water & sanitation

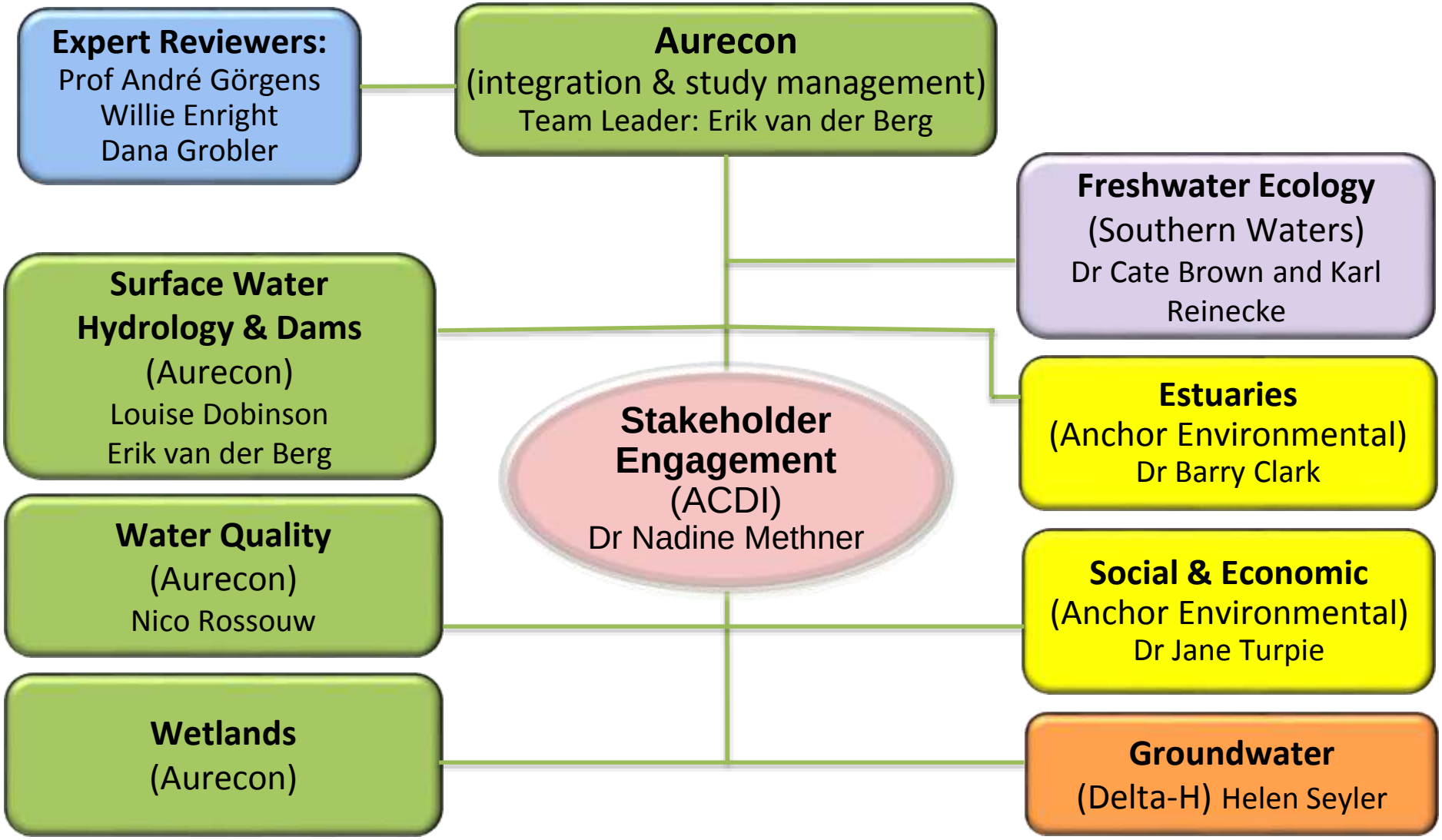
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

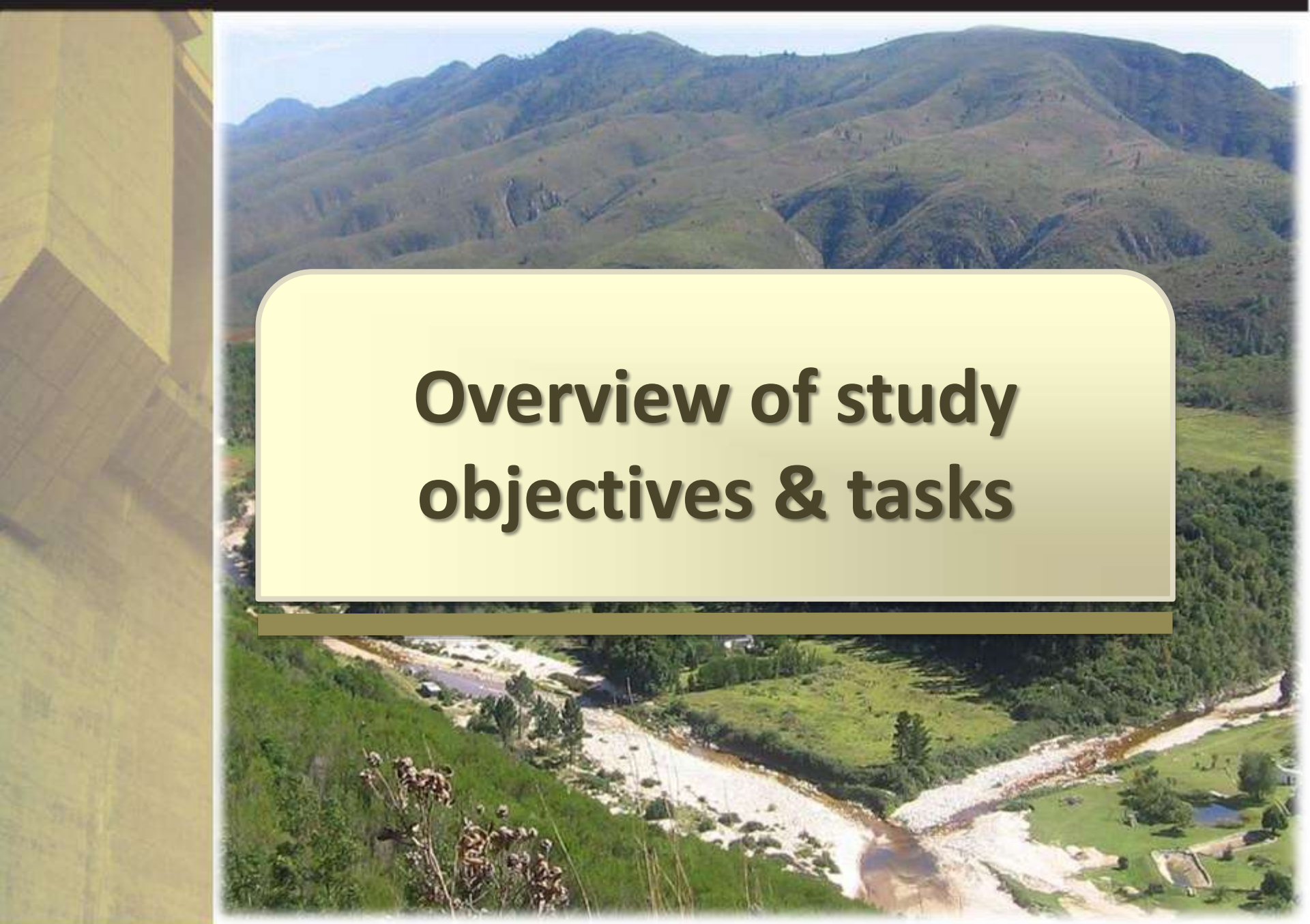
Determination of Water Resources Classes and Resource Quality Objectives in the Breede-Gouritz WMA

First Public Meeting

15th November 2016
Pine Lodge, George

The Study Team





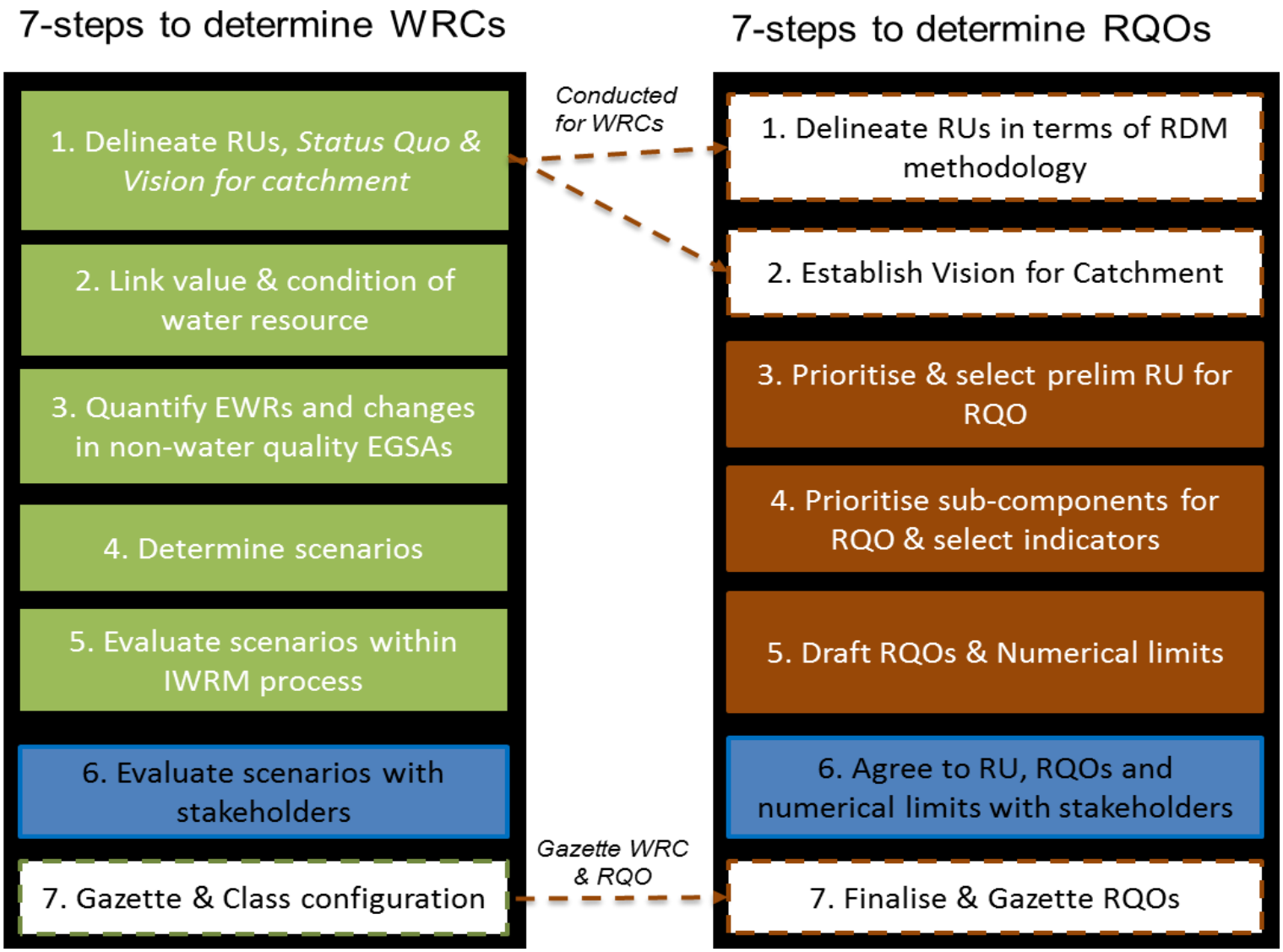
Overview of study objectives & tasks

Study Objectives

Co-ordinate implementation of the Water Resources Classification System (WRCS)

- **Determine Water Resource Classes (WRCs)**
- **Determine Resource Quality Objectives (RQOs)**
- **Support Gazetting of Recommended Water Resources Classes and RQOs**

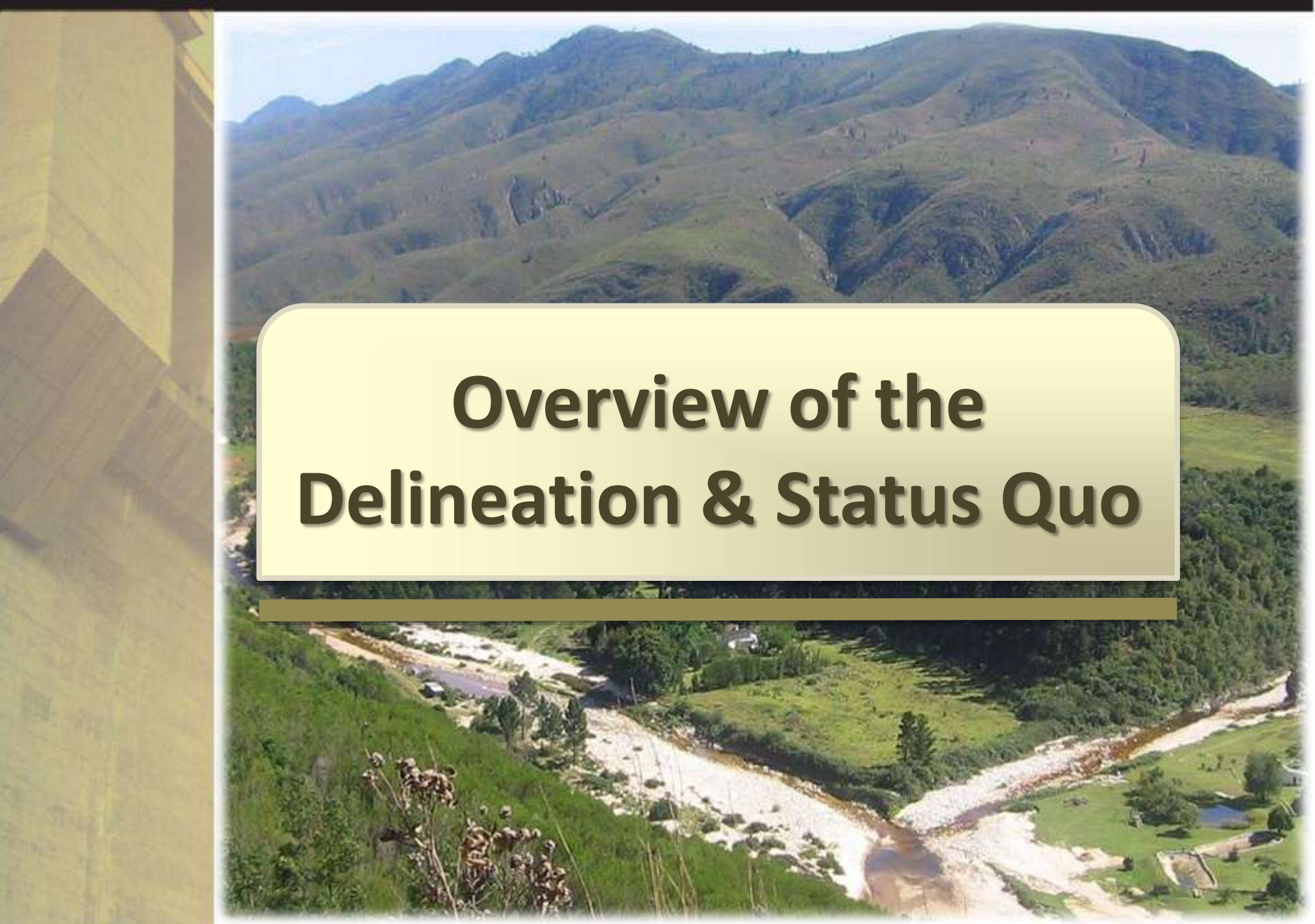
Classification and RQOs Steps



Main study tasks

- **Task 1: Inception** → Completed
  - Inception Report
  - Stakeholder Identification and Mapping Report
- **Task 2: Information gathering** → Completed
  - Water Resources Information and Gap Analysis --> Information gaps
- **Task 3: Determine Water Resource Classes**
  - Resource Units & IUA Delineation Report
  - Status Quo Report
  - Linking the Value & Condition of Water Resources
  - Quantification of the EWR and changes in EGSAs
  - Ecological Base Configuration Scenarios Report
  - Report on Evaluation of Classification Scenarios

  } Current
- **Task 4: Determine Resource Quality Objectives**
  - Resource Unit Prioritization Report
  - Evaluation of Resource Units
  - Outline of Resource Quality Objectives
  - Monitoring Program to Support RQOs Implementation
  - Confidence Assessment of Resource Quality Objectives
- **Task 5: Support Gazetting done by DWS to legalise**
  - Final Report and Gazette template



Overview of the Delineation & Status Quo

Resource Unit & IUA Delineation

- Divided catchment into Socio-Economic Zones
- Identified a network of significant water resources
- Established biophysical & allocation nodes
- Defined preliminary assessment areas called Integrated Units of Analysis (IUAs)

Socio-economics

Valuing the Link with the Resource & Scenarios

- Described socio-economic status (from census)
- Described current economic activities and outputs
- Identified socio-economic zones
- Determined value relationships
  - Production to cost functions
  - marginal costs of abatement
  - water efficiency gains

Socio-economics

Ecosystem services

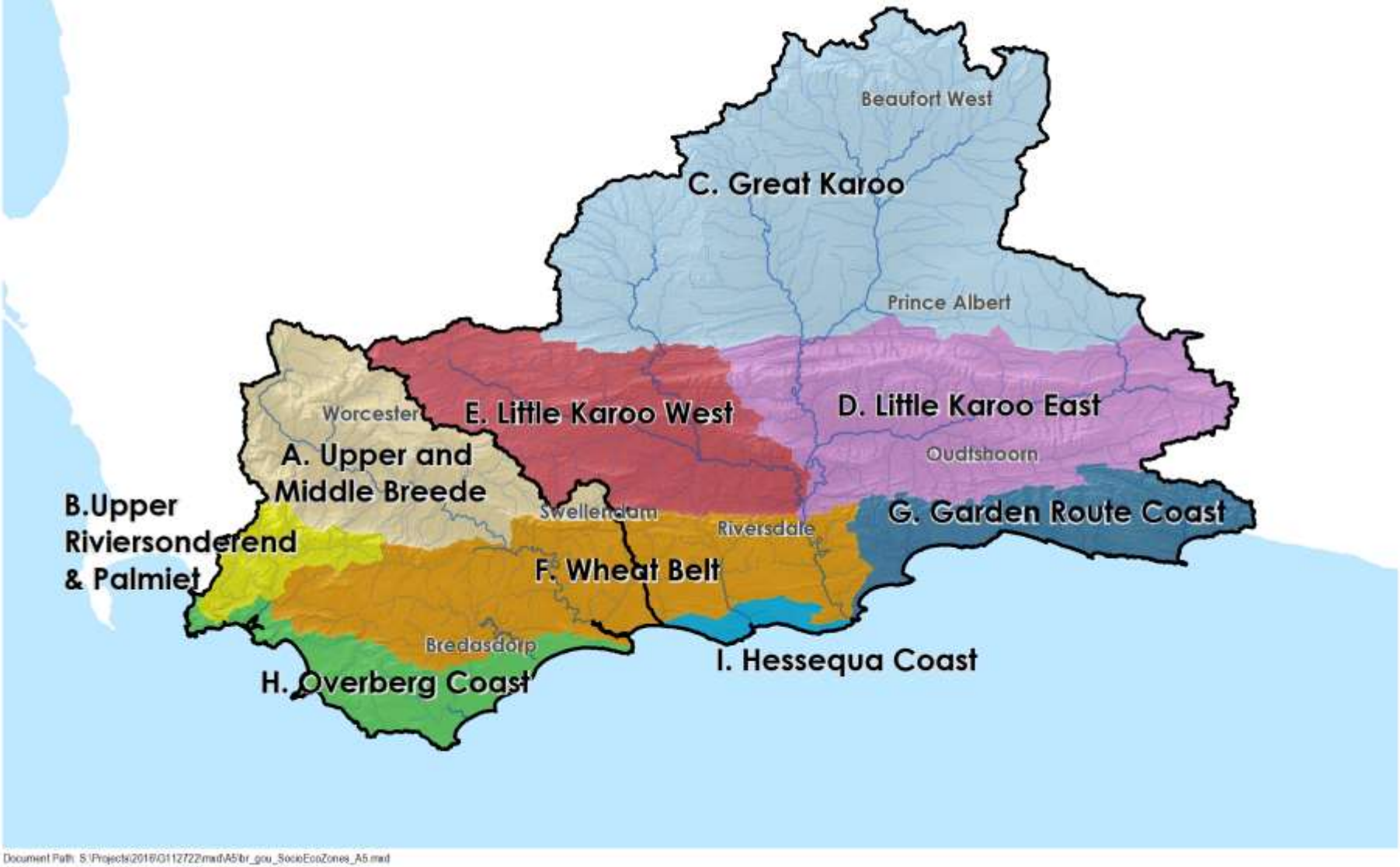
These are benefits obtained by people from ecosystems:

- Provisioning – food production and water supply
- Amenity - eg tourism, property value
- Nursery value for fishery
- Water quality improvement
- Flood attenuation

Delineation of Socio-economic Zones

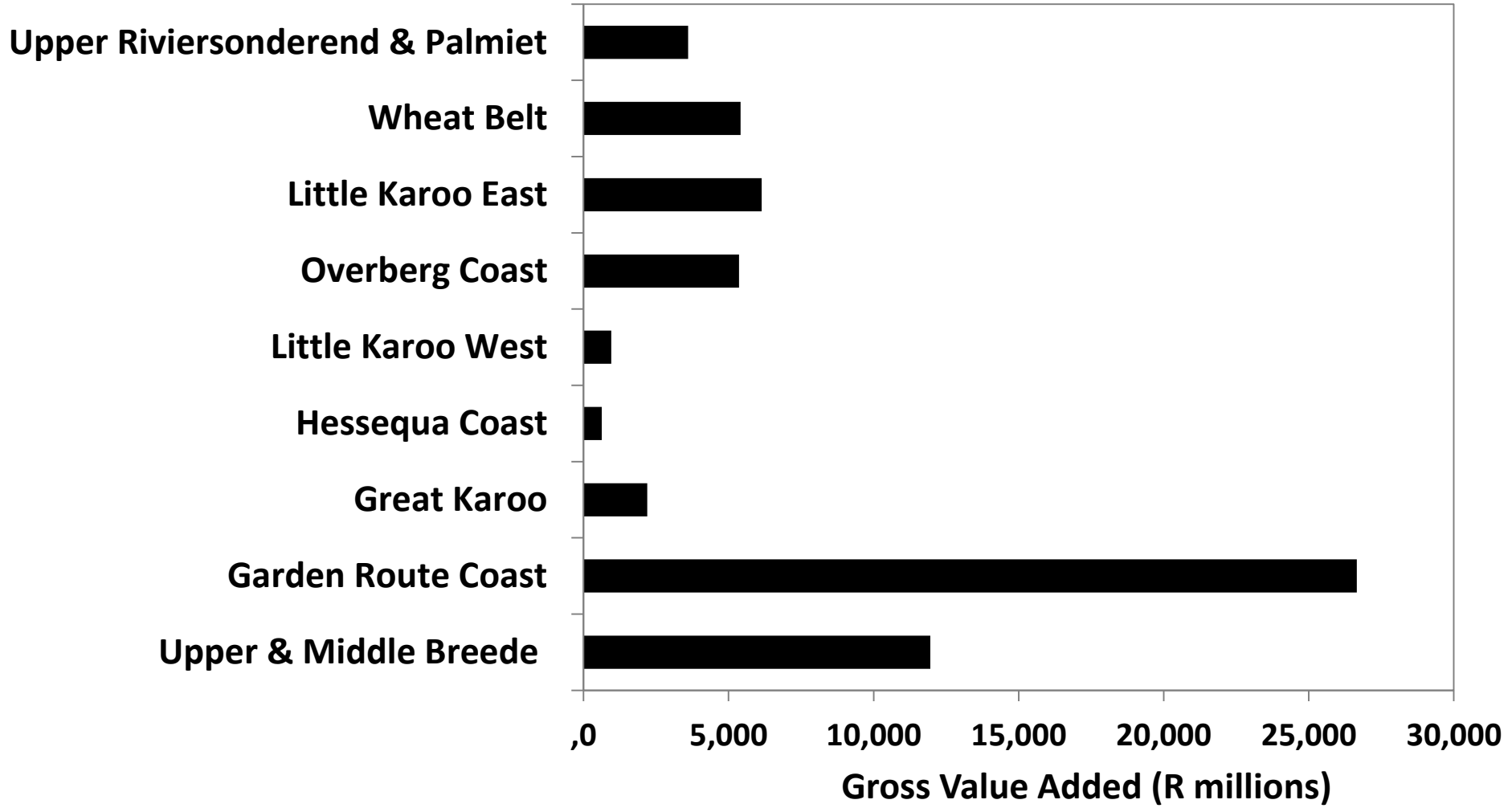
- Zones should have relatively similar economic activities with regard to water use
  - make it easier to describe potential socio-economic implications of different classification scenarios to stakeholders, who can relate to the various areas that they depend upon
- Zones were demarcated primarily on the basis of land use
  - after detailed inspection of a range of spatial information on geography, climate, drainage, vegetation and land use
- Initial boundaries were then compared with river characteristics and catchment boundaries and refined

9 Socio-economic Zones

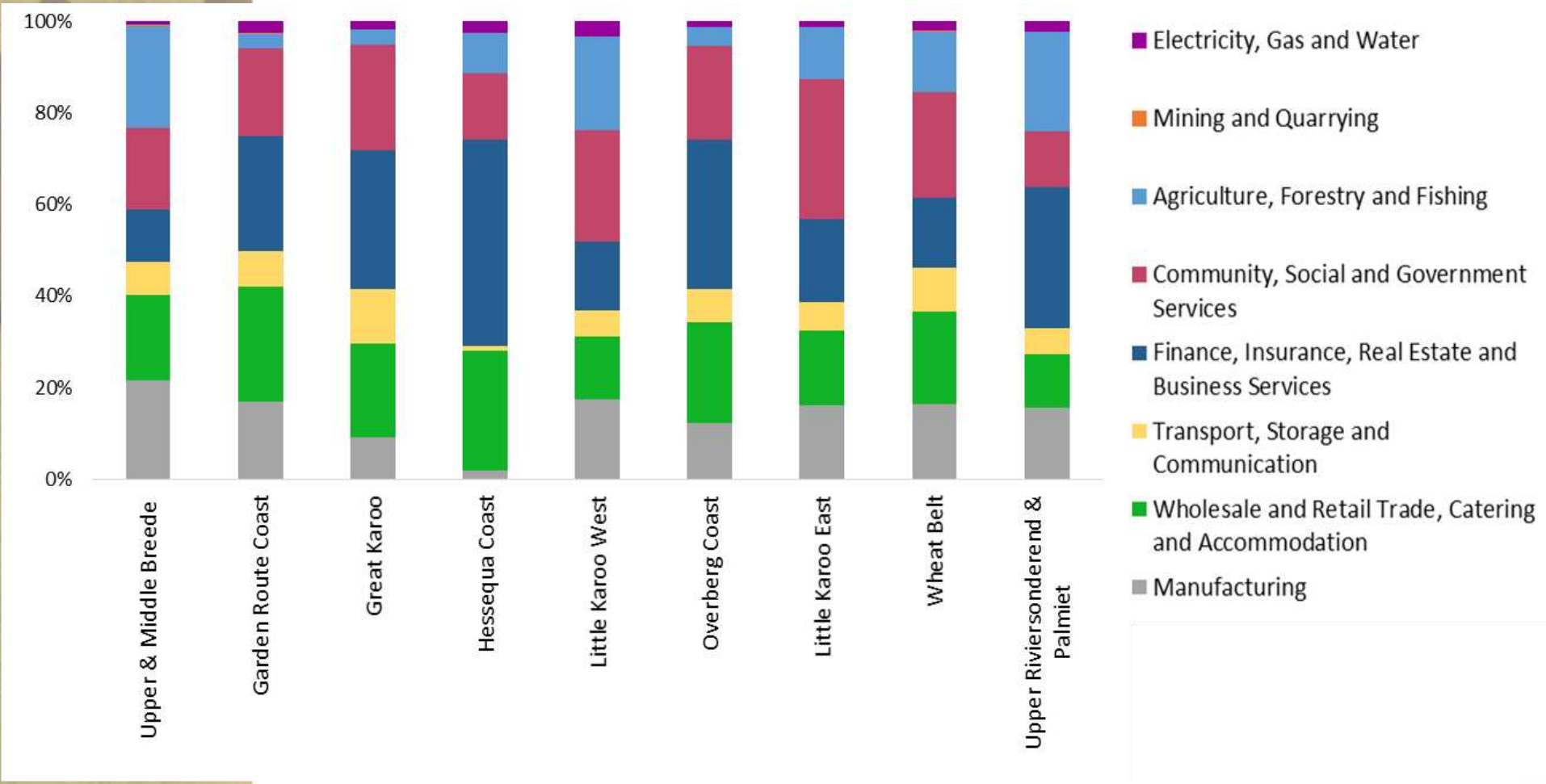


Document Path: S:\Projects\2016\G112722\mxd\A5\br_gou_SocioEcoZones_A5.mxd

Socio-economic activities per Zone



Socio-economic activities per Zone

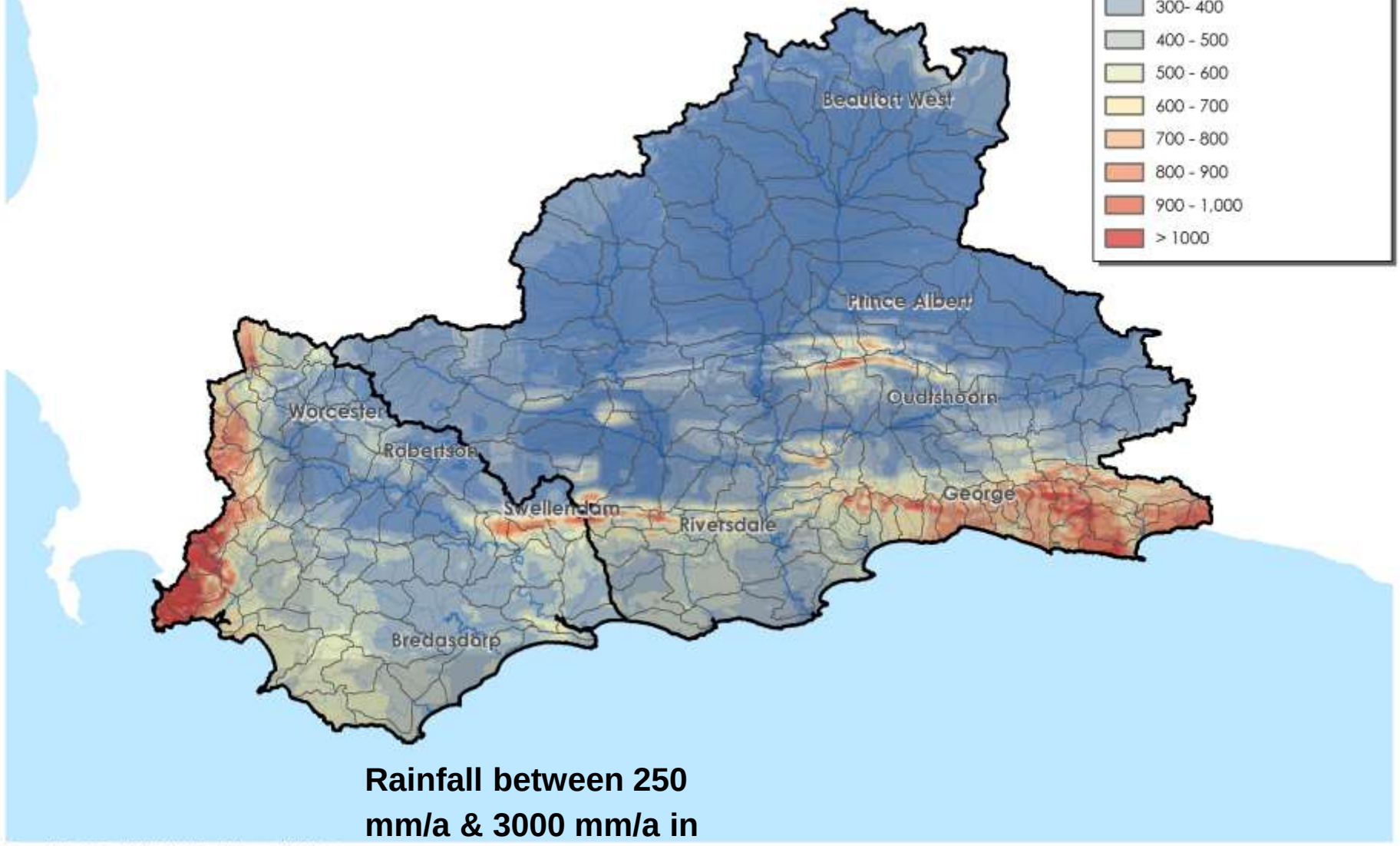


Socio-economic activities per Zone

	Socio-economic Zone	Primary	Secondary
A	Upper and Middle Breede	Agriculture, Forestry & Fishing	Manufacturing
B	Upper Riversonderend & Palmiet	Finance, Insurance, Real Estate and Business Services	Agriculture, Forestry & Fishing
C	Overberg Coast	Finance, Insurance, Real Estate and Business Services	Wholesale & Retail Trade, Catering & accommodation
D	Wheat Belt	Community, social and government services	Wholesale & Retail Trade, Catering & accommodation
E	Hessequa Coast	Finance, Insurance, Real Estate and Business Services	Wholesale & Retail Trade, Catering & accommodation
F	Little Karoo West	Community, social and government services	Finance, Insurance, Real Estate and Business Services
G	Great Karoo	Finance, Insurance, Real Estate and Business Services	Community, social and government services
H	Little Karoo East	Community, social and government services	Finance, Insurance, Real Estate and Business Services
I	Garden Route Coast	Finance, Insurance, Real Estate and Business Services	Wholesale & Retail Trade, Catering & accommodation

Rainfall

Rainfall in Karoo <500 mm/a & up to 1000 mm/a in narrow coastal plain



Rainfall between 250 mm/a & 3000 mm/a in southwest mountains

Surface water hydrology

- Estimate river flows by quaternary for natural state & current situation
- Using WR (of South Africa) 2012 hydrological modelling
- Taking meteorology, water allocations, water use, water infrastructure and water transfers into account
- Some determination of within-quaternary flows where necessary

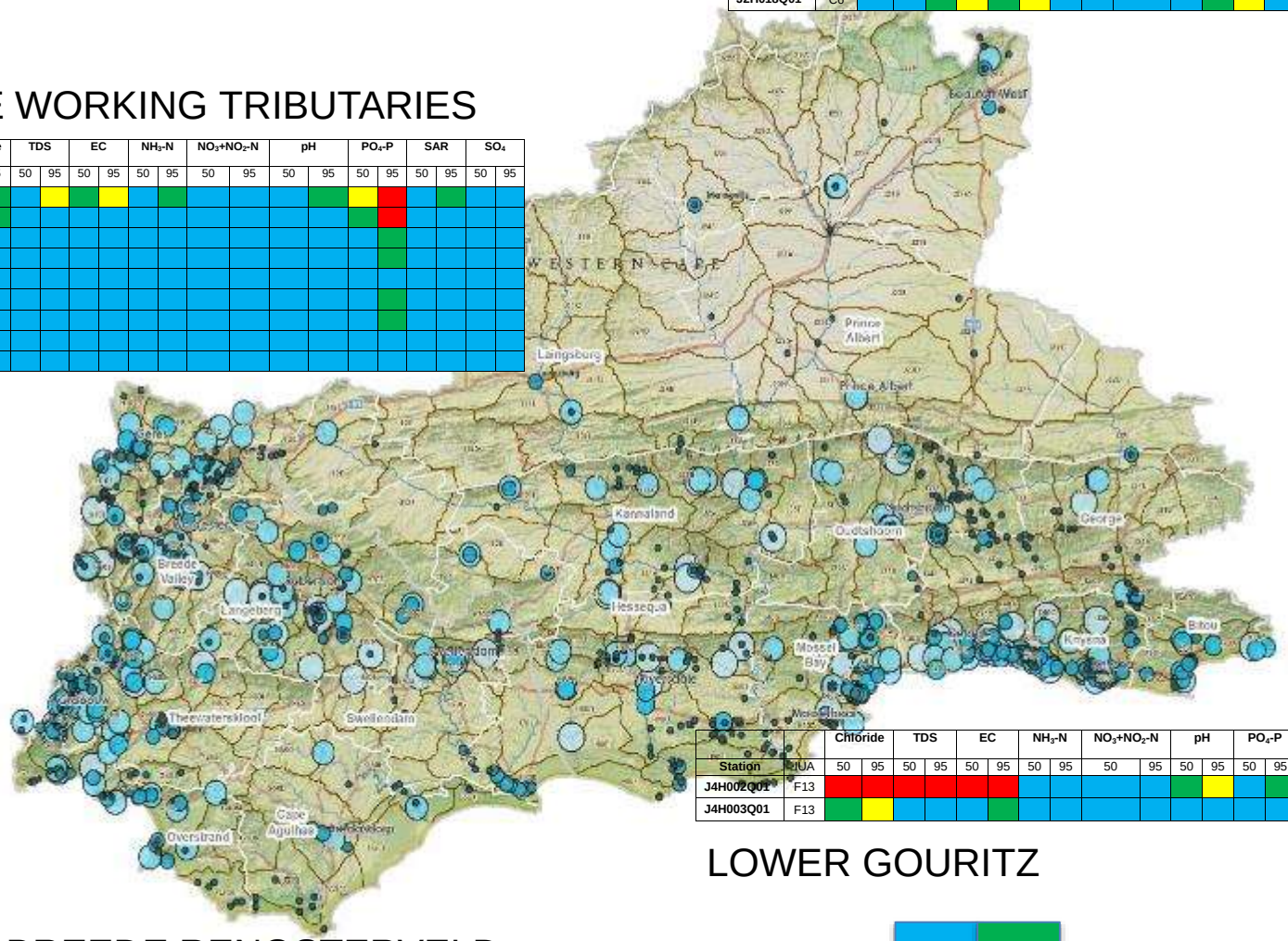
Water Quality

GREAT KAROO

Station	IUA	Chloride		TDS		EC		NH_3-N		NO_3+NO_2-N		pH		PO_4-P		SAR		SO_4	
		50	95	50	95	50	95	50	95	50	95	50	95	50	95	50	95	50	95
J1H028Q01	C6																		
J2H018Q01	C6																		

BREEDE WORKING TRIBUTARIES

Station	IUA	Chloride		TDS		EC		NH_3-N		NO_3+NO_2-N		pH		PO_4-P		SAR		SO_4	
		50	95	50	95	50	95	50	95	50	95	50	95	50	95	50	95	50	95
H1H003Q01	A1																		
H1H006Q01	A1																		
H1H007Q01	A1																		
H1H012Q01	A1																		
H1H013Q01	A1																		
H1H018Q01	A1																		
H1H033Q01	A1																		
H2H015Q01	A1																		
H2H016Q01	A1																		



Station	IUA	Chloride		TDS		EC		NH_3-N		NO_3+NO_2-N		pH		PO_4-P		SAR		SO_4	
		50	95	50	95	50	95	50	95	50	95	50	95	50	95	50	95	50	95
J4H002Q01	F13																		
J4H003Q01	F13																		

LOWER GOURITZ

LOWER BREEDE RENOSTERVELD

Station	IUA	Chloride		TDS		EC		NH_3-N		NO_3+NO_2-N		pH		PO_4-P		SAR		SO_4	
		50	95	50	95	50	95	50	95	50	95	50	95	50	95	50	95	50	95
H7H005Q01	F11																		
H7H006Q01	F11																		
H7H007Q01	F11																		
H7H013Q01	F11																		

Better water quality

Poorer water quality

Defined resource Units (RUs) and River Nodes

- **Nodes** are locations of interest (points) in a water resouce (rivers, wetlands, estuaries)
- Are sited using:
  - Water infrastructure (gauging weirs, dams, water transfers)
  - Aquatic ecosystem attributes (flow, geology, vegetation, ecological condition)
- Are used to allocate water for environment and development

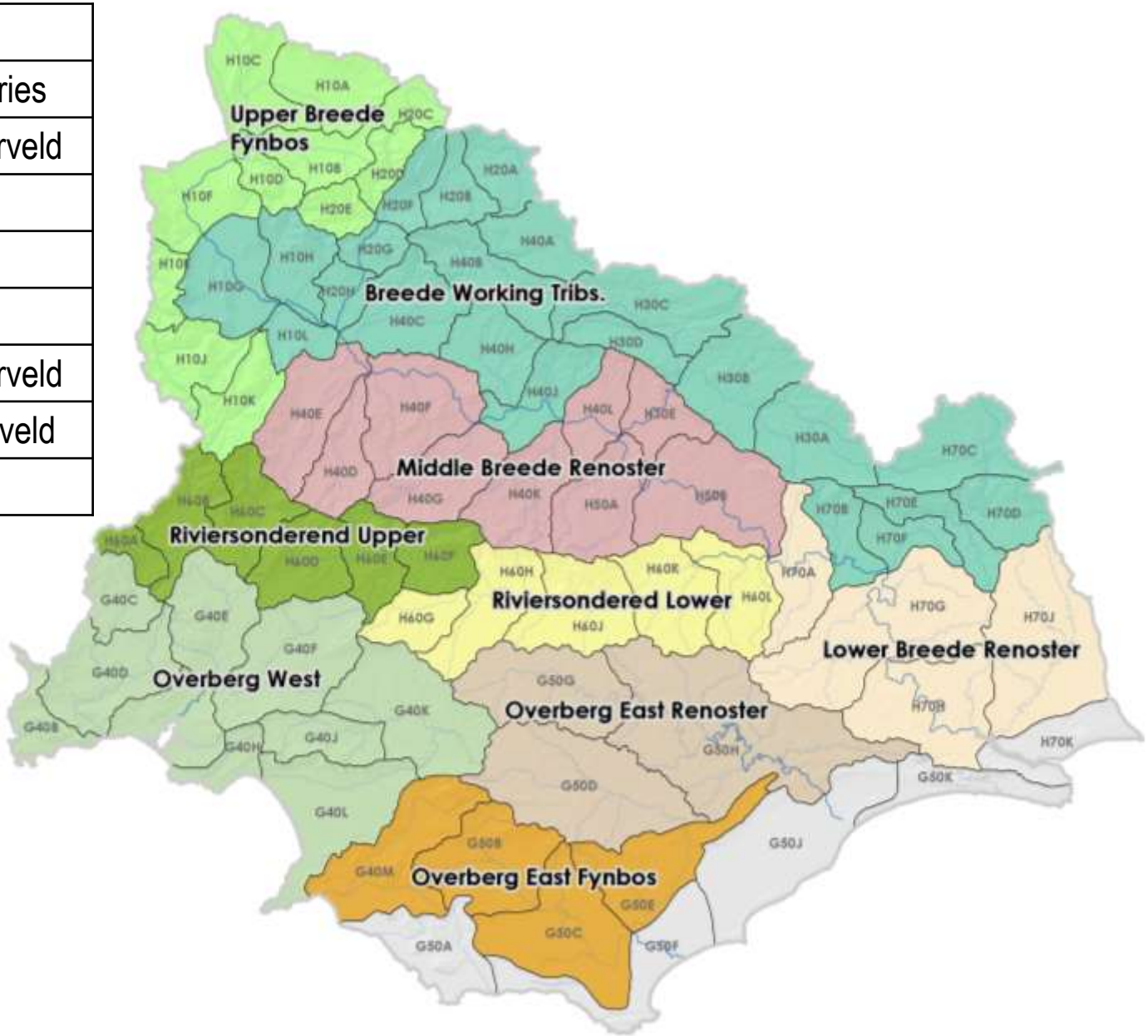
- **River resource units (RUs)** are river basins (grouped areas) deemed similar in terms of:
  - Flow (constant flow or not)
  - Where it is located in the basin (mountain streams, foothills, lowlands)
  - River bank vegetation type
  - Neighbouring land-based vegetation type
- Are used to transfer information between basins

6 River Resource Units (Gouritz part of the WMA)

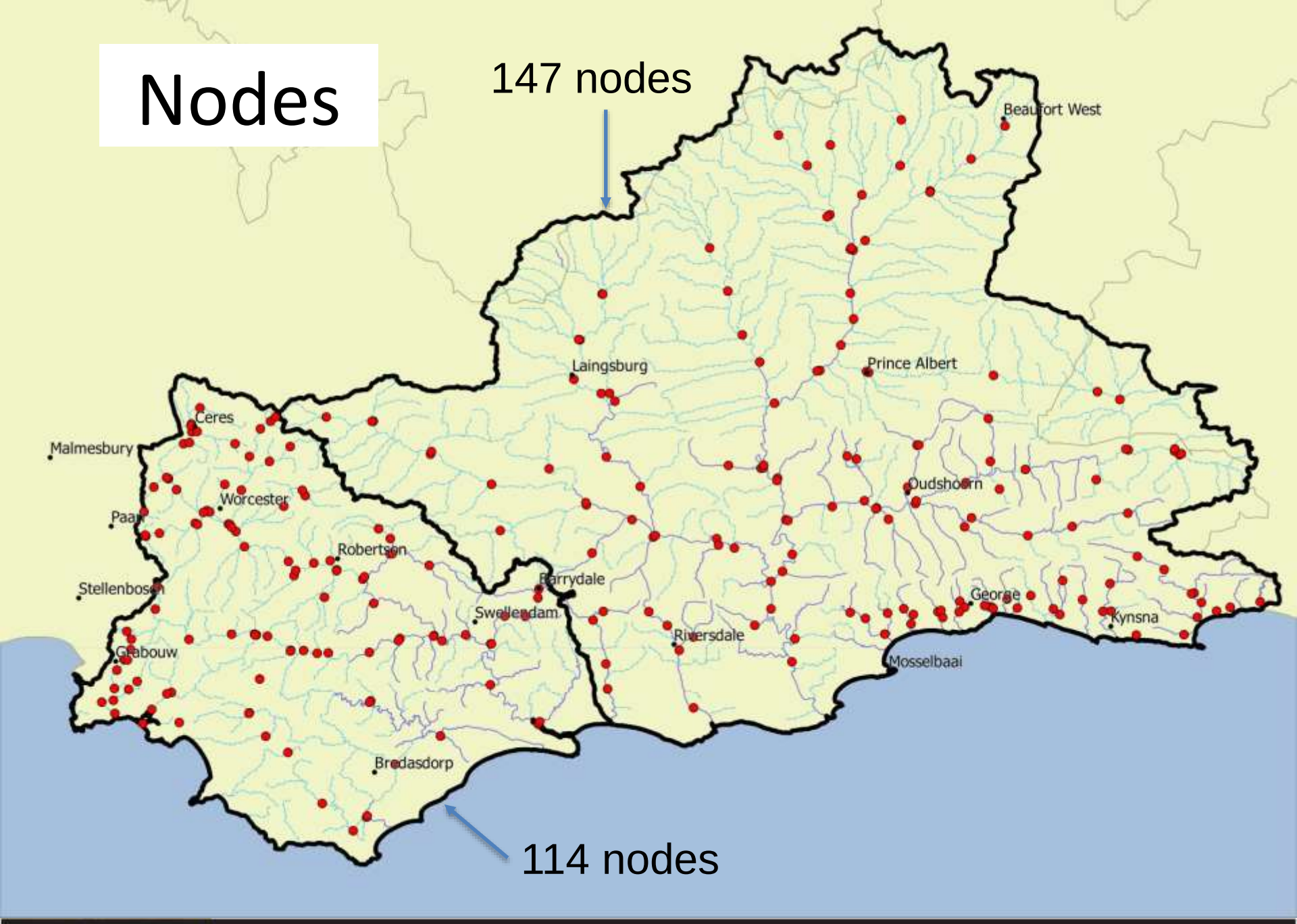
1	Groot/Touws
2	Gamka
3	Lower Gouritz
4	Olifants
5	Duiwenhoks
6	Coastal Rivers

9 River Resource Units: (Breede part of the WMA)

7	Upper Breede Fynbos
8	Breede Working Tributaries
9	Middle Breede Renosterveld
10	Riviersonderend Upper
11	Riviersonderend Lower
12	Overberg West
13	Overberg East Renosterveld
14	Lower Breede Renosterveld
15	Overberg East Fynbos

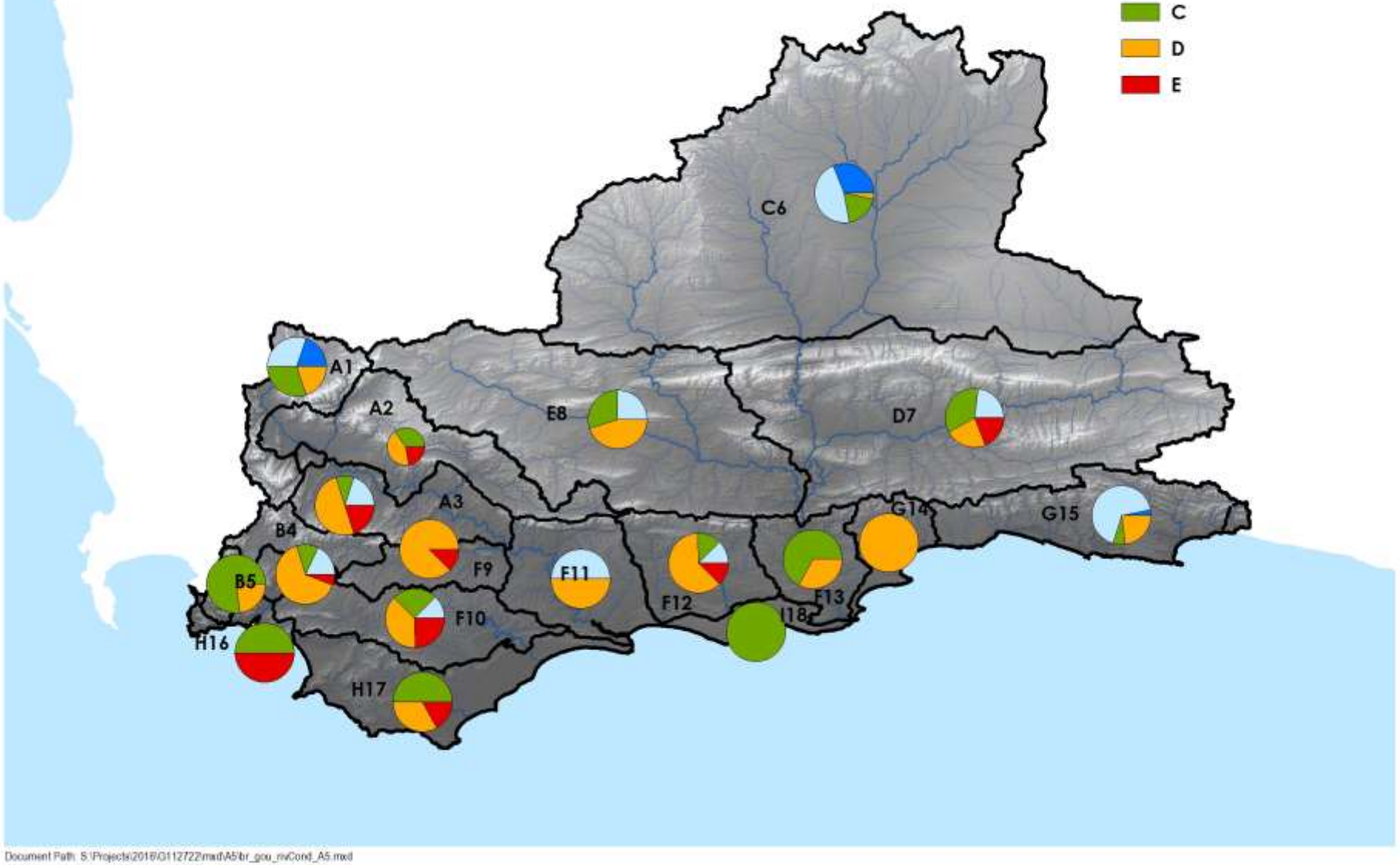


Nodes


147 nodes
Beaufort West
Laingsburg
Prince Albert
Ceres
Malmesbury
Worcester
Oudshoorn
Paarl
Robertson
Barrydale
Stellenbosch
George
Swellendam
Knysna
Riversdale
Caledon
Mosselbaai
Bredasdorp
114 nodes

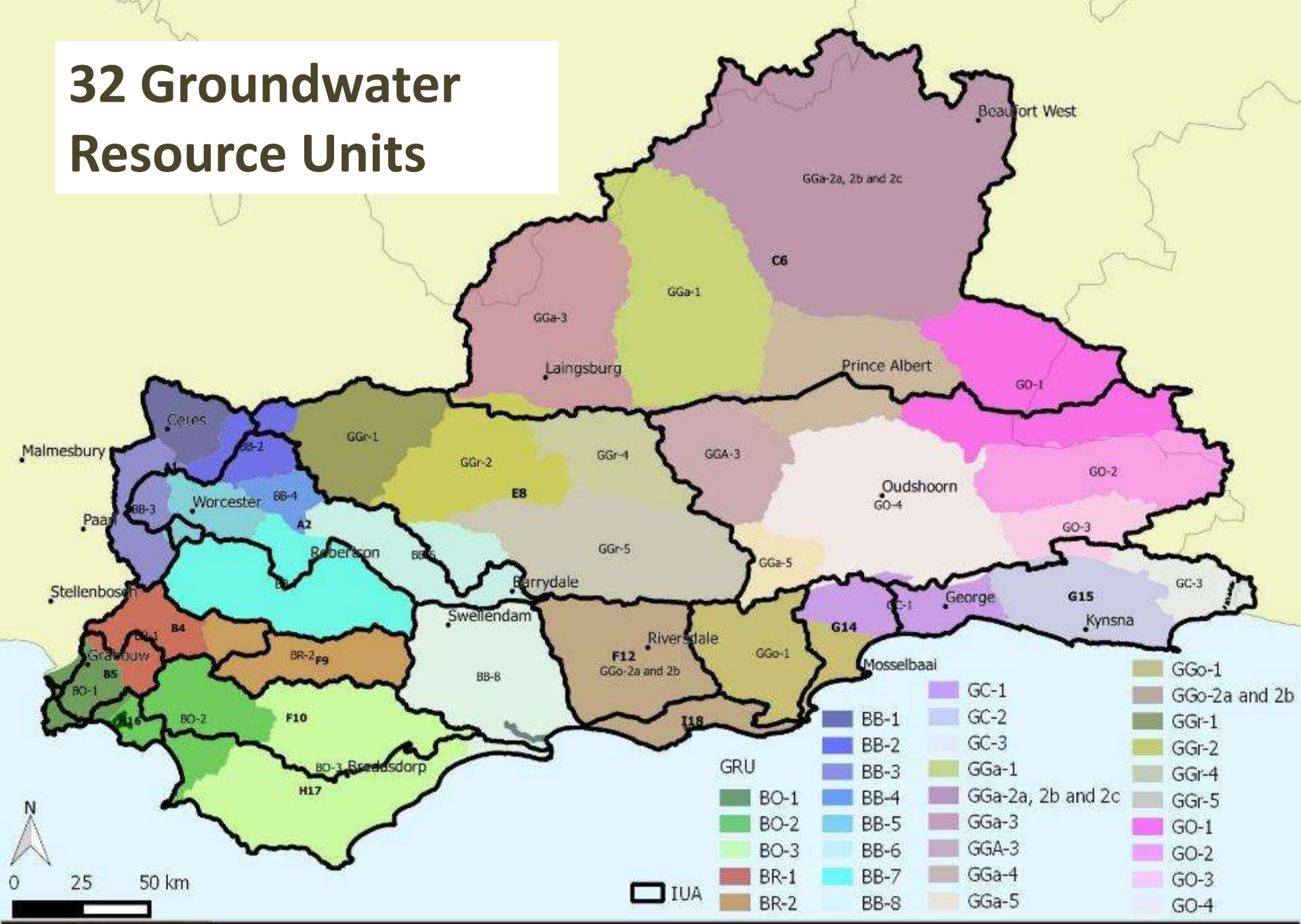
Rivers

Ecological condition:
(1999 (not shown) and 2014)



Document Path: S:\Projects\2016\G112722\mxd\A5\br_gou_nvCond_A5.mxd

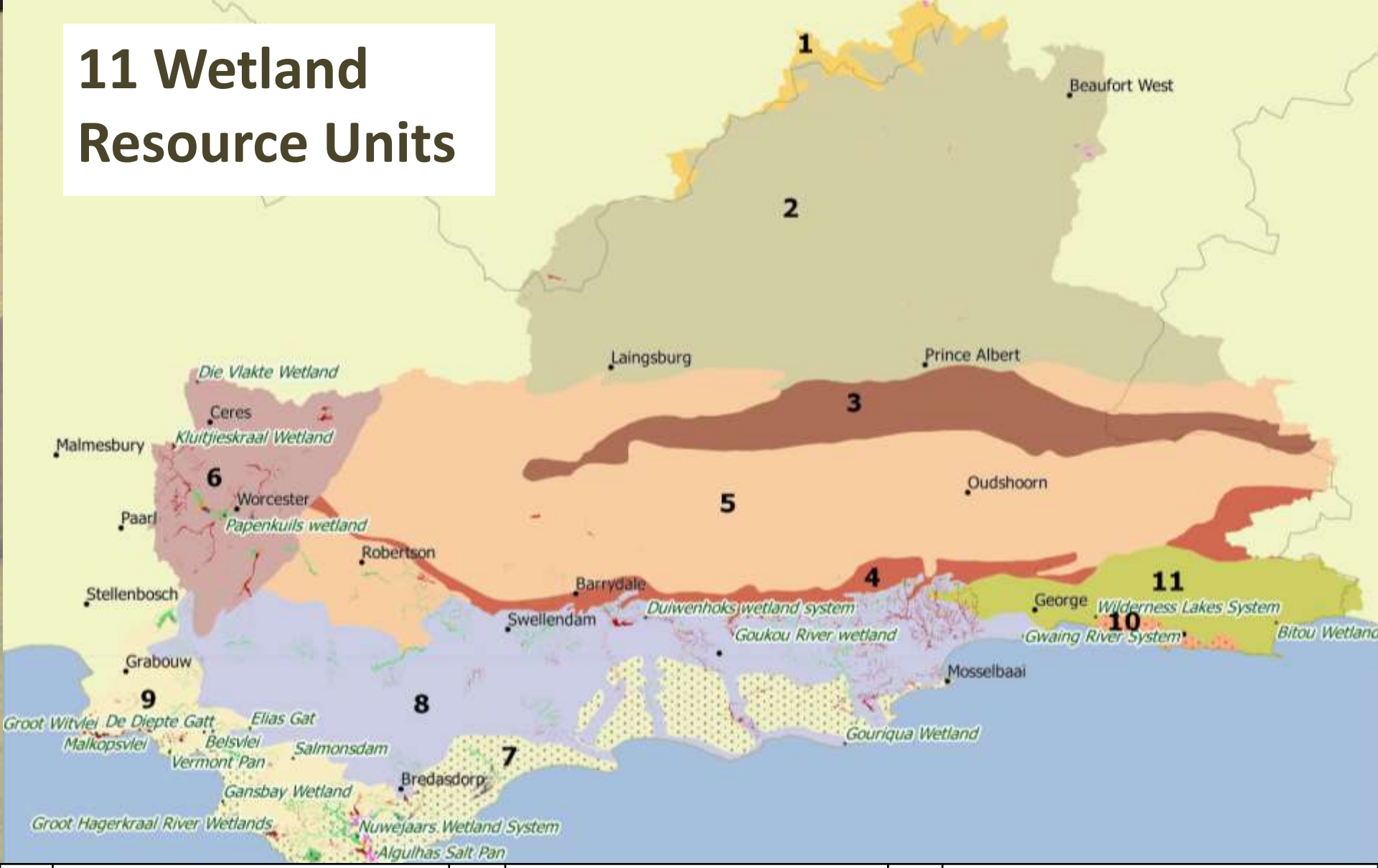
32 Groundwater Resource Units



Groundwater

- Recharge per GRU ranges 4 – 230 million m^3/a, <1mm/a to >150mm/a
- Use per GRU ranges 0.43 – 32.89 million m^3/a
  - 86% agriculture
  - 8% water supply service
  - 28 settlements with groundwater “sole supply” (>50%)
  - 20 settlements with groundwater only supply (100%)
- Trend analysis done:
  - number of GRUs with stable groundwater level and groundwater quality
  - GRUs with insufficient data
  - GRUs with declining water levels / worsening water quality

11 Wetland Resource Units



1	Nama-Karoo	5	Southern Fold Mountains	9	Coastal Southern Folded Mountains
2	Great Karoo	6	Western Folded Mountains	10	Sedimentary Coastal Lakes
3	Cape Fold (Swartberg)	7	Coastal Sedimentary Deposits	11	South Eastern Coastal Belt
4	South Cape Fold Mountains	8	Southern Coastal Belt		

Wetlands

Ecological importance and sensitivity (EIS)
Present ecological status (PES)

WRU name	Typical wetlands	Priority Wetlands
WRU1_Nama Karoo	Seeps with a likely high degree of groundwater dependence	n/a
WRU2_Great Karoo	Small seeps and river-linked wetlands	n/a
WRU3_Cape Fold (Swartberg)	Small seeps associated with groundwater-fed springs	n/a
WRU4_South Cape Fold Mountains	Small seeps associated with groundwater-fed springs	n/a
WRU5_Southern Folded Mountains	Small seeps and river-linked wetlands with a likely high degree of direct and indirect groundwater dependence respectively	n/a
WRU6_Western Folded Mountains	Valley bottom and floodplain wetlands	Die Vlakte Wetland, Kluitjieskraal Wetland, Papenkuils Wetland
WRU7_Coastal Sedimentary Deposits	Desktop information shows wetlands are very infrequent - possible due to deep infiltrating soils and a lack of shallow/perched water tables. Inter-dune depressional wetlands are present, suggesting groundwater contributions (DWS, 2015)	Vermont Pan Gans Bay Wetland, Algulhas Salt Pan, Nuwejaars Wetland System, Gouriqua Wetland
WRU8_Southern Coastal Belt	Valley bottom wetlands, seepage wetlands	Duiwenhoks Wetland System, Goukou River Wetland, Gwaing River System
WRU9_Coastal Southern Folded Mountains	Seeps and depression wetlands as well as valley bottom and floodplain wetlands	Groot Witvlei, Malkopsvlei, Hemel-en-Aarde, Blesvlei, Diepte Gatt, Elias Gat, Salmonsdam, Groot Hagerkraal Wetlands
WRU10_Sedimentary Coastal Lakes	Lakes and wetland flats	Wilderness Lakes System
WRU11_South Eastern Coastal Belt	Channelled and unchannelled valley bottom wetlands	Bitou Wetland

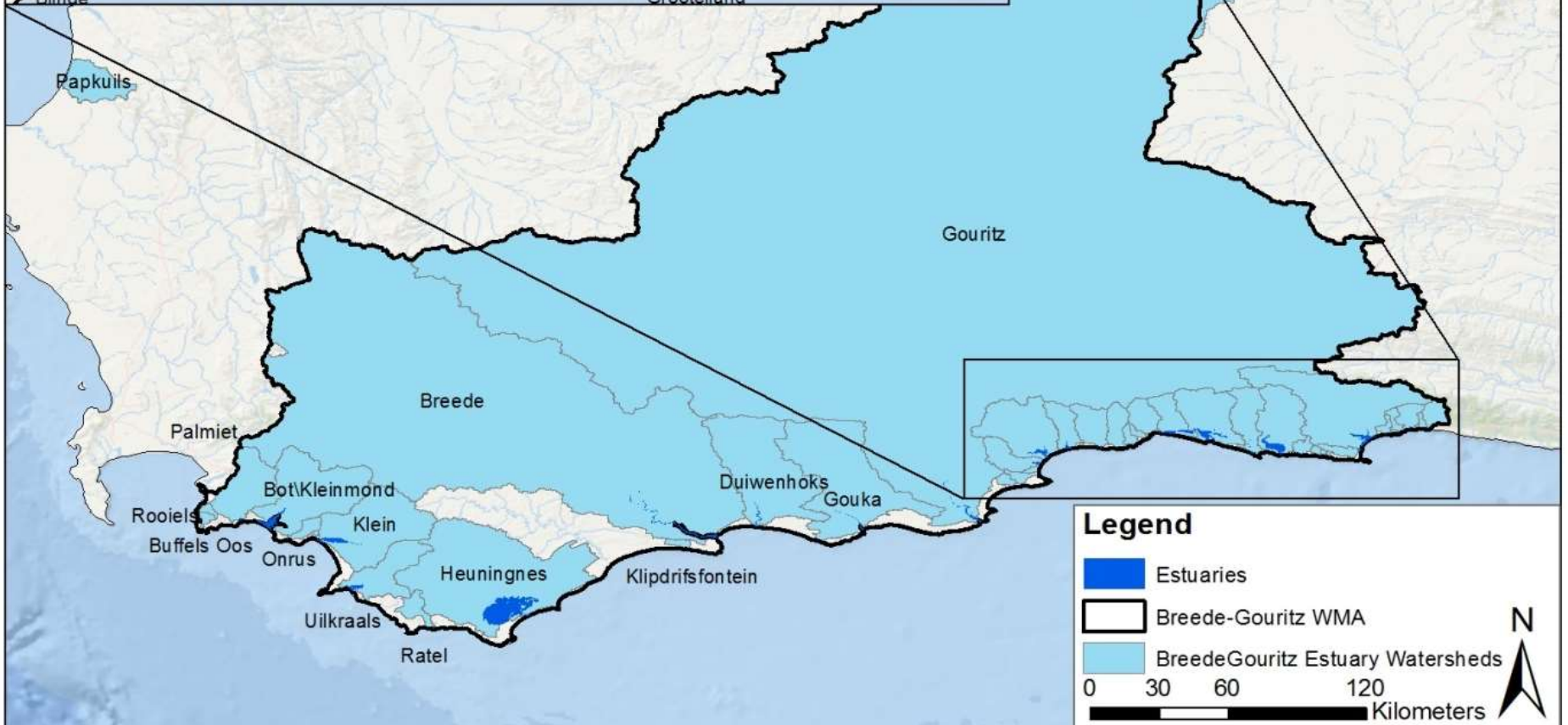
Wetlands

Ecological importance and sensitivity (EIS)
Present ecological status (PES)

IUA code	IUA	Priority Wetlands	EIS	PES
C6	Gamka-Buffels	N/A	Mod	B
D7	Gouritz-Olifants	N/A	Low	C
E8	Touws	N/A	Low	C
F12	Duiwenhoks	Duiwenhoks Wetland System	Mod	D
		Goukou River Wetland	7.1	
F13	Lower Gouritz	N/A	Mod	C/D
G14	Groot Brak	N/A	Mod	C
G15	Coastal	Gwaing River System		
		Wilderness Lakes System		
		Bitou Wetland	Mod	C
I18	Hessequa	Gouriqua Wetland	5	
A1	Upper Breede Tributaries	Die Vlakte Wetland	5.9	
		Kluitjieskraal Wetland	N/A	
A2	Breede Working Tributaries	Papenkuils Wetland	8.3	
F10	Overberg East Renosterveld	Diepte Gatt	5.4	B
		Elias Gat	4.1	C
		Salmonsdam	6.5	A
H16	Overberg West Coastal	Vermont Pan	5.3	B/C
		Groot Witvlei	6.2	B
		Malkopsvlei	6	B
		Hemel-en-Aarde	5.6	B/C
		Belsvlei	5	E
H17	Overberg East Fynbos	Gansbay Wetland	3.8	
		Algulhas Salt Pan	6.2	B
		Soetendalsvlei	9.1	
		Voelvlei	6.2	
		Groot Hagerkraal Wetlands	7.3	A/B

26 Significant Estuaries

1	Palmiet	14	Maalgate
2	Bot/Kleinmond	15	Gwaing
3	Onrus	16	Kaaimans
4	Klein	17	Wilderness
5	Uilkraals	18	Swartvlei
6	Heuningnes	19	Goukamma
7	Breede	20	Knysna
8	Duiwenhoks	21	Noetsie
9	Goukou	22	Piesang
10	Gouritz	23	Keurbooms
11	Hartenbos	24	Groot (Wes)
12	Klein Brak	25	Bloukrans
13	Groot Brak	26	Haelkraal

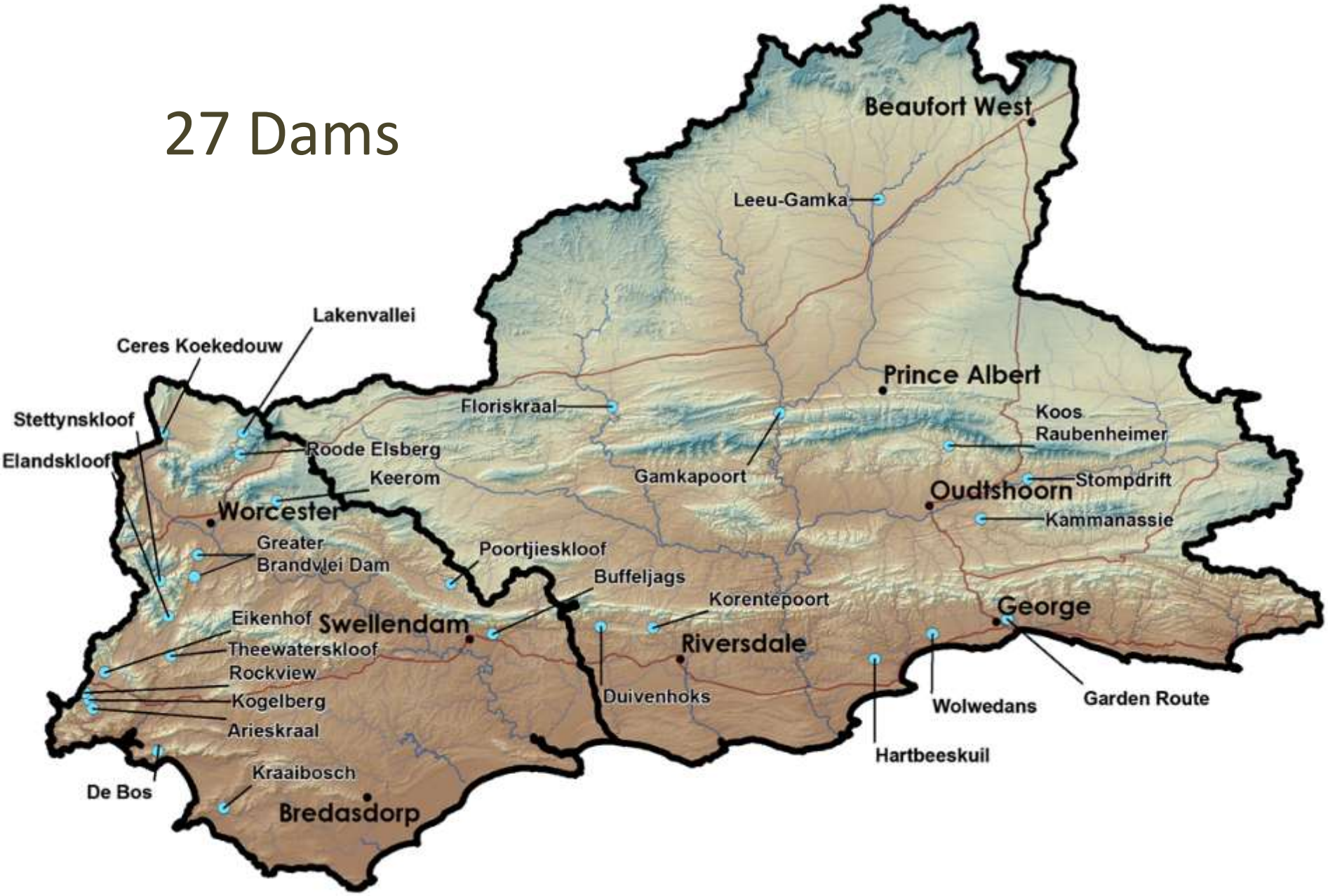


Estuary	PES	Importance	REC
Knysna	B	100	B
Bot/Kleinmond	C	97	B
Klein	C	97	B
Swartvlei	B	97	B
Gouritz	C/D	88	B
Keurbooms	A/B	88	A
Breede	B	87	B/C
Duiwenhoks	B	84	B
Heuningnes	D	83	A or BAS
Wilderness (Touws)	B	83	A or BAS
Goukou	C	80	B
Groot Brak	D	77	C
Uilkraals	D	76	B
Piesang	C	73	B
Goukamma	B	72	A
Hartenbos	D	66	D
Palmiet	C	63	B
Groot (Wes)	B	63	A or BAS
Onrus	E	59	B
Klein Brak	C	53	C
Bloukrans	A	51	A or BAS
Maalgate	B	38	B
Kaaimans	B	28	B
Noetsie	B	28	B
Gwaing	B	10	B
Haelkraal	C	Not rated	B

Estuaries

- Present ecological status (PES)
- Conservation importance (scale of 1-100)
- Recommended future ecological class (REC)

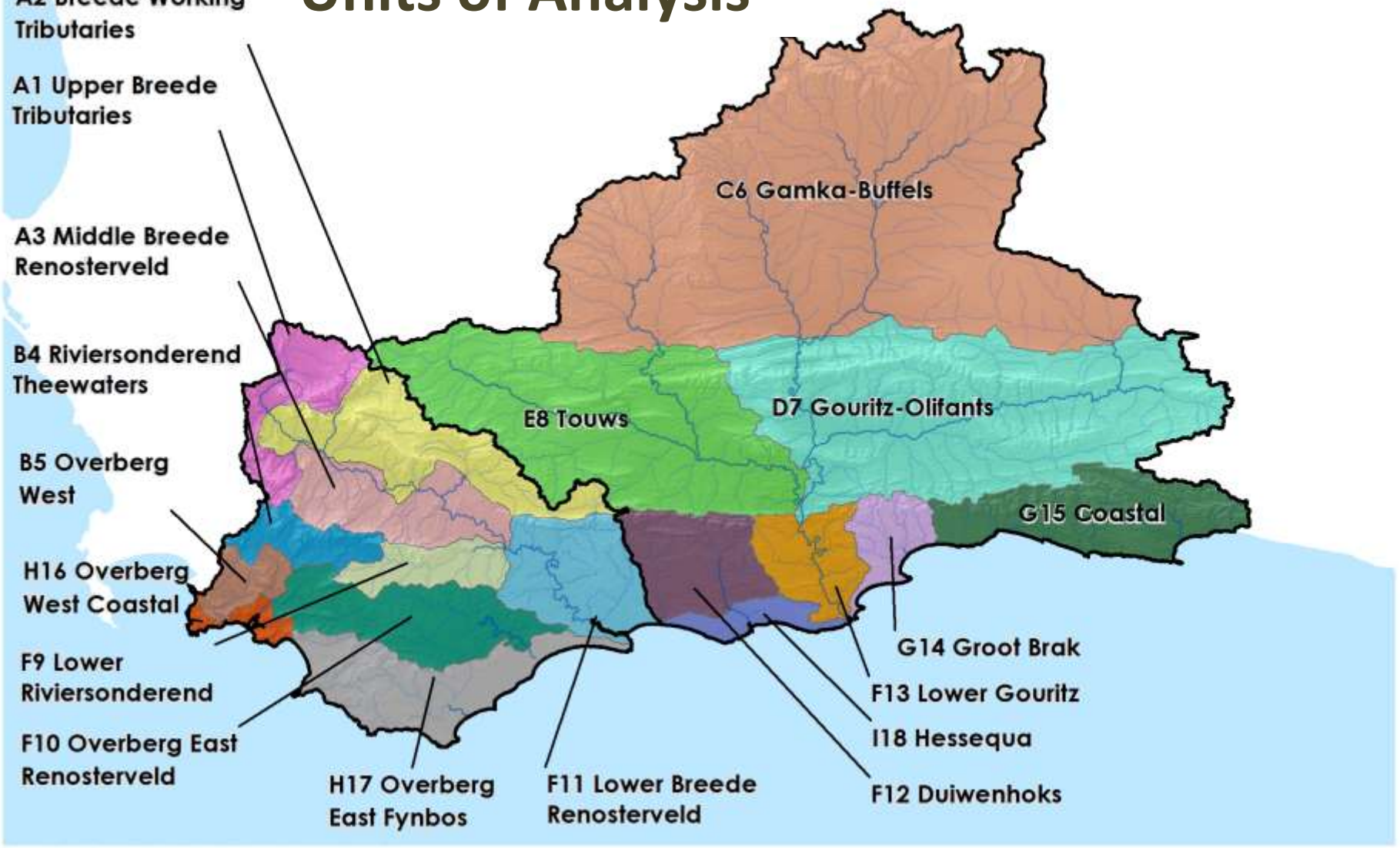
27 Dams


Beaufort West
Leeu-Gamka
Lakenvallei
Ceres Koekedouw
Prince Albert
Floriskraal
Stettynskloof
Elandskloof
Roode Elsberg
Keerom
Gamkapoort
Koos
Raubenheimer
Stompdrift
Oudtshoorn
Kammanassie
Worcester
Greater
Brandvlei Dam
Poortjieskloof
Buffeljags
Korentepoort
George
Eikenhof
Swellendam
Theewaterskloof
Rockview
Kogelberg
Arieskraal
Riversdale
Duivenhoks
Wolwedans
Garden Route
Hartbeeskuil
Kraaibosch
De Bos
Bredasdorp

Defined Integrated Units of Analysis (IUAs)

- Identified **significant resources**:
  - Based on Physical, Biological & Socio-economic factors
- Each IUA represents a similar area requiring a Water Resources Class (WRC)
- Why do we need these?
  - Broad-scale units to assess socio-economic implications of scenarios *(possible future situations)*
  - Report on ecological conditions at a sub-catchment scale
  - Set WR Classes for different parts of a catchment
- 18 IUAs delineated - 10 in the Breede & 8 in the Gouritz

18 Integrated Units of Analysis



Document Path: S:\Projects\2010\G112722\mxd\A5\br_gou_IntegratedUnitsV1_A5.mxd

Integrated Units of Analysis

Socio-economic Zone	Zone Code	River Resource Unit	IUA Name	IUA Code
Upper and Middle Breede	A	Upper Breede Tributaries	Upper Breede Tributaries	A1
		Breede Working	Breede Working Tributaries	A2
		Middle Breede Renosterveld	Middle Breede Renosterveld	A3
Upper Riversonderend and Palmiet	B	Riviersonderend Upper	Riviersonderend Theewaters	B4
		Overberg West (part 1 of 3)	Overberg West	B5
Great Karoo	C	Groot/Touws (part 1 of 2)	Gamka-Buffels	C6
		Gamka (part 1 of 2)		
Little Karoo West	D	Lower Gouritz (part 1 of 2)	Gouritz-Olifants	D7
		Olifants		
Little Karoo East	E	Groot/Touws (part 2 of 2)	Touws	E8
Wheat belt	F	Riviersonderend Lower	Lower Riviersonderend	F9
		Overberg West (part 2 of 3)	Overberg East Renosterveld	F10
		Overberg East Renosterveld (part 1 of 2)		
		Lower Breede Renosterveld	Lower Breede Renosterveld	F11
		Duiwenhoks (1 of 2)	Duiwenhoks	F12
Garden Route coast	G	Coastal Rivers (1 of 2)	Groot Brak	G14
		Coastal Rivers (2 of 2)	Coastal	G15
Overberg coast	H	Overberg West (3 of 3)	Overberg West Coastal	H16
		Overberg East (Fynbos)	Overberg East Fynbos	H17
Hessequa coast	I	Duiwenhoks (2 of 2)	Hessequa	I18

Thank you!

- For more information:
  - Register on project specific web-site or email:
    - https://www.dwa.gov.za/rdm/Documents.aspx
    - BGClassRQO@gmail.com
- For more information contact:
  - Project Team: Diane Erasmus
    Diane.Erasmus@aurecongroup.com
    or Erik van der Berg
    Erik.vanderBerg@aurecongroup.com
  - DWS (Pretoria): Lekalake Esther (LekalakeE@dws.gov.za)

Information gaps identified

- Main gaps relate to groundwater
- But… GW classifications can be completed everywhere
  - significant point dataset for water levels & water quality
  - lower confidence where there is limited info
- Groundwater surveys to be recommended to fill specific identified gaps (DWS staff to undertake)

– Small-scale water supply models available

- Noteworthy data gap is *available GW recharge dataset*
  - best available estimates of losses from surface water to groundwater to be made

Main Study Tasks