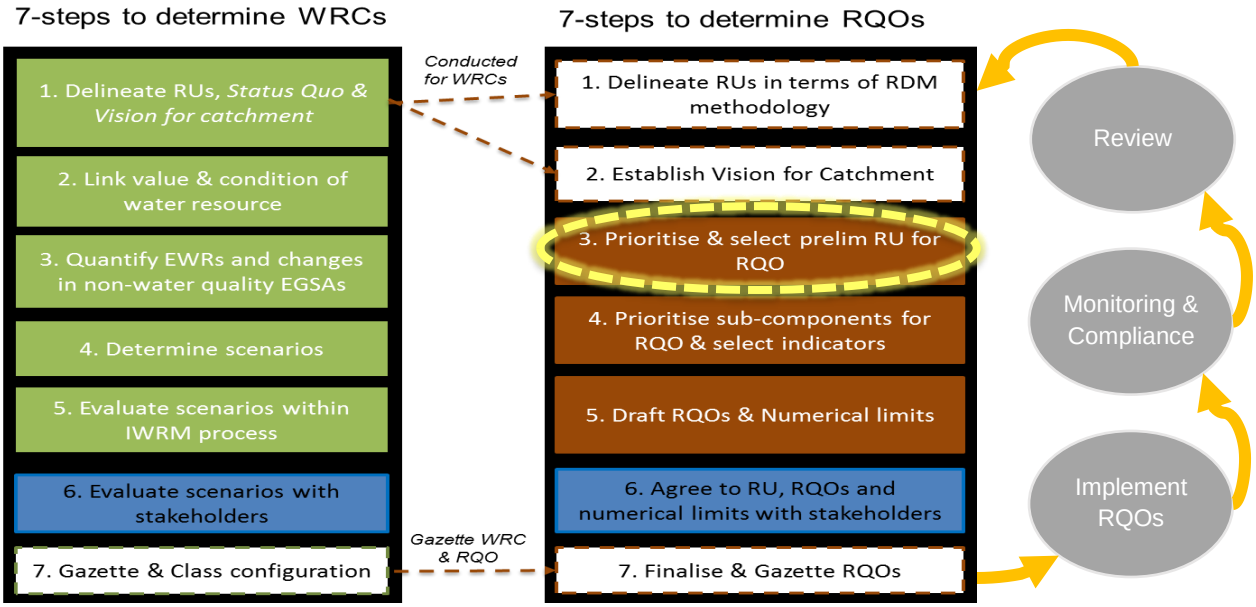

Figure 2.1 Integration of the seven-step processes for WRC determination and the RQO determination (DWA, 2011), incorporating the three additional steps to implement the Adaptive Management Cycle

Management, monitoring and compliance are the three additional steps of the Adaptive Management Cycle to be implemented after the seven-step RQO process. This introduces a continual learning and improvement procedure which allows for changes to align the RQOs with the vision for the resource. The changes, if needed, will indicate that the measures that are in place to protect the water resource are not sufficient to comply with the RQOs set, or alternatively that the RQOs that have been set are not realistic, and the process will need to be revisited to correct these issues.

2.2 Resource Unit Prioritisation overview

The Resource Unit Prioritisation (Step 3) comprises an iterative process of prioritising the RUs within the study area, based on levels of threat in relation to conservation and socio-economic importance. To guide this selection process, and to facilitate the standard selection of prioritised resource units/sub-quaternaries,

a decision support tool has been developed, using an MS Office Excel spreadsheet (DWA 2011). This tool, named the Resource Unit Prioritisation Tool (RUPT), incorporates a multi criteria decision analyses approach to assess the importance of monitoring each RU, as part of management operations, to identify important RUs and it is used for the Resource Unit Prioritisation step.

The Resource Unit Prioritisation step comprises the population of information in the RUPT for each RU. In this tool standardized rankings and weightings have been applied, and those criteria and sub-criteria with the highest ranking are regarded as the most important criteria for consideration in prioritising resource units, with the highest weightings contributing more towards the summary score for the criteria and sub-criteria being assessed. To promote consistency in the application of the tool, any changes to standard weightings should be documented and justified with an appropriate rationale.

A number of sub-steps are followed during Step 3. These are briefly enumerated below:

1. Extract and map catchment and Resource Unit level information
2. Determine the position of each Resource Unit within the IUA
3. Assess the importance of each Resource Unit to users
4. Determine the level of threat posed to water resource quality for users
5. Assess the importance of each Resource Unit to ecological components
6. Determine the level of threat posed to water resource quality for the environment
7. Identify Resource Units for which management action should be prioritised
8. Assess practical considerations associated with RQO determination for each Resource Unit
9. Evaluate the relative ranking and weighting of each criterion
10. Select Preliminary Resource Units for RQO determination using prioritisation scores
11. Complete the information sheet for the Resource Unit Prioritization Tool.

The Resource Unit Prioritisation Tool focusses on the prioritisation of RUs for rivers, wetlands and estuaries. However, for the wetland prioritisation process, the application of a standardised prioritisation tool has been particularly difficult for wetlands, due to the cumbersome and time-consuming process involved in using the tool (INR, 2017). A different method was thus followed for this study, using a procedure for determining wetland RQOs that is under development as part of a concurrent study being undertaken through the Water Research Commission (INR, 2017) which intends to address the limitations of current wetland prioritisation methodologies.

For the dam and groundwater prioritisation processes there was a need to adopt a different set of criteria and sub-criteria appropriate to these resources, which intends to address the limitations of current methodologies. A Resource Unit Prioritisation Tool for the prioritisation of RUs for dams was developed, based upon relevant prioritisation criteria for the rivers prioritisation, and the addition of dam-specific criteria.

The specific approaches used to prioritise the river, dam, wetland, estuary and groundwater resources within the Breede-Gouritz WMA are discussed below.

2.3 River Resource Unit prioritisation

2.3.1 Delineation of River Resource Units

RUs in the Breede River catchment and Overberg region were ranked against one another and separately to the RUs in the Gouritz and Coastal region. All quaternary catchments in the study area were prioritised. Quaternary catchments were selected as the best scale for prioritisation since this is also the scale at which water resource developments are planned, hydrology is modelled and ground water studies are based. If biophysical and allocation nodes were present in the quaternary catchments these were used to represent the significant water resources in the quaternary catchment since these have already been located using a variety of decisions to do with water resource planning, hydrological infrastructure, biophysical attributes, ecological and conservation considerations during the WRCS (Table 2.1). This was also necessary to align the results of the scenario analyses undertaken during the WRCS with those of the process toward writing

RQOs. Where no nodes were present the main river in the quaternary catchment was selected for prioritisation.

Table 2.1 The rules for establishing WRCS nodes

TIER	Data/GIS layers	Procedure for river node selection		Minimum unit
		Filtering process	Additional explanation	
I	Ecoregions Level I (Kleynhans *et al*., 2005)	Exclude Ecoregions that comprise < 5% of the total area of the primary catchment AND where >75% is represented elsewhere.	Place node at each Ecoregion/ quaternary catchment intersection where >75% of the upstream quaternary is comprised of a different Ecoregion from the downstream quaternary.	Quaternary
II	Hydrological index Classes (HydI) (Dollar *et al*., 2006) derived from the hydrological index (Hughes and Hannart, 2003)	Hydl Class 1: HydI = 1 to 4 (perennial).	Place node at each Quaternary intersection where there is a change in HydI Class.	
		Hydl Class 2: HydI = 5 (seasonal).		
		Hydl Class 3: HydI = 6 to 9 (ephemeral).		
III	Geomorphic zones (Rowntree and Wadeson, 1999[1]).	Group 1: Mountain Headwater, Mountain Stream, Transitional and Upper Foothills.	Place node at each quaternary intersection, where >75% of the upstream quaternary is comprised of a different geomorphic zone from the downstream quaternary.	
		Group 2: Lower Foothills.		
		Group 3: Lowland Rivers.		
		Group 4: Rejuvenated Floodplains.	Place node at the head of the estuary.	
IV	Tributaries	Two nodes: one for each river upstream of the confluence.	Place node at the nearest quaternary intersection on each river.	
V	Ecological Importance and Sensitivity Category (EISC)	Use EISC information (Kleynhans, 2000) and augment with local data where applicable.	Place node at each quaternary intersection downstream of high or very high EISC.	
VI	Present Ecological Status (PES)/Habitat Integrity (HI)	Use PES information (Kleyn-hans, 2000) and augment with local data where applicable.	Place node at each quaternary intersection, where > 75% of the upstream quaternary is comprised of a different PES/HI from the downstream quaternary. If sub-quaternary data are available, then adjust the information accordingly.	
		Group 1: A and B.		
		Group 2: C.		
		Group 3: D.		
		Group 4: E and F.		
VII	Infrastructure	This Tier comprises both establishment of river nodes and some rationalisation of previously established nodes.		
		(a) Insertions.	i. Place a node at each DWAF gauging weir for which there is a hydrological record.	Sub-quaternary
			ii. Place a node at the upstream limit of the inundation of any major dam.	
			iii. Place a node upstream of mines, towns or other localities likely to influence water quality.	

[1] These zones have been determined by DWAF's Chief Directorate: Resource Quality Services (CD: RQS) for the 1:500 000 rivers coverage for the whole of South Africa, and are available on request from the CD: RQS.

TIER	Data/GIS layers	Procedure for river node selection		Minimum unit
		Filtering process	Additional explanation	
			iv. Place a node at each quaternary intersection where the area covered by farm dams in the up-stream quaternary is > 5 times that of the downstream quaternary.	Quaternary
			v. Place a node on a river imme-diately upstream of the confluence with an Inter Catchment Transfer (IBT).	Sub-quaternary
		(b) Deletions.	vi. Remove any nodes that are inundated by impoundments.	
			vii. Remove any nodes that describe upstream sections for which no description is required, e.g. impoundments.	
VIII	RDM data	Comprehensive or Inter-mediate Reserve determinations.	Place a node at the nearest quaternary boundary downstream of each Ecological Water Requirement (EWR) site.	
IX	First level rationalisation	Minimum distance between nodes = 10 km.	i. Delete nodes that are less than 10 km (river length) apart. Retain the node that is closest to a quaternary intersection.	n/a
		Minimum contribution to natural Mean Annual Runoff (nMAR) = 1%.	ii. Delete nodes where the cumu-lative contribution to nMAR <1%.	
X	Water resource management /planning/ allocation	Where applicable for hydrology/ water resource management/ planning/ allocation.	It is essential that ecological information can be provided at a scale (and locations) relevant to other procedures linked to the Classification Process. If these are not already captured in the node delineation process described above, insert nodes at relevant positions as dictated to by other procedures linked to the Classification Process.	Sub-quaternary
XI	International Water Agreements (IWA)	Based on IWAs signed between South Africa and neighbouring countries.	Place node at each quaternary intersection where required for an IWA.	Sub-quaternary

2.3.2 Prioritisation of river Resource Units

The river RU Tool was used to rank RUs relative to one another. The tools' standard scoring and ranking of scores were used throughout; no changes were made to the default settings. Some of the more important data used to answer the questions posed by the tool are provided in the results tables (see Section 3.1). The scores given to the RUs used, to rank them relative to one another, are provided in Appendix A.

The following criteria were assessed, using the tool:

- The position of the RU in the IUA, where:
    - RUs on a main stem river at the base of an IUA were given a score of 1;
    - and those not on a main stem river nor at the base of an IUA were given a 0;
- The importance of the RU to users, such as recreational use, tourism, scientific benefits, aesthetic, cultural or spiritual benefits, where:
    - RUs with no cultural services were given a 0;

    - RUs with some services were given a 0.5;
    - RUs providing very important cultural services were given a 1;
- RUs that support the livelihoods of significant vulnerable communities, such as water, food or grazing and raw materials, where:
    - RUs with limited support were given 0;
    - RUs with some support were given 0.5;
    - RUs with an important role were given 1;
- RUs with strategic or international obligations, for the generation of power, or for water-related agreements, such as the RAMSAR convention; where:
    - RUs not important were scored 0;
    - RUs with moderate importance were scored 0.5;
    - Important RUs were scored 1;
- RUs that provide supporting or regulating services, such as flood attenuation, water purification, flow regulation, erosion control, sediment retention and disease and pest control, where:
    - RUs with limited support were given 0;
    - RUs with some support were given 0.5;
    - RUs with an important role were given 1;
- RUs that contribute to the economy, where:
    - RUs that make no contribution were given 0;
    - RUs that make a moderate contribution were given a 0.5;
    - RUs that make a significant contribution were given a 1;
- The level of threat posed to the water quality for users, where:
    - RUs where the level of threat is low were scored 0;
    - RUs where the threat is moderate were scored 0.5;
    - RUs where the threat was high were scored 1;
- The ecological importance of the RUs, for example a high ecological importance and sensitivity (EIS), a good ecological condition, an NFEPA (National Freshwater Ecosystem Protection Area, Critical Biodiversity Area (CBA) or Ecological Support Area (ESA), where:
    - Low to moderate EIS was scored 0;
    - High EIS was scored 0.5;
    - Very high EIS was scored 1;
    - Ecological condition lower than a B were scored 0;
    - Ecological condition B was scored 0.5;
    - Ecological condition > B scored 1;
    - No NFEPA scored 0;
    - NFEPA support areas scored 0.5;
    - NFEPAs scored 1;
    - Low irreplaceability scored 0;
    - ESAs scored 0.5;
    - CBAs scored 1;

- The level of threat posed to the water quality for the environment, where:
    - RUs where the level of threat is low were scored 0;
    - RUs where the threat is moderate were scored 0.5;
    - RUs where the threat was high were scored 1;
- RUs where management action should be prioritised, where:
    - RUs in a D condition or greater where given a 0;
    - RUs in a D/E condition or lower where given a 1[2];
- Practical considerations, such as the existence of EWR sites and DWS gauging weirs, where:
    - RUs with no such information were given a 0;
    - RUs with a gauging weir where given a 0.5;
    - RUs with EWR sites and/or gauging weirs were given a 1;
    - RUs with poor accessibility or that are unsafe to monitor were given a 0;
    - RUs with moderate accessibility and safety were given a 0.5;
    - RUs with good accessibility safety were given a 1;

Since the tool only allows the user to load 40 RUs at one time, and since there were more than 40 in each of the Breede and Gouritz water catchments, groups of RUs per IUA were first ranked separately and the overall results were combined into one final ranked list. Where there was more than one sub-quaternary river ranked in each quaternary the overall ranks were averaged. Results were reported at the level of quaternary catchments to align with those of the estuary, wetlands and groundwater prioritisation results.

2.4 Estuary Resource Unit prioritisation

The RUPT Tool, published by DWA (2011), was used to prioritise estuaries and river outlets in the Breede-Gouritz WMA. The RUPT uses a range of criteria that assesses the importance of monitoring each RU as part of management operations. This includes the position of Resource Units within an IUA, user and ecological considerations, practical constraints and management considerations. Key criteria considered in the evaluation process included the following:

- Provision of cultural services to society
- Provision of supporting livelihoods of significant vulnerable communities
- Importance in meeting strategic requirements and international obligations
- Provision of supporting and regulating services
- Contributing to the economy (GDP and job creation) in the catchment (e.g. commercial agriculture, industrial abstractions and bulk abstractions by water authorities)
- Level of threat posed to users
- EIS category
- Present ecological status
- Priority in provincial / fine scale aquatic biodiversity plans
- Level of threat posed to ecological components of the estuary
- Estuaries with PES lower than a D Category or lower than the accepted gazetted category

[2] It was assumed that the Rating Guideline for the Management Considerations criteria was intended to refer to “D Category” and not “C category”

- Availability of EWR site data or other monitoring data (RHP, DWS gauging weirs etc.)
- Accessibility of resource unit for monitoring
- Safety risk associated with monitoring RUs.

2.5 Dam Resource Unit prioritisation

The preliminary screening list for prioritisation of the existing dams prepared for the *Resource Unit and Integrated Units of Analysis Delineation Report* (DWS, 2016b), followed a conservative approach where all the dams located within the study area were subjected to a first high-level screening, as follows:

- The National List of Registered Dams (DWS, 2016), kept by the Dam Safety Office of DWS, was filtered to view dams that are located in the WMA, and 717 dams were identified,
- High or significant hazard potential dams were selected,
- Category 2 or category 3 dams were selected, in terms of dam safety legislation, and
- Dams with a capacity of more than 5 million m^3 were selected. Dams that have a capacity of 5 million m^3 or less are generally not regarded as significant dams.

A further screening process was then undertaken to identify the Dams RUs that should be prioritised. As a prioritisation tool has not yet been developed for the RU prioritisation of dams, the existing surface water prioritisation tool was adapted to prioritise dams. The adaptations to the tool were done to make the prioritisation more relevant to dams whilst trying to limit significant changes to the criteria and the ranking system that was applied in the original RUPT tool.

The following criteria were assessed, using the tool:

- The location of the RU, where:
    - RUs on a main/large stem river were given a score of 1;
    - and those not on a main/large stem river were given a 0;
- The importance of the RU to users, such as recreational use, tourism, scientific benefits, aesthetic, cultural or spiritual benefits, where:
    - RUs with no cultural services were given a 0;
    - RUs with some services were given a 0.5;
    - RUs providing very important cultural services were given a 1;
- RUs that support the livelihoods of significant vulnerable communities, such as water, food or grazing and raw materials, where:
    - RUs with limited support were given 0;
    - RUs with some support were given 0.5;
    - RUs with an important role were given 1;
- RUs with strategic or international obligations, for the generation of power, or for water-related agreements, such as the RAMSAR convention, where:
    - RUs not important were scored 0;
    - RUs with moderate importance were scored 0.5;
    - Important RUs were scored 1;
- RUs that provide supporting or regulating services, such as water supply, flood attenuation, water quality control, stream flow regulation, and sediment retention, apart from the common function of water storage, where:
    - RUs with limited support were given 0;
    - RUs with some support were given 0.5;

    - RUs with an important role were given 1;
- RUs that contribute to the economy, where:
    - RUs that make no contribution were given 0;
    - RUs that make a moderate contribution were given a 0.5;
    - RUs that make a significant contribution were given a 1;
- The ecological importance of the RUs, linked to the flow releases for ecological purposes, where:
    - RUs with a low ecological support function were scored 0
    - RUs with a moderate ecological support function were scored 0.5
    - RUs with a high ecological support function were scored 1
- The level of threat posed to the water quality for the environment, where:
    - RUs where the level of threat is low were scored 0;
    - RUs where the threat is moderate were scored 0.5;
    - RUs where the threat was high were scored 1;
- Practical considerations, such as the existence of EWR sites and DWS gauging weirs, where:
    - RUs with no such information were given a 0;
    - RUs with a gauging weir where given a 0.5;
    - RUs with EWR sites and/or gauging weirs were given a 1;
    - RUs with poor accessibility were given a 0;
    - RUs with moderate accessibility were given a 0.5;
    - RUs with good accessibility were given a 1;
    - RUs that are unsafe to monitor were given a 0;
    - RUs with moderate safety were given a 0.5;
    - RUs with good safety were given a 1.

2.6 Wetland Resource Unit prioritisation

2.6.1 Review of the Wetland Resource Unit Prioritisation Tool (WRPT)

The procedure to develop and implement RQOs (DWA, 2011) was designed to be applied to rivers, wetlands and estuaries, and to have a similar approach for different water resources. The model comes with three variants, for the different water resources, which are essentially very similar.

The use of the standardised WRPT has proved particularly problematic for wetland resources, due to the unrealistic input data requirements and the cumbersome and time-consuming process involved in using the tool (INR, 2017). A key component of RQO methodology is the need to ensure sustainable use of large numbers of wetlands and, although various tools have been developed to facilitate management of wetlands, application at a landscape level has not been met. Thus, the approach to prioritising wetlands in this study follows the draft procedure developed as part of a Water Research Commission project, aimed at developing procedures for setting wetland RQO's (including wetland prioritisation), that is currently underway (INR 2017).

From an EWR perspective, important wetlands include those that have both ecological importance for the maintenance of biodiversity ecosystem integrity, as well as those that provide ecosystem services. In terms of ecosystem services, wetland prioritisation needs to consider both the ability of a wetland to provide services as well as the demand for such services within the catchment. These two aspects therefore define the importance of wetlands in terms of ecosystem services.

The prioritisation of Wetland RUs is done within each Wetland Region, and is based on those wetlands that have been defined as important in terms of ecological importance and for provision of ecosystem services (Figure 2.2).

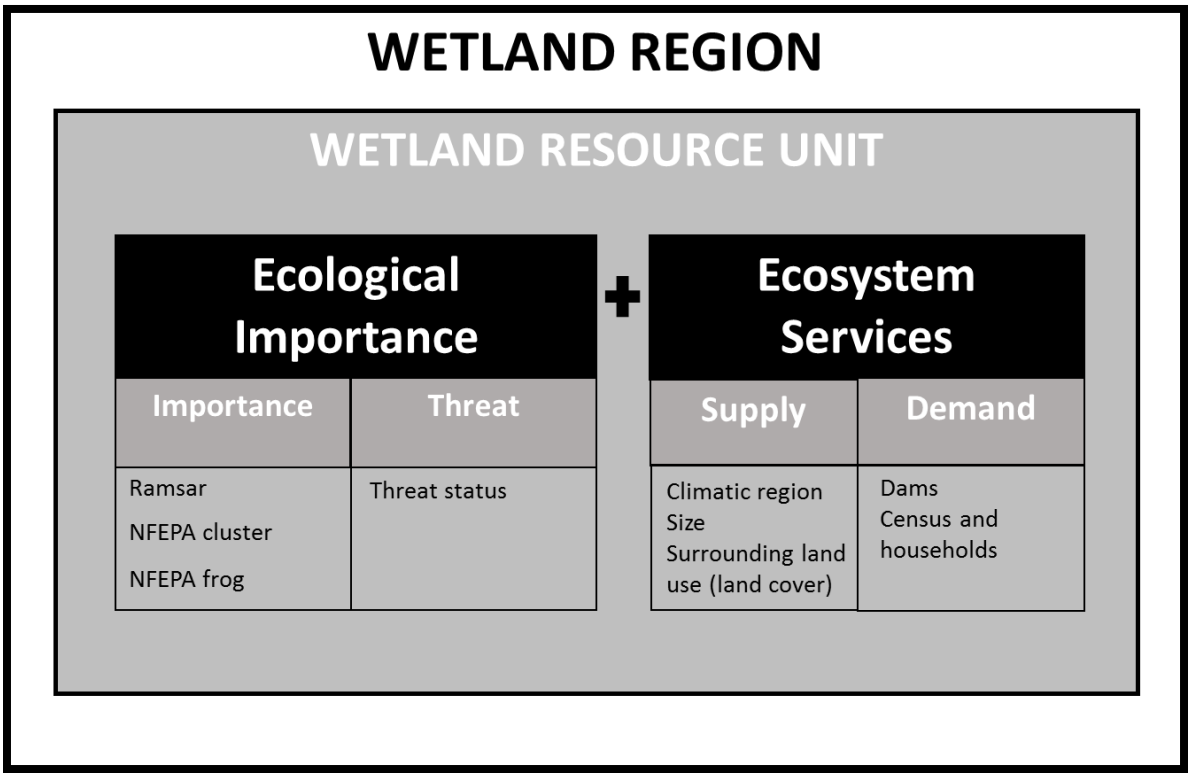

Figure 2.2 Conceptualisation of how Wetland Resource Units are nested within Wetland Regions

2.6.2 Development of a consolidated wetland map

The most up-to-date, consolidated wetland map in the Western Cape was used (Cape Nature Wetland Map, 2017). This wetland map consolidated an updated version of the NFEPA Wetlands map (NFEPA.elim.Z2) with additional land cover-derived delineations and flood modelling. These additions added an extra 85 000 ha of wetlands to the Western Cape NFEPA layer, which resulted in a wetland coverage of 300 000 ha in the Western Cape (Genevieve Pence, Cape Nature, per coms).

2.6.3 Recap of Wetland Regions

Wetland Regions in the study area were defined according to EcoRegion, which is influenced by geological and climatic controls. The hydrogeomorphic (HGM) unit, used for classification of wetland type, relates to location in the landscape; therefore, it is important to consider the Wetland Regions, as these provide an overview of the underlying controls of wetland types. As different Wetland Regions have different characteristics it is also important to maintain a representation of these Regions in the prioritisation process.

2.6.4 Ecologically Important Wetlands

The Ecological Importance of wetlands was defined in each Wetland Region. This allowed for a regional representation of ecologically important wetlands in the study area.

Methodology to define Ecological Importance of wetlands

The ecological Importance of a wetland was defined according to the presence of important frogs as defined in NFEPA, whether the wetland was a NFEPA cluster and whether the wetland was a Ramsar wetland. It was also considered important to determine whether the wetland was under threat, as these wetlands would have a higher priority in terms of requiring conservation measures. The latest NBI vegetation layer was used for this, which indicated vegetation that was considered to be under different levels of threat. Threat status was used as a means to allow for the spatial scale of the study area to be effectively represented. It

is noted that, in terms of wetlands in the study area, there is a bias towards the Breede-Overberg and coastal regions in terms of data availability. Including threat status allowed for a ranking which was relative across the whole study area. The Ecological Importance ranking was applied to each Wetland Region. The weighting of each of the spatial layers considered both ecological importance and threat status per Wetland Region (Table 2.2).

Table 2.2 Adjustment factor to account for the influence of ecological importance of the wetland

Ecological Importance	NFEPA cluster	NFEPA frogs	Ramsar	Critically endangered	Endangered	Threatened	Least Threatened
NFEPA cluster	0.25						
NFEPA frogs		0.25					
Ramsar			0.25				
Threat status				1	0.8	0.6	0

The ecological importance methodology was applied in ArcGIS. A wetland layer was created in ArcGIS by using the "union" tool for each layer. The ranking per wetland within each Wetland region was based on the cumulative value of each layer. This provided a wetland layer for ecological importance per Wetland Region.

2.6.5 Ecosystem services

Identifying supply and demand for ecosystem services broadly identifies "hotspots" for regulating and supporting services provided by wetlands across the study area. This was applied separately for the Breede-Overberg and Gouritz-Coastal regions to allow for representation.

The WET-Ecoservices tool (Kotze et al. 2007) identifies eight important regulating and supporting services provided by wetlands including flood attenuation, streamflow regulation, carbon storage and numerous water quality enhancement benefits (Table 2.3). A supply map for each of these services and demand map for two of the services was generated using desktop information. The approach to identifying wetlands that supply specific ecological services and the areas of greatest demand for such services are described below.

Table 2.3 Regulating and supporting services provided by wetlands (extracted from Kotze et al. 2007)

Regulating and supporting benefits	**Flood attenuation**		The spreading out and slowing down of floodwater in the wetland, thereby reducing the severity of floods downstream
	Streamflow regulation		Sustaining streamflow during low flow periods
	Water quality enhancement benefits	**Sediment trapping**	The trapping and retention in the wetland of sediment carried by runoff waters
		Phosphate assimilation	Removal by the wetland of phosphates carried by runoff water
		Nitrate assimilation	Removal by the wetland of nitrates carried by runoff water
		Toxicant assimilation	Removal by the wetland of toxicants (e.g. metals, biocides and salts) carried by runoff water
		Erosion control	Controlling of erosion at the wetland site, principally through the protection provided by vegetation
	Carbon storage		The trapping of carbon by the wetland, principally as soil organic matter

Methodology to define wetlands that supply ecosystem services

Climate

The first step in determining the wetlands that provide important ecosystem services are to determine the climatic region of the study area. This involved using the mean annual precipitation and Potential Evapotranspiration to define three climatic regions (Arid, Semi-arid and Humid). These different regions

have an impact on the capabilities of a wetland (under natural vegetation) to supply a range of ecosystem services.

Wetland size

The supply of ecosystem services is also dependent on wetland size and the different land uses across the catchment (represented through land cover types). In order to account for this each wetland was assigned a climatic adjustment factor. The potential supply of ecosystem services from wetlands in different climatic settings was also adjusted to its extent. A relative adjustment factor on a scale of 0 to 1 was applied with the largest wetland receiving a factor or 1 and all other wetlands receiving an adjustment factor relative to the largest wetland.

Surrounding land use

The location and extent of different land cover types may also affect the capability of a wetland to supply ecosystem services. Some land cover types, such as commercial annual crops, may occur within a wetland and considerably diminish the ecological condition of the wetland and its ability to supply certain ecosystem services (Kotze, 2016). Other land cover types may occur in the upslope catchment of a wetland with less direct impacts. The capability of a wetland to supply ecosystem services was adjusted based on the type and extent of the surrounding land covers. Generic adjustment factors which account for the influence of land cover types occurring within the wetland and in the wetland's upslope catchment were developed for seven land cover types. The adjustment factors were then multiplied by the proportional extent of identified land covers.

Strategic water source area

The Strategic Water Source Areas spatial layer was also used to determine areas in the study area which contribute to river and groundwater resources. Wetlands in Strategic Water Source Areas were given a score of "1" in the supply map.

Table 2.4 Adjustment factor to account for the influence of land-cover types occurring in the wetland on the capability of a wetland to supply the ecosystem services given in Table 2-3

Ecosystem service		Land-cover type							SWSA
		Natural	Dams	Crops	Alien trees[1]	Mining	Eroded	Urban infrastructure	
1	**Sediment trapping & Erosion control**	1.0	0.8	0.3	0.8	0.4	0.2	0.7	
2	**Phosphate, nitrate and toxicant assimilation**	1.0	0.8	0.1	0.6	0.2	0.2	0.1	
3	Flood attenuation	1.0	0.8	0.4	1.1	0.3	0.4	0.0	
4	Streamflow regulation	1.0	0.6	0.5	0.5	0.2	0.5	0.0	
5	Carbon storage	1.0	0.6	0.2	0.6	0.0	0.2	0.2	
6	Provision of water	1.0	1.1	0.2	0.2	0.0	0.4	0.0	
7	Harvestable resources	1.0	0.5	0.2	0.3	0.0	0.3	0.0	
8	Cultivated foods	0.0	0.0	1.0	0.0	0.0	0.0	0.0	
9	Strategic Water Source Area								1.0

The supply methodology was applied in ArcGIS. For the land-use related services (1-8) for each service, in each wetland, the starting scores from Table 2.4 were multiplied by the relative adjustment factor for extent. The resulting scores for each service in each wetland were adjusted to account for land-cover impacts. This entails estimating the total extent of different land cover types. The proportional extent of each land cover was multiplied by the adjustment factor for each impact. The final supply score for each service was calculated by adjusting the climatic scores by both extent and land cover impacts. This was done by multiplying the climatic score adjusted by extent by the adjustment factors for land cover impacts.

Methodology for establishing areas of greatest demand for wetland ecosystem services

The two main ecosystem services focused on in terms of demand were the demand for sediment trapping and erosion control, and water quality amelioration as these were considered to be the most important services required in the study area. The study area has many dams, which are reaching their storage capacity due to the accumulation of sediment from upstream catchments. The trapping of sediments in these upstream catchments by wetlands is therefore critical for water security in the region. Water quality amelioration is also important in urban areas where surface water resources are under pollution pressure.

In order to determine the demand for sediment avoidance it is necessary to first determine the presence of water supply dams in the study area. Quaternary catchments which have water supply dams within them were identified by using the national dam layer from DWS. All quaternary catchments that contain a dam were scored a 2. All upstream quaternary catchments were given a score of 1. All other catchments were scored a 0.

2.7 Groundwater Resource Unit prioritisation

The framework for RU prioritisation focusses on the prioritisation of river RUs (DWA, 2011). It requires a set of criteria and sub-criteria to be rated to calculate a priority rating for resource units. Therefore, a set of criteria and sub-criteria appropriate to groundwater were selected for the groundwater prioritisation process, based on available datasets and following the examples set by recent studies (specifically studies in the Olifants-Doorn and Olifants). The selected criteria and the relative points applied is shown in Table 2.5.

The criteria are summarised as:

- Importance for (human) users: groundwater is relied upon as a “sole supply source” in several areas of the WMA. This is evaluated through assessing the presence of sole-supply towns. In addition to use for domestic supply, groundwater plays an important role in supporting activities contributing to the economy (GDP, job creation) in several areas of the WMA catchment (e.g. commercial agriculture, industrial abstraction). These areas and ‘beneficiaries” were assessed by Le Maitre *et al*, 2017, and are included as sub-criteria. Lastly; strategic water source areas for groundwater have been defined, and take into account areas of high groundwater availability and high or strategic groundwater use (Le Maitre *et al*, 2017), and these areas are also included as sub-criteria.
- Level of surface water – groundwater interaction: groundwater has a variable role in supporting the environment through discharge to surface water that maintains EWRs. Where groundwater has a significant potential role in meeting EWRs, these areas are prioritised in order to protect this contribution. In addition, the presence of priority wetlands that are likely to be groundwater-fed is also included as sub-criteria.
- Threat posed to users: the various aquifers in the resource unit may be at risk of abstraction that is not maintainable, or of water quality impacts. The threat of water quality impact is taken into account in the prioritisation through the assessment of water quality data to identify medium to long-term declining trends (completed for the Status Quo phase of the project). The threat of over-abstraction is also taken into account through the assessment of water level data to identify medium to long-term declining trends. In addition, the stress index (use/recharge) under present day and under likely future conditions is used as an indication of where over-abstraction may be a risk, although this is not a definitive indicator. The future stress index is based on the recommended scenario analysis.
- Practical considerations: in order to implement and enforce RQOs, they must be measurable. The existence of current monitoring points was considered in the prioritisation criteria, although were not strongly weighted.

A challenge applying the rating shown in the table is that some of the sub-criteria refer to data that is spatially discretised below the scale of the groundwater resource unit i.e. the sub-criteria can have a spatial variability across the resource unit. However, only one rating can be applied per resource unit. The sub-criteria category which covers the largest part of the resource unit was assigned. Furthermore, a

conservative or worst case was often applied, for example if declining water level trends were noted in one part of a resource unit, but not in another, the resource unit still scored a "1" for declining water level trends.

A final score is derived for each quaternary catchment. The final resource unit prioritisation rating score (0-100, low to high) has been divided into three categories from 1 (not priority), 2 (low priority), 3 (high priority). The categories were based on the distribution of the final scores, and a cut-off value of >35.25 (out of 100) was selected as representative of high priority 3.

In addition, a handful of quaternary catchments were amended manually based on the following reasoning:

- It would be favourable to have at least one quaternary catchment per GRU prioritised for development of RQOs. Therefore, in GRUs with no quaternary catchments scoring a "3", the quaternary catchment with the highest score in that GRU was manually assigned a "3". These catchments are marked with in red "3" in Table 3.15. This was not applied where all scores in the GRU were low, i.e. there is no worth of defining RQOs.
- In some cases, a quaternary catchment was considered high priority; however, no baseline data exists against which to monitor and enforce the RQOs (existence of baseline is not considered in the prioritisation scoring). These catchments are flagged for development of narrative RQOs and establishment of baseline data with new monitoring networks.

Table 2.5 Criteria and sub-criteria used to prioritise groundwater resource units, showing the rating applied (following DWA, 2011)

Criterion	Points	Sub-criteria	Sub-criteria weight as a % of the criteria (and as Points)	Rating guidelines (equivalent to a factor)
Importance for users	25	RUs most important in supporting 'sole-supply' settlements	60 (15 points)	0 – RUs which do not support sole-supply settlements 0.5 – RUs supporting some sole-supply settlements (1-2) 1 – RUs supporting several sole-supply settlements (>2)
		RUs within strategic water source areas for groundwater (high groundwater availability & strategic use)	20 (5 points)	0 - RUs outside of SWSA-gw
				1 – RUs within SWSA-gw
		RUs most important in supporting activities contributing to economy (GDP, job creation) (e.g. commercial agriculture, industrial abstraction, bulk abstraction by water authorities)	20 (5 points)	0 – RUs which do not directly support any activities which contribute to economy [as indicated by <0.05l/s/km2] 0.5 – RUs which moderately support activities which provide a contribution to economy [as indicated by 0.05-0.1l/s/km2] 1 – RUs which significantly support activities which contribute to the economy [as indicated by >0.1l/s/km2]
Threat posed to users	30	Medium to Long-term declining trend in water or piezometric levels	35 (10.5 points)	0 – RUs where no trend is visible 0.5 – RUs where short-term trend is potentially visible, or minor 1 – RUs where long-term trend is visible, or where no data is available to assess trend
		Medium to Long-term declining trend in natural water quality	35 (10.5 points)	0 – RUs where no trend is visible 0.5 – RUs where short-term trend is potentially visible, or minor 1 – RUs where long-term trend is visible, or where no data is available to assess trend
			15 (4.5 points)	0 – RUs where stress is low (category I)

Criterion	Points	Sub-criteria	Sub-criteria weight as a % of the criteria (and as Points)	Rating guidelines (equivalent to a factor)
		Presence of high stress category (currently)		0.5 – RUs where stress is moderate (category II) 1 – RUs where stress is high (category III)
		Presence of high stress category (future)	15 (4.5 points)	0 – RUs where stress is low (category I) 0.5 – RUs where stress is moderate (category II) 1 – RUs where stress is high (category III)
Practical Considerations	15	Availability of water quality monitoring data (WMS monitoring boreholes) located within RU?	50 (7.5 points)	0 – RUs where no resource quality information exists 0.5 – RUs for which a moderate level of resource quality information exists (1-4 points) 1 – RUs for which there is a good availability of resource quality information (>4 points)
		Availability of water level monitoring data (DWA monitoring boreholes) located within RU?	50 (7.5 points)	0 – RUs where no water level information exists 0.5 – RUs for which a moderate level of water level information exists (1-4 points) 1 – RUs for which there is a good availability of water level information (>4 points)
Level of surface water – groundwater interaction	30	Relevance of groundwater contribution to maintain required low flow conditions	50 (15 points)	0 – RUs without relevant groundwater contribution (low GWBF/EWR) (GWBF/EWR < 11%) 0.5 – RUs where groundwater contribution supports low flow condition (GWBF/EWR moderate, 12-75%) 1 – RUs where groundwater contribution is crucial to maintain low flow condition (GWBF/EWR high >75%)
		Relevance of groundwater contribution to maintain priority groundwater-dependent ecology	50 (15 points)	0 – RUs without priority groundwater-dependent systems (estuaries / wetlands) 0.5 – RUs with some priority groundwater-dependent systems (estuaries / wetlands) (<200ha) 1 – RUs with significant area of groundwater-dependent systems (estuaries / wetlands) (>200ha)

3 Results

3.1 River Priority Resource Units

The relative priority of the Resource Units in the Breede River catchment and Overberg region are shown in Figure 3.1 and are listed in Table 3.1. In the map, the top ten highest priority RUs are shown in red, the next top ten in dark pink the next top ten thereafter in dark green. These together represent the 30 RUs with the highest priority in the study area. Further details for the scores assigned to rank each RU are provided in Table 3.1. Each IUA is taken in turn to explain how many high priority RUs there are per IUA and the reasons that these scored high or low. In Table 3.1 the river RUs, names in column 4, are listed in a downstream direction from source to sea and grouped per IUA, designated in column 1. The Water Resource Class and Target Ecological Condition (TEC), the outcomes of the WRCS are also shown in columns 2 and 6. The quaternary catchment in which each RU is located is provided in column 3 and the node code, if relevant, in column 4. The scores from the prioritisation tool are given in four columns (7-10); position in the IUA, concerns of users, concern for the environment and management considerations. Each of these four categories can contribute a total 0.25 to the overall score out of 1. The categories scored for each of these four main categories are described in Section 2.3.2.

The scoring of the top 30 highest ranking RUs in the Breede-Overberg and top 30 in the Gouritz-Coastal Region was as follows:

- The highest rank given to the top ten highest scoring RUs was 4 (**red** on the map).
    - These RUs will have Descriptive RQOs, numerical limits and Thresholds of Potential Concern
- The next ten highest scoring RUs were given a rank of 3 (**dark pink** on the map).
    - These RUs will have hydrological and ecological condition RQOs
- The next ten highest scoring RUs were given a rank of 2 (**dark green** on the map).
    - These RUs will have hydrological and ecological condition RQOs

Together these represent the top 30 highest scoring RUs in the study area.

- The other RUs were given a rank of 1 (**light green** on the map)
    - The RUs within conservation areas will have a table of importance for SWSA, EC, FEPAs/CBAs/ESAs and endangered fish in the RQO outline report

Breede-Overberg Region

There are two high priority RUs in the Upper Breede Tributaries ranked with 4 in the top 10; the Breede River in quaternary catchment H10F and the Molenaars River in quaternary catchment H10J. Both these scored highly, relative to the other RUs in this IUA, because they are both situated at an IUA outlet. All the other RUs here were ranked 1, being lowest priority, since they were of low importance to users, scored moderately for environmental importance, and were of low to moderate management importance.

There was one high priority RU in the Breede Working Tributaries IUA ranked 3 in the top 20; the Hex River in quaternary catchment H20G. This RU scored highly due to having important environmental and conservation importance and also scoring strongly from a management perspective. It offered limited benefit to users. Three RUS were ranked 2 with moderate priority; the Smalblaar River in quaternary catchment H10J, the Breede River in quaternary catchments H10H and H40C, The Smalblaar River scored highly from a management perspective and poorly in the other categories. The Breede River here scored moderately from both the environmental and management perspectives and relatively poorly for the users' perspective. All the other RUs here were ranked 1, being lowest priority, since they were of low importance to users, scored moderately for environmental importance, and were of low to moderate management importance.

There were two high priority RUs in the Middle Breede Renosterveld IUA; the Breede River in quaternary catchment H40F ranked 3 and the Breede River in quaternary catchment H50B, ranked 4. Both scored well from a user, environmental and management perspective but the latter also represented the outlet of an IUA, which scores the highest in the ranking system. All the other RUs here were ranked 1, being lowest

priority, since they were of low importance to users, scored moderately for environmental importance, and were of low to moderate management importance.

There were four high priority RUs in the Riviersonderend-Theewaters IUA. Three were ranked 3; the Du Toits River at quaternary catchment H60B, the Riversonderend River at quaternary catchment H60D, and the Baviaans River at quaternary catchment H60E. The former two scored equally well from a user perspective and also from an environmental and management perspective, while the latter one only scored highly from an environmental and management perspective. The other high priority RU ranked 4 was the Riviersonderend River in quaternary catchment H60F, that scored equally well from a user perspective and also from an environmental and management perspective and also was the outlet of the IUA. All the other RUs here were ranked 1, being lowest priority, since they were of low importance to users, scored moderately for environmental importance, and were of low to moderate management importance.

There was one high priority RU in the Lower Riviersonderend IUA; the Riviersonderend River in quaternary catchment H60L, the outlet of the IUA and also scoring moderately well from a user, environment and management perspective. All the other RUs here were ranked 1, being lowest priority, since they were of low importance to users, scored moderately for environmental importance, and were of low to moderate management importance.

There was one high priority RU ranked 3 in the Lower Breede Renosterveld IUA, the Breede River in quaternary catchment H70G, which scored highly from an environmental and management perspective. Four other RUs were moderately important ranked 2; the Leeu River in quaternary catchment H70A, the Klip and Breede Rivers in quaternary catchment H70B and the Slang River in quaternary catchment H70J. All these RUs scored highly from an environmental and management perspective while the Breede River in quaternary catchments H70B and H70G also scored moderately well from a user's perspective. All the other RUs here were ranked 1, being lowest priority, since they were of low importance to users, scored moderately for environmental importance, and were of low to moderate management importance.

There were three high priority RUs in the Overberg West IUA; all on the Palmiet River in quaternary catchments G40C and G40D, the former scoring highly from an environmental and management perspective and the latter also scoring highly being the outlet of an IUA and but important from a user perspective. There was also one moderately important RU, the Krom/Ribbok River in quaternary catchment G40D that scored highly from a management perspective. All the other RUs here were ranked 1, being lowest priority, since they were of low importance to users, scored moderately for environmental importance, and were of low to moderate management importance.

There was one moderately important RU in the Overberg West Coastal IUA, the Bot River in quaternary catchment G40E, which scored moderately well from a user, environment and management perspective. All the other RUs here were ranked 1, being lowest priority, since they were of low importance to users, scored moderately for environmental importance, and were of low to moderate management importance.

There were five high priority RUs in the Overberg East Fynbos IUA, the Nuwejaaars River in quaternary catchment G50B, the Heuningnes River in quaternary catchment G50C, which is estuarine in character, and the Kars River in quaternary catchments G50D and G50E, the latter which are also estuarine in character. The Nuwejaars River and the Kars in quaternary catchment G50D were both IUA outlets but the Kars and Heuningnes Rivers also scored well from a management perspective. All the other RUs here were ranked 1, being lowest priority, since they were of low importance to users, scored moderately for environmental importance, and were of low to moderate management importance.

There was one high priority RU in the Overberg East Renosterveld IUA, the Klein River in quaternary catchment G40K, that scored highly being the outlet of the IUA but also from an environmental and management perspective. There was one moderately important RU, the Hartbees River in quaternary catchment G40J, the scored well from a management perspective, All the other RUs here were ranked 1, being lowest priority, since they were of low importance to users, scored moderately for environmental importance, and were of low to moderate management importance.

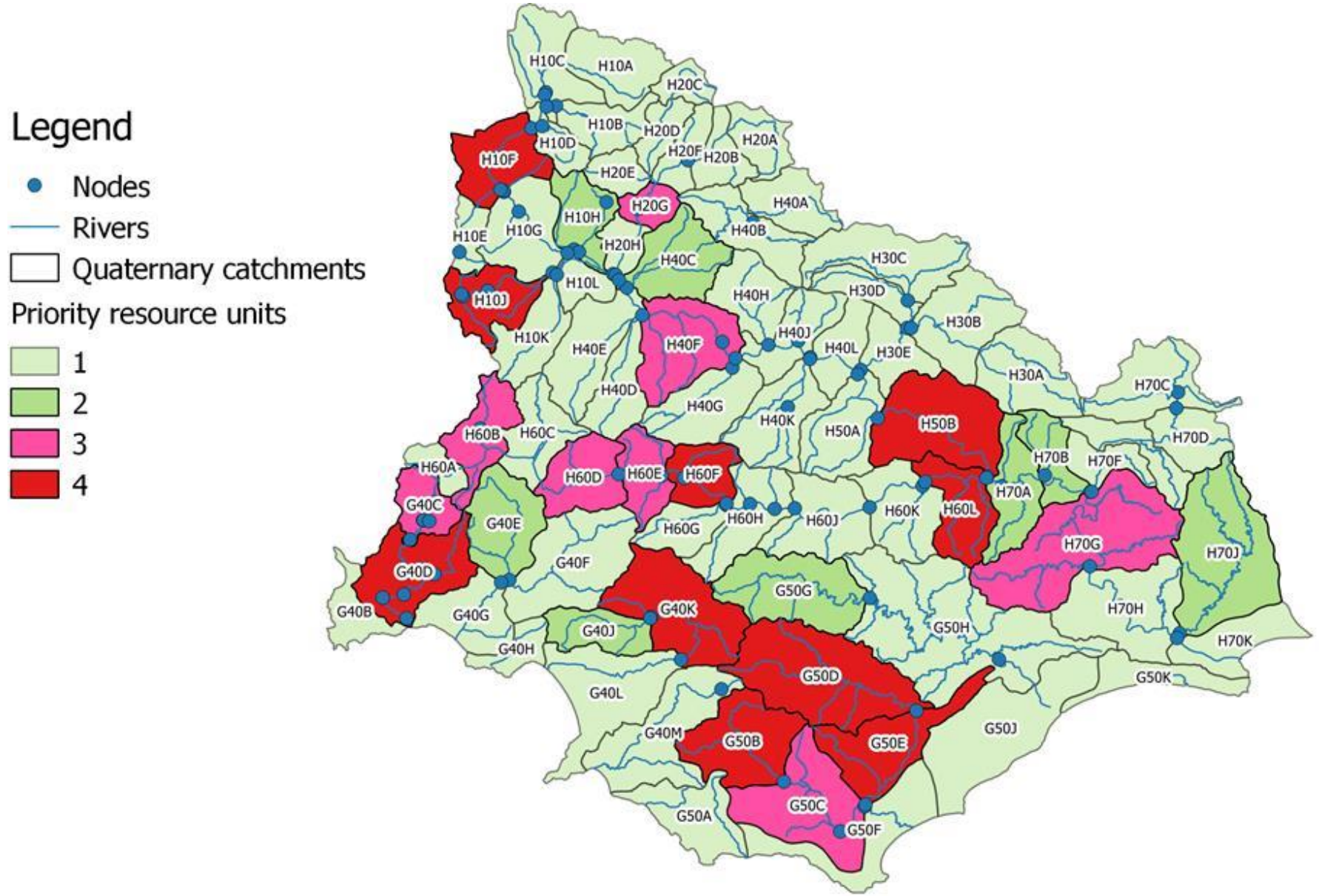

Figure 3.1 Priority River Resource Units in the Breede River catchment and the Overberg region

Table 3.1 Results of the river Resource Units prioritisation exercise showing ranked RUs in the Breede River catchment and Overberg region

IUA	Water Resource Class	Quat #	Node	River	TEC	Position	Users	Environment	Management	Score	Rank	Description
A1 Upper Breede Tributaries	II	H10A	-	Modder	-	0.00	0.00	0.01	0.05	0.06	1	
		H10B	niv3	Titus	C	0.00	0.00	0.04	0.08	0.12	1	
		H10C	niv1	Koekedou	D	0.00	0.00	0.03	0.08	0.11	1	
		H10C	niv2	Dwars	C	0.00	0.00	0.08	0.10	0.18	1	
		H10C	nvi4	Breede	C	0.00	0.02	0.01	0.10	0.13	1	
		H10D	niv4	Witels	A	0.00	0.02	0.09	0.08	0.19	1	
		H10D	nvi3	Breede	C	0.00	0.03	0.09	0.10	0.22	1	
		H10E	nvii16	Witte	A	0.00	0.03	0.09	0.08	0.20	1	
		H10F	niv5	Witte	A	0.00	0.01	0.13	0.10	0.24	1	
		H10F	niv6	Wabooms	D	0.00	0.00	0.05	0.08	0.12	1	
		H10F	nviii1	Breede	D/E	0.25	0.07	0.08	0.25	0.65	4	IUA outlet
		H10J	niv40	Elands	B	0.00	0.02	0.11	0.10	0.23	1	
		H10J	niv41	Krom	B	0.00	0.02	0.11	0.08	0.20	1	
		H10J	nvii2	Molenaars	B	0.25	0.02	0.10	0.13	0.49	4	IUA outlet
A2 Breede Working Tributaries	III	H10G	niv7	Slanghoek	D	0.00	0.00	0.03	0.10	0.13	1	
		H10G	niii1	Breede	D	0.00	0.00	0.06	0.08	0.14	1	
		H10J	niv42	Smalblaar	E	0.00	0.00	0.03	0.23	0.26	2	
		H10H	niv8	Jan du Toit	D	0.00	0.02	0.09	0.08	0.19	1	
		H10H	nvii6	Hartbees	D	0.00	0.02	0.08	0.10	0.20	1	
		H10H	niv9	Hartbees	D	0.00	0.02	0.08	0.08	0.17	1	
		H10K	niv12	Holsloot	C	0.00	0.01	0.03	0.10	0.14	1	
		H10H	nv3	Breede	C	0.00	0.06	0.11	0.10	0.27	2	
		H10L	-	Holsloot	-	0.00	0.05	0.03	0.10	0.18	1	
		H20A	-	Hex	-	0.00	0.02	0.04	0.04	0.10	1	
		H20B	-	Hex	-	0.00	0.02	0.04	0.04	0.10	1	
		H20C	-	Spek	-	0.00	0.02	0.08	0.03	0.13	1	
		H20D	-	Spek	-	0.00	0.02	0.08	0.03	0.13	1	
		H20E	-	Amandel	-	0.00	0.02	0.08	0.00	0.10	1	
		H20F	nv18	Hex	D/E	0.00	0.00	0.03	0.08	0.11	1	
		H20G	nvii7	Hex	C	0.00	0.06	0.13	0.13	0.31	3	Management and environmental importance
		H20H	niv10	Hex	D	0.00	0.01	0.06	0.08	0.15	1	
		H40A	-	Die Brak	-	0.00	0.02	0.04	0.01	0.08	1	
		H40C	nii1	Breede	C	0.00	0.06	0.10	0.10	0.26	2	
		H40B	nvii5	Koo	D	0.00	0.00	0.06	0.10	0.17	1	
		H40C	niv11	Nuy	E	0.00	0.00	0.01	0.23	0.24	1	
		H30A	-	Groot	-	0.00	0.02	0.03	0.06	0.12	1	
		H30B	niv18	Kingna	D	0.00	0.00	0.01	0.10	0.11	1	
		H30C	niv20	Pietersfontein	D	0.00	0.00	0.03	0.08	0.11	1	
		H30D	nvii9	Keisie	D	0.00	0.02	0.03	0.08	0.12	1	

IUA	Water Resource Class	Quat #	Node	River	TEC	Position	Users	Environment	Management	Score	Rank	Description
A3 Middle Breede Renosterveld	III	H40D	niv13	Doring	E	0.00	0.00	0.03	0.20	0.23	1	
		H40E	-	Hoeks	-	0.00	0.02	0.03	0.09	0.15	1	
		H40F	nvii8	Breede	D	0.00	0.09	0.08	0.13	0.29	3	User, management and environmental importance
		H40F	ni1	Breede	B	0.00	0.01	0.05	0.08	0.13	1	
		H40G	nvii11	Poesjenels	D	0.00	0.00	0.01	0.10	0.11	1	
		H40H	niv15	Vink	D	0.00	0.00	0.03	0.10	0.13	1	
		H40J	nviii2	Willem Nels	D	0.00	0.00	0.01	0.08	0.09	1	
		H40J	nvii19	Breede	B	0.00	0.08	0.09	0.08	0.25	1	
		H40K	nvii12	Keisers	D	0.00	0.00	0.03	0.10	0.13	1	
		H40K	niv14	Keisers	D	0.00	0.00	0.03	0.10	0.13	1	
		H40L	nvi1	Breede	D	0.00	0.00	0.01	0.08	0.09	1	
		H30E	nii2	Kogmanskloof	D	0.00	0.02	0.09	0.08	0.18	1	
		H50A	niii3	Breede	D	0.00	0.08	0.08	0.08	0.23	1	
		H50B	ni2	Breede	D	0.25	0.08	0.11	0.10	0.54	4	IUA outlet
B4 Riviersonderend Theewaterskloof	III	H60A	-	Riviersondered	-	0.00	0.02	0.05	0.05	0.12	1	
		H60B	nvii10	Du Toits	B	0.00	0.12	0.09	0.10	0.31	3	User, management and environmental importance
		H60C	-	Elands	-	0.00	0.09	0.08	0.09	0.25	1	
		H60D	nv7	Riviersonderend	C	0.00	0.13	0.12	0.08	0.34	3	User, management and environmental importance
		H60E	niv28	Baviaans	B	0.00	0.02	0.11	0.13	0.28	3	Management and environmental importance
		H60E	niv29	Sersants	D	0.00	0.00	0.01	0.08	0.09	1	
		H60F	niv30	Gobos	C	0.00	0.00	0.09	0.08	0.17	1	
		H60F	nv9	Riviersonderend	D	0.25	0.13	0.11	0.13	0.62	4	IUA outlet
F9 Lower Riviersonderend	III	H60G	niv31	Kwartel	D	0.00	0.00	0.05	0.08	0.12	1	
		H60H	niv33	Soetmelksvlei	D	0.00	0.00	0.08	0.08	0.16	1	
		H60H	niv34	Slang	D	0.00	0.00	0.03	0.08	0.10	1	
		H60H	nv10	Riviersonderend	D	0.00	0.01	0.12	0.08	0.21	1	
		H60J	nv11	Riviersonderend	D	0.00	0.01	0.12	0.08	0.21	1	
		H60K	niv35	Kwassadie	E	0.00	0.00	0.03	0.20	0.23	1	
		H60K	nv12	Riviersonderend	D	0.00	0.01	0.11	0.10	0.22	1	
		H60L	ni3	Riviersonderend	D	0.25	0.07	0.11	0.08	0.51	4	IUA outlet
B5 Overberg West	II	G40C	piii1	Palmiet	C	0.00	0.05	0.13	0.13	0.30	3	Management and environmental importance
		G40C	piv10	Witklippieskloof	D	0.00	0.04	0.01	0.17	0.22	1	
		G40C	piv9	Palmiet	D	0.00	0.04	0.06	0.13	0.23	1	
		G40C	pvi1	Palmiet	D	0.00	0.04	0.06	0.13	0.23	1	
		G40C	piv8	Klipdrif	D	0.00	0.04	0.01	0.17	0.22	1	
		G40D	piv4	Klein-Palmiet	D	0.00	0.04	0.06	0.14	0.24	1	
		G40D	piv7	Krom/Ribbok	D	0.00	0.04	0.08	0.14	0.26	2	

IUA	Water Resource Class	Quat #	Node	River	TEC	Position	Users	Environment	Management	Score	Rank	Description
		G40D	piii2	Palmiet	B/C	0.00	0.05	0.16	0.13	0.33	3	Management and environmental importance
		G40D	piv12	Dwars/Louws	C	0.00	0.05	0.09	0.08	0.22	1	
		G40D	piii3	Palmiet	B	0.25	0.17	0.23	0.13	0.78	4	IUA outlet
H16 Overberg West Coastal	II	G40F	niv43	Swart	E	0.00	0.01	0.01	0.20	0.23	1	
		G40G	-	Bot	-	0.00	0.05	0.03	0.07	0.15	1	
		G40B	-	Rooiels	-	0.00	0.05	0.06	0.07	0.18	1	
		G40E	niii5	Bot	C	0.00	0.09	0.09	0.10	0.28	2	
F10 Overberg East Renosterveld	II	G40J	nii4	Hartbees	D	0.00	0.00	0.06	0.20	0.26	2	
		G40K	niv45	Steenbok	E	0.00	0.00	0.03	0.20	0.23	1	
		G40K	nv23	Klein	C/D	0.25	0.09	0.11	0.13	0.58	4	IUA outlet
		G50G	nii6	Sout	D	0.00	0.00	0.03	0.19	0.22	1	
		G50H	nii7	DeHoopVlei	B	0.00	0.01	0.10	0.05	0.15	1	
H17 Overberg East Fynbos	III	G40H	-	Onrus	-	0.00	0.03	0.03	0.18	0.24	1	
		G40L	-	Klein	-	0.00	0.02	0.03	0.08	0.14	1	
		G40M	nx8	Uilkraal	C	0.00	0.00	0.06	0.08	0.14	1	
		G50A	-	Ratel/Haelkraal	-	0.00	0.02	0.05	0.04	0.11	1	
		G50B	ni4	Nuwejaar	D	0.25	0.01	0.06	0.08	0.40	4	IUA outlet
		G50C	nvii15	Heuningnes	D	0.00	0.03	0.06	0.20	0.29	3	Estuarine, management
		G50C	niv44	Heuningnes	D	0.00	0.02	0.08	0.25	0.34	3	Estuarine, management
		G50D	nv24	Kars	B/C	0.25	0.01	0.08	0.25	0.59	4	IUA outlet
		G50E	nii5	Kars	E	0.00	0.07	0.12	0.20	0.40	4	Estuarine, management
		G50F	-	*Heuningnes estuary*	-	0.00	0.00	0.00	0.00	0.00	1	
		G50J	-	*De Hoopvlei*	-	0.00	0.00	0.00	0.00	0.00	1	
		G50K	-	Klipdrifsfontein	-	0.00	0.02	0.08	0.04	0.14	1	
F11 Lower Breede Renosterveld	III	H70A	niv24	Leeu	E	0.00	0.00	0.08	0.20	0.28	2	
		H70B	niv24a	Klip	E	0.00	0.00	0.08	0.20	0.28	2	
		H70B	nv2	Breede	C	0.00	0.09	0.11	0.08	0.27	2	
		H70C	nvii14	Huis	C	0.00	0.00	0.08	0.10	0.18	1	
		H70C	nii3	Tradouw	B	0.00	0.01	0.06	0.08	0.14	1	
		H70D	-	Grootvadersbos	-	0.00	0.02	0.03	0.09	0.14	1	
		H70E	-	Uilshoek	-	0.00	0.02	0.03	0.07	0.12	1	
		H70F	niv25	Buffeljags	E	0.00	0.00	0.03	0.20	0.23	1	
		H70G	niii4	Breede	C	0.00	0.05	0.14	0.13	0.32	3	Management and environmental importance
		H70H	nviii3	Breede	B/C	0.00	0.01	0.15	0.08	0.23	1	
		H70J	niv26	Slang	E	0.00	0.00	0.06	0.20	0.27	2	
		H70K	-	*Breede estuary*	-	0.00	0.00	0.00	0.00	0.00	1	

Gouritz-Coastal Region

There were five high priority RUs in the Touws IUA; the Doring and Touws River in quaternary catchment J12L and the Groot River in quaternary catchment J13C, all ranked 3, the Buffels River in quaternary catchment J11H and the Groot River in quaternary catchment J11J, both ranked 4. The Doring River scored high for environmental and management purposes while the Touws scored relatively well in the user's category too. The Buffels and the Groot River in quaternary J11J scored well from a user, environment and management perspective while the Groot River in quaternary catchment J13C scored highly being the outlet of the IUA and poorly in the other categories. All the other RUs here were ranked 1, being lowest priority, since they were of low importance to users, scored moderately for environmental importance, and were of low to moderate management importance.

There was one moderately important RU in the Gamka-Buffels IUA, the Geelbeck and Hartbeespruit Rivers in quaternary catchment J11G, which scored highly from a user and an environment's perspective. All the other RUs here were ranked 1, being lowest priority, since they were of low importance to users, scored moderately for environmental importance, and were of low to moderate management importance.

There were four high priority RUs in the Gamka-Olifants and Lower Gouritz IUAs; the Gamka River in quaternary catchment J25A ranked 3, the Olifants River in quaternary catchment J31C ranked 4, the Kammanassie River in quaternary catchment J34C ranked 3 and the Gouritz River in quaternary catchment J40B ranked 4. There was one moderately important RU here, the Gouritz River in quaternary catchment J40D. All the high priority RUs were similar in that they scored highly from an environmental and management perspective and moderately well from a user's perspective. The Gouritz in quaternary catchment J40B scored additionally for being the outlet of the IUA. The other Gouritz quaternary catchment J40D scored moderately well from a management, environmental and user's perspective. All the other RUs here were ranked 1, being lowest priority, since they were of low importance to users, scored moderately for environmental importance, and were of low to moderate management importance.

There are two high priority RUs in the Duiwenhoks-Hessequa IUA; the Duiwenhoks River in quaternary catchment H80D and the Goukou River in quaternary catchment H90A. There was also one moderately important RU on the Duiwenhoks River in quaternary catchment H80B. The moderately important Duiwenhoks in quaternary catchment H80B scored highly from a management perspective but poorly in the other categories. The lower Duiwenhoks River in quaternary catchment H80D scored most for being the outlet of the IUA but also well in the environmental and management perspective. The Goukou River in quaternary catchment H90A scored highly from a user's and a management perspective and moderately well from an environmental perspective. All the other RUs here were ranked 1, being lowest priority, since they were of low importance to users, scored moderately for environmental importance, and were of low to moderate management importance.

There was one high priority and one moderately important RU in the Groot Brak IUA; the former being the Groot-Brak River in quaternary catchment K20A and the latter the Moordkuil River in quaternary catchment K10E. The Groot Brak River scored high from an environmental and management perspective and moderately well from a user's point of view. The Moordkuil scored highly from an environmental and management perspective. All the other RUs here were ranked 1, being lowest priority, since they were of low importance to users, scored moderately for environmental importance, and were of low to moderate management importance.

There were eight high priority RUs in the Coastal IUA and six moderately important RUs. The high priority RUs were; the Malgas River in quaternary catchment K30B, the Kaaimans River in quaternary catchment K30C, the Diep River in quaternary catchment K40A, the Karatara River in quaternary catchment K40C, the Goukamma River in quaternary catchment K40E, the Knysna River in quaternary catchment K50A, the Gouna River in quaternary catchment K50B and the Keurbooms River in quaternary catchment K60C, The Kaaimans, Diep, Karatara, Goukamma, Gouna and Keurbooms Rivers all scored highly from an environmental and management perspective and well from a user's perspective; all were ranked 4. The Malgas and Knysna Rivers also scored highly from an environmental and management perspective and moderately so from a user's perspective; both were ranked 3. The moderately important RUs were Gwaing River in quaternary catchment K30B, the Touws River in quaternary catchment K30D, the Hoekraal River in quaternary catchment K40B, the Karatara River in quaternary catchment K40C, the Palmiet River in quaternary catchment K60D and the

Bloukrans River in quaternary catchment K70B. The Gwaing scored highly from a management perspective and moderately from a user's perspective. The Touws, Hoekraal, Karatara, Palmiet and Bloukrans Rivers all scored highly from an environmental perspective, moderately from a management perspective and less well from a user's perspective.

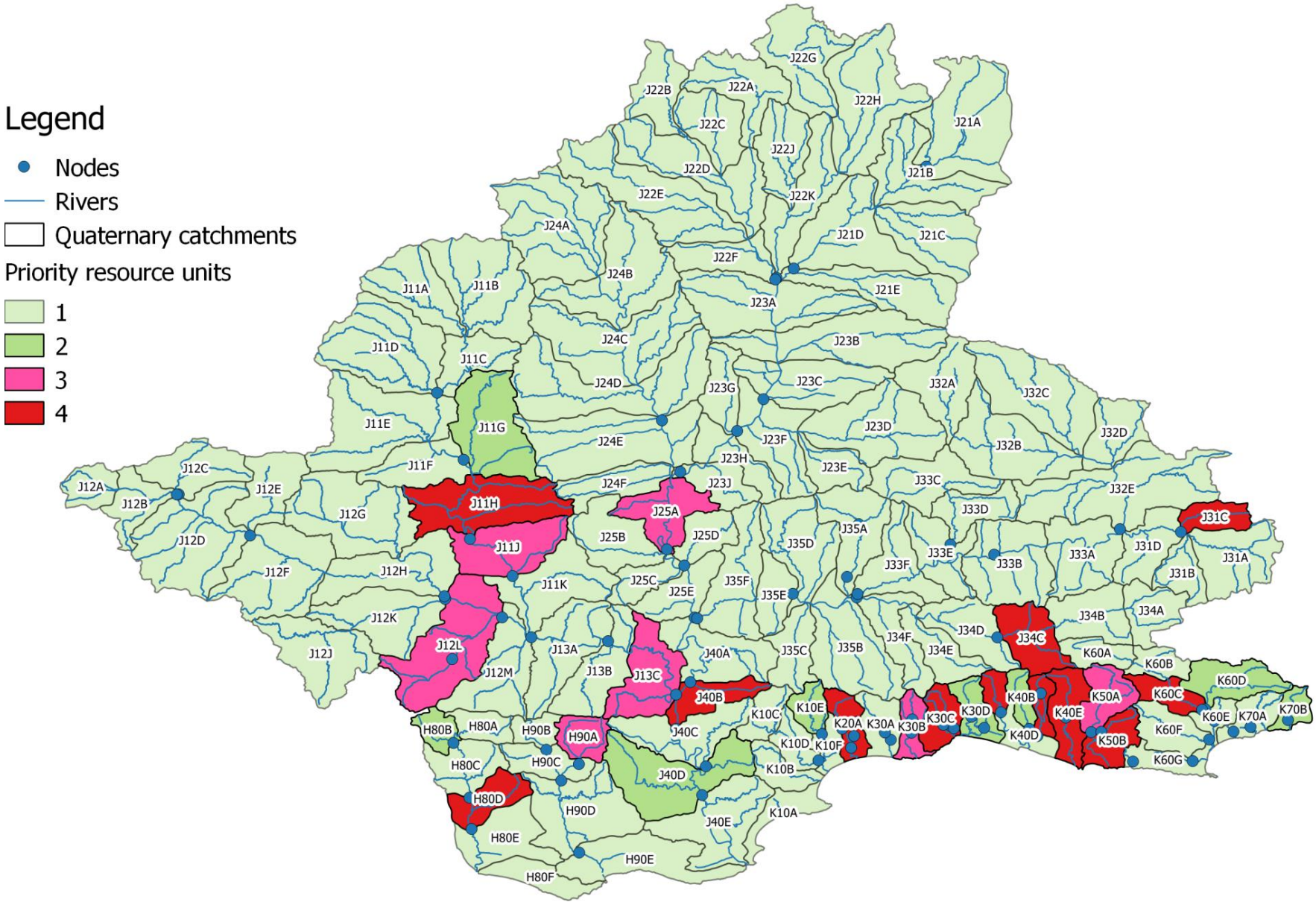

Figure 3.2 Priority River Resource Units in the Gouritz River basin and the Coastal region

Table 3.2 Results of the river Resource Units prioritisation exercise showing ranked RUs in the Gouritz River basin and the Coastal region

IUA	Water Resource Class	Quat #	Node	River	TEC	Position	Users	Environment	Management	Score	Rank	Description
C6 Gamka Buffels	II	J11A	-	Buffels	-	0.00	0.09	0.12	0.04	0.25	1	
		J11B	-	Koringplaas	-	0.00	0.09	0.13	0.04	0.25	1	
		J11C	giv34	Buffels	A	0.00	0.02	0.06	0.08	0.16	1	
		J11D	-	Roggeveld	-	0.00	0.09	0.11	0.04	0.23	1	
		J11E	-	Wilgehout/Baviaans	-	0.00	0.09	0.11	0.06	0.26	1	
		J11F	gv25	Buffels	C	0.00	0.02	0.05	0.10	0.17	1	
		J11G	-	Geelbek/Hartbeespruit	-	0.00	0.10	0.13	0.06	0.29	2	
		J21A	gv18	Gamka	B	0.00	0.00	0.06	0.08	0.14	1	
		J21B	-	Gamka	-	0.00	0.02	0.11	0.04	0.17	1	
		J21C	-	Put/Plaatjites	-	0.00	0.02	0.12	0.04	0.18	1	
		J21D	giv3	Gamka	B	0.00	0.00	0.08	0.08	0.16	1	
		J21E	-	Veldmans	-	0.00	0.02	0.12	0.04	0.18	1	
		J22A	-	Koekemoers	-	0.00	0.02	0.11	0.04	0.17	1	
		J22B	-	Teekloof	-	0.00	0.02	0.12	0.04	0.18	1	
		J22C	-	Waaikraal	-	0.00	0.02	0.12	0.04	0.18	1	
		J22D	-	Viskuil	-	0.00	0.02	0.14	0.04	0.20	1	
		J22E	-	Puts/Rietpoort	-	0.00	0.02	0.13	0.04	0.19	1	
		J22F	giv1	Koekemoers	C	0.00	0.00	0.08	0.08	0.16	1	
		J22G	-	Leeu/Paalhuis	-	0.00	0.02	0.14	0.04	0.20	1	
		J22H	-	Sand/Doringhoek	-	0.00	0.02	0.14	0.04	0.20	1	
		J22J	-	Hottentots	-	0.00	0.02	0.15	0.04	0.22	1	
		J22K	giv2	Leeu	C	0.00	0.00	0.08	0.10	0.18	1	
		J23A	-	Saai/Klip	-	0.00	0.02	0.13	0.06	0.21	1	
		J23B	-	Groot	-	0.00	0.02	0.12	0.04	0.19	1	
		J23C	gv17	Gamka	B	0.00	0.00	0.08	0.10	0.18	1	
		J23D	-	Sand	-	0.00	0.02	0.12	0.04	0.19	1	
		J23E	-	Cordiers/Gang se Leegte	-	0.00	0.02	0.14	0.04	0.22	1	
		J23F	giv21	Gamka	B	0.00	0.00	0.05	0.08	0.12	1	
		J23G	-	Kat	-	0.00	0.02	0.11	0.04	0.17	1	

IUA	Water Resource Class	Quat #	Node	River	TEC	Position	Users	Environment	Management	Score	Rank	Description
		J23H	-	Dewits	-	0.00	0.02	0.14	0.04	0.20	1	
		J23J	gv27	Gamka	C	0.00	0.02	0.06	0.08	0.17	1	
		J24A	-	Dwyka	-	0.00	0.02	0.12	0.04	0.19	1	
		J24B	-	Wolwefontein	-	0.00	0.02	0.14	0.04	0.20	1	
		J24C	-	Perdelaagte	-	0.00	0.02	0.15	0.04	0.22	1	
		J24D	gv14	Dwyka	A	0.00	0.02	0.09	0.08	0.20	1	
		J24E	-	Kerks/Jakkals	-	0.00	0.02	0.14	0.04	0.20	1	
		J24F	-	Elandskloof/Bosluiskloof	-	0.00	0.02	0.15	0.04	0.23	1	
E8 Touws	III	J12A	-	Smalblaar	-	0.00	0.05	0.03	0.06	0.15	1	
		J12C	giv30	Ysterdams	D	0.00	0.00	0.01	0.10	0.11	1	
		J12B	giv31	Donkies	D	0.00	0.00	0.00	0.08	0.08	1	
		J12D	giv28	Touws	D	0.00	0.00	0.05	0.08	0.12	1	
		J12E	-	Kragga	-	0.00	0.02	0.03	0.04	0.09	1	
		J12F	-	Kruis	-	0.00	0.03	0.05	0.04	0.12	1	
		J12G	-	Elandskloof	-	0.00	0.03	0.05	0.04	0.12	1	
		J12H	giv27	Touws	B	0.00	0.00	0.05	0.08	0.13	1	
		J12J	-	Gatkraal se	-	0.00	0.03	0.01	0.06	0.11	1	
		J12K	giv26	Brak	C	0.00	0.00	0.05	0.08	0.12	1	
		J12L	gviii1	Doring	C/D	0.00	0.02	0.16	0.13	0.30	3	Management and environmental importance
		J12L	gv5	Touws	B/C	0.00	0.07	0.11	0.13	0.31	3	Users, management and environmental importance
		J12M	-	Brandwag	-	0.00	0.03	0.06	0.06	0.15	1	
		J11H	gv4	Buffels	C	0.00	0.09	0.13	0.13	0.34	4	IUA outlet
		J11J	gv6	Groot	D	0.00	0.09	0.13	0.13	0.34	3	Users, management and environmental importance
		J11K	giv32	Groot	D	0.00	0.00	0.11	0.10	0.21	1	
		J13A	gv7	Groot	C	0.00	0.01	0.13	0.10	0.24	1	
		J13B	-	Derde/Bos	-	0.00	0.02	0.08	0.06	0.16	1	
		J13C	gii3	Groot	B	0.25	0.00	0.06	0.00	0.31	3	IUA outlet

IUA	Water Resource Class	Quat #	Node	River	TEC	Position	Users	Environment	Management	Score	Rank	Description
D7 Gouritz-Olifants	III	J25A	giv20	Gamka	C	0.00	0.06	0.16	0.13	0.34	3	Management and environmental importance
		J25B	-	Kobus	-	0.00	0.02	0.09	0.04	0.16	1	
		J25C	-	Taais	-	0.00	0.02	0.14	0.04	0.20	1	
		J25D	giv18	Nels	E	0.00	0.00	0.03	0.10	0.13	1	
		J25E	gii2	Gamka	C	0.00	0.01	0.06	0.10	0.17	1	
		J31A	-	Olifants	-	0.00	0.02	0.05	0.04	0.11	1	
		J31B	-	Hartbees/Nouga	-	0.00	0.02	0.05	0.04	0.11	1	
		J31C	giii2	Olifants	C	0.00	0.09	0.14	0.13	0.35	4	Management and environmental importance
		J31D	-	Olifants	-	0.00	0.02	0.03	0.04	0.09	1	
		J32A	-	Traka	-	0.00	0.02	0.11	0.06	0.19	1	
		J32B	-	Traka	-	0.00	0.02	0.11	0.04	0.17	1	
		J32C	-	Kouka	-	0.00	0.02	0.11	0.04	0.17	1	
		J32D	-	Soetendalsvlei	-	0.00	0.02	0.09	0.04	0.15	1	
		J32E	giv15	Traka	C/D	0.00	0.00	0.06	0.10	0.17	1	
		J33A	-	Wilge	-	0.00	0.02	0.13	0.06	0.21	1	
		J33B	gv33	Olifants	D	0.00	0.09	0.06	0.08	0.23	1	
		J33C	-	Aaps	-	0.00	0.02	0.14	0.06	0.23	1	
		J33D	gv21	Meirings	C	0.00	0.00	0.08	0.10	0.18	1	
		J33E	-	Nels	-	0.00	0.02	0.08	0.04	0.14	1	
		J33F	giv11	Olifants	E	0.00	0.06	0.00	0.20	0.26	1	
		J34A	-	Holdrif	-	0.00	0.02	0.11	0.04	0.17	1	
		J34B	-	Kammanassie	-	0.00	0.02	0.04	0.04	0.11	1	
		J34C	gv36	Kammanassie	C/D	0.00	0.05	0.12	0.13	0.30	3	Management and environmental importance
		J34D	-	Kammanassie	-	0.00	0.02	0.11	0.04	0.17	1	
		J34E	-	Brak	-	0.00	0.02	0.03	0.04	0.09	1	
		J34F	giv10	Kammanassie	D	0.00	0.00	0.06	0.19	0.25	1	
		J35A	gvii2	Grobbelaars	C	0.00	0.00	0.06	0.10	0.16	1	
		J35A	giv9	Grobbelaars	E	0.00	0.02	0.03	0.20	0.25	1	
		J35B	-	Kandelaars	-	0.00	0.02	0.11	0.06	0.20	1	

IUA	Water Resource Class	Quat #	Node	River	TEC	Position	Users	Environment	Management	Score	Rank	Description
		J35C	-	Moeras	-	0.00	0.01	0.03	0.04	0.08	1	
		J35D	gv19	Olifants	E	0.00	0.01	0.01	0.20	0.23	1	
		J35E	-	Olifants	-	0.00	0.01	0.01	0.16	0.19	1	
		J35F	giv17	Olifants	D	0.00	0.01	0.05	0.10	0.16	1	
		J40A	giv16	Gouritz	C	0.00	0.02	0.03	0.08	0.13	1	
F13 Lower Gouritz	II	J40B	gi4	Gouritz	C	0.25	0.03	0.14	0.13	0.55	4	IUA outlet
		J40C	gv28	Gouritz	D	0.00	0.02	0.13	0.08	0.22	1	
		J40D	gv9	Gouritz	C	0.00	0.10	0.11	0.08	0.29	2	
		J40E	-	Gouritz	-	0.00	0.03	0.13	0.06	0.22	1	
F12 Duiwenhoks	III	H80A	-	Duiwenhoks	-	0.00	0.02	0.12	0.06	0.21	1	
		H80B	giii5	Duiwenhoks	E	0.00	0.00	0.05	0.23	0.28	2	
		H80C	gv11	Duiwenhoks	D	0.00	0.00	0.06	0.08	0.14	1	
		H80D	giii8	Duiwenhoks	D	0.25	0.02	0.08	0.13	0.48	4	IUA outlet
		H80E	-	Duiwenhoks	-	0.00	0.02	0.11	0.06	0.19	1	
		H90B	giii6	Korinte	D	0.00	0.00	0.14	0.10	0.24	1	
		H90A	giii7	Goukou	C/D	0.00	0.14	0.06	0.13	0.33	3	User and management
		H90C	gv10	Goukou	D	0.00	0.01	0.05	0.08	0.13	1	
		H90D	gv41	Goukou	C	0.00	0.01	0.05	0.10	0.16	1	
I18 Hessequa	III	H80F	-	*Coastal none*	-	0.00	0.00	0.00	0.00	0.00	1	
		H90E	-	9364	-	0.00	0.02	0.11	0.06	0.20	1	
G14 Groot-Brak	III	K10A	-	*Coastal none*	-	0.00	0.00	0.00	0.00	0.00	1	
		K10B	-	Hartenbos	-	0.00	0.02	0.03	0.06	0.12	1	
		K10C	-	Kouma	-	0.00	0.03	0.03	0.04	0.10	1	
		K10D	giv25	Brandwag	D	0.00	0.02	0.11	0.10	0.23	1	
		K10E	gv39	Moordkuil	D	0.00	0.02	0.13	0.13	0.28	2	
		K10F	-	Moordkuil	-	0.00	0.02	0.03	0.06	0.12	1	
		K20A	gviii2	Groot-Brak	B/C	0.00	0.08	0.14	0.13	0.34	3	Management and environmental importance
		K20A	gviii12	Varing	C/D	0.00	0.08	0.03	0.13	0.24	1	
		K20A	gviii3	Varing	D	0.00	0.08	0.06	0.13	0.26	1	
		K20A	gvii7	Groot-Brak	B/C	0.00	0.02	0.14	0.10	0.26	1	

IUA	Water Resource Class	Quat #	Node	River	TEC	Position	Users	Environment	Management	Score	Rank	Description
G15 Coastal	II	K30A	gviii4	Maalgate	D	0.00	0.00	0.09	0.10	0.19	1	
		K30A	gvii8	Maalgate	D	0.00	0.09	0.09	0.13	0.24	1	
		K30B	gvii9	Malgas	C	0.00	0.06	0.12	0.13	0.31	3	Management and environmental importance
		K30B	gviii6	Gwaing	E	0.00	0.09	0.00	0.19	0.27	2	
		K30C	gviii7	Swart	D	0.00	0.02	0.11	0.13	0.26	1	
		K30C	gvii11	Kaaimans	B	0.00	0.09	0.16	0.13	0.37	4	Management and environmental importance
		K30C	gviii8	Silver	B	0.00	0.00	0.16	0.08	0.23	1	
		K30D	gvii12	Touws	B	0.00	0.02	0.17	0.10	0.30	2	
		K30D	gx8	Klein	C	0.00	0.02	0.13	0.08	0.23	1	
		K40A	giii10	Diep	E	0.00	0.09	0.14	0.13	0.35	4	Management and environmental importance
		K40B	giii13	Hoekraal	B	0.00	0.03	0.16	0.10	0.29	2	
		K40C	gvii13	Karatara	B	0.00	0.07	0.17	0.13	0.37	4	Management and environmental importance
		K40C	giii11	Karatara	B	0.00	0.02	0.17	0.08	0.27	2	
		K40D	-	*Swartvlei none*	-	0.00	0.00	0.00	0.00	0.00	1	
		K40E	gviii9	Goukamma	B/C	0.00	0.09	0.16	0.13	0.37	4	Management and environmental importance
		K50A	gvii14	Knysna	B	0.00	0.06	0.12	0.13	0.31	3	Management and environmental importance
		K50A	giii12	Knysna	B	0.00	0.02	0.14	0.08	0.24	1	
		K50B	gviii11	Gouna	A/B	0.00	0.09	0.19	0.13	0.40	4	Management and environmental importance
		K60G	gviii10	Noetzie	B	0.00	0.09	0.08	0.06	0.22	1	
		K60G	gx3	Piesang	E	0.00	0.01	0.09	0.13	0.22	1	
		K60A	-	Keurbooms	-	0.00	0.02	0.12	0.06	0.21	1	
		K60B	-	Kwaai	-	0.00	0.02	0.14	0.04	0.20	1	
		K60C	giv6	Keurbooms	C	0.00	0.09	0.16	0.13	0.38	4	Management and environmental importance
		K60D	giv5	Palmiet	A	0.00	0.02	0.19	0.08	0.29	2	
		K60E	gx9	Keurbooms	B	0.00	0.02	0.14	0.08	0.24	1	

IUA	Water Resource Class	Quat #	Node	River	TEC	Position	Users	Environment	Management	Score	Rank	Description
		K60F	giv4	Bitou	D	0.00	0.02	0.16	0.08	0.26	1	
		K70A	gx4	Buffels	C	0.00	0.02	0.14	0.08	0.24	1	
		K70A	gx5	Sout	B	0.00	0.02	0.16	0.08	0.26	1	
		K70B	gvii15	Bloukrans	C	0.00	0.03	0.16	0.10	0.29	2	

Certain RUs may have been given a ranking of 1, but are within important conservation areas. These RUs will be included in a table in the RQO outline report (Table 3.3, Table 3.4). The RUs within conservation areas will have a table of importance for SWSA, EC, FEPAs/CBAs/ESAs and endangered fish in the RQO outline report

Table 3.3 Priority Resource Units in the Breede River catchment and Overberg region, considering conservation areas

IUA	RU priority	Quat #	Node	River	FEPA	FishCons	CBA	ESA
A1 Upper Breede Tributaries	1	H10B	Niv3	Titus	Fish	x		
	1	H10C	Niv1	Koekedou	FEPA	x		
	1	H10C	Niv2	Dwars	Upstream			
	1	H10D	Niv4	Witels	FEPA			
	1	H10E	Nvii16	Witte	FEPA	x		
	1	H10F	Niv5	Witte	FEPA	x	x	
	1	H10F	Niv6	Wabooms	FEPA			
	4	H10F	Nviii1	Breede	FEPA			
	1	H10J	Niv40	Elands	FEPA			
	1	H10J	Niv41	Krom	FEPA	x		
	3	H10J	Nvii2	Molenaars	FEPA			
A2 Middle Breede Renosterveld	1	H10G	Niv7	Slanghoek	Upstream		x	
	1	H10G	Niii1	Breede			x	
	2	H10J	Niv42	Smalblaar	Upstream		x	
	1	H10H	Niv8	Jan du Toit	FEPA	x	x	
	1	H10H	Nvii6	Hartbees	Upstream			
	1	H10H	Niv9	Hartbees	Upstream		x	
	1	H10K	Niv12	Holsloot	Rehab			
	2	H10H	Nv3	Breede	Fish		x	
	1	H20F	Nv18	Hex			x	
	3	H20G	Nvii7	Hex	Fish	x	x	
	1	H20H	Niv10	Hex	Fish		x	
	4	H40C	Nii1	Breede	Fish		x	
	1	H40B	Nvii5	Koo	Upstream		x	
	1	H40C	Niv11	Nuy			x	
	1	H30B	Niv18	Kingna	Rehab			x
A3 Breede Working Tributaries	1	H40D	Niv13	Doring	Fish			
	2	H40F	Nvii8	Breede	Rehab		x	
	1	H40F	Ni1	Breede	Rehab		x	
	1	H40J	Nviii2	Willem Nels				x
	1	H40J	Nvii19	Breede			x	
	1	H40K	Nvii12	Keisers	FEPA		x	
	1	H40L	Nvi1	Breede			x	
	1	H30E	Nii2	Kogmanskloof			x	
	1	H50A	Niii3	Breede			x	
	4	H50B	Ni2	Breede			x	

IUA	RU priority	Quat #	Node	River	FEPA	FishCons	CBA	ESA
B4 Riviersondered Theewaterskloof	3	H60B	Nvii10	Du Toits	FEPA	x		
	3	H60D	Nv7	Riviersonderend			x	
	1	H60E	Niv28	Baviaans	FEPA	x	x	
	1	H60E	Niv29	Sersants	Rehab			
	1	H60F	Niv30	Gobos	FEPA	x	x	
	4	H60F	Nv9	Riviersonderend			x	
F9 Lower Riviersonderend	1	H60G	Niv31	Kwartel			x	
	1	H60H	Niv33	Soetmelksvlei			x	
	1	H60H	Niv34	Slang			x	
	1	H60H	Nv10	Riviersonderend			x	
	1	H60J	Nv11	Riviersonderend			x	
	1	H60K	Niv35	Kwassadie			x	
	1	H60K	Nv12	Riviersonderend			x	
	3	H60L	Ni3	Riviersonderend			x	
B5 Overberg West	1	G40C	Piii1	Palmiet	Rehab		x	
	3	G40C	Piv9	Palmiet	Rehab		x	
	3	G40C	Pvi1	Palmiet	Rehab		x	
	1	G40C	Piv8	Klipdrif			x	
	2	G40D	Piii2	Palmiet	FEPA			
	1	G40D	Piv12	Dwars/Louws		x		
	4	G40D	Piii3	Palmiet	FEPA		x	
H16 Overberg West Coastal	1	G40F	Niv43	Swart			x	
	4	G40E	Niii5	Bot			x	
	1	G40M	Nx8	Uilkraal	Rehab	x	x	
	4	G50B	Ni4	Nuwejaar	Fish		x	
	2	G50C	Nvii15	Heuningnes	Fish			
	1	G50C	Niv44	Heuningnes	Fish	x	x	
	3	G50D	Nv24	Kars	FEPA			
	4	G50E	Nii5	Kars	FEPA			
F10 Overberg East Renosterveld	2	G40J	Nii4	Hartbees			x	
	1	G40K	Niv45	Steenbok			x	
	4	G40K	Nv23	Klein		x		
	2	G50G	Nii6	Sout			x	
	3	G50H	Nii7	DeHoopVlei	FEPA		x	
F11 Lower Breede Renosterveld	2	H70A	Niv24	Leeu	Fish	x	x	
	2	H70B	Niv24a	Klip	Upstream	x		
	2	H70B	Nv2	Breede			x	
	1	H70C	Nvii14	Huis	Rehab	x	x	
	1	H70C	Nii3	Tradouw	Rehab			
	1	H70F	Niv25	Buffeljags	Upstream		x	
	4	H70G	Niii4	Breede			x	
	1	H70H	Nviii3	Breede	FEPA		x	

IUA	RU priority	Quat #	Node	River	FEPA	FishCons	CBA	ESA
	2	H70J	Niv26	Slang	Upstream		x	

Where: IUA = Integrated Unit of Analysis, Quat = quaternary catchment, FEPA = Freshwater Ecosystem Priority Area, FishCons = river identified by CapeNature for fish conservation, CBA = Critical Biodiversity Area, ESA = Ecological Support Area

Table 3.4 Priority Resource Units in the Gouritz River catchment and Coastal region, considering conservation areas

IUA	RU priority	Quat #	Node code	River	FEPA	FishCons	CBA	ESA
C6 Gamka Buffels	1	J11C	giv34	Buffels	Upstream		x	
	1	J11F	gv25	Buffels	Upstream	x		
	1	J21A	gv18	Gamka	Upstream			
	1	J21D	giv3	Gamka	Upstream		x	
	1	J22F	giv1	Koekemoers	Upstream		x	
	1	J22K	giv2	Leeu	Upstream		x	
	1	J23C	gv17	Gamka			x	
	1	J23F	giv21	Gamka				
	4	J23J	gv27	Gamka	Fish			
	1	J24D	gv14	Dwyka	Upstream			
	1	J24E	*gv14*				x	
E8 Touws	1	J12C	giv30	Ysterdams	Rehab			
	1	J12D	giv28	Touws				x
	1	J12H	giv27	Touws		x	x	
	1	J12K	giv26	Brak				x
	1	J12L	gviii1	Doring	Upstream			
	1	J12L	gv5	Touws	Rehab			
	1	J12M	*gv5*				x	
	1	J11H	gv4	Buffels	Upstream			
	1	J11J	gv6	Groot	Rehab			
	1	J11K	giv32	Groot			x	
	1	J13A	gv7	Groot	Rehab	x		
	4	J13C	gii3	Groot	Rehab		x	
D7 Gouritz-Olifants	1	J25A	giv20	Gamka	Fish	x	x	
	1	J25D	giv18	Nels	Fish	x		
	1	J25E	gii2	Gamka			x	
	1	J31C	giii2	Olifants	Upstream		x	
	1	J32E	giv15	Traka	Upstream			
	1	J33B	gv33	Olifants	Upstream	x		
	1	J33D	gv21	Meirings	Fish	x	x	
	4	J34C	gv36	Kammanassie	Upstream			
	4	J34D	*gv36*				x	
	1	J34F	giv10	Kammanassie	Upstream		x	
	1	J35A	gvii2	Grobbelaars	FEPA			
	1	J35A	giv9	Grobbelaars	Fish	x		
	1	J35D	gv19	Olifants	Upstream	x		

IUA	RU priority	Quat #	Node code	River	FEPA	FishCons	CBA	ESA
	1	J35F	giv17	Olifants	Fish		x	
	1	J40A	giv16	Gouritz	Fish			
F13 Lower Gouritz	4	J40B	gi4	Gouritz	Rehab	x	x	
	1	J40C	gv28	Gouritz	Fish	x		
	2	J40D	gv9	Gouritz			x	
F12 Duiwenhoks	3	H80B	giii5	Duiwenhoks	FEPA		x	
	4	H80D	giii8	Duiwenhoks	Upstream		x	
	3	H90B	giii6	Korinte	FEPA	x	x	
	1	H90A	giii7	Goukou			x	
	1	H90C	gv10	Goukou				
	1	H90D	gv41	Goukou			x	
G14 Groot-Brak	1	K10D	giv25	Brandwag			x	
	2	K10E	gv39	Moordkuil	FEPA			
	1	K20A	gviii2	Groot-Brak	Fish		x	
	1	K20A	gviii12	Varing			x	
	2	K20A	gviii3	Varing			x	
	2	K20A	gvii7	Groot-Brak	Fish		x	
G15 Coastal	1	K30A	gviii4	Maalgate				
	3	K30B	gvii9	Malgas	Fish	x		
	4	K30B	gviii6	Gwaing	Fish		x	
	3	K30C	gvii11	Kaaimans	Fish	x	x	
	1	K30C	gviii8	Silver			x	
	2	K30D	gvii12	Touws	FEPA		x	
	1	K30D	gx8	Klein	Upstream		x	
	3	K40A	giii10	Diep	Upstream	x		
	2	K40B	giii13	Hoekraal	FEPA	x	x	
	2	K40C	giii11	Karatara	FEPA	x		
	4	K40E	gviii9	Goukamma	FEPA	x	x	
	3	K50A	gvii14	Knysna	Upstream			
	1	K50A	giii12	Knysna	FEPA		x	
	4	K50B	gviii11	Gouna	FEPA	x	x	
	3	K60G	gviii10	Noetzie			x	
	4	K60C	giv6	Keurbooms	FEPA	x	x	
	2	K60D	giv5	Palmiet	FEPA			
	1	K60E	gx9	Keurbooms	FEPA			
	1	K60F	giv4	Bitou	FEPA	x	x	
	1	K70A	gx4	Buffels			x	
	1	K70A	gx5	Sout	FEPA	x		
	2	K70B	gvii15	Bloukrans	FEPA	x		

Where: IUA = Integrated Unit of Analysis, Quat = quaternary catchment, FEPA = Freshwater Ecosystem Priority Area, FishCons = river identified by CapeNature for fish conservation, CBA = Critical Biodiversity Area, ESA = Ecological Support Area

3.2 Estuary Priority Resource Units

Results of the resource unit prioritisation for all estuaries and river outlets in the Breede-Gouritz are presented in Table 3.5 and on Figure 3.3. Scores allocated for the position in the IUA are the same for all systems (=0.25) as they are all located at the terminal end of their respective catchments. Scores for "Concern for users", "Concern for environment" and "Management and practical considerations" vary in accordance with the individual characteristics of each estuary/outlet. "Total Prioritisation Score" is a weighted sum of each of the above subcomponent scores, and along with "Priority Rating" indicates overall importance of each estuary/outlet in the WMA. Estuaries scored between 0.3 and 1.0, while the river outlets all scored 0.3 due to the limited services they are able to provide. Estuaries with a "Priority Rating" between 0.8 and 1.0 are considered to be of greatest importance, while those with scores between 0.4 and 0.7 are average importance, and those with scores lower than 0.4 are considered of low importance.

Importance scores allocated to estuaries in the Breede-Gouritz WMA in terms of the Resource Unit Prioritisation Tool correspond reasonably well with the overall importance score and rank scores assigned to all estuaries in South Africa by Turpie et al. (2013, Table 3.6). Exceptions to this include estuaries such as the Groot Brak, Gouritz and Goukou which have low importance scores but score highly on the RUPT owing to the high level of threat to which these estuaries are exposed due to impacts such as freshwater deprivation, mouth manipulation, pollution and development.

It is not considered necessary to develop RQO for any of the river outlets in this WMA. 23 Estuaries obtained a score of equal or greater than 0.5.

Table 3.5 Resource unit priority scores for estuaries (bold text) and river outlets in the Breede-Gouritz WMA

	Rooiels	**Buffels (Oos)**	**Palmiet**	**Bot/Kleinmond**	**Onrus**	Mossel	**Klein**	**Uilkraal**	Haelkraal	Rietfontein	**Ratel**	Drie Vleitjies	**Heuningnes**	**Klipdrifsfontein**	Papkuils	**Breede**	**Gouritz**	**Duiwenhoks**	**Goukou**	**Blinde**	**Tweekuilen**	**Gericke**	**Hartenbos**	**Klein Brak**
Position in IUA	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Concern for users	0.01	0.01	0.07	0.17	0.20	0.00	0.24	0.06	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.19	0.18	0.18	0.16	0.13	0.07	0.07	0.20	0.20
Concern for environment	0.03	0.03	0.03	0.11	0.13	0.00	0.11	0.01	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.16	0.23	0.19	0.19	0.11	0.06	0.06	0.17	0.19
Management and practical considerations	0.08	0.08	0.10	0.10	0.23	0.05	0.23	0.10	0.02	0.02	0.02	0.02	0.13	0.02	0.02	0.13	0.10	0.20	0.10	0.05	0.08	0.06	0.10	0.10
Total Prioritization Score	0.36	0.36	0.45	0.63	0.80	0.30	0.82	0.43	0.27	0.27	0.27	0.27	0.72	0.27	0.27	0.72	0.77	0.81	0.69	0.53	0.46	0.44	0.72	0.73
Priority Rating	0.4	0.4	0.5	0.6	0.8	0.3	0.8	0.4	0.3	0.3	0.3	0.3	0.7	0.3	0.3	0.7	0.8	0.8	0.7	0.5	0.5	0.4	0.7	0.7
Description			Management	Management, env, users	Management, env, users		Management, env, users	,					Management env, users			Management, env, users	High threat	Management, env, users	High threat	Users	Management		Management, users	Env, users

	Groot Brak	Rooi	**Maalgate**	**Gwaing**	Skaapkop	Meul	**Kaaimans**	**Wilderness**	**Swartvlei**	**Goukamma**	**Knysna**	**Noetsie**	Grooteiland	Kranshoek	Crooks	**Piesang**	**Keurbooms**	**Matjies**	Brak	**Sout (Oos)**	**Groot (Wes)**	Sout (Oos)	Helpmekaars	**Bloukrans**
Position in IUA	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Concern for users	0.20	0.00	0.09	0.07	0.00	0.00	0.10	0.25	0.25	0.18	0.25	0.01	0.00	0.00	0.00	0.13	0.19	0.02	0.00	0.01	0.13	0.00	0.00	0.01
Concern for environment	0.19	0.00	0.08	0.08	0.00	0.00	0.08	0.25	0.25	0.19	0.25	0.00	0.00	0.00	0.00	0.19	0.25	0.00	0.00	0.00	0.05	0.00	0.00	0.00
Management and practical considerations	0.25	0.02	0.05	0.05	0.02	0.02	0.07	0.13	0.10	0.10	0.25	0.08	0.02	0.02	0.02	0.10	0.10	0.05	0.02	0.02	0.10	0.02	0.02	0.05
Total Prioritization Score	0.88	0.27	0.46	0.44	0.27	0.27	0.50	0.88	0.85	0.72	1.00	0.34	0.27	0.27	0.27	0.66	0.79	0.32	0.27	0.28	0.53	0.27	0.27	0.31
Priority Rating	0.9	0.3	0.5	0.4	0.3	0.3	0.5	0.9	0.9	0.7	1.0	0.3	0.3	0.3	0.3	0.7	0.8	0.3	0.3	0.3	0.5	0.3	0.3	0.3
Description	High threat		Users				Users	Env, users	Env, users	Management, users	Management, env, users					Management, users	Management, env, users				Management, users			

Table 3.6 Overall importance score and rank of all estuaries in the Breede-Gouritz WMA (according to National assessment done by Turpie et al. 2013)

Data presented includes four component scores of the importance score (biodiversity, size, habitat and zonal type rarity (ZTR), and the four component scores of the biodiversity score (plants, invertebrates, fish and birds).

ESTUARY (West to East)	Plant	Invert	Fish	Bird	Biodiversity	Size	Habitat	ZTR	Importance Score*	Rank
Rooiels	90	40	20	10	65.0	40	40	10	43.3	148
Buffels (Oos)	100	50	30	10	73.5	50	30	10	46.9	134
Palmiet	80	80	40	60	71.0	70	60	20	62.8	82
Bot/Kleinmond	90	100	100	100	98.5	100	100	70	96.6	8
Onrus	70	10	40	50	59.5	70	60	10	58.9	94
Klein	100	100	100	100	100.0	100	100	70	97.0	5
Uilkraals	90	80	40	90	82.0	80	90	10	76.0	47
Ratel	10	40	20	70	52.0	40	10	10	32.5	191
Heuningnes	100	90	60	80	90.5	90	90	20	83.1	24
Klipdrifsfontein	10	30	10	60	43.5	10	10	10	18.4	237
Breë	80	100	90	90	89.0	100	90	20	86.8	19
Duiwenhoks	60	100	70	80	76.5	100	90	20	83.6	23
Goukou (Kaffirkuils)	80	90	70	80	79.0	90	90	20	80.3	31
Gouritz	90	80	80	90	88.0	90	60	20	75.0	49
Blinde	100	40	10	60	77.5	10	10	10	26.9	216
Hartenbos	100	70	40	80	86.5	70	60	10	65.6	75
Klein Brak	70	80	70	60	69.0	80	10	10	52.8	115
Groot Brak	80	100	70	80	79.5	90	80	10	76.9	46
Maalgate	10	60	50	70	57.5	50	10	10	37.9	172
Gwaing	10	40	10	10	11.5	10	10	10	10.4	254
Kaaimans	50	50	40	30	45.5	30	10	20	27.9	210
Wilderness	90	40	50	100	88.0	90	70	70	82.5	27
Swartvlei	100	90	100	100	99.5	100	100	70	96.9	7
Goukamma	50	100	90	80	83.0	70	40	10	59.8	59
Knysna	100	100	100	100	100.0	100	100	100	100.0	1
Noetsie	10	50	70	10	51.0	30	10	10	28.3	209
Piesang	80	80	70	40	72.5	80	80	10	71.1	62
Keurbooms	100	90	80	90	95.0	100	90	20	88.3	18
Matjies/Bitou	10	40	10	100	70.0	10	10	10	25.0	220
Sout (Oos)	70	80	70	50	67.5	70	50	20	59.4	91
Groot (Wes)	100	70	40	60	83.5	70	50	10	62.4	84
Bloukrans	90	40	10	10	63.5	70	10	50	51.4	120

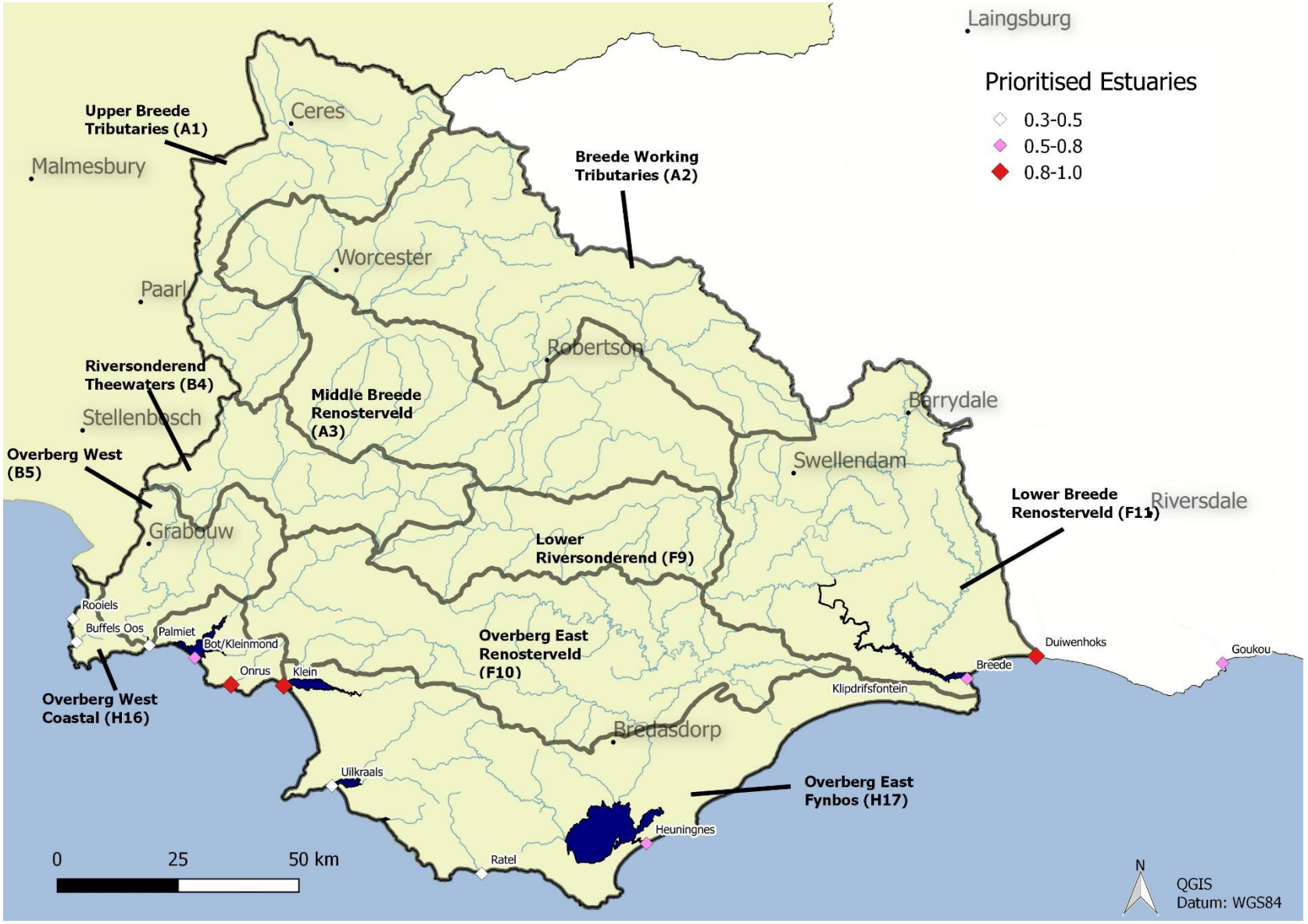

Figure 3.3 Importance ranking of estuaries in the Breede-Overberg region of the study area assessed using the Resource Unit Prioritisation Tool (DWA 2011)

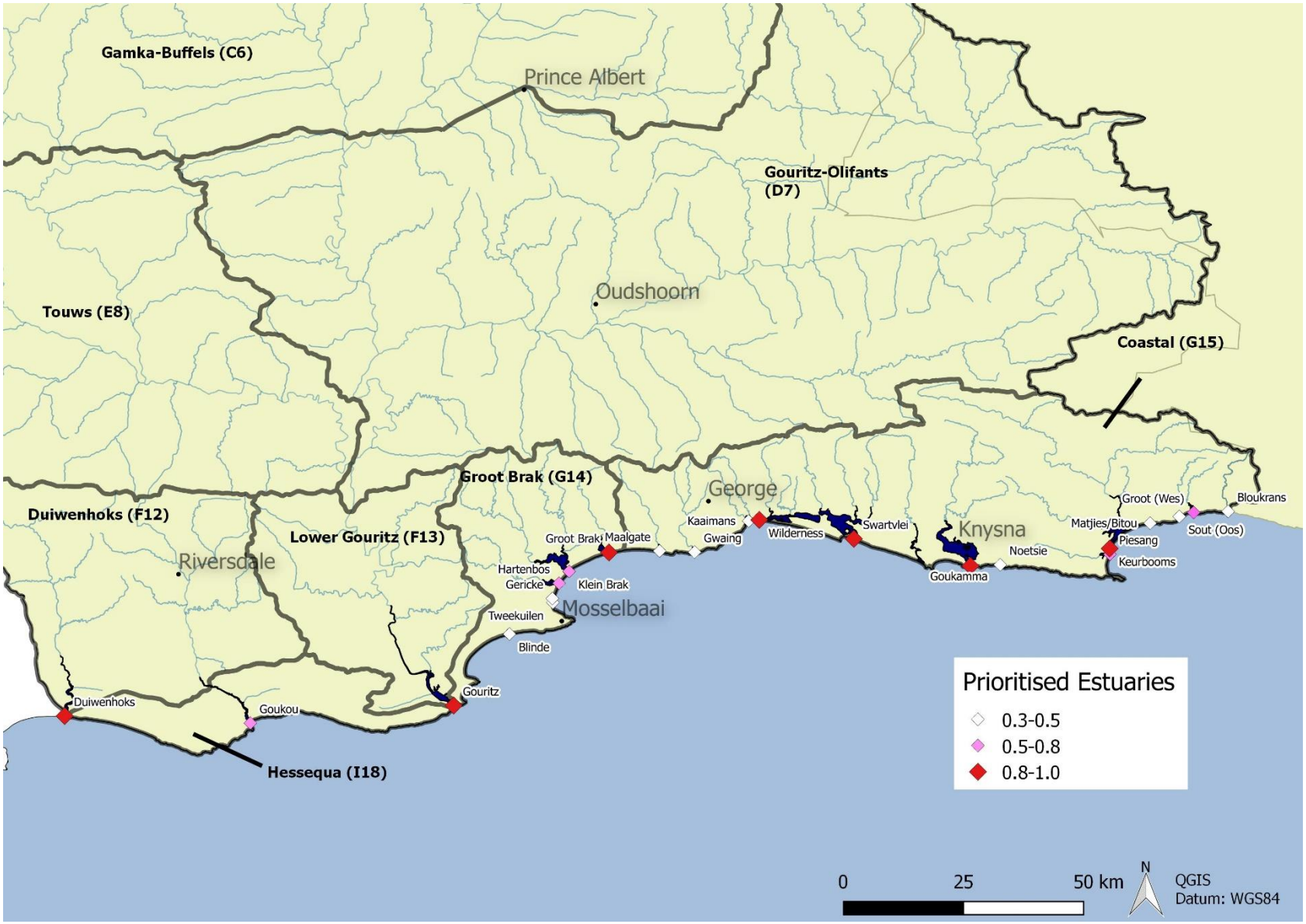

Figure 3.4 Importance ranking of estuaries in the Gouritz-Coastal region of the study area assessed using the Resource Unit Prioritisation Tool (DWA 2011)

3.3 Dam Priority Resource Units

Results of the RU prioritisation for the pre-screened dams in the Breede-Gouritz WMA are presented in Table 3.7 and in Figure 3.3. Scores allocated for the "Position in the IUA", "Concern for Users", "Concern for Environment" and "Management and Practical Considerations" vary in accordance with the individual characteristics of each dam. The "Total Prioritisation Score" is a weighted sum of each of the above sub-component scores, and along with "Priority Rating" indicates overall importance of each dam in the WMA. Dams with a "Priority Rating" of between 0.6 and 1.0 are considered to be of the greatest importance, while those with scores between 0.4 and 0.5 are of average importance, and those with scores lower than 0.3 or less are considered of low importance.

Table 3.7 Resource unit priority scores for dams in the Breede-Gouritz WMA

	Theewaterskloof	Greater Brandvlei	Eikenhof	Kogelberg Dam	Ceres Koekedouw	Rockview Dam	Stettynskloof	Elandskloof	Lakenvallei	Poortjieskloof	Keerom	Roode Elsberg	De Bos	Arieskraal	Kraaibosch	Buffeljags
Position in IUA	0.14	0.00	0.14	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00
Concern for users	0.21	0.21	0.14	0.18	0.16	0.11	0.09	0.09	0.09	0.07	0.07	0.05	0.05	0.05	0.05	0.07
Concern for environment	0.29	0.29	0.00	0.29	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.29	0.14	0.00
Management and practical considerations	0.14	0.14	0.14	0.14	0.14	0.09	0.09	0.14	0.14	0.14	0.14	0.14	0.12	0.12	0.12	0.14
Total Prioritization Score	0.79	0.64	0.43	0.75	0.44	0.20	0.18	0.23	0.23	0.21	0.21	0.20	0.38	0.60	0.31	0.21
Relative Priority Rating	1.00	0.82	0.54	0.96	0.56	0.25	0.23	0.30	0.30	0.27	0.27	0.25	0.49	0.76	0.40	0.27
Description	All	Management, env, users	Position, management, users	All	Management, env, users								Management, env, users		Management, env, users	

	Stompdrift	Floriskraal	Gamkapoort	Kammanassie	Wolwedans	Leeu-Gamka	Koos Raubenheimer	Korentepoort	Garden Route	Hartbeeskuil	Duivenhoks
Position in IUA	0.14	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concern for users	0.16	0.14	0.04	0.16	0.20	0.07	0.11	0.07	0.11	0.11	0.07
Concern for environment	0.00	0.00	0.00	0.00	0.36	0.00	0.00	0.00	0.07	0.00	0.00
Management and practical considerations	0.14	0.14	0.12	0.14	0.14	0.09	0.12	0.09	0.14	0.14	0.09
Total Prioritization Score	0.44	0.28	0.30	0.30	0.70	0.16	0.22	0.16	0.32	0.25	0.16
Relative Priority Rating	0.56	0.36	0.38	0.38	0.89	0.20	0.28	0.20	0.41	0.32	0.20
Description	Position, management, users				Management, env, users				Management, env, users		

It is recommended that RQOs be developed for the dams in the Breede-Gouritz WMA with a “Priority Rating” of higher than or close to a relative priority rating of 0.6. The priority Dam RUs for the study area are indicated in Table 3.8 and in Figure 3.5.

Table 3.8 Priority Dams Resource Units for the Breede-Gouritz WMA

No of dam	Name of dam	Quaternary Drainage Area	Completion date	Completion date raising	River or Watercourse	Wall type	Capacity (1000 m^3)	Purpose / use	Owner
H600/02	Theewaterskloof	H60D	1980		Riviersonderend	Earthfill	480 406	Municipal, industrial and irrigation	DWS
H100/08	Greater Brandvlei	H10L	1983		Breede Tributary	Earthfill	456 000	Irrigation	DWS
H101/BL	Ceres Koekedouw	H10C	2001		Koekedouw	Rockfill	17 200	Irrigation	Witzenberg Local Municipality
G401/80	Eikenhof Dam	G40C	1977	1998	Palmiet	Earthfill	29 000	Irrigation, municipal	Groenland WUA
G400/05	Kogelberg	G40D	1986		Palmiet	Arch & Earthfill	19 300	Industrial (hydropower)	DWS
G401/78	Arieskraal	G40D	1967		Palmiet River	Arch	5 500	Irrigation	Henderson D.A.
J330/01	Stompdrift	J33B	1965	2014	Olifants River	Multi-Arch	55 300	Irrigation	DWS
K200/02	Wolwedans	K20A	1990		Groot Brak	Gravity Arch	25 530	Municipal and industrial	DWS

The main reasons why the various dams have been prioritised is described in Table 3.7.

Table 3.9 Prioritised Dam Resource Units

Dam	IUA	Reason for prioritisation
Theewaterskloof	B4 Riviersonderend Theewaterskloof	The dam is located on the Sonderend River; while it is a tributary of the Breede River, and is a significant river in itself. It is the largest dam in the Western Cape Province and the main supply dam to the Western Cape Water Supply System (WCWSS), which supports very significant economic and recreational activities. It plays a major role in regulating water services.
Greater Brandvlei	A2 Breede Working Tributaries	This is largely an off-channel dam but the dam supports very significant agricultural economic and recreational activities. A scheme will soon be implemented to increase the yield of the dam. The dam has the capacity to make freshening releases to reduce salinity in the middle and lower reaches of the Breede River.
Ceres Koekedouw	A1 Upper Breede Tributaries	The dam is located on a smaller tributary of the Breede River, in a scenic area with an irrigation area located upstream. The dam provides important regional economic activities. The construction of the dam was approved subject to the release of ecological flows which are being implemented to some extent. Should the Michell's Pass Scheme proceed, this dam may increase in importance from an ecological perspective.
Eikenhof Dam	B5 Overberg West	Eikenhof Dam is important from an economic and environmental perspective. Most of the water transferred from the Kogelberg Dam to the WCWSS is released from mainly Eikenhof Dam. The dam is managed strictly in accordance with the Palmiet River Catchment Management Plan, to *inter-alia* make ecological releases.
Kogelberg	B5 Overberg West	The Applethwaite, Kogelberg and Arieskraal dams form a series of dams, with significant irrigation, industry and the town of Grabouw upstream, located on the main stem of the Palmiet River. Flow conditions are significantly modified, with some water quality concerns. Together with the off-channel Rockview Dam, the dam comprises part of the Palmiet Pumped Storage Scheme that generates power for distribution to the Cape Metropolitan Area, as well as provides water to the WCWSS. The dam is therefore important from a strategic and economic perspective. Although managed releases from the combined Kogelberg and Arieskraal dams are restricted by the capacities of the existing outlet works at these dams, it is important in the light of the Kogelberg Nature Reserve and Biosphere Reserve, where the dams are located.
Arieskraal	B5 Overberg West	The Applethwaite, Kogelberg and Arieskraal dams form a series of dams, with significant irrigation, industry and the town of Grabouw upstream, located on the main stem of the Palmiet River. Flow conditions are significantly modified, with some water quality concerns. The dam is moderately important in terms of economic activity, but very important from an ecological perspective. Although managed releases from the combined Kogelberg and Arieskraal dams are restricted by the capacities of the existing outlet works at these dams, it is important in the light of the Kogelberg Nature Reserve and Biosphere Reserve, where the dams are located.
Stompdrift	D7 Gouritz-Olifants	The dam is located on the main stem of the Olifants River and is very important to the region from an economic perspective, notably for irrigation, and there are many recreational activities. There is no EWR site in the Olifants River downstream, and the ecological condition of the river deteriorates significantly below the dam. Although ecological flows cannot currently be released, the dam nevertheless has a high ecological importance due to the significant impact that the dam has on the downstream ecological condition of the river.
Wolwedans	G15 Coastal	The dam is important from a strategic and economic perspective, as well as from an ecological perspective. the main source of water for the municipality of Mossel Bay as well as the gas-to-liquids refinery PetroSA, i.e. municipal and industrial water supply. The dam has a significant impact on the downstream flow regime, and releases to the Groot Brak estuary is essential to meet the estuarine EWR requirements and to ensure estuarine health.

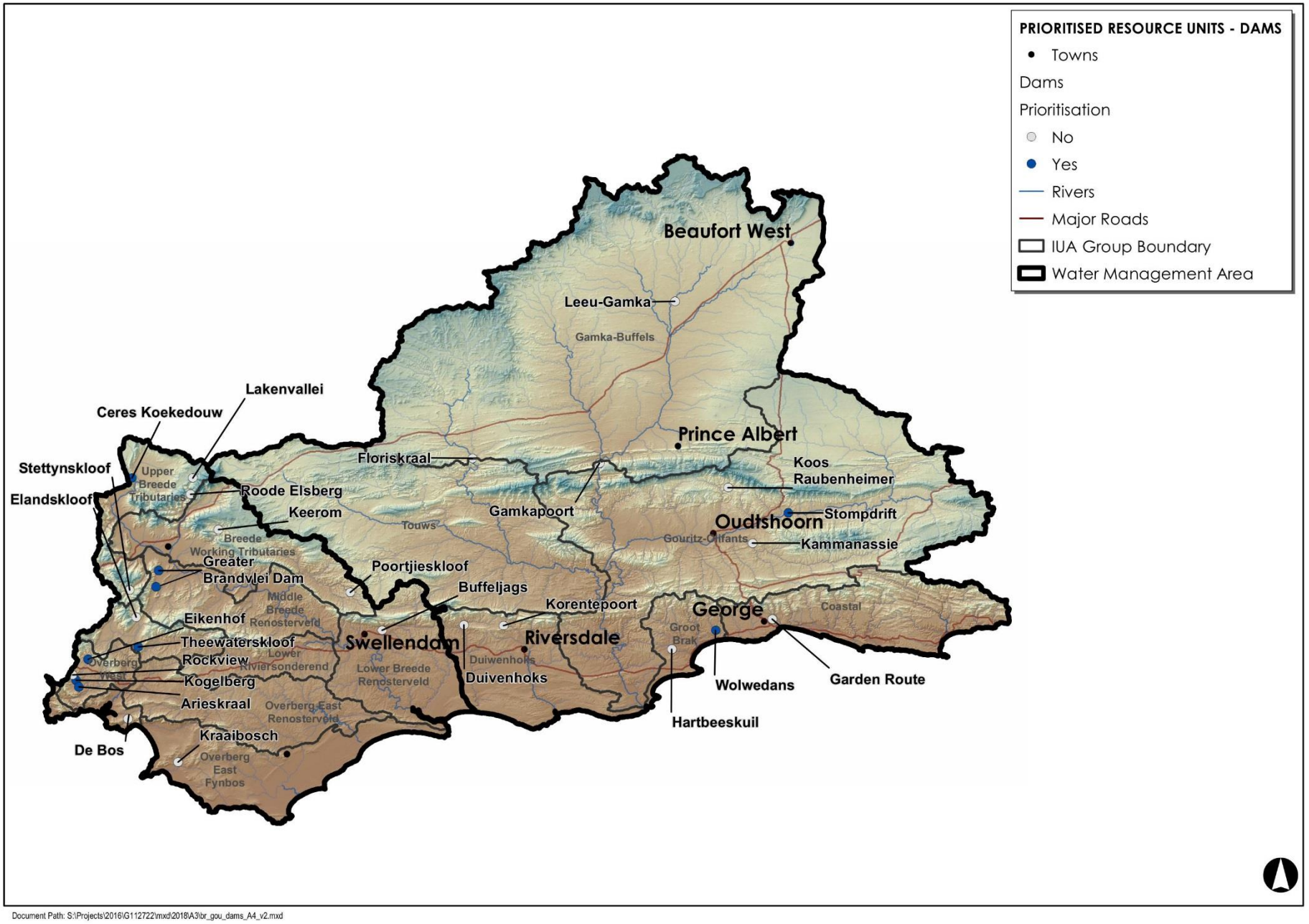

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Figure 3.5 Preliminary Dams Resource Units delineated for the Breede-Gouritz WMA

3.4 Wetland Priority Resource Units

3.4.1 Wetland Regions

As described in the Status Quo Report (DWS, 2016), the Breede-Gouritz has 11 Wetland Regions. These are as follows:

- Western Folded Wetland Region (WR1)
- Coastal Southern Folded Wetland Region (WR2)
- Southern Coastal Wetland Region (WR3)
- Coastal Sediment Wetland Region (WR4)
- Nama Karoo Wetland Region (WR5)
- Great Karoo Wetland Region (WR6)
- Cape Fold Wetland Region (WR7)
- Southern Folded Wetland Region (WR8)
- Southern Cape Folded Wetland Region (WR9)
- South East Coastal Wetland Region (WR10)
- Sedimentary Lakes Wetland Region (WR11).

3.4.2 Ecologically important wetlands

For each of these 11 Wetland Regions the upper twenty percent (20%) of ecologically important wetlands were determined. The Ecological Importance ranking was based on both ecological importance and threat status. In general, the highest priority wetlands were wetlands of high ecological importance and high threat status, although in the drier regions (Nama Karoo and Great Karoo) wetlands with a high ecological importance and low threat status were identified.

Table 3.10 Integration matrix to identify ecological importance

		Threat	
		High	**Low**
Ecological Importance	**High**	Implement restoration and rehabilitation to conserve ecologically important areas that are under threat.	Retain low current threat and possible future threat in ecological important areas.
	Low	Areas of least concern	Areas of least concern

The most ecologically important wetlands (highest 20%) in each Wetland Region were as follows:

Table 3.11 Ecologically important wetlands (highest 20%) per Wetland Region

Wetland Region	NFEPA cluster	NFEPA frogs	Ramsar	Critically endangered	Endangered	Vulnerable	Least Threatened	Score
Western Folded Wetland Region (WR1)	x				x			1.05
				x				1.0
	x					x		0.6
Coastal Southern Folded Wetland Region (WR2)	x	x		x				1.5
	x	/x			x			1.3
	x	x		x				1.25
Southern Coastal Wetland Region (WR3)	x	/x		x				1.25
	x	/x			x			1.05

Wetland Region	NFEPA cluster	NFEPA frogs	Ramsar	Critically endangered	Endangered	Vulnerable	Least Threatened	Score
Coastal Sediment Wetland Region (WR4)	x	x		x				1.5
	x	x			x			1.3
	x	/x	/x	x				1.25
Nama Karoo Wetland Region (WR5)	x						x	0.25
Great Karoo Wetland Region (WR6)	x						x	0.25
Cape Fold Wetland Region (WR7)				x				1
Southern Folded Wetland Region (WR8)				x				1
Southern Cape Folded Wetland Region (WR9)				x				1
	x					x		0.85
South East Coastal Wetland Region (WR10)	x		/x		x			1.05
				x				1
	x		/x			x		0.85
Sedimentary Lakes Wetland Region (WR11)	x			x				1.25

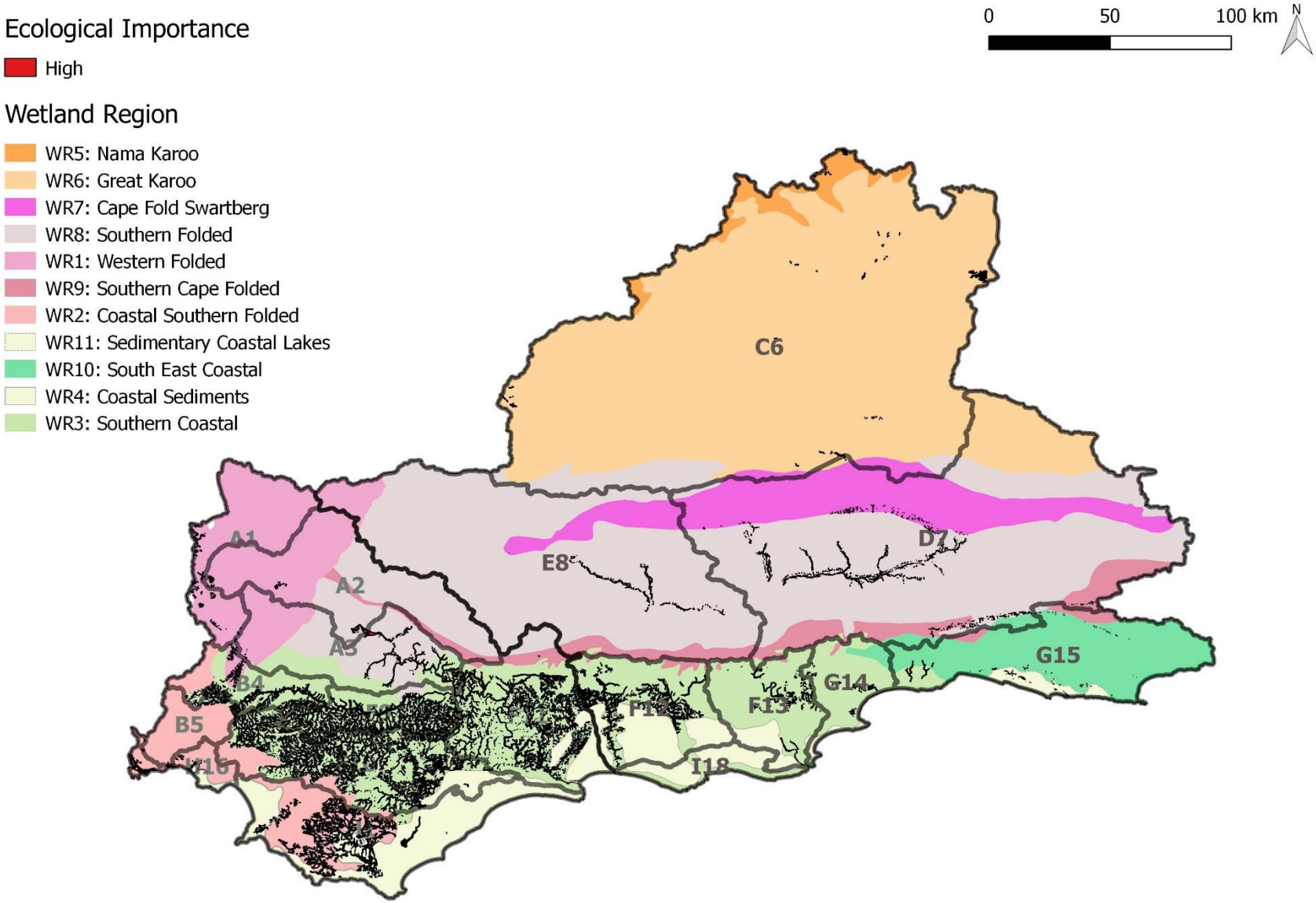


Figure 3.6 Ecologically important wetlands per Wetland Region in the study area

3.4.3 Ecosystem services

The ecosystem services supplied by all wetlands in the Breede-Overberg and Gouritz-Coastal area were calculated using the Land Use methodology. The top forty percent of wetlands in the Breede-Overberg and Gouritz-Coastal areas were chosen as the wetlands supplying the highest level of ecosystem services. The final Ecosystem services supply layer is a cumulative layer of each service (Figure 3.7). The supply maps for each ecosystem service are provided in Appendix B.

Supply of ecosystem services

Supply of flood attenuation

Most wetlands which supply high levels of flood attenuation are located in the Breede-Overberg region, with the Agulhas wetland system and the Breede River Floodplain providing the most benefits. Although there is a small depression wetland in the Great Karoo as well as some seep wetlands in the upper catchments of the Breede and coastal regions, most of the wetlands which supply high levels of flood attenuation are floodplain wetlands.

Supply of streamflow regulation

Similarly, the Breede River Floodplain and Agulhas wetland system provides important streamflow regulation services, as does the Goukou wetland and Gouritz wetland systems. The whole of the Breede River Floodplain does not provide the same level of streamflow regulation as it does flood attenuation. Most streamflow regulation occurs in the upper catchment.

Supply of sediment avoidance and erosion control

Widespread sediment avoidance and erosion control are provided by wetlands in the study area, particularly due to the large number of wetlands.

Supply of phosphate, nitrate and toxicant assimilation; carbon storage, water provision and harvestable resources

Similar levels of water quality enhancement, carbon storage as well as water supply provision and harvestable resources are supplied by the Agulhas wetland system, Duiwenhoks, Goukou and Gouritz wetland systems.

Supply of cultivated foods

High levels of supply of cultivated goods occurs in wetlands on a small portion of the Agulhas wetland system, upper Duiwenhoks and Goukou wetland systems.

Strategic Water Source Areas

Strategic Water Source wetlands occur in the mountainous regions of the upper Breede and Palmiet areas, as well as within the Langeberg and Swartberg mountainous regions (Figure 3.8).

Demand for ecosystem services

In terms of demand for ecosystem services, there is a demand for sediment avoidance in all IUAs, due to the large proportion of dams in the study area. There is also a high demand for water quality enhancement across most of the study area.

Demand and supply of ecosystem services

Areas where there is a high Demand and a high Supply of an ecosystem service by wetlands are considered important, but similarly areas where there is a high demand but a low Supply of an ecosystem service are also considered important. If there is a wetland within the area of high demand, even though the wetland is not providing a high supply of the ecosystem service the wetland must still be considered as important due to the high demand in that area.

Table 3.12 Integration matrix to identify ecosystem services hotspots

		Supply	
		High	**Low**
Demand	**High**	Retain to meet current demand. Implement management action to limit impact of heavy demand and ensure continued supply.	Implement restoration and rehabilitation to help meet current demand.
	Low	Retain to meet low current and possible future demand.	Areas of least concern

3.4.4 Integration of ecological importance and ecosystem services

These layers were integrated to provide a list of wetland resource units for prioritisation according to high ecological importance and high supply/demand of ecosystem services (Figure 3.7 and Table 3.13). Integration of the Supply layers indicated that the highest levels of supply of ecosystem services occur in the Agulhas Wetland System in H17 (Overberg East Fynbos), A1 (Upper Breede Tributaries), F11 (Lower Breede Renosterveld), Goukou Wetland System in F12/I18 (Duiwenhoks) and F13 (Lower Gouritz). There is also a small wetland at the top of C6 (Gamka-Buffels) which supplies high levels of ecosystem services. Integration of Demand layers indicated that the highest levels of demand for ecosystem services occurs across all IUAs in the study area.

Table 3.13 Integration matrix to identify wetland resource unit

		Demand.Supply			
		High.High	**High.Low**	**Low.High**	**Low.Low**
Ecological Importance. Threat	**High.High**				
	High.Low				
	Low.High				
	Low.Low				

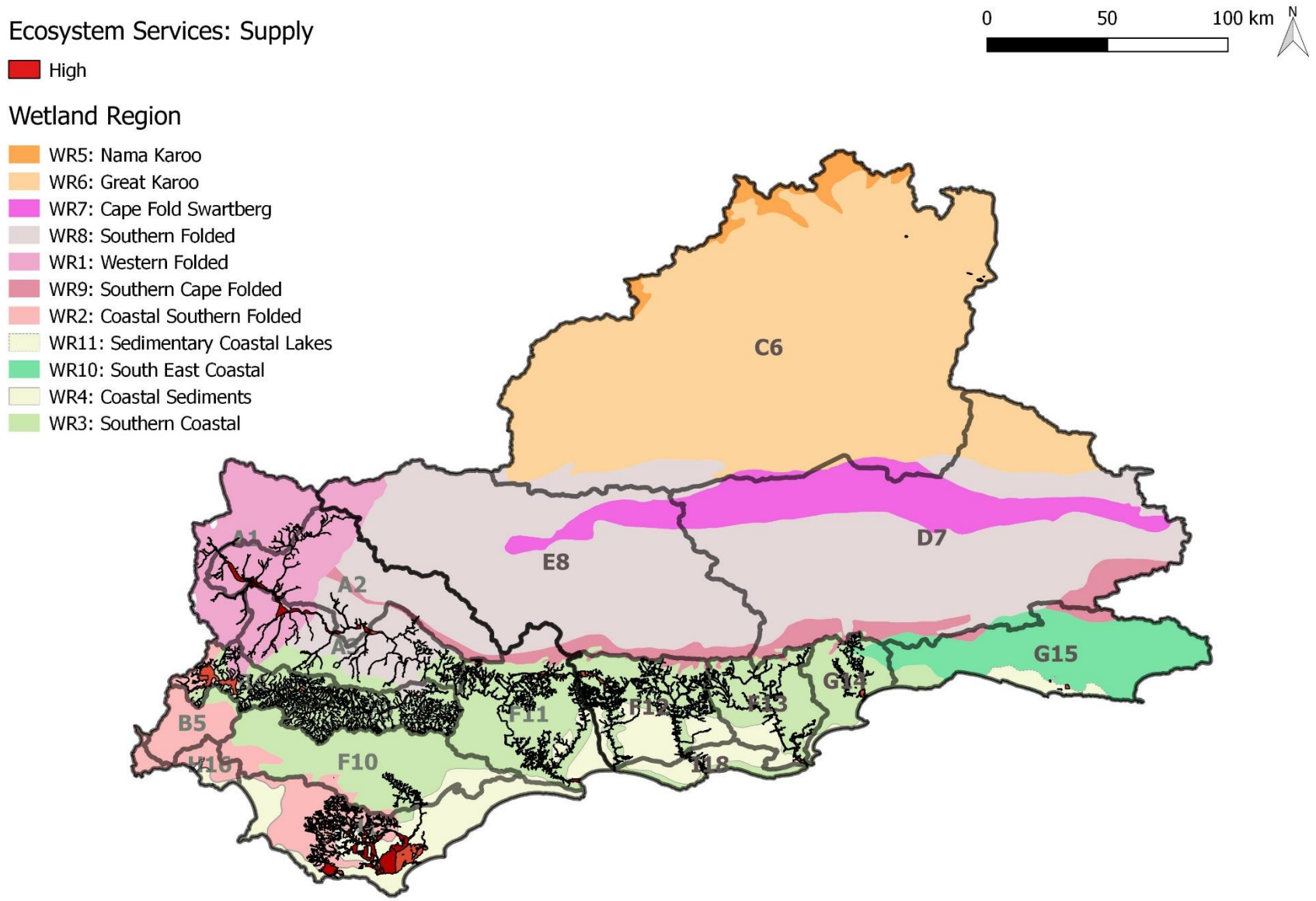


Figure 3.7 Wetlands which supply a high level of ecosystem services

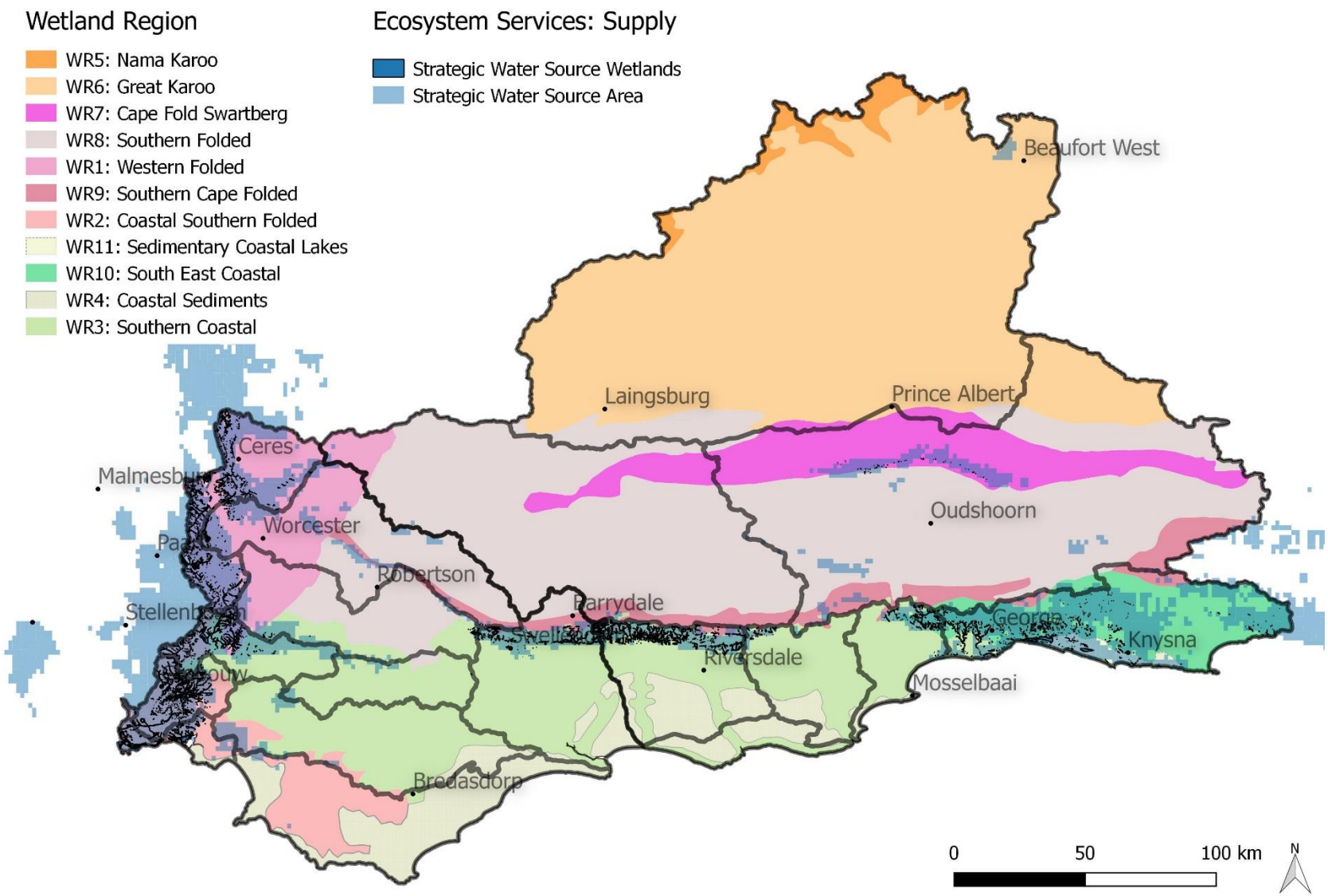


Figure 3.8 Wetlands within Strategic Water Source Areas

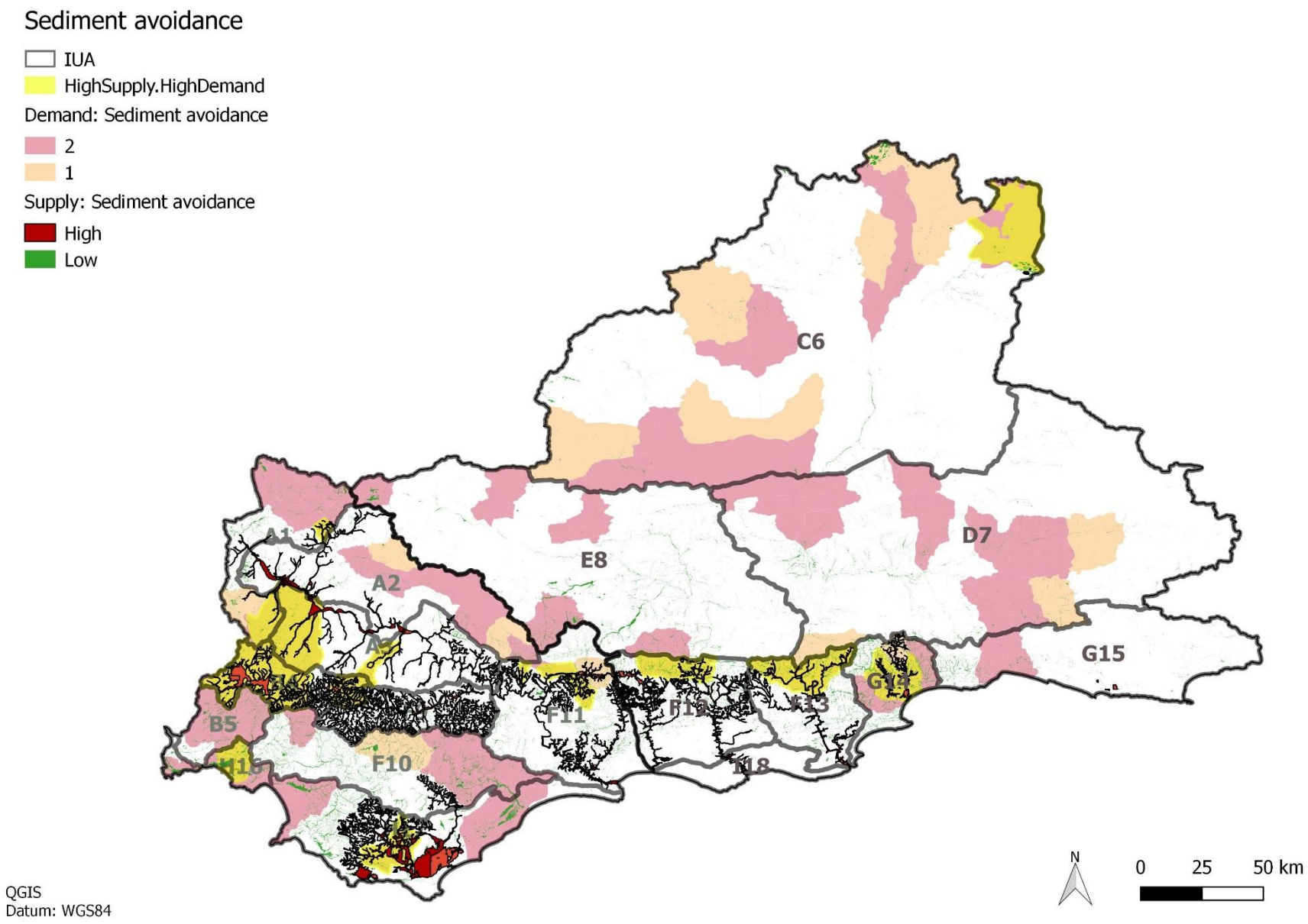


Figure 3.9 The high demand and supply for sediment avoidance ecosystem services from wetlands

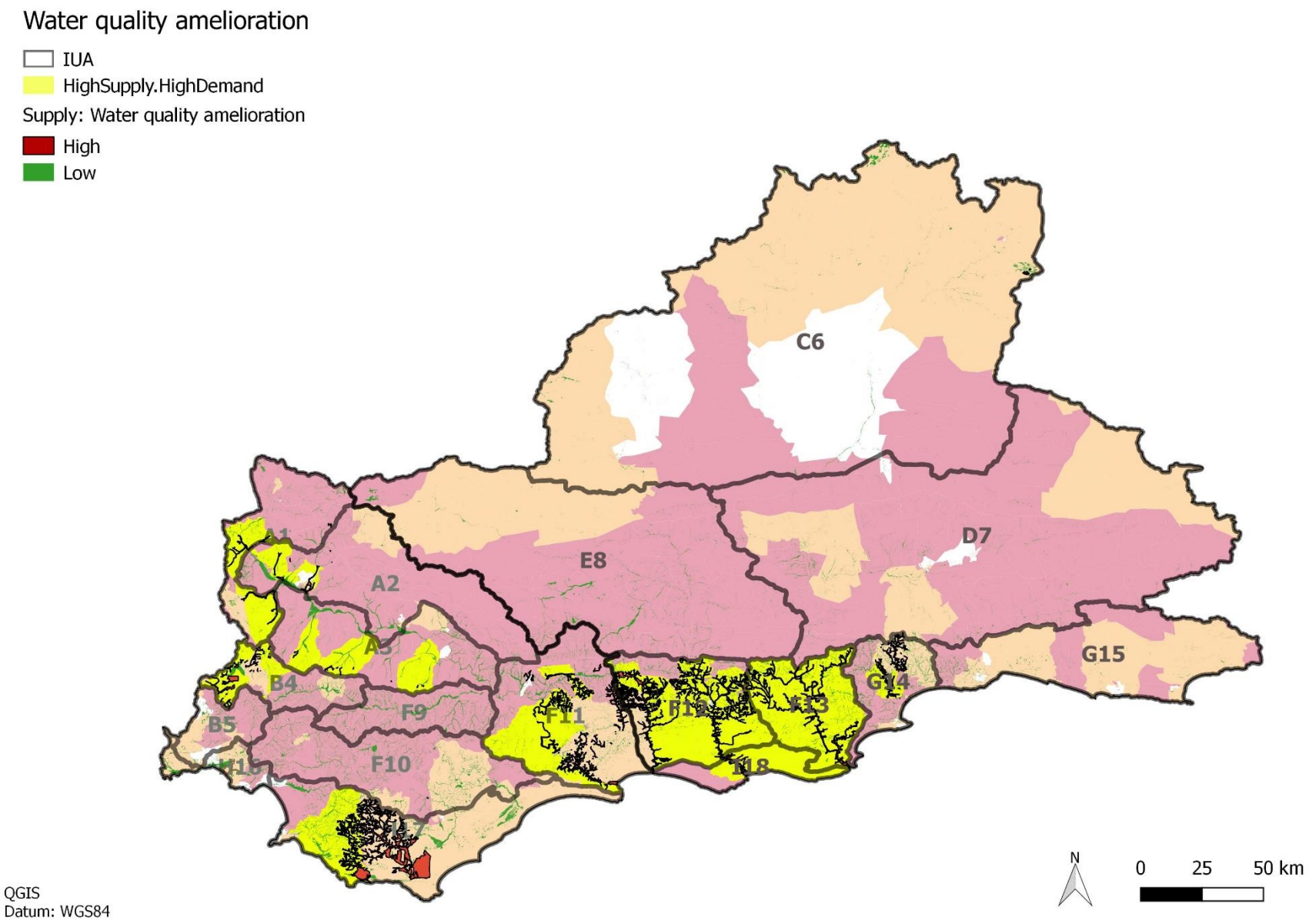


Figure 3.10 The demand for water quality enhancement ecosystem services from wetlands

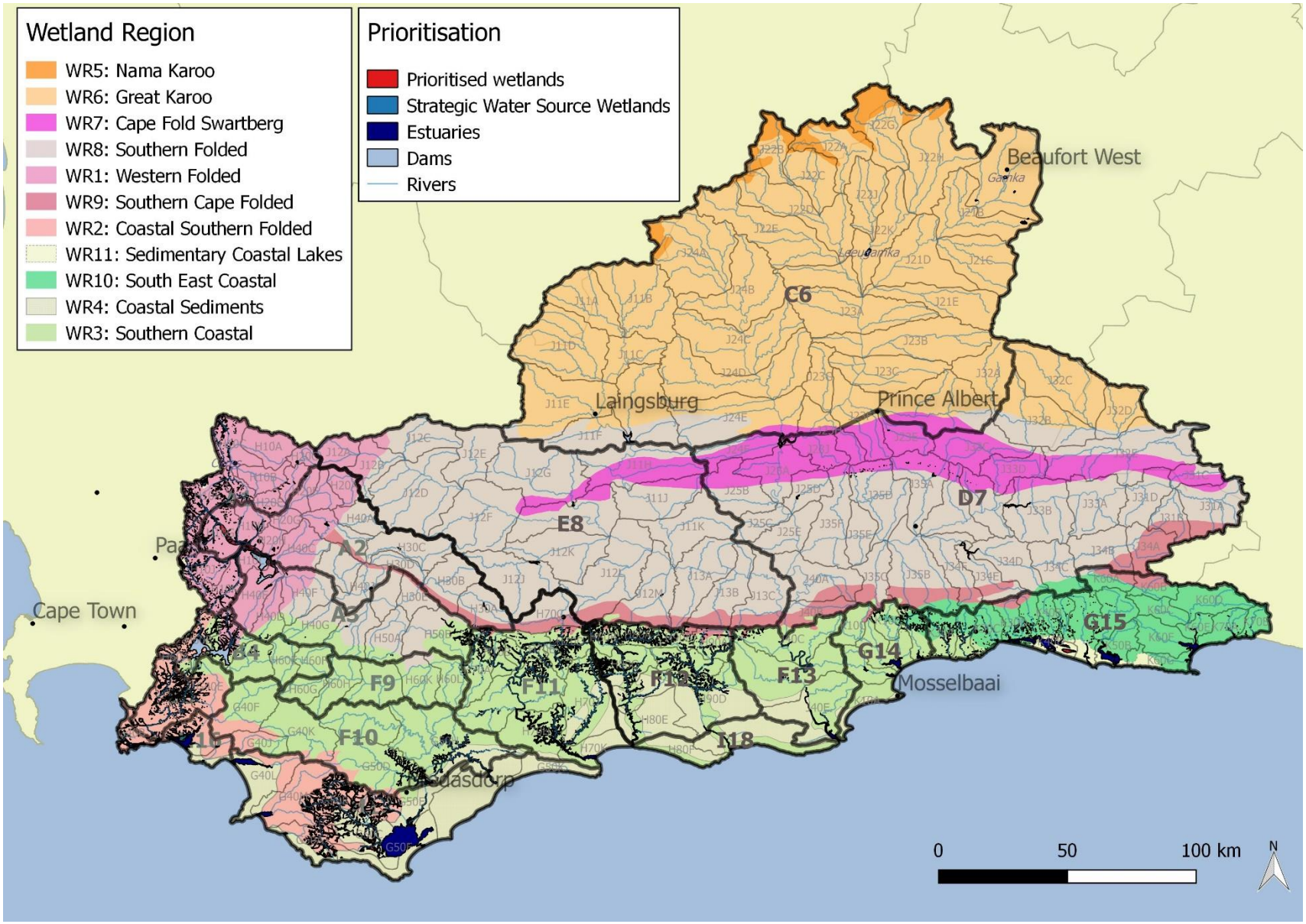


Figure 3.11 The prioritised wetlands for the Breede-Gouritz WMA

Table 3.14 Wetland resource unit prioritisation

IUA		Wetland Region	Wetland Resource Unit	Name	Ecol NB	Supply	Demand
Gouritz-Coastal	C6 Great Karoo	WR5 Nama Karoo	Upper Nama Karoo Depression	N/A	x		
		WR6 Great Karoo	Lower Nama Karoo Depression	N/A	x	x	
	D7 Touws	WR7 Cape Fold Swartberg	Wetlands within Strategic Water Source Areas	N/A		x	
	G15 Coastal	WR11 Sedimentary Coastal Lakes	Freshwater Lake	Groenvlei	x		
		WR10 South East Coastal	Freshwater Lake	Wilderness Lakes	x		
			Wetlands within Strategic Water Source Areas	N/A		x	
	F13 Lower Gouritz	WR3 Southern Coastal	Albany Thicket Floodplain	Gouritz River	x	x	x
	F12 Duiwenhoks	WR3 Southern Coastal	East Coast Shale Renosterveld Channelled Valley Bottom and Floodplain	Goukou Wetland	x	x	
			East Coast Shale Renosterveld Channelled Valley Bottom and Floodplain	Duiwenhoks Wetland	x	x	x
Breede-Overberg	A1 Upper Breede Tributaries	WR1 Western Folded	Wetlands within Strategic Water Source Areas	N/A		x	
			East Coast Shale Renosterveld Floodplain (Papenkuils)	Papenkuils		x	
	A2 Breede Working Tributaries	WR1 Western Folded	East Coast Shale Renosterveld Floodplain (Papenkuils)	Papenkuils		x	
	A3 Middle Breede Tributaries	WR1 Western Folded	East Coast Shale Renosterveld Floodplain	Breede River		x	x
		WR8 Southern Folded	East Coast Shale Renosterveld Floodplain	Breede River	x	x	x
	F11 Lower Breede Renosterveld	WR3 Southern Coastal	East Coast Shale Renosterveld Floodplain	Breede River		x	
	B4 Riviersonderend Theewaters	WR3 Southern Coastal	Wetlands within Strategic Water Source Areas	Riviersonderend River	x	x	x
	B5 Overberg West	WR3 Southern Coastal	Wetlands within Strategic Water Source Areas	Palmiet River		x	
	F10 Overberg East Renosterveld	WR8 Southern Coastal	Southwest Ferricrete Fynbos Floodplain	Kars River	x	x	
	H16 Overberg West Coastal	WR2 Coastal Southern Folded	Southwest Sand Fynbos Channelled Valley Bottom	Bot-Kleinmond Estuary	x		x
			Wetlands within Strategic Water Source Areas	N/A		x	
	H17 Overberg East Fynbos	WR4 Coastal Sediments	Southwest Ferricrete Fynbos Flat, Depression and Floodplain	Agulhas Wetland System	x	x	x
			East Coast Shale Renosterveld Floodplain	De Hoop Vlei	x		

3.5 Groundwater Priority Resource Units

Full results of the prioritisation process, showing the scoring system per priority resource unit, are shown in Table 3.15. A total of 42 quaternary catchments are prioritised (20% of all catchments), relating to 21 GRUs and 15 IUAs.

The reason for the prioritisation of an area and the existence of baseline data informs the type of RQOs to be developed. In some cases, an area became prioritised but only in terms of contribution to surface water (i.e. K70A). In these cases, RQOs must focus on maintaining groundwater's contribution to SW. In cases where there is insufficient baseline data on which to establish an RQO, narrative RQOs can be developed along with monitoring recommendations in order to establish the baseline and implement more detailed RQOs in future. In other cases, full RQOs for groundwater need to be considered (Table 3.16).

Following the reasoning provided in section 2.7, in some GRUs there are no quaternary catchments prioritised for the development of RQOs. Some of these areas remain important for municipal groundwater supply, and it is recommended that best practice wellfield management guidelines be provided to these local municipalities, such that their groundwater resource is adequately protected. These are listed in Table 3.17.

Table 3.15 Prioritised groundwater resource units showing scores

GRU	Quat	Criteria:	Importance for users			Threat posed to users				Practical considerations		Level of SW-GW interaction	
		Criteria weight:	25			30				15		30	
		Sub-criteria weight:	Sole-supply	SWSA-gw	Economic activities	Declining trend in WL	Declining trend in WQ	High stress (current)	High stress (future)	Availability of WQ monitoring	Availability of water level WL monitoring	GW for low flow conditions	Priority GW-dependent ecology
		RU Score	60	20	20	35	35	15	15	50	50	50	50
BO-1	G40A	38.5	0	1	1	1	1	0	0	0	0	0.5	0
BO-1	G40C	48.3	0	1	1	1	1	0	0.5	0	1	0.5	0
BO-1	G40D	42.3	0	1	1	1	1	0	0	0	0.5	0.5	0
BO-2	G40H	39.3	0.5	1	1	0	0	0.5	1	0	0	1	0
BO-3	G50B	47.5	0.5	1	1	0	0	0	0	0	0	1	1
BO-3	G50D	42.5	0.5	1	0	0	0	0	0	0	0	1	1
BO-3	G50E	53.8	0.5	1	0	1	0	0.5	0.5	0.5	0	0.5	1
BB-1	H10A	35.5	0	1	1	1	1	0.5	0.5	0	0	0	0
BB-1	H10B	40.0	0	1	1	1	1	1	1	0	0	0	0
BB-1	H10C	58.8	0.5	1	1	1	1	1	1	0.5	1	0	0
BB-3	H10F	45.3	0	1	1	1	1	0.5	1	0	0	0	0.5
BB-3	H10G	51.3	0.5	1	1	1	0	0.5	0.5	0.5	1	0	0.5
BB-3	H10H	46.8	0	1	1	1	1	0.5	0.5	0	0.5	0.5	0
BB-3	H10J	44.5	0	1	1	1	1	0	0.5	0	0.5	0.5	0
BB-3	H10L	47.5	0	1	1	1	1	1	1	0.5	0.5	0	0
BB-2	H20A	40.0	0	1	1	1	1	1	1	0	0	0	0
BB-2	H20B	40.0	0	1	1	1	1	1	1	0	0	0	0
BB-2	H20C	35.5	0	1	1	1	1	0.5	0.5	0	0	0	0
BB-2	H20F	40.0	0	1	1	1	1	1	1	0	0	0	0
BB-5	H20H	40.8	0	1	1	0	1	1	1	0	0.5	0	0.5
BB-6	H30B	**29.5**	0	1	1	1	0	1	1	0	0	0	0
BB-4	H40B	**21.3**	0	1	1	0	0	0	0	0.5	1	0	0
BB-5	H40C	36.3	0	1	1	0	1	0.5	0.5	0	0.5	0.5	0
BB-7	H40J	43.0	0	1	1	1	1	0.5	0.5	0	0	0	0.5
BB-7	H40K	38.0	0	0	1	1	1	0.5	0.5	0	0	0.5	0
BR-1	H60A	**17.5**	0	1	1	0	0	0	0	0	1	0	0
BR-1	H60B	**16.0**	0	1	1	0	0	0	0.5	0	0.5	0	0

GRU	Quat	Criteria:	Importance for users			Threat posed to users				Practical considerations		Level of SW-GW interaction	
		Criteria weight:	25			30				15		30	
		Sub-criteria weight:	Sole-supply	SWSA-gw	Economic activities	Declining trend in WL	Declining trend in WQ	High stress (current)	High stress (future)	Availability of WQ monitoring	Availability of water level WL monitoring	GW for low flow conditions	Priority GW-dependent ecology
		RU Score	60	20	20	35	35	15	15	50	50	50	50
BR-1	H60C	**23.5**	0	1	1	0	0	0	0.5	0	0.5	0	0.5
GGo-2a and 2b	H90E	**32.5**	1	0	0.5	1	0	0.5	0.5	0	0	0	0
GGr-3	J11E	**27.0**	0.5	0	0	1	0	1	1	0	0	0	0
GGr-1	J12C	**35.0**	0	0	1	1	1	1	1	0	0	0	0
GGr-1	J12D	35.5	0	1	1	1	1	0.5	0.5	0	0	0	0
GGa-2a, 2b and 2c	J21A	66.3	0.5	0	0.5	1	1	1	1	0.5	1	0	1
GGa-2a, 2b and 2c	J21B	45.0	0	0	0	1	1	1	1	0	0	0	1
GGa-2a, 2b and 2c	J23A	37.5	0	0	0	1	1	1	1	0	1	0	0
GGa-1	J24B	**26.3**	0.5	0	0	1	0	0.5	0.5	0	0.5	0	0
GO-4	J35B	35.3	0.5	1	0.5	1	0	0	0.5	0	1	0	0
GGo-1	J40C	40.5	0.5	0	0	0	1	0	0	0	0	0.5	1
GGo-1	J40D	40.5	0.5	0	0	0	1	0	0	0	1	0	1
GC-1	K20A	35.3	0	1	0.5	1	0	0	0.5	0	0	1	0
GC-2	K40D	38.5	0	0	0.5	1	1	0	0	0	0	0	1
GC-3	K70A	38.5	0	0	0.5	1	1	0	0	0	0	1	0

Table 3.16 Summary of criteria met per prioritised groundwater resource unit, including type of RQO or product to be developed

IUA	GRU	Quaternary catchment	Score	Status of data availability for baseline trend	Motivation for prioritisation of this quats within GRU (summary of the key main criteria met)	Type of RQOs or outcome applicable
[Berg]	BO-1	G40A	38.5	Insufficient data for baseline	Quaternary catchment lies within a SWSA-gw, related to high groundwater use to support economic activities (agriculture). Insufficient data to establish baseline, hence risk to users is high. Potentially significant future GW use for CCT. GW could play a moderate role in supporting EWRs.	Narrative RQOs with recommendations to establish baseline

IUA	GRU	Quaternary catchment	Score	Status of data availability for baseline trend	Motivation for prioritisation of this quats within GRU (summary of the key main criteria met)	Type of RQOs or outcome applicable
Overberg West	BO-1	G40C	48.3	Insufficient data for baseline	Quaternary catchment lies within a SWSA-gw, related to high groundwater use to support economic activities (agriculture). Insufficient data to establish baseline, hence risk to users is high. Potentially significant future GW use for CCT. GW could play a moderate role in supporting EWRs.	Narrative RQOs with recommendations to establish baseline
Overberg West	BO-1	G40D	42.3	Insufficient data for baseline	Quaternary catchment lies within a SWSA-gw, related to high groundwater use to support economic activities (agriculture). Insufficient data to establish baseline, hence there is a risk to users. Potentially significant future GW use for CCT. GW could play a moderate role in supporting EWRs.	Narrative RQOs with recommendations to establish baseline
Overberg West Coastal	BO-2	G40H	39.3	Baseline established	Quaternary supports domestic use in Hermanus, lies within a SWSA-gw, related to high groundwater use to support economic activities. The catchment is currently moderately used, which is projected to increase to heavily used in future. GW could play a significant role in supporting EWRs.	Full groundwater RQOs
Overberg East Fynbos	BO-3	G50B	47.5	Baseline established	Quaternary supports domestic use in Elim (sole supply), and lies within a SWSA-gw, related to high groundwater use to support economic activities. GW could play a significant role in supporting EWRs and the groundwater-fed wetlands in the quaternary are considered a priority.	Full groundwater RQOs
Overberg East Renosterveld	BO-3	G50D	42.5	Baseline established	Quaternary supports domestic use in Napier (sole supply), and lies within a SWSA-gw. GW could play a significant role in supporting EWRs and the groundwater-fed wetlands in the quaternary are considered a priority.	Full groundwater RQOs
Overberg East Fynbos	BO-3	G50E	53.8	Baseline established	Quaternary supports domestic use in Bredasdorp (sole supply), and lies within a SWSA-gw. GW in the catchment is currently moderately used, and monitoring data suggests a potential declining trend in groundwater levels. GW could play a moderate role in supporting EWRs and the groundwater-fed wetlands in the quaternary are considered a priority.	Full groundwater RQOs
Upper Breede Tributaries	BB-1	H10A	35.5	Insufficient data for baseline	Quaternary catchment lies within a SWSA-gw, related to high groundwater use to support economic activities (agriculture). Insufficient data to establish baseline, and groundwater in catchment is moderately used, hence risk to users.	Narrative RQOs with recommendations to establish baseline

IUA	GRU	Quaternary catchment	Score	Status of data availability for baseline trend	Motivation for prioritisation of this quats within GRU (summary of the key main criteria met)	Type of RQOs or outcome applicable
Upper Breede Tributaries	BB-1	H10B	40.0	Baseline established	Quaternary catchment lies within a SWSA-gw, related to high groundwater use to support economic activities (agriculture). Available data shows a potential worsening trend in groundwater quality, and groundwater in catchment is currently moderately used, hence there is a risk to users.	Full groundwater RQOs
Upper Breede Tributaries	BB-1	H10C	58.8	Baseline established	Quaternary catchment lies within a SWSA-gw, related to high groundwater use to support economic activities (agriculture). GW in the catchment is currently heavily used, and monitoring data suggests a potential declining trend in groundwater levels, with insufficient data to establish water quality baseline, hence there is a risk to users.	Full groundwater RQOs
Upper Breede Tributaries	BB-3	H10F	45.3	Insufficient data for baseline	Quaternary catchment lies within a SWSA-gw, related to high groundwater use to support economic activities (agriculture). GW in the catchment is currently moderately used, which may increase to heavily used in future. Monitoring data is insufficient to establish a baseline, hence there is a risk to users. The groundwater-fed wetlands in the quaternary are considered a moderate priority.	Narrative RQOs with recommendations to establish baseline
Breede Working Tributaries	BB-3	H10G	51.3	Baseline established	Quaternary supports domestic use in Rawsonville (sole supply), and lies within a SWSA-gw, related to high groundwater use to support economic activities (agriculture). GW in the catchment is currently moderately used, and monitoring data suggests a potential declining trend in groundwater levels. The groundwater-fed wetlands in the quaternary are considered a moderate priority.	Full groundwater RQOs
Breede Working Tributaries	BB-3	H10H	46.8	Baseline established	Quaternary catchment lies within a SWSA-gw, related to high groundwater use to support economic activities (agriculture). GW in the catchment is currently moderately used, and monitoring data suggests a potential declining trend in groundwater levels. GW could play a moderate role in supporting EWRs.	Full groundwater RQOs
Upper Breede Tributaries	BB-3	H10J	44.5	Insufficient data for baseline	Quaternary catchment lies within a SWSA-gw, related to high groundwater use to support economic activities (agriculture). The catchment may become moderately used in future, and monitoring data is insufficient to establish a baseline, hence there is a risk to users. GW could play a moderate role in supporting EWRs.	Narrative RQOs with recommendations to establish baseline

IUA	GRU	Quaternary catchment	Score	Status of data availability for baseline trend	Motivation for prioritisation of this quats within GRU (summary of the key main criteria met)	Type of RQOs or outcome applicable
Breede Working Tributaries	BB-3	H10L	47.5	Insufficient data for baseline	Quaternary catchment lies within a SWSA-gw, related to high groundwater use to support economic activities (agriculture). Groundwater in the catchment is currently heavily used, and monitoring data is insufficient to establish a baseline, hence there is a risk to users.	Narrative RQOs with recommendations to establish baseline
Breede Working Tributaries	BB-2	H20A	40.0	Insufficient data for baseline	Quaternary catchment lies within a SWSA-gw, related to high groundwater use to support economic activities (agriculture). Groundwater in the catchment is currently heavily used, and monitoring data is insufficient to establish a baseline, hence there is a risk to users.	Narrative RQOs with recommendations to establish baseline
Breede Working Tributaries	BB-2	H20B	40.0	Insufficient data for baseline	Quaternary catchment lies within a SWSA-gw, related to high groundwater use to support economic activities (agriculture). Groundwater in the catchment is currently heavily used, and monitoring data is insufficient to establish a baseline, hence there is a risk to users.	Narrative RQOs with recommendations to establish baseline
Upper Breede Tributaries	BB-2	H20C	35.5	Insufficient data for baseline	Quaternary catchment lies within a SWSA-gw, related to high groundwater use to support economic activities (agriculture). Groundwater in the catchment is currently moderately used, and monitoring data is insufficient to establish a baseline, hence there is a risk to users.	Narrative RQOs with recommendations to establish baseline
Breede Working Tributaries	BB-2	H20F	40.0	Insufficient data for baseline	Quaternary catchment lies within a SWSA-gw, related to high groundwater use to support economic activities (agriculture). Groundwater in the catchment is currently heavily used, and monitoring data is insufficient to establish a baseline, hence there is a risk to users.	Narrative RQOs with recommendations to establish baseline
Breede Working Tributaries	BB-5	H20H	40.8	Baseline established	Quaternary catchment lies within a SWSA-gw, related to high groundwater use to support economic activities (agriculture). Groundwater in the catchment is currently heavily used. The groundwater-fed wetlands in the quaternary are considered a moderate priority.	Full groundwater RQOs
Breede Working Tributaries	BB-6	H30B	**29.5**	Baseline established	Quaternary catchment lies within a SWSA-gw, related to high groundwater use to support economic activities (agriculture). Groundwater in the catchment is currently heavily used.	Full groundwater RQOs
Breede Working Tributaries	BB-4	H40B	**21.3**	Baseline established	Quaternary catchment lies within a SWSA-gw, related to high groundwater use to support economic activities (agriculture).	Full groundwater RQOs

IUA	GRU	Quaternary catchment	Score	Status of data availability for baseline trend	Motivation for prioritisation of this quats within GRU (summary of the key main criteria met)	Type of RQOs or outcome applicable
Breede Working Tributaries	BB-5	H40C	36.3	Baseline established	Quaternary catchment lies within a SWSA-gw, related to high groundwater use to support economic activities (agriculture). GW in the catchment is currently moderately used. GW could play a moderate role in supporting EWRs.	Full groundwater RQOs
Breede Working Tributaries	BB-7	H40J	43.0	Insufficient data for baseline	Quaternary catchment lies within a SWSA-gw, related to high groundwater use to support economic activities (agriculture). The catchment is moderately used, and monitoring data is insufficient to establish a baseline, hence there is a risk to users. The groundwater-fed wetlands in the quaternary are considered a moderate priority.	Narrative RQOs with recommendations to establish baseline
Middle Breede Renosterveld	BB-7	H40K	38.0	Insufficient data for baseline	Catchment has high groundwater use to support economic activities (agriculture). The catchment is moderately used, and monitoring data is insufficient to establish a baseline, hence there is a risk to users. GW could play a moderate role in supporting EWRs.	Narrative RQOs with recommendations to establish baseline
Riviersonderend Theewaters	BR-1	H60A	**17.5**	Baseline established	Quaternary catchment lies within a SWSA-gw, related to groundwater use to support economic activities (agriculture). The catchment is currently minimally used, but groundwater use may increase significantly in future related to CCT abstraction plans.	Full groundwater RQOs
Riviersonderend Theewaters	BR-1	H60B	**16.0**	Baseline established	Quaternary catchment lies within a SWSA-gw, related to groundwater use to support economic activities (agriculture). The catchment is currently minimally used, but groundwater use may increase significantly in future related to CCT abstraction plans.	Full groundwater RQOs
Riviersonderend Theewaters	BR-1	H60C	**23.5**	Baseline established	Quaternary catchment lies within a SWSA-gw, related to groundwater use to support economic activities (agriculture). The catchment is currently minimally used, but groundwater use may increase significantly in future related to CCT abstraction plans. The groundwater-fed wetlands in the quaternary are considered a moderate priority.	Full groundwater RQOs
Hessequa	GGo-2a and 2b	H90E	**32.5**	Baseline established	Quaternary supports domestic use in three sole supply settlements (Stilbaai, Melkhoutfontein, Gouritzmond), has moderate groundwater use to support economic activities, and is categorised as a moderately used catchment.	Full groundwater RQOs
Gamka-Buffels	GGr-3	J11E	**27.0**	Insufficient data for baseline	Quaternary supports domestic use in two sole supply settlements (Laingsberg & Matjiesfontein), and is categorised as a heavily used catchment.	Narrative RQOs with recommendations to establish baseline

IUA	GRU	Quaternary catchment	Score	Status of data availability for baseline trend	Motivation for prioritisation of this quats within GRU (summary of the key main criteria met)	Type of RQOs or outcome applicable
Touws	GGr-1	J12C	35.0	Baseline established	Catchment has high groundwater use to support economic activities. The catchment is heavily used, and available monitoring data suggests a declining water level trend, hence there is a risk to users.	Full groundwater RQOs
Touws	GGr-1	J12D	35.5	Baseline established	Quaternary catchment lies within a SWSA-gw, related to groundwater use to support economic activities. The catchment is moderately used, and available monitoring data suggests a declining water level trend, hence there is a risk to users.	Full groundwater RQOs
Gamka-Buffels	GGa-2a, 2b and 2c	J21A	66.3	Baseline established	Quaternary catchment supports domestic use in two sole supply settlements (Murraysberg & Beaufort West), and has high groundwater use to support economic activities. The catchment is heavily used, and available monitoring data suggests a declining water level trend and potentially worsening water quality, hence there is a risk to users. The groundwater-fed wetlands in the quaternary are considered a moderate priority.	Full groundwater RQOs
Gamka-Buffels	GGa-2a, 2b and 2c	J21B	45.0	Baseline established	The catchment is heavily used, and available monitoring data suggests a declining water level trend and potentially worsening water quality, hence there is a risk to users. The groundwater-fed wetlands in the quaternary are considered a moderate priority.	Full groundwater RQOs
Gamka-Buffels	GGa-2a, 2b and 2c	J23A	37.5	Baseline established	The catchment is heavily used, and available monitoring data suggests a declining water level trend and potentially worsening water quality, hence there is a risk to users.	Full groundwater RQOs
Gamka-Buffels	GGa-1	J24B	**26.3**	Baseline established	Quaternary catchment supports domestic use in one sole supply settlement (Merweville). The catchment is moderately used, and available monitoring data suggests a declining water level trend, hence there is a risk to users.	Full groundwater RQOs
Gouritz-Olifants	GO-4	J35B	35.3	Baseline established	Quaternary catchment supports domestic use in sole supply settlements (the KKRWSS), lies within a SWSA-gw, related to groundwater use to support economic activities (agriculture). Groundwater use in the catchment is expected to increase to moderately used (stressed) in future. The available monitoring data suggests a declining water level trend, hence there is a risk to users.	Full groundwater RQOs

IUA	GRU	Quaternary catchment	Score	Status of data availability for baseline trend	Motivation for prioritisation of this quats within GRU (summary of the key main criteria met)	Type of RQOs or outcome applicable
Lower Gouritz	GGo-1	J40C	40.5	Baseline established	Quaternary catchment supports domestic use in a sole supply settlement (Herbertsdale). GW could play a moderate role in supporting EWRs and the groundwater-fed wetlands in the quaternary are considered a priority.	Full groundwater RQOs
Lower Gouritz	GGo-1	J40D	40.5	Baseline established	Quaternary catchment supports domestic use in a sole supply settlement (Albertinia). The groundwater-fed wetlands in the quaternary are considered a priority.	Full groundwater RQOs
Groot Brak / Coastal	GC-1	K20A	35.3	Insufficient data for baseline	Quaternary catchment lies within a SWSA-gw. Groundwater use in the catchment may increase in future. Meets high priority only in terms of SW-GW interactions (GW could play a significant role in supporting EWRs).	Groundwater discharge - related RQOs
Coastal	GC-2	K40D	38.5	Insufficient data for baseline	Groundwater use supports economic activities (agriculture). There is insufficient data to establish current trends. The groundwater-fed wetlands in the quaternary are considered a priority.	Narrative RQOs with recommendations to establish baseline
Coastal	GC-3	K70A	38.5	Insufficient data for baseline	Meets high priority only in terms of SW-GW interactions (GW could play a significant role in supporting EWRs).	Groundwater discharge - related RQOs

Table 3.17 Summary of GRUs without any prioritised catchments

IUA	GRU	Quaternary catchment	Score	Status of data availability for baseline trend	Motivation for prioritisation of this quats within GRU (summary of the key main criteria met)	Type of RQOs or outcome applicable
Lower Riviersonderend	BR-2	(None)	(n/a)	Insufficient data for baseline	GRU is not considered a priority; few criteria are met, and the GRU has no GW dependent towns.	(None)
Gouritz-Olifants	GGa-3	(None)	(n/a)	Insufficient data for baseline	GRU is not considered a priority; few criteria are met. Part of KKRWSS wellfields lie in area. Scheme requires appropriate GW management.	Guidelines to support for municipal domestic supply

IUA	GRU	Quaternary catchment	Score	Status of data availability for baseline trend	Motivation for prioritisation of this quats within GRU (summary of the key main criteria met)	Type of RQOs or outcome applicable
Gamka-Buffels, Gouritz-Olifants	GGa-4	(None)	(n/a)	Baseline established	GRU is not considered a priority; few criteria are met. One town (Prince Albert) uses some groundwater. Scheme requires appropriate GW management.	Guidelines to support for municipal domestic supply
Gouritz-Olifants	GGa-5	(None)	(n/a)	Insufficient data for baseline	GRU is not considered a priority; few criteria are met, and the GRU has no GW dependent towns.	(None)
Touws	GGr-2	(None)	(n/a)	Insufficient data for baseline	GRU is not considered a priority; few criteria are met, and the GRU has no GW dependent towns.	(None)
Touws	GGr-4	(None)	(n/a)	Baseline established	GRU is not considered a priority; few criteria are met. One town (Ladismith) uses some groundwater. Scheme requires appropriate GW management.	Guidelines to support for municipal domestic supply
Touws	GGr-5	(None)	(n/a)	Baseline established	GRU is not considered a priority; few criteria are met. One GW dependent town (Van Wyksdorp). Scheme requires appropriate GW management.	Guidelines to support for municipal domestic supply
Gouritz-Olifants	GO-1	(None)	(n/a)	Insufficient data for baseline	GRU is not considered a priority; few criteria are met, and the GRU has no GW dependent towns.	(None)
Gouritz-Olifants	GO-2	(None)	(n/a)	Baseline established	GRU is not considered a priority; few criteria are met, and the GRU has no GW dependent towns.	(None)
Gouritz-Olifants	GO-3	(None)	(n/a)	Baseline established	GRU is not considered a priority; few criteria are met, and the GRU has no GW dependent towns.	(None)
Lower Breede Renosterveld	BB-8	(None)	(n/a)	Baseline established	GRU is not considered a priority; few criteria are met, and the GRU has no GW dependent towns, and low SW-GW interaction.	(None)

4 Conclusion

4.1 Summary of prioritised RUs

A summary of the priority RUs for rivers, estuaries, dams, wetlands and groundwater resource units are presented below. These represent the list of proposed RUs for which RQOs should be developed.

The prioritized RUs for determining RQOs have been identified using the following criteria:

- The top 17 river priority RUs in the Breede and Overberg IUAs and the top 20 river priority RUs in the Gouritz and Coastal IUAs
- Estuaries with a priority weighting of ≥ 0.5
- Dams determined from prioritisation process with a priority weighting of > 0.5
- Wetlands RUs as determined from the prioritisation process
- Groundwater RUs with a priority level of 3.

The prioritisation approach is resource-specific, for example enabling different areas to be prioritised for surface water and groundwater respectively. This is necessary, given that the criteria for each differ. However, in certain circumstances, the RQO for one resource may require the RQO of another resource to be developed to support it. This is especially true for areas where river RQOs specify a particular dry season low flow requirement to meet an ecological category, yet groundwater is not prioritised in the same region, hence no RQO would be set. During the outline of RQOs step initial linkages need to be highlighted, and through stakeholder engagement further linkages need to be made between prioritised Resource Units. In this way RQOs can be developed to cross-support each other.

The resource units listed in Table 4.1 and Table 4.2 and mapped in Figure 4.1 and Figure 4.2 should therefore be seen as a minimum, as additional resource units may be required.

Table 4.1 Summary of results of the prioritisation process for the Breede and Overberg IUAs

IUA	Prioritised Resource Units (RUs)				
	River	Estuary	Dam	Wetland	Groundwater
A1 Upper Breede Tributaries	nviii1 Breede nvii2 Molenaars		Ceres Koekedouw	Strategic Water Source wetlands	BB-1 (H10A) BB-1 (H10B) BB-1 (H10C) BB-3 (H10F) BB-3 (H10J) BB-2 (H20B) BB-2 (H20C)
A2 Breede Working Tributaries	nvii7 Hex		Greater Brandvlei	East Coast Shale Renosterveld Channelled Floodplain (Papenkuils)	BB-3 (H10G) BB-3 (H10H) BB-3 (H10L) BB-2 (H20A) BB-2 (H20F) BB-5 (H20H) BB-6 (H30B) BB-4 (H40B) BB-5 (H40C) BB-7 (H40J)
A3 Middle Breede Renosterveld	nvii8 Breede ni2 Breede			East Coast Shale Renosterveld Floodplain (Breede)	BB-7 (H40K)
B4 Riviersonderend Theewaterskloof	nvii10 Du Toits nv7 Riviersonderend		Theewaterskloof	Strategic Water Source wetlands	BR-1 (H60A) BR-1 (H60B)

IUA	Prioritised Resource Units (RUs)				
	River	Estuary	Dam	Wetland	Groundwater
	niv28 Baviaans nv9 Riviersonderend				BR-1 (H60C)
F9 Lower Riviersonderend	ni3 Riviersonderend				
B5 Overberg West	piii1 Palmiet piii2 Palmiet piii3 Palmiet	Palmiet	Eikenhof Kogelberg Arieskraal No.2	Strategic Water Source wetlands (Palmiet)	BO-1 (G40C) BO-1 (G40D)
H16 Overberg West Coastal		Buffels Rooiels Bot Onrus		Southwest Sand Fynbos Channelled Valley Bottom (Kleinmond) Strategic Water Source wetlands	BO-2 (G40H)
F10 Overberg East Renosterveld	nv23 Klein			Southwest Ferricrete Fynbos Floodplain (Kars)	BO-3 (G50D)
H17 Overberg East Fynbos	ni4 Nuwejaar nv24 Kars	Klein Uilkraal Ratel Heuningnes Klipdrifsfontein		Southwest Ferricrete Fynbos Flat, Depression and Floodplain (Agulhas Wetland System) East Coast Shale Renosterveld Floodplain (De Hoop) East Coast Shale Renosterveld Floodplain (Heuningnes)	BO-3 (G50B) BO-3 (G50E)
F11 Lower Breede Renosterveld	niii4 Breede	Breede		East Coast Shale Renosterveld Floodplain (Breede)	
TOTALS	**17**	**11**	**6**	**12**	**27**

Table 4.2 Summary of results of the prioritisation process for the Gouritz and Coastal IUAs

IUA	Prioritised Resource Units (RUs)				
	River	Estuary	Dam	Wetland	Groundwater
C6 Gamka Buffels				Upper Nama Karoo Depression Lower Nama Karoo Depression	GGr-3 (J11E) GGa-2a, 2b and 2c (J21A) GGa-2a, 2b and 2c (J21B) GGa-2a, 2b and 2c (J23A) GGa-1 (J24B)
E8 Touws	gviii1 Doring gv5 Touws gv4 Buffels gv6 Groot gii3 Groot				GGr-1 (J12C) GGr-1 (J12D)
D7 Gouritz-Olifants	giv20 Gamka giii2 Olifants gv36 Kammanassie		Stompdrift		GO-4 (J35B)
F13 Lower Gouritz	gi4 Gouritz	Gouritz		Albany Thicket Floodplain (Gouritz)	GGo-1 (J40C) GGo-1 (J40D)
F12 Duiwenhoks	giii8 Duiwenhoks	Duiwenhoks		East Coast Shale Renosterveld Channelled Valley Bottom and	

IUA	Prioritised Resource Units (RUs)				
	River	Estuary	Dam	Wetland	Groundwater
				Floodplain (Goukou) East Coast Shale Renosterveld Channelled Valley Bottom and Floodplain (Duiwenhoks)	
I18 Hessequa	giii7 Goukou	Goukou			GGo-2A and 2B (H90E)
G14 Groot-Brak	gviii2 Groot-Brak	Klein Brak Groot Brak Blinde Tweekuilen Gericke Hartenbos	Wolwedans		GC-1 (K20A)
G15 Coastal	gvii9 Malgas gvii11 Kaaimans giii10 Diep gvii13 Karatara gviii9 Goukamma gvii14 Knysna gviii11 Gouna giv6 Keurbooms	Maalgate Gwaing Kaaimans Wilderness Swartvlei Goukamma Knysna Noetsie Piesang Keurbooms Matjies Sout (Oos) Groot (Wes) Bloukrans		Freshwater Lake (Groenvlei) Freshwater Lake (Wilderness Lakes) Strategic Water Source wetlands	GC-2 (K40D) GC-3 (K70A)
TOTALS	**20**	**23**	**2**	**8**	**14**

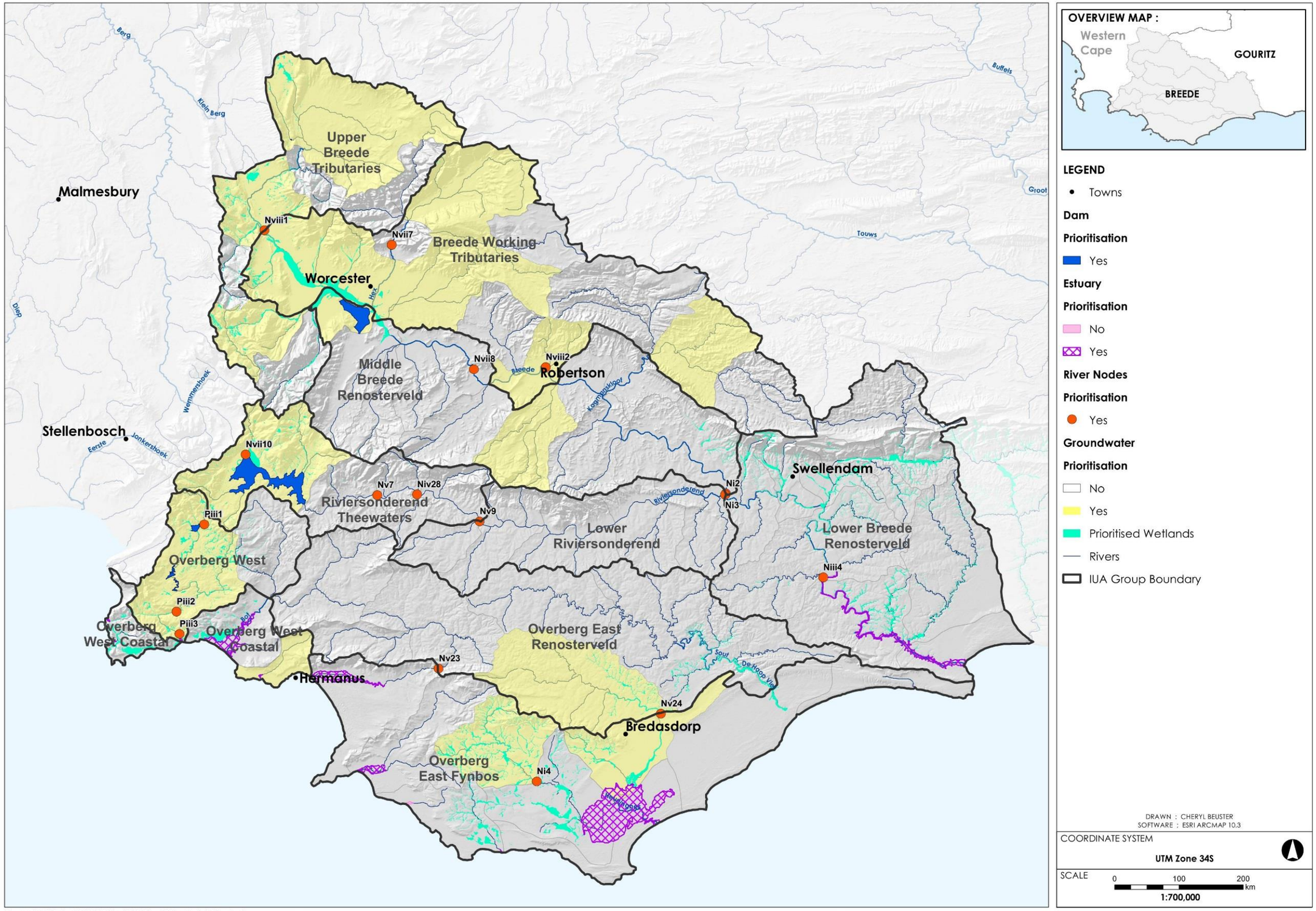


Figure 4.1 Summary of results of the prioritisation process for the Breede and Overberg IUAs

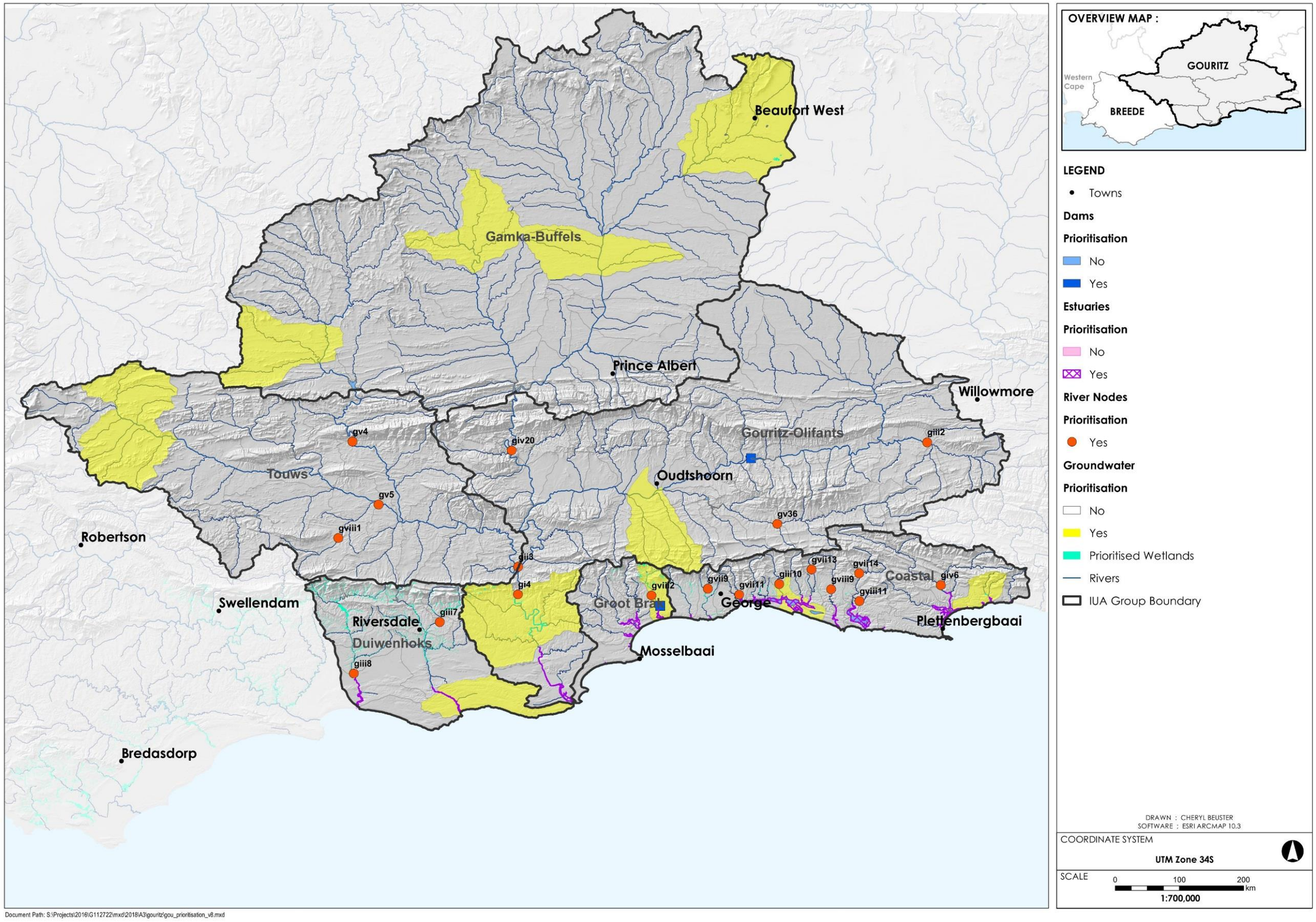


Figure 4.2 Summary of results of the prioritisation process for the Gouritz and Coastal IUAs

4.2 Addressing uncertainties

Some of the key limitations and uncertainties which may influence the confidence of the outcomes of the RU prioritisation process, which should be considered when implementing the RQOs, are described below.

4.2.1 Rivers

The river prioritisation tool provides a good overview of important considerations but gives unnecessary priority to IUA outlets, which skewed the results away from the EWR sites in some areas. No adjustments were made to the default settings in the tool to adjust when calculating the results or to adjust for this, however consideration was given to other factors such as existing EWR sites or specific river resource units identified by stakeholders, to ensure that these resource units were also included in the recommended list for determining RQOs.

4.2.2 Estuaries

Some large discrepancies were evident between importance scores allocated using the RUPT Tool and the conservation importance ranking that has been established for estuaries in South Africa (Turpie *et al*. 2013). Both ranking systems thus need to be considered when prioritising estuaries for the development of RQOs. The recommended priority estuary RUs, for which RQOs will be developed, was derived from a combination of the results of the RUPT Tool and other prioritised estuaries. It was particularly important to ensure that estuaries considered significant at national level were included.

4.2.3 Dams

While there had been previous attempts to include the dam RU prioritisation methodology in the RQO process, there is no agreed/standardised tool to prioritise dams. The prioritisation approach followed in this report was a two-tier screening. The first level of screening was documented in the Resource Unit and Integrated Units of Analysis Delineation Report (DWS, 2016b) of this study, and was largely based on the size and importance of dams for water supply. The existing surface water prioritisation tool was then adapted, in this assessment, to prioritise the pre-screened dams. The adaptation to the tool was done to make the prioritisation more relevant to dams whilst trying to limit significant changes to the criteria and the ranking system that was applied in the original RUPT tool. It is recommended that these prioritisation criteria be critically evaluated and further refined.

4.2.4 Wetlands

The methodology for prioritising wetlands, and used in this study is currently under development. An important factor in this is included user value as well as ecological importance to the prioritisation of wetlands. This prioritisation approach is largely based on the consideration of spatial overlays of data in a GIS system and is therefore relatively mechanical in its approach. There are however limitations in the quality of the spatial data available, and in particular the scale at which wetlands are delineated. Where available other systems for prioritisation wetlands have been considered, such as the NFEPA wetlands to ensure

4.2.5 Groundwater`

The groundwater prioritisation follows examples of other previous studies, however, the resulting score is sensitive to the weights applied, which are largely subjective. Those weights selected have attempted to strike a balance in the final prioritisation between resource units important for human use (sole supply settlements and areas where groundwater use supports economic activities), and resource units important for supporting ecological functioning.

4.3 Way forward

The next step of the RQO determination process, Step 4, consists of prioritising sub-components for RQO determination and the selection of indicators for monitoring. Each of the prioritised RUs identified during Step 3, and indicated in this report, will be analysed in more detail, to identify which sub-components present in these RUs should be protected, in order to support water resource dependent activities and/or to maintain the integrity and ecological functioning of the water resource. This analysis will be done using the RU Evaluation Tool, where applicable.

5 References

Department of Water Affairs and Forestry, South Africa. 2004. Breede Water Management Area: Internal Strategic Perspective. Prepared by Ninham Shand (Pty) Ltd in association with Jakoet & Associates, Umvoto Africa and Tlou and Matji, on behalf of the Directorate: National Water Resource Planning. DWAF Report No P WMA18/000/00/0304.

Department of Water Affairs and Forestry, South Africa. 2004. Gouritz Water Management Area: Internal Strategic Perspective. Prepared by Ninham Shand (Pty) Ltd in association with Jakoet & Associates and Umvoto Africa, on behalf of the Directorate: National Water Resource Planning. DWAF Report No P WMA16/000/00/0304.

Department of Water Affairs and Forestry (DWAF). 2006. Groundwater Resource Assessment II: Task 3aE Recharge. Version 2.0 Final Report 2006-06-20.

Department of Water Affairs (DWA). 2009. Strategy and Guideline Development for National Groundwater Planning Requirements. Review of GRA1, GRA2 and international assessment methodologies.

Department of Water Affairs (DWA). 2010. National Groundwater Strategy.

Department of Water Affairs (DWA). 2011. Procedures to develop and implement resource quality objectives. Department of Water Affairs, Pretoria, South Africa.

Department of Water Affairs (DWA). 2014. Determination of Resource Quality Objectives for the Olifants Doorn Water Management Area – Report No. 3 - RQO Determination Report. Prepared by Umvoto Africa (Pty) Ltd in association with Southern Water Ecological Research and Consulting cc (Authors: K Riemann. A Joubert, C. Brown) on behalf of the Directorate: RDM Compliance.

Department of Water Affairs (DWA). 2014b. Reserve determination for surface water, groundwater, estuaries and wetlands in the Gouritz Water Management Area: Desktop ecoclassification report. Prepared by AECOM (Pty) Ltd. And Sherman Colloty and Associates cc. Report No RDM/WMA16/00/CON/0213.

Department of Water and Sanitation (DWS). 2014. Determination of Resource Quality Objectives in the Upper Vaal Water Management Area (WMA8): Resource Unit Prioritisation Report. Report No.: RDM/WMA08/00/CON/RQO/0213. Chief Directorate: Water Ecosystems. Prepared by the Institute of Natural Resources (INR), Pietermaritzburg, South Africa.

Department of Water and Sanitation (DWS). 2015. Reserve Determination Studies for the Selected Surface Water, Groundwater, Estuaries and Wetlands in the Gouritz Water Management Area: Groundwater Report. Prepared by Exigo Sustainability for Scherman Colloty & Associates cc. Report no. RDM/WMA16/02/CON/0413.

Department of Water and Sanitation (DWS). 2016a. Determination of Water Resources Classes and Resource Quality Objectives in the Breede-Gouritz Water Management Area: Water Resources Information and Gap Analysis. Report No: RDM/WMA8/00/CON/CLA/0316. Prepared by Aurecon South Africa (Pty) Ltd in association with Southern Waters Ecological Consulting, Anchor Environmental and Delta-H Water Systems Modelling. Department of Water and Sanitation, Pretoria.

Department of Water and Sanitation (DWS). 2016b. Determination of Water Resources Classes and Resource Quality Objectives in the Breede-Gouritz Water Management Area: Resource Unit and Integrated Units of Analysis Delineation. Report No: RDM/WMA8/00/CON/CLA/0416. Prepared by Aurecon South Africa (Pty) Ltd in association with Southern Waters Ecological Consulting, Anchor Environmental and Delta-H Water Systems Modelling. Department of Water and Sanitation, Pretoria.

Department of Water and Sanitation (DWS). 2016c. Determination of Water Resources Classes and Resource Quality Objectives in the Breede-Gouritz Water Management Area: Status Quo. Report No: RDM/WMA8/00/CON/CLA/0516. Prepared by Aurecon South Africa (Pty) Ltd in association with Southern Waters Ecological Consulting, Anchor Environmental and Delta-H Water Systems Modelling. Department of Water and Sanitation, Pretoria.

Department of Water and Sanitation (DWS). 2016d.The National Groundwater Strategy: Final Draft.

Department of Water and Sanitation (DWS). 2017a. Determination of Water Resources Classes and Resource Quality Objectives in the Breede-Gouritz Water Management Area: Linking the Value and Condition of the Water Resource. Report No: RDM/WMA8/00/CON/CLA/0117. Prepared by Aurecon South Africa (Pty) Ltd in association with Southern Waters Ecological Consulting, Anchor Environmental and Delta-H Water Systems Modelling. Department of Water and Sanitation, Pretoria.

Department of Water and Sanitation (DWS). 2017b. Determination of Water Resources Classes and Resource Quality Objectives in the Breede-Gouritz Water Management Area: Ecological Base Configuration Scenario Report. Report No: RDM/WMA8/00/CON/CLA/0317. Prepared by Aurecon South Africa (Pty) Ltd in association with Southern Waters Ecological Consulting, Anchor Environmental and Delta-H Water Systems Modelling. Department of Water and Sanitation, Pretoria. *Draft Report*

Institute of Natural Resources (INR), 2017. Deliverable 3: Revised Draft of the procedure for determining wetland Resource Quality Objectives. Water Research Commission Project K5/2547: Demystifying Wetland Resource Quality Objectives.

Kleynhans, C.J., Louw, M.D. 2007. River Ecoclassification. Manual for Ecostatus determination (Version 2). Module A: Ecoclassification and Ecostatus determination. Joint Water Research Commission and Department of Water Affairs and Forestry Report.

Kotze, D.C., Marneweck, G.C., Batchelor, A.L. Lindley, D.S. and Collions, N.B. 2007. WET-Ecoservices: A technique for rapidly assessing ecosystem services supplied by wetlands. Water Research Commission Report No. TT 339/08, Water Research Commission, Pretoria.

Parsons, R. 1995. A South African Aquifer System Management Classification. Report to the Water Research Commission of South Africa. Water Research Commission Report KV 77/95.

Parsons, R. and J. Wentzel. 2007. Groundwater Resources Directed Measures Manual Water Research Commission Report No TT 299/07. ISBN 978-1-77005-510-0.

Riemann, K. 2013. 'Groundwater Reserve' – a critical review. Paper presented at the 13th Biennial Groundwater Conference of the Geological Society of South Africa, 17th-19th September 2013, Durban, South Africa.

Seyler, H., Witthueser, K. and Holland, M. 2016. The Capture Principle Approach to Sustainable Groundwater Use. November 2016. Water Research Commission Report No. ISBN.

Sophocleous, M. 2000. From safe yield to sustainable development of water resources – the Kansas experience. Journal of Hydrology 235: 27–43.

Turpie, J.K., Wilson, G. and Van Niekerk, L. 2012. National Biodiversity Assessment 2011: National Estuary Biodiversity Plan for South Africa. Anchor Environmental Consulting, Cape Town. Report produced for the Council for Scientific and Industrial Research and the South African National Biodiversity Institute.

Van Niekerk L, Turpie JK eds. 2012. South African National Biodiversity Assessment 2011: Technical Report. Volume 3: Estuary Component. CSIR Report Number CSIR/NRE/ECOS/ER/2011/0045/B. Council for Scientific and Industrial Research, Stellenbosch.

Wilmot, E. 2008. Deep Artesian Groundwater Exploration for Oudtshoorn Supply. Estimation of sustainable yield of the deep artesian aquifer through hydraulic testing and numerical modelling. MSC Thesis submitted to University of Birmingham.

Appendix A Prioritisation of River Resource Units

Appendix Table 1 Prioritisation scores for Resource Units in the Breede River catchment and Overberg region

#	Node code	Position in IUA	Concern for users	Concern for environment	Management and practical considerations	Total Prioritization Score	Priority Rating	Overall rating
1	Niv2	0.000	0.000	0.030	0.077	0.108	0.166	83
2	Niv1	0.000	0.000	0.078	0.101	0.179	0.276	59
3	Niv3	0.000	0.000	0.044	0.077	0.121	0.187	80
4	Nvi4	0.000	0.017	0.014	0.101	0.132	0.204	73
5	Niv4	0.000	0.017	0.091	0.077	0.186	0.287	57
6	Nvi3	0.000	0.028	0.093	0.101	0.222	0.343	47
7	Nvii16	0.000	0.031	0.091	0.077	0.200	0.308	54
8	Niv5	0.000	0.009	0.125	0.101	0.236	0.364	36
9	Niv6	0.000	0.000	0.047	0.077	0.125	0.192	77
10	Nviii1	0.250	0.072	0.076	0.250	0.648	1.000	2
11	Niv7	0.000	0.000	0.030	0.101	0.132	0.203	74
12	Niii1	0.000	0.000	0.061	0.077	0.138	0.213	71
13	Niv40	0.000	0.017	0.110	0.101	0.228	0.352	44
14	Niv41	0.000	0.017	0.110	0.077	0.204	0.315	53
15	Nvii2	0.250	0.017	0.096	0.125	0.488	0.754	12
16	Niv42	0.000	0.000	0.064	0.226	0.290	0.448	22
17	Niv8	0.000	0.017	0.095	0.077	0.189	0.292	56
18	Nvii6	0.000	0.017	0.078	0.101	0.196	0.303	55
19	Niv9	0.000	0.017	0.078	0.077	0.172	0.266	61
20	Niv12	0.000	0.008	0.030	0.101	0.139	0.215	70
21	Nv3	0.000	0.072	0.127	0.101	0.300	0.463	20
22	Nv18	0.000	0.000	0.030	0.077	0.108	0.166	84
23	Nvii7	0.000	0.063	0.127	0.125	0.314	0.485	18
24	Niv10	0.000	0.009	0.064	0.077	0.151	0.233	67
25	Nii1	0.250	0.100	0.113	0.101	0.564	0.871	8
26	Nvii5	0.000	0.000	0.064	0.101	0.165	0.255	63
27	Niv11	0.000	0.000	0.014	0.226	0.240	0.370	35
28	Niv13	0.000	0.000	0.030	0.202	0.233	0.359	38
29	Nvii8	0.000	0.080	0.064	0.125	0.269	0.415	27
30	Ni1	0.000	0.009	0.046	0.077	0.132	0.204	72
31	Nvii11	0.000	0.000	0.014	0.101	0.115	0.177	81
32	Niv15	0.000	0.000	0.027	0.101	0.128	0.198	75

#	Node code	Position in IUA	Concern for users	Concern for environment	Management and practical considerations	Total Prioritization Score	Priority Rating	Overall rating
33	Nviii2	0.000	0.000	0.014	0.077	0.091	0.140	87
34	Nvii19	0.000	0.080	0.091	0.077	0.248	0.383	32
35	Niv14	0.000	0.000	0.027	0.101	0.128	0.198	76
36	Niv18	0.000	0.000	0.014	0.101	0.115	0.177	82
37	Niv20	0.000	0.000	0.030	0.077	0.108	0.166	85
38	Nvii9	0.000	0.017	0.027	0.077	0.122	0.188	79
39	Nvii1	0.000	0.000	0.014	0.077	0.091	0.140	88
40	Nii2	0.000	0.017	0.090	0.077	0.184	0.284	58
41	Niii3	0.000	0.080	0.076	0.077	0.233	0.376	37
42	Ni2	0.250	0.080	0.110	0.101	0.541	0.873	9
43	Nvii10	0.000	0.117	0.093	0.101	0.311	0.503	19
44	Nv7	0.000	0.134	0.123	0.077	0.335	0.541	17
45	Niv28	0.000	0.000	0.110	0.101	0.211	0.341	50
46	Niv29	0.000	0.000	0.014	0.077	0.091	0.147	89
47	Niv30	0.000	0.000	0.095	0.077	0.172	0.278	62
48	Nv9	0.250	0.134	0.110	0.125	0.619	1.000	4
49	Niv31	0.000	0.000	0.047	0.077	0.125	0.201	78
50	Niv33	0.000	0.000	0.078	0.077	0.155	0.250	65
51	Niv34	0.000	0.000	0.027	0.077	0.104	0.169	86
52	Nv10	0.000	0.009	0.123	0.077	0.210	0.339	51
53	Nv11	0.000	0.009	0.123	0.077	0.210	0.339	52
54	Niv35	0.000	0.000	0.027	0.202	0.229	0.371	42
55	Nv12	0.000	0.009	0.110	0.101	0.220	0.356	49
56	Ni3	0.250	0.072	0.110	0.077	0.509	0.822	11
57	Niv24	0.000	0.000	0.078	0.202	0.280	0.452	24
58	Niv24a	0.000	0.000	0.078	0.202	0.280	0.452	25
59	Nv2	0.000	0.088	0.110	0.077	0.275	0.444	26
60	Nvii14	0.000	0.000	0.078	0.101	0.179	0.289	60
61	Nii3	0.000	0.008	0.059	0.077	0.144	0.233	69
62	Niv25	0.000	0.000	0.030	0.202	0.233	0.376	39
63	Niii4	0.250	0.053	0.144	0.125	0.572	0.923	7
64	Nviii3	0.000	0.009	0.145	0.077	0.232	0.375	40
65	Niv26	0.000	0.000	0.064	0.202	0.267	0.431	29
66	Piii1	0.000	0.053	0.064	0.125	0.242	0.309	34
67	Piv10	0.000	0.038	0.014	0.173	0.224	0.286	45
68	Piv9	0.000	0.100	0.093	0.196	0.389	0.497	14
69	Piv8	0.000	0.038	0.014	0.173	0.224	0.286	46
70	Pvi1	0.000	0.100	0.093	0.196	0.389	0.497	15
71	Piv4	0.000	0.038	0.064	0.143	0.245	0.312	33
72	Piv7	0.000	0.038	0.078	0.143	0.258	0.329	31
73	Piii2	0.000	0.048	0.095	0.125	0.268	0.342	28
74	Piv12	0.000	0.048	0.095	0.077	0.220	0.281	48
75	Piii3	0.250	0.173	0.235	0.125	0.783	1.000	1
76	Niii5	0.250	0.086	0.090	0.101	0.527	0.672	10
77	Nx6	0.000	0.031	0.047	0.077	0.156	0.199	64

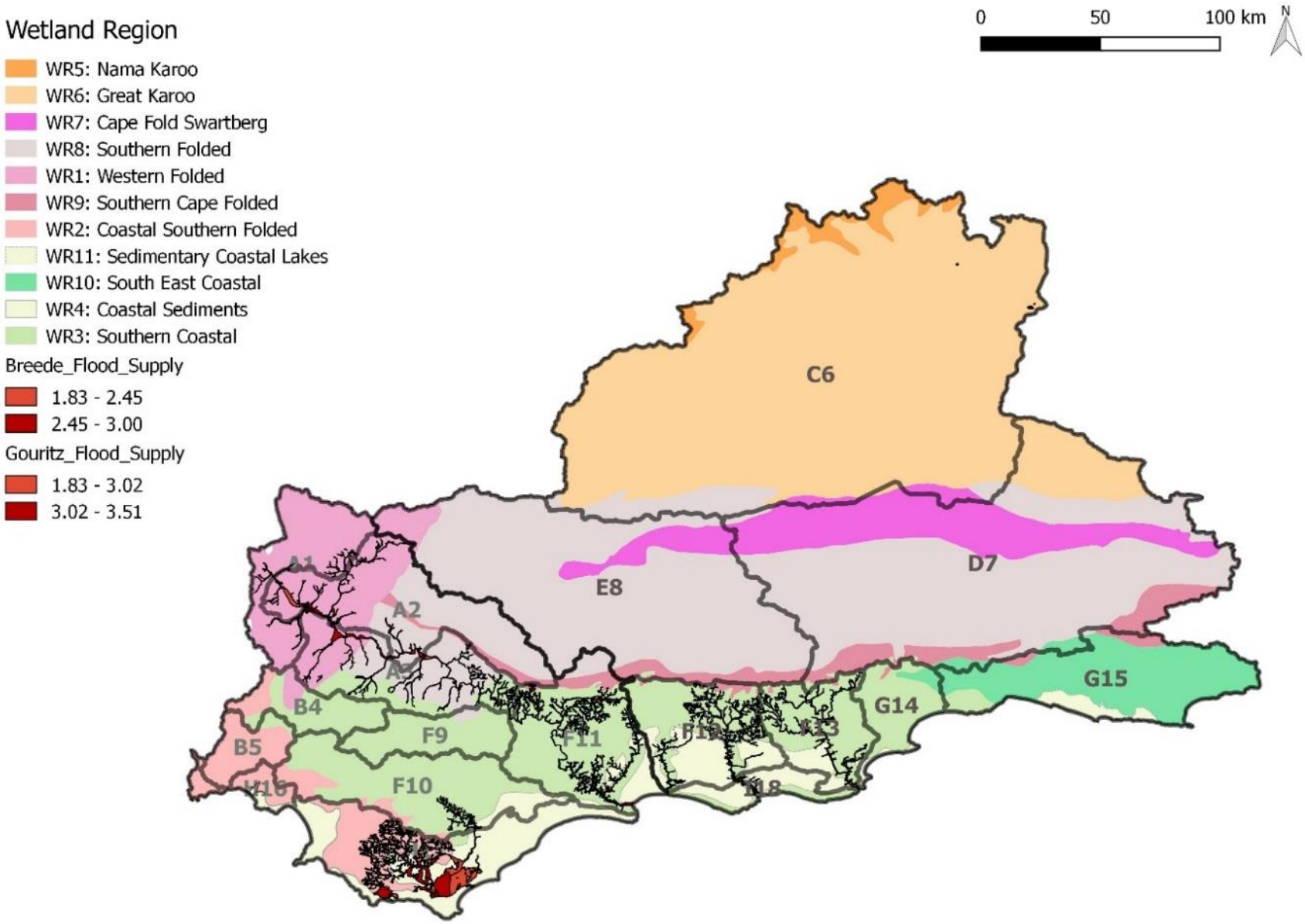
#	Node code	Position in IUA	Concern for users	Concern for environment	Management and practical considerations	Total Prioritization Score	Priority Rating	Overall rating
78	Niv43	0.000	0.014	0.014	0.202	0.230	0.294	41
79	Niv45	0.000	0.000	0.027	0.202	0.229	0.293	43
80	Nii4	0.000	0.000	0.061	0.202	0.263	0.336	30
81	Nv23	0.250	0.094	0.110	0.125	0.579	0.739	6
82	Nii6	0.000	0.000	0.030	0.250	0.280	0.358	23
83	Nii7	0.250	0.009	0.096	0.048	0.403	0.515	13
84	Nx8	0.000	0.000	0.078	0.077	0.155	0.198	66
85	Ni4	0.000	0.009	0.064	0.077	0.151	0.193	68
86	Nvii15	0.000	0.027	0.064	0.202	0.293	0.374	21
87	Niv44	0.250	0.017	0.078	0.250	0.595	0.760	5
88	Nv24	0.000	0.009	0.081	0.250	0.340	0.435	16
89	Nii5	0.250	0.072	0.123	0.202	0.648	0.827	3

Appendix Table 2 Prioritisation scores for Resource Units in the Gouritz River catchment and Coastal region

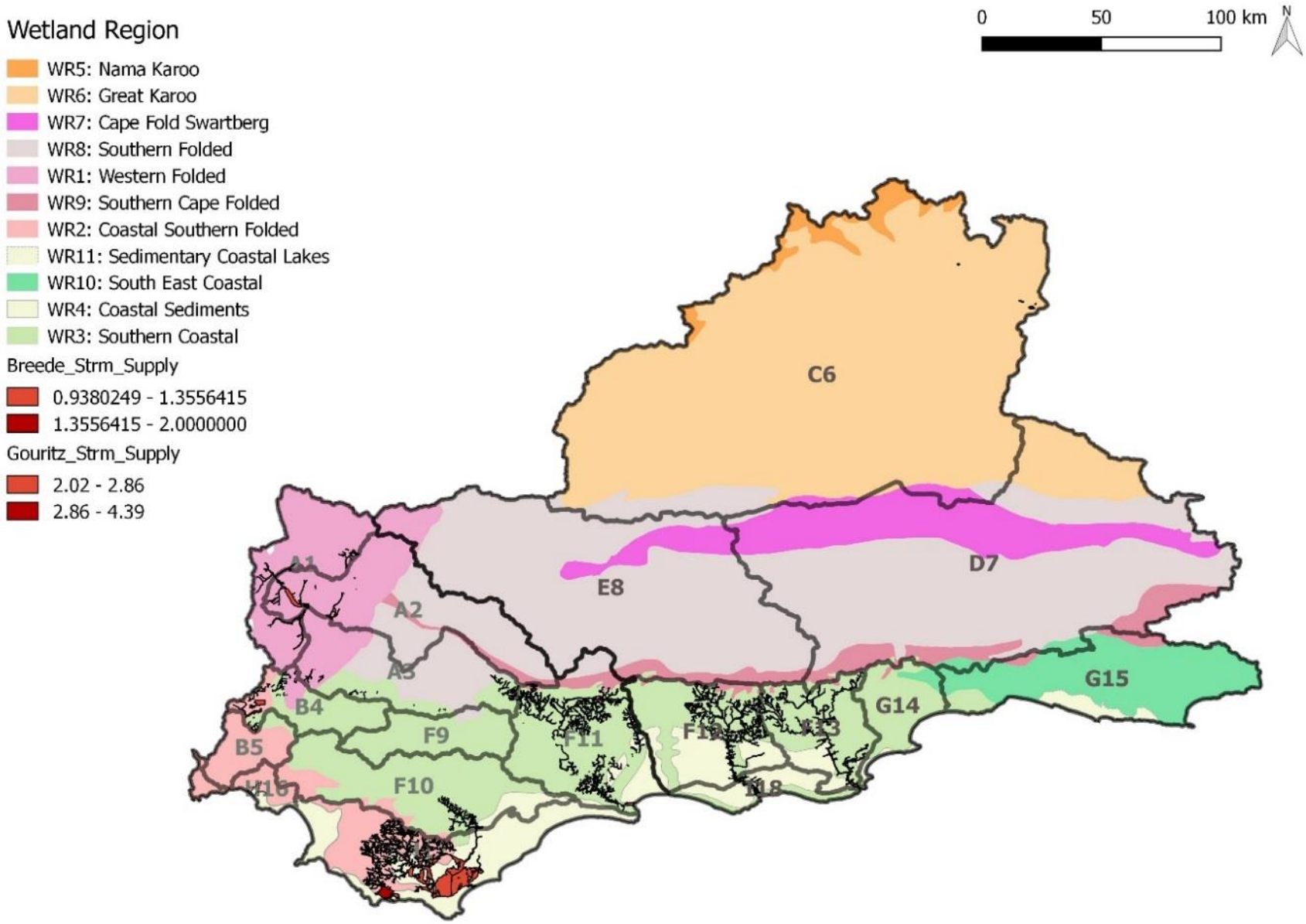
#	Node code	Position in IUA	Concern for users	Concern for environment	Management and practical considerations	Total Prioritization Score	Priority Rating	Overall rating
1	giv30	0.000	0.000	0.014	0.101	0.115	0.209	78
2	giv31	0.000	0.000	0.000	0.077	0.077	0.141	79
3	giv28	0.000	0.000	0.047	0.077	0.125	0.228	75
4	giv27	0.000	0.000	0.049	0.077	0.126	0.231	74
5	giv26	0.000	0.000	0.047	0.077	0.125	0.228	76
6	gviii1	0.000	0.000	0.030	0.125	0.155	0.284	67
7	gv5	0.000	0.009	0.064	0.125	0.199	0.362	48
8	giv34	0.000	0.023	0.061	0.077	0.162	0.295	63
9	gv25	0.000	0.023	0.047	0.101	0.172	0.314	59
10	gv4	0.000	0.000	0.076	0.125	0.201	0.367	47
11	gv6	0.000	0.000	0.093	0.077	0.170	0.311	60
12	giv32	0.000	0.000	0.110	0.101	0.211	0.385	46
13	gv7	0.000	0.009	0.127	0.101	0.237	0.433	38
14	gii3	0.250	0.009	0.142	0.077	0.479	0.873	2
15	gv18	0.000	0.000	0.059	0.077	0.137	0.249	70
16	giv3	0.000	0.000	0.079	0.077	0.157	0.286	66
17	giv1	0.000	0.000	0.078	0.077	0.155	0.283	68
18	giv2	0.000	0.000	0.078	0.101	0.179	0.326	55
19	gv17	0.000	0.000	0.079	0.101	0.181	0.330	54
20	giv21	0.000	0.000	0.046	0.077	0.123	0.224	77
21	gv27	0.250	0.023	0.064	0.077	0.415	0.757	5
22	gv14	0.000	0.023	0.095	0.077	0.195	0.357	51
23	giv20	0.000	0.009	0.064	0.125	0.199	0.362	49
24	giv18	0.000	0.000	0.030	0.101	0.132	0.240	72
25	gii2	0.000	0.009	0.064	0.101	0.175	0.319	58
26	giii2	0.000	0.009	0.064	0.125	0.199	0.362	50
27	giv15	0.000	0.000	0.064	0.101	0.165	0.302	61
28	gv33	0.000	0.086	0.064	0.077	0.228	0.415	42
29	gv21	0.000	0.000	0.078	0.101	0.179	0.326	56
30	giv11	0.000	0.063	0.076	0.226	0.365	0.665	13
31	gv36	0.000	0.063	0.106	0.226	0.395	0.721	7
32	giv10	0.000	0.023	0.030	0.125	0.179	0.326	57
33	gvii2	0.000	0.000	0.061	0.101	0.162	0.296	62
34	giv9	0.000	0.019	0.030	0.202	0.252	0.459	33
35	gv19	0.000	0.009	0.014	0.202	0.225	0.411	44
36	giv17	0.000	0.009	0.047	0.101	0.158	0.288	64
37	giv16	0.000	0.019	0.030	0.077	0.127	0.231	73
38	gi4	0.250	0.033	0.140	0.125	0.548	1.000	1
39	gv28	0.000	0.017	0.127	0.077	0.221	0.404	45
40	gv9	0.000	0.103	0.110	0.077	0.290	0.530	22
41	giii5	0.000	0.000	0.078	0.226	0.304	0.638	19
42	gv11	0.000	0.000	0.061	0.077	0.138	0.290	69
43	giii8	0.250	0.023	0.078	0.125	0.476	1.000	3
44	giii6	0.000	0.077	0.144	0.101	0.321	0.675	16
45	giii7	0.000	0.000	0.061	0.125	0.186	0.390	53
46	gv10	0.000	0.009	0.047	0.077	0.134	0.282	71
47	gv41	0.000	0.009	0.047	0.101	0.158	0.332	65
48	giv25	0.000	0.023	0.110	0.101	0.234	0.492	40
49	gv39	0.000	0.023	0.127	0.125	0.275	0.578	26
50	gviii2	0.000	0.077	0.044	0.125	0.245	0.516	34
51	gviii12	0.000	0.077	0.034	0.125	0.235	0.494	39
52	gviii3	0.000	0.077	0.063	0.125	0.264	0.555	29
53	gvii7	0.000	0.023	0.140	0.101	0.265	0.556	28
54	gviii4	0.000	0.000	0.090	0.101	0.191	0.428	52

#	Node code	Position in IUA	Concern for users	Concern for environment	Management and practical considerations	Total Prioritization Score	Priority Rating	Overall rating
55	gvii8	0.000	0.086	0.090	0.125	0.300	0.674	20
56	gvii9	0.000	0.063	0.123	0.125	0.311	0.697	17
57	gviii6	0.000	0.086	0.110	0.250	0.446	1.000	4
58	gviii7	0.000	0.023	0.110	0.125	0.258	0.579	30
59	gvii11	0.000	0.086	0.155	0.125	0.366	0.822	12
60	gviii8	0.000	0.000	0.155	0.077	0.233	0.522	41
61	gvii12	0.000	0.023	0.172	0.101	0.297	0.666	21
62	gx8	0.000	0.023	0.127	0.077	0.228	0.510	43
63	giii10	0.000	0.086	0.139	0.125	0.349	0.784	14
64	giii13	0.000	0.031	0.155	0.101	0.288	0.646	24
65	gvii13	0.000	0.070	0.172	0.125	0.368	0.825	11
66	giii11	0.000	0.023	0.172	0.077	0.273	0.613	27
67	gviii9	0.000	0.086	0.157	0.125	0.368	0.826	10
68	gvii14	0.000	0.063	0.122	0.125	0.309	0.694	18
69	giii12	0.000	0.023	0.139	0.077	0.239	0.537	35
70	gviii11	0.000	0.086	0.188	0.125	0.398	0.894	6
71	gviii10	0.000	0.086	0.139	0.125	0.349	0.784	15
72	giv6	0.000	0.094	0.157	0.125	0.376	0.843	9
73	giv5	0.000	0.023	0.188	0.077	0.288	0.647	23
74	gx9	0.000	0.023	0.139	0.077	0.239	0.537	36
75	giv4	0.000	0.023	0.157	0.077	0.258	0.579	31
76	gvii15	0.000	0.031	0.155	0.101	0.288	0.646	25
77	gx3	0.000	0.031	0.157	0.202	0.391	0.877	8
78	gx4	0.000	0.023	0.139	0.077	0.239	0.537	37
79	gx5	0.000	0.023	0.155	0.077	0.256	0.575	32

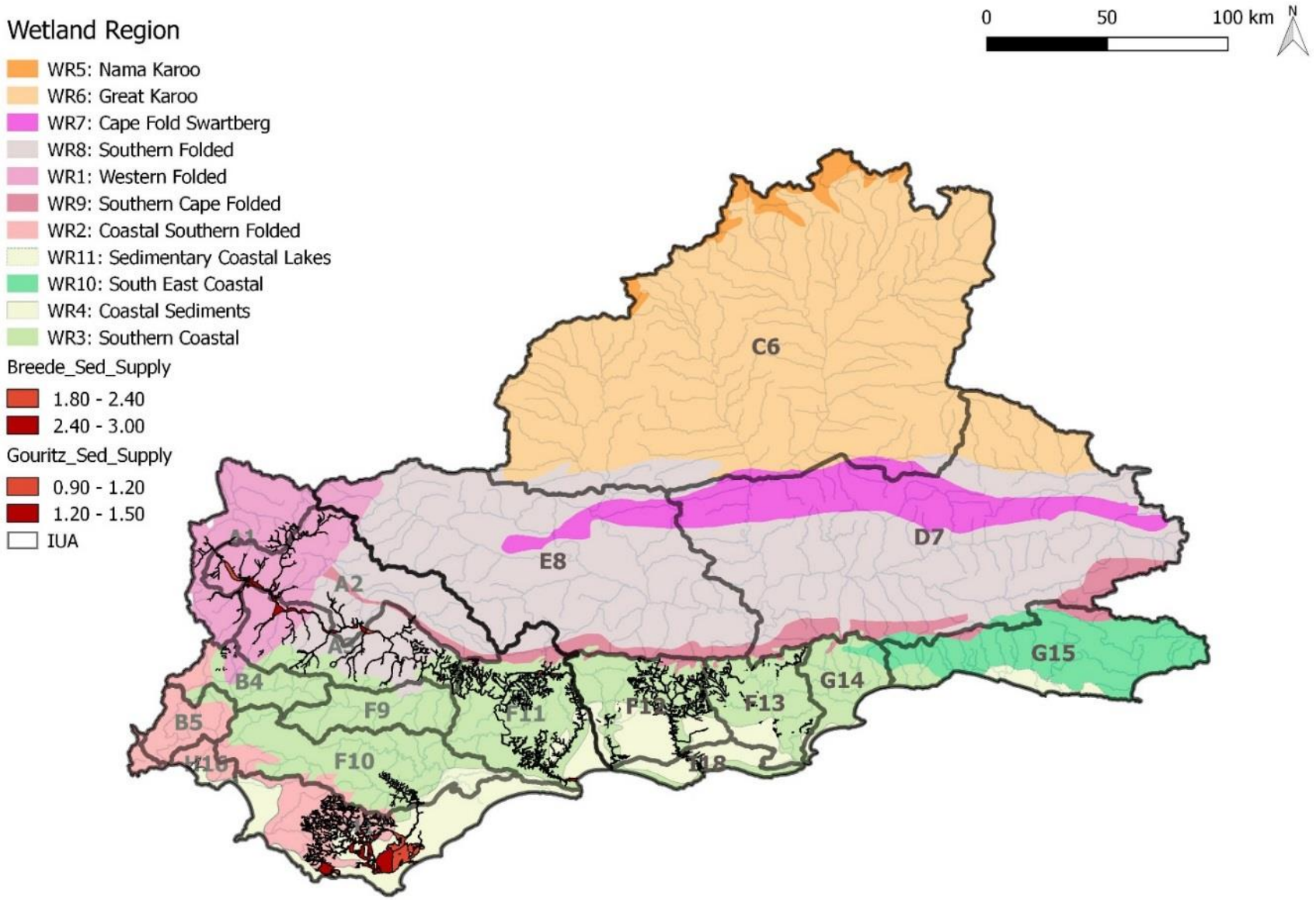
Appendix B
Wetland supply maps



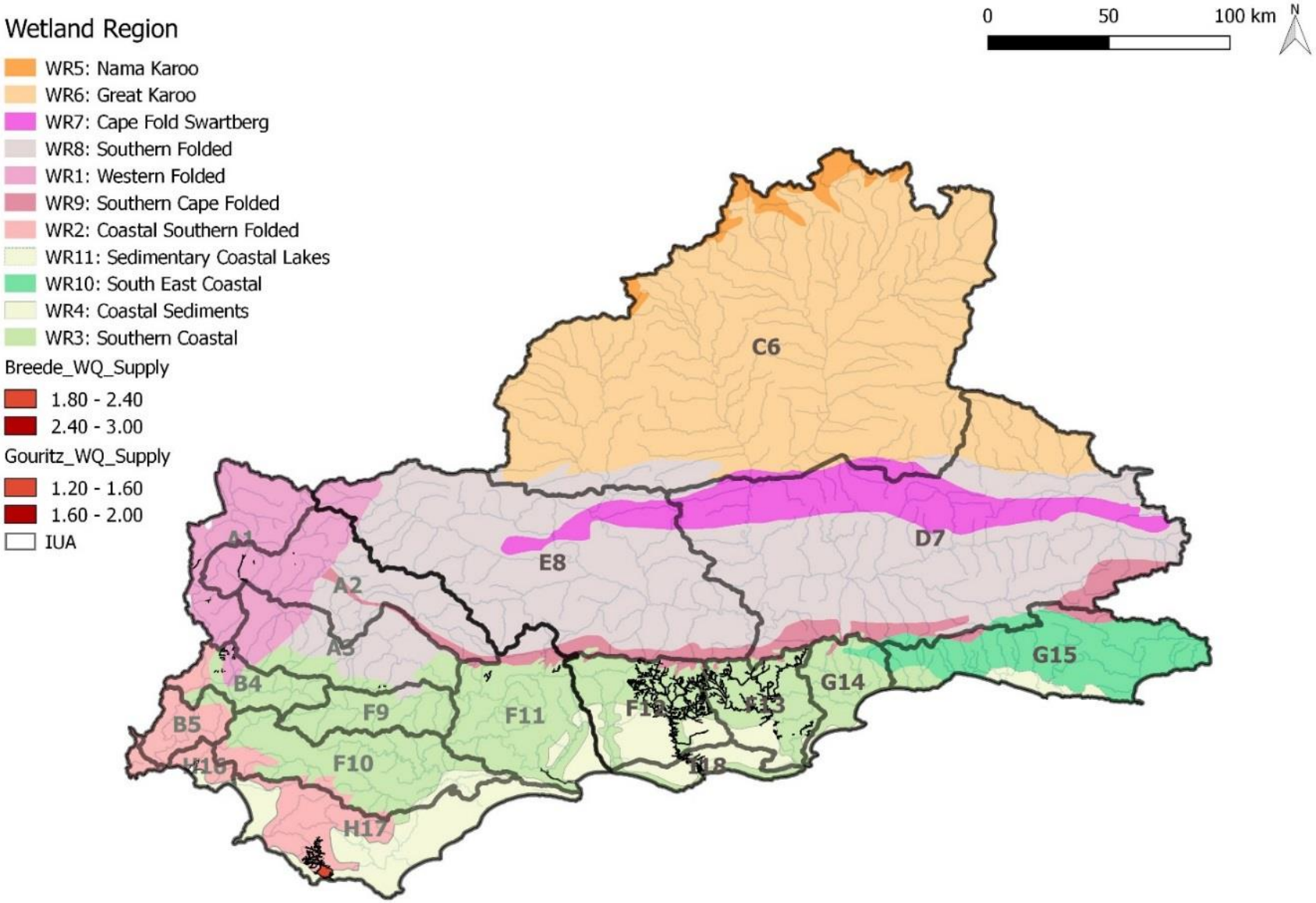
Appendix Figure 1 The supply of flood attenuation ecosystem services from wetlands



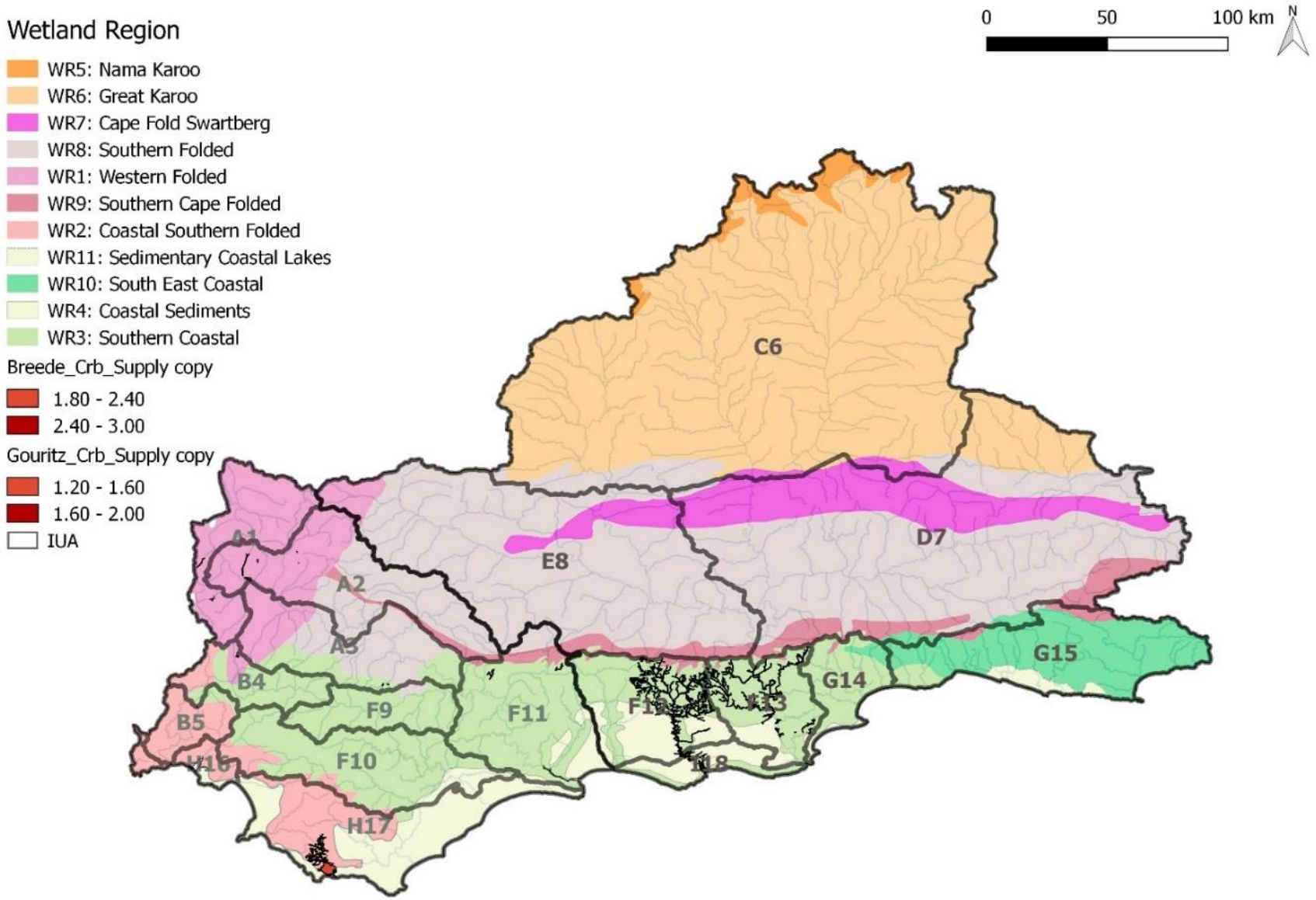
Appendix Figure 2 The supply of streamflow regulation ecosystem services from wetlands



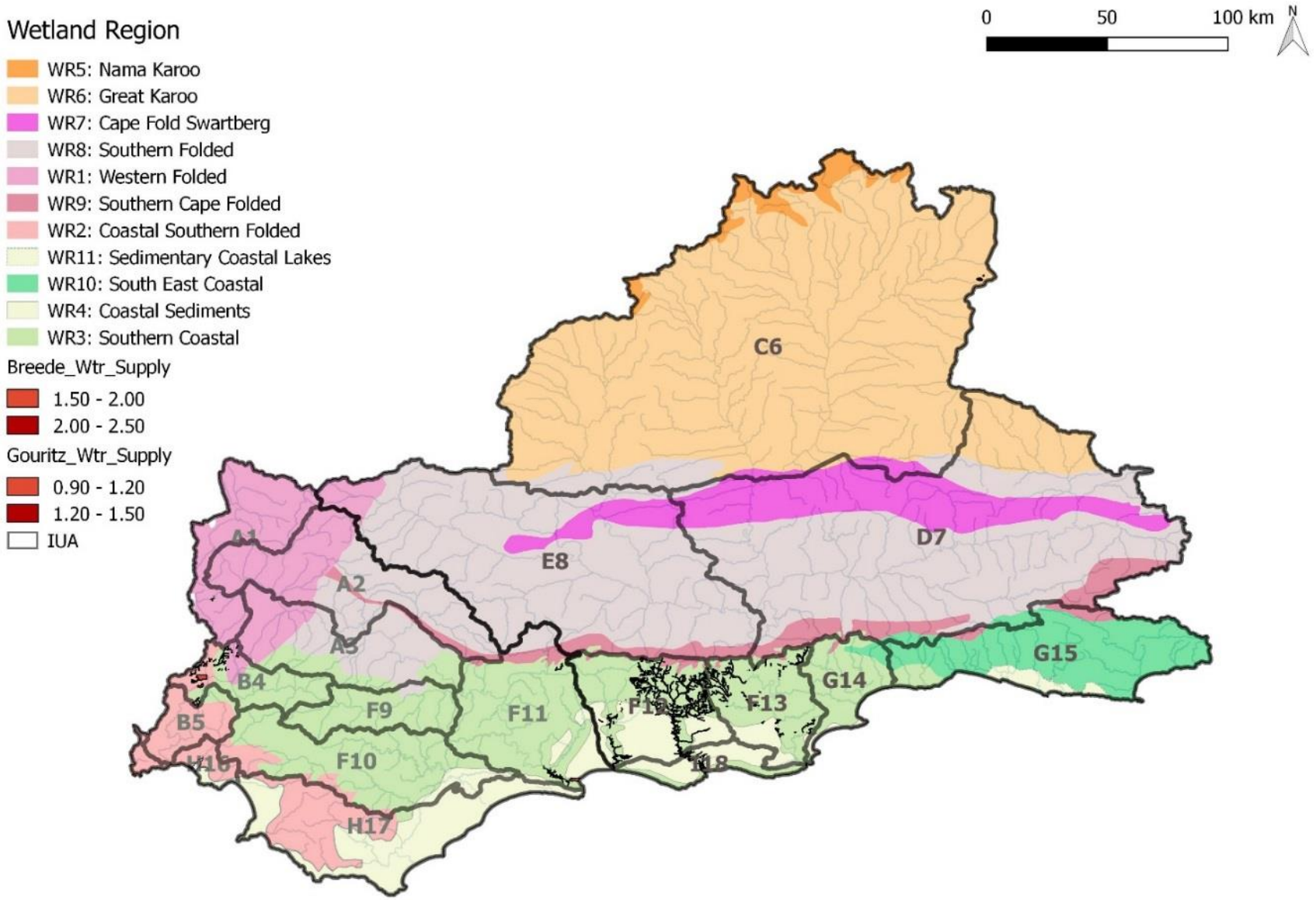
Appendix Figure 3 The supply of sediment avoidance ecosystem services from wetlands



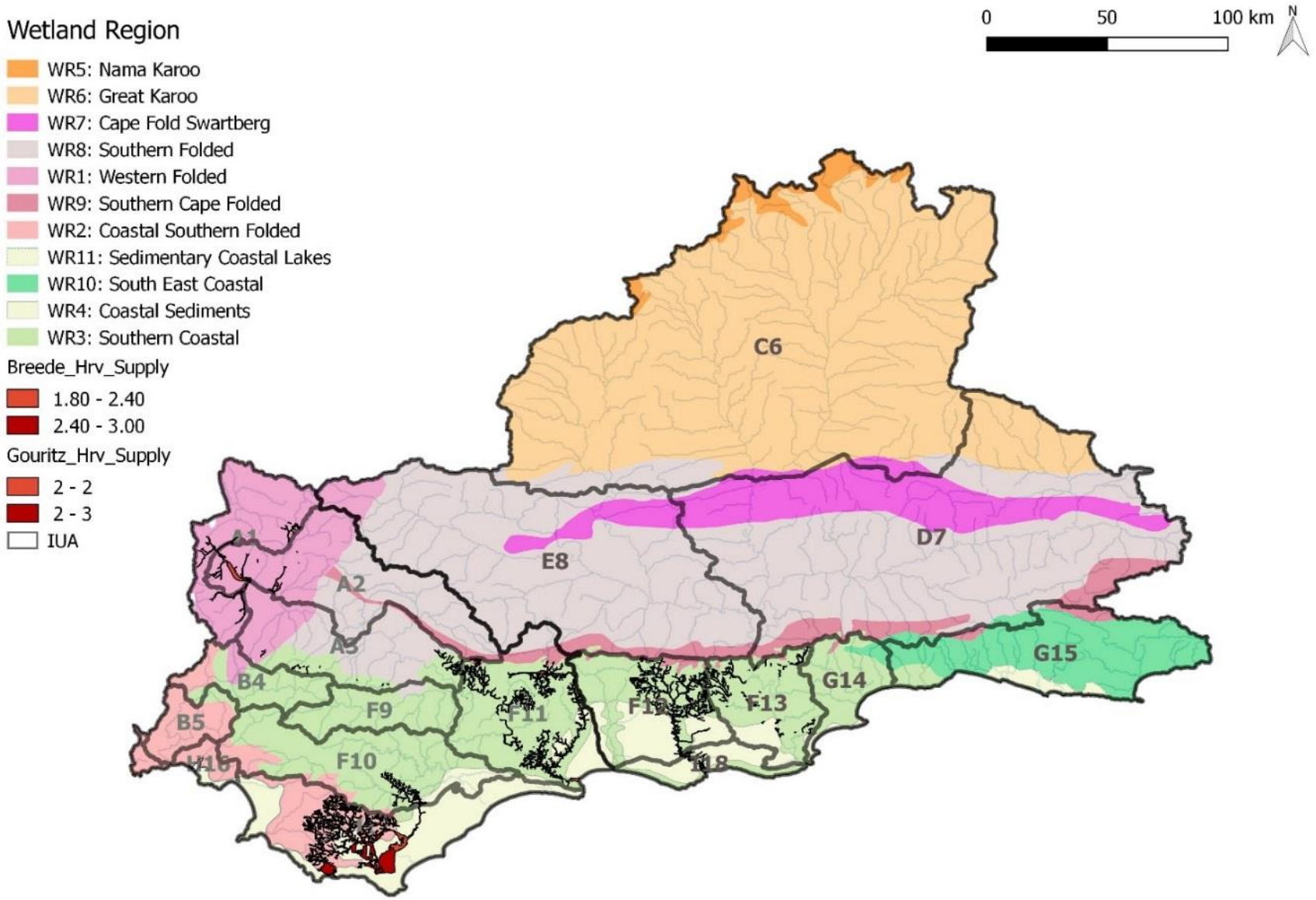
Appendix Figure 4 The supply of water quality enhancement ecosystem services from wetlands



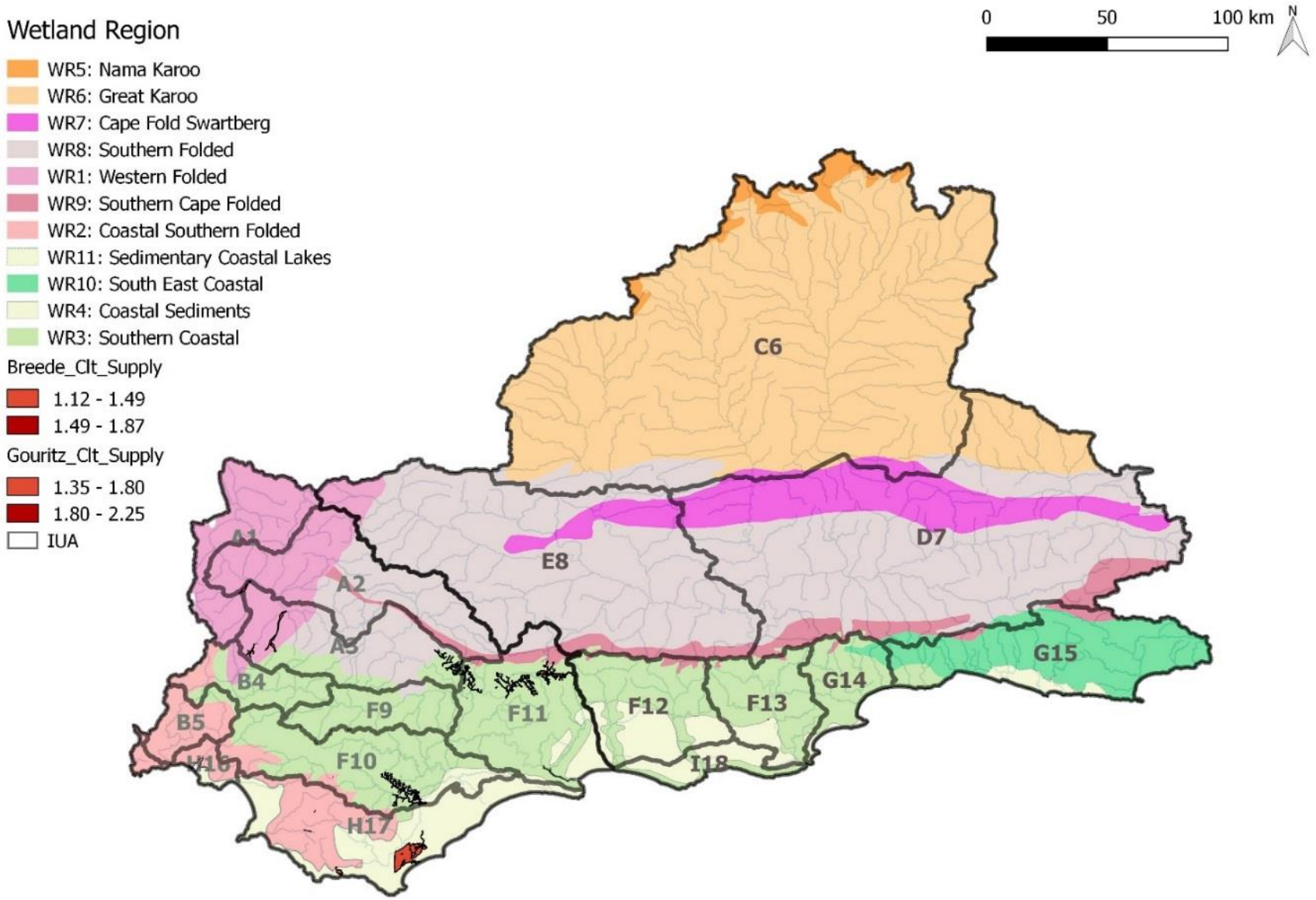
Appendix Figure 5 The supply of carbon storage ecosystem services from wetlands



Appendix Figure 6 The supply of water provision ecosystem services from wetlands



Appendix Figure 7 The supply of harvestable resources ecosystem services from wetlands



Appendix Figure 8 The supply of cultural ecosystem services from wetlands