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NATIONAL DEVELOPMENT PLAN
Our Future - make it work

HIGH CONFIDENCE GROUNDWATER RESERVE DETERMINATION STUDY IN THE BERG CATCHMENT

PROJECT STAKEHOLDER COMMITTEE MEETING

Presented by: Umvoto
Date: 02 August 2022



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HIGH CONFIDENCE GROUNDWATER RESERVE DETERMINATION STUDY IN THE BERG CATCHMENT



EARTH | WATER | SCIENCE | LIFE

PRESENTATION OUTLINE

1. Overview of the study
2. Study progress
3. Reserve determination
 - a) Step 1: Initiate the BHN and EWR assessment
 - Summary of surface water information (DWS, 2016)
 - Summary of groundwater Information (DWS, 2016)
 - Summary of water resource models
 - b) Step 2: Delineate resource units and select study sites
4. Discussion

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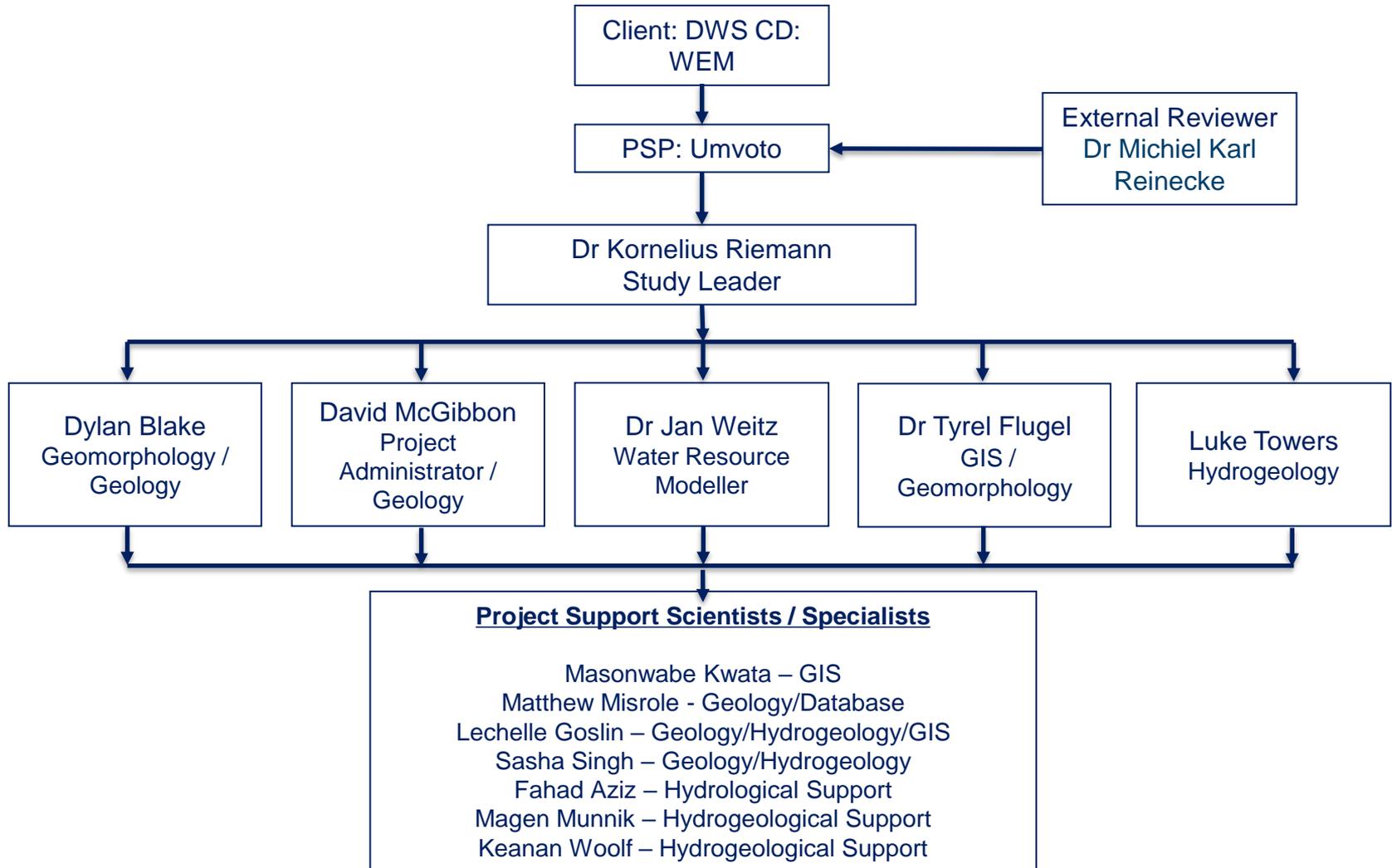


OVERVIEW OF STUDY, PHASES AND TASKS



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STUDY TEAM



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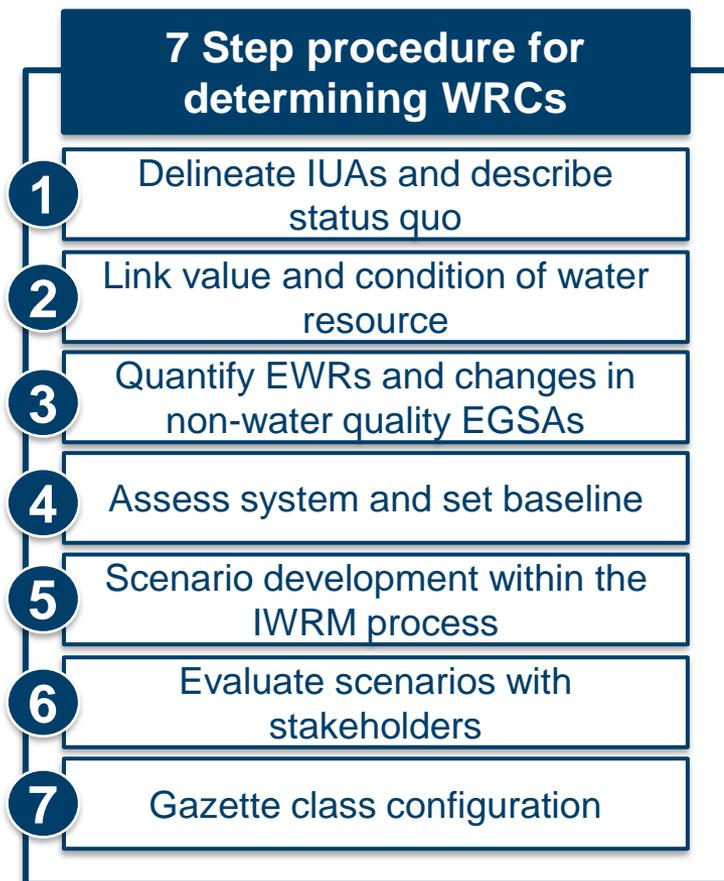


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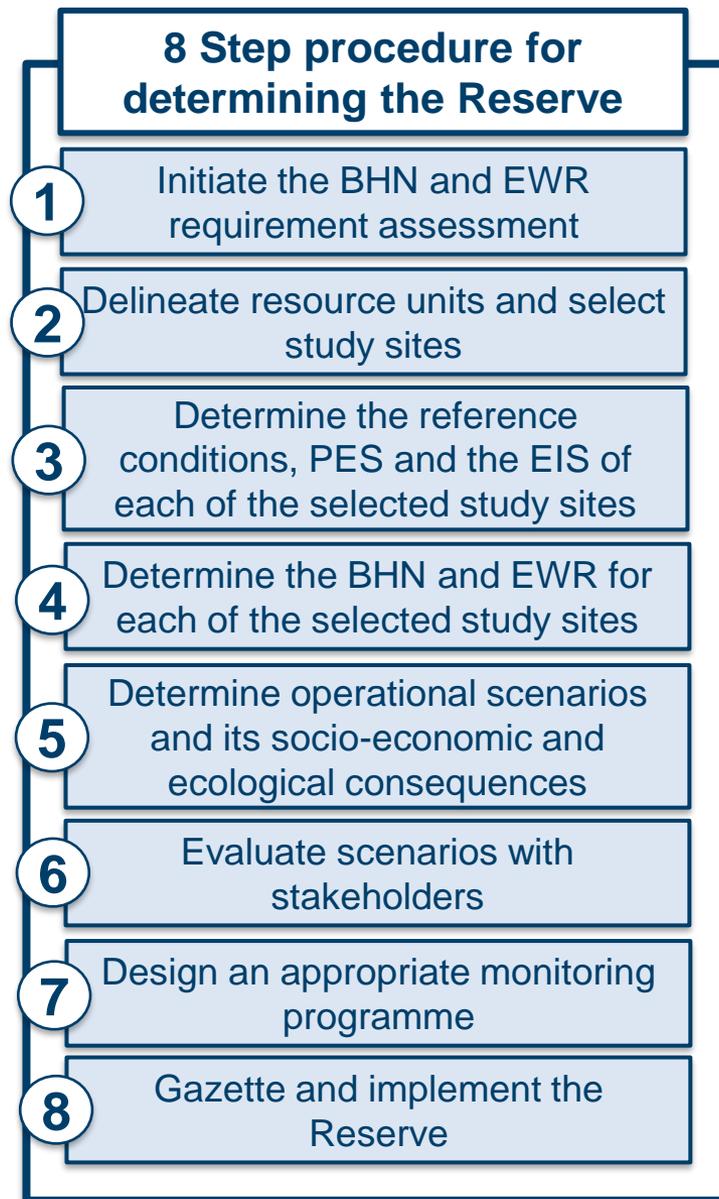
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RDM: THE RESERVE



Aligned



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SUMMARY OF OBJECTIVES FOR THE 8 STEP RDM PROCEDURE

Step 1: Initiate the BHN and EWR assessment

OBJECTIVES

- Assess scope of project
- Data/Information collation & review
- Develop GIS dataset

Step 2: Delineate Resource Units and select study sites

OBJECTIVES

- Define aquifer specific GRU's
- Review surface EWR's

Step 3: Determine the reference conditions, PES and the EIS of each of the selected sites

OBJECTIVES

- Define reference conditions for GRU's
- Estimate recharge
- Determine the allocated groundwater component
- Assess groundwater quality
- Estimate discharge

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SUMMARY OF OBJECTIVES FOR THE 8 STEP RDM PROCEDURE

Step 4: Determine BHN and EWR for each of the selected study sites

OBJECTIVES

- Determine groundwater dependent population and BHN for all identified GRU's
- Determine EWR's dependent on groundwater discharge for all GRU's
- Determine associated baseflow's
- Determine allocable groundwater

Step 5: Determine operational scenarios and its socio-economic and ecological consequences

OBJECTIVES

- Determine operational scenarios
- Assess socio-economic and ecological impacts
- Update impact assessment based on current and future operations

SUMMARY OF OBJECTIVES FOR THE 8 STEP RDM PROCEDURE

Step 6: Evaluate scenarios with stakeholders

OBJECTIVES

- Examine scenarios, impacts, BHN's and EWR's for the groundwater component with the relevant stakeholders.

Step 7: Design an appropriate monitoring programme

OBJECTIVES

- Review existing monitoring programmes
- Design new monitoring programmes (if required)
- Outline additional costs (if required)

Step 8: Gazette and implement the Reserve

OBJECTIVES

- Draft gazette template
- Database collation

STUDY PROGRESS



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Phase 1	Project inception		
Task 1.1	Inception		• Inception Report
Phase 2	Review of water resource information and data		
Task 2.1	Data collection and collation		• Gap Analysis Report • Inventory of Water Resource Models Report
Phase 3	Reserve determination		
Task 3.1	Step 1	Initiate the BHN and EWR requirement assessment	• Recorded in Phase 2
Task 3.2	Step 2	Water RU delineation	• Report
Task 3.3	Step 3	Ecological status and Reference conditions per RU	• Report
Task 3.4	Step 4	Determine BHN and EWR	• Report
Task 3.5	Step 5	Operational scenarios & socio-economic and ecological consequences	• Report
Task 3.6	Step 6	Evaluate scenarios with stakeholders	• Report
Task 3.7	Step 7	Monitoring programme	• Report
Task 3.8	Step 8	Gazette & implement Reserve	• Groundwater Reserve Determination Report • Database • Gazette Template

COMPLETE



**IN
PROGRESS**



**NOT
STARTED**



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PHASE 2

PROJECT INCEPTION

COMPLETE



2022										2023										2024			
Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
	Kick-off meeting																						
	X	Inception report																					
General project management, capacity building and stakeholder engagement																							

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PHASE 2

REVIEW OF WATER RESOURCE INFORMATION AND DATA

COMPLETE



2022										2023										2024			
Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
			X	Gap analysis report																			
			X	Inventory of water resource models report																			
General project management, capacity building and stakeholder engagement																							

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PHASE 3

RESERVE DETERMINATION

IN
PROGRESS



2022										2023										2024			
Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
				Step 1: Initiate the BHN and EWR requirement assessment																			
					X	Step 2: Groundwater resource unit delineation report																	
							X	Step 3: Ecological status & reference conditions per RU report															
											X	Step 4: Determine BHN & EWR report											
														X	Step 5: Operational scenarios & socio-economic and ecological consequences report								
																	X	Step 6: Evaluate scenarios with stakeholder's report					
																			X	Step 7: Monitoring programme report			
																						X	
																							X
																							X
																							X
General project management, capacity building and stakeholder engagement																							

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RESERVE DETERMINATION



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STEP 1: INITIATE THE BHN AND EWR ASSESSMENT

OBJECTIVES

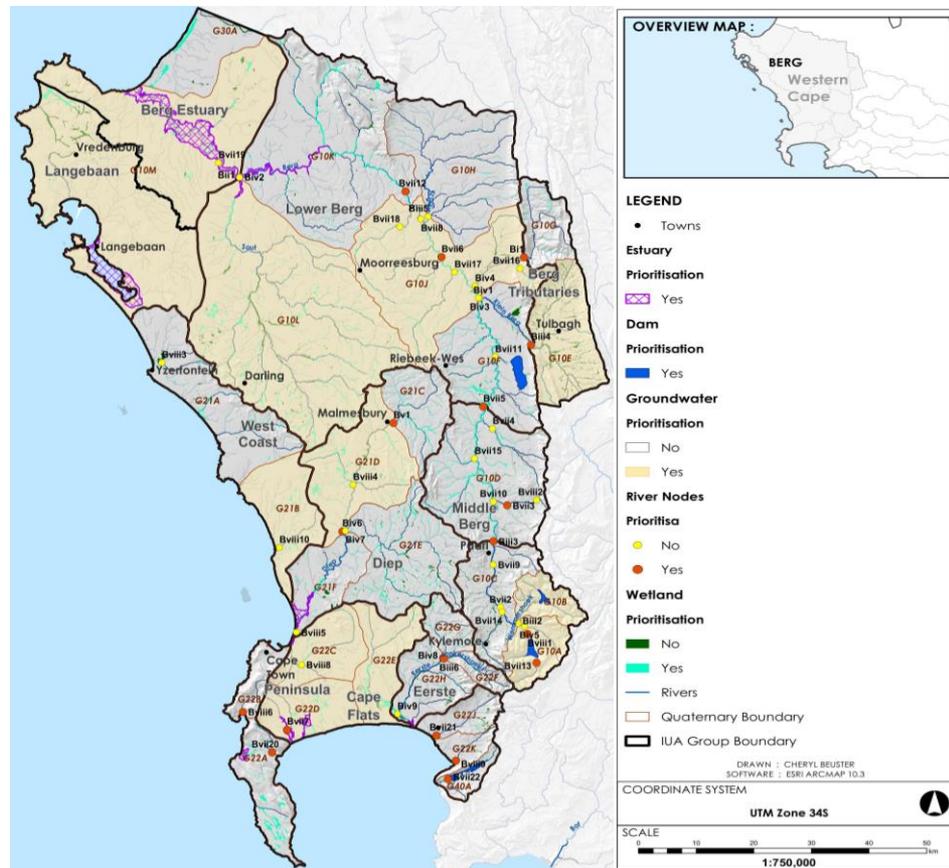
- Review of available information and data to determine the process and detail of the assessment and determination. Initiated through:
 - Inception Report
 - Gap Analysis Report
 - Inventory of Water Resource Models Report
 - Stakeholder engagement

Considering there is no parallel study for the surface water component of the Reserve determination, the surface water data/information review and understanding will be summarised from the **Gazette No.42451:121** (DWS, 2019: 121), and the informing study ***“Determination of Water Resource Classes and Resource Quality Objectives in the Berg catchment”*** study completed by Aurecon (Pty) Ltd (DWS, 2016).

Prioritised Resource Units (Rus)					
	Rivers	Estuaries	Dams	Wetlands	Groundwater
Total	20	7	6	24	10

RIVERS AND DAMS (DWS, 2016)

IUA	Prioritised Resource Units	
	Rivers	Dams
D8 Upper Berg	Bviii1, Bvii13, Biii3	Berg River Dam, Wemmershoek Dam
D9 Middle Berg	Bvii5, Bviii11, Bvii3	
C5 Berg Tributaries	Biii4, Bi1	
B4 Lower Berg	Bvii12, Bvii6	Voëlvlei Dam, Misverstand Dam
A1 Berg Estuary		
A2 Langebaan		
A3 West Coast		
D10 Diep	Bv1, Biv6	
E11 Peninsula	Bviii6, Bvii20	
E12 Cape Flats	Bvii7	
D6 Eerste	Biii6, Biv8	
D7 Sir Lowry's	Bvii22, Bvii21, Bviii9	Steenbras Reservoir, Steenbras Upper Dam
TOTAL	20	6



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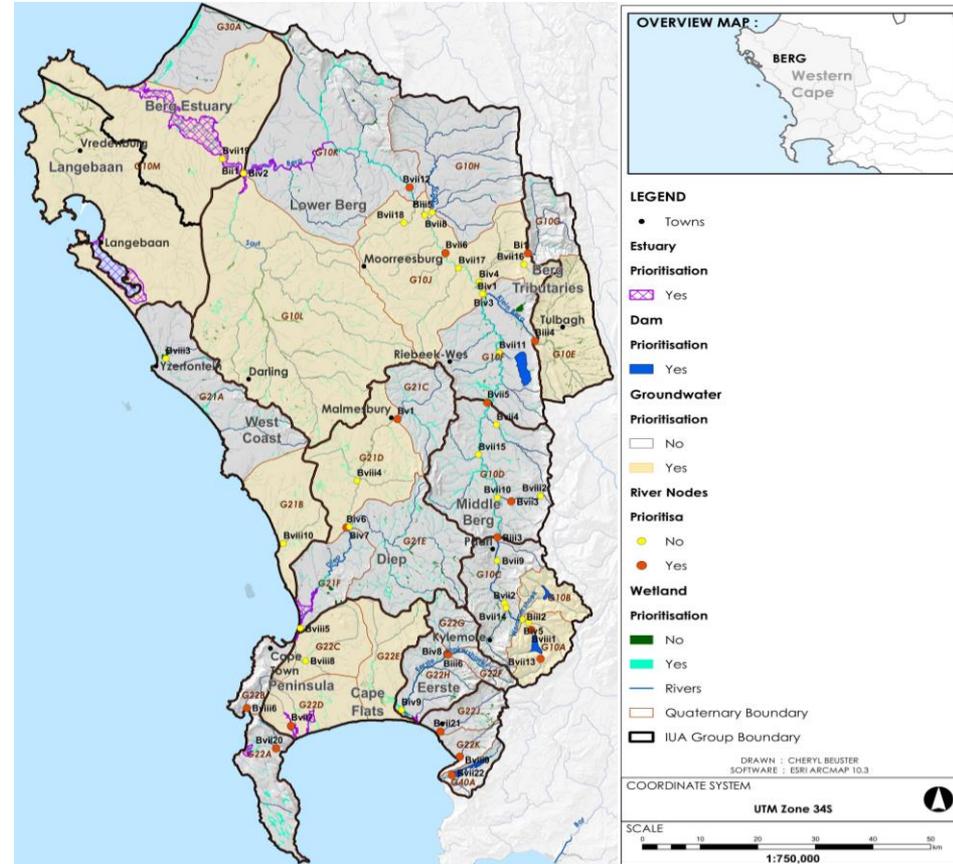
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ESTUARIES (DWS, 2016)

IUA	Prioritised Resource Units (RUs)
	Estuary
D8 Upper Berg	
D9 Middle Berg	
C5 Berg Tributaries	
B4 Lower Berg	
A1 Berg Estuary	Berg (Groot)
A2 Langebaan	Langebaan
A3 West Coast	
D10 Diep	Rietvlei/ Diep
E11 Peninsula	Wildevöelvlei
E12 Cape Flats	Zandvlei
D6 Eerste	Eerste
D7 Sir Lowry's	Lourens
TOTAL	7



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WETLANDS (DWS, 2016)

IUA	Prioritised Resource Units (RUs)
	Wetland
D8 Upper Berg	• SWSA* SEEP
D9 Middle Berg	• West Coast Shale Renosterveld FLOODPLAIN (Berg)
C5 Berg Tributaries	• SWSA* SEEP
B4 Lower Berg	• West Coast Shale Renosterveld FLOODPLAIN (Berg) • Northwest Sandstone Fynbos SEEP and FLOODPLAIN (Boesmans River) • Kiekoesvlei DEPRESSION • Koekiespan DEPRESSION
A1 Berg Estuary	• Southwestern Shale Fynbos UNCHANNELLED VALLEY BOTTOM (Berg)
A2 Langebaan	• Salt marsh SEEP (Geelbek)
A3 West Coast	• Southwest Sand Fynbos DEPRESSION (Yzerfontein)
D10 Diep	• Rietvlei Southwest Sand Fynbos FLOODPLAIN and Dune • Strandveld FLOODPLAIN (seasonal) • Riverlands DEPRESSION and SEEP
E11 Peninsula	• Sand Fynbos DEPRESSION (Pick n Pay Reedbeds) • Sand Fynbos DEPRESSION (Wildvöelvlei) Sand Fynbos DEPRESSION (seasonal) • SWSA* UNCHANNELLED VALLEY- BOTTOM
E12 Cape Flats	• Zeekoeivlei DEPRESSION (open water and seasonal) • Rondevlei DEPRESSION (open water and seasonal) • Nooiensfontein FLOODPLAIN • Blouvlei DEPRESSION • Princessvlei DEPRESSION • SEEP (Philippi seasonal wetlands)
D6 Eerste	• SWSA* SEEP
D7 Sir Lowry's	• SWSA* SEEP
TOTAL	24

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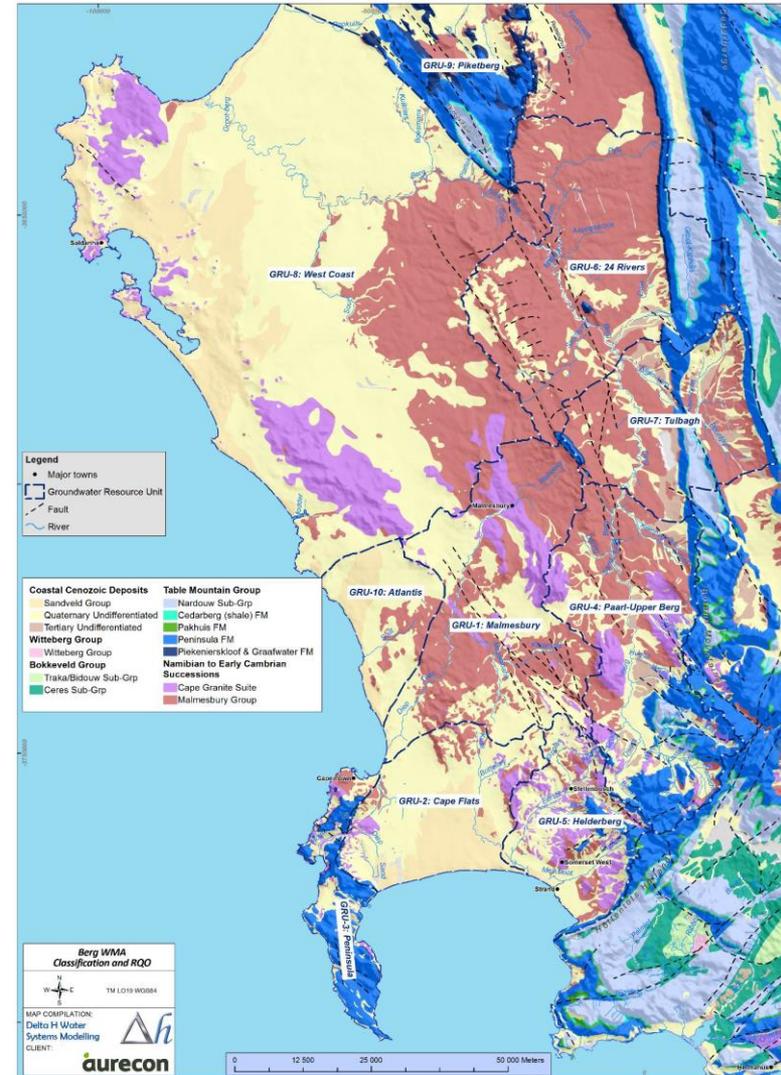


GROUNDWATER (DWS, 2016)

The geology of the Berg catchment is the dominating control on the topography, recharge (in terms drainage and the orogenic control over precipitation) and water chemistry.

NOTE

GRUs were primarily delineated according to surface water catchments with varying aquifer types grouped.



GROUNDWATER (DWS, 2016)

IUA	Prioritised Resource Units (RUs)	
	GRU	Catchments
D8 Upper Berg	4-Paarl-Upper Berg	G10A, G10B
D9 Middle Berg		
C5 Berg Tributaries	5-Tulbagh Valley	G10E
B4 Lower Berg	6-24 Rivers	G10J
	7-Piketberg	
A1 Berg Estuary	8-West Coast	G10M
A2 Langebaan	8-West Coast	G10M
A3 West Coast	9-Atlantis	G21B
D10 Diep	10-Malmesbury	G21D
E11 Peninsula	1-Peninsula	
E12 Cape Flats	2-Cape Flats	G22C, G22D, G22E
D6 Eerste	3-Helderberg	
D7 Sir Lowry's		
TOTAL	10	10

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INFORMATION GAPS, CONSIDERATIONS AND RECOMMENDATIONS

SURFACE WATER

1. Since aquifer specific GRUs are required, surface water nodes may require disaggregation to estimate groundwater contribution accurately.
2. Wetland maps are not comprehensive and may require additional processing.
3. Groundwater dependency of wetlands may require additional processing.

GROUNDWATER

1. Availability of groundwater planning strategies / developments / implementation post All Towns (2016).
2. GRUs delineation will be redone.
3. Data processing (co-ordinate correction / verification, site identifier overlap, etc.)

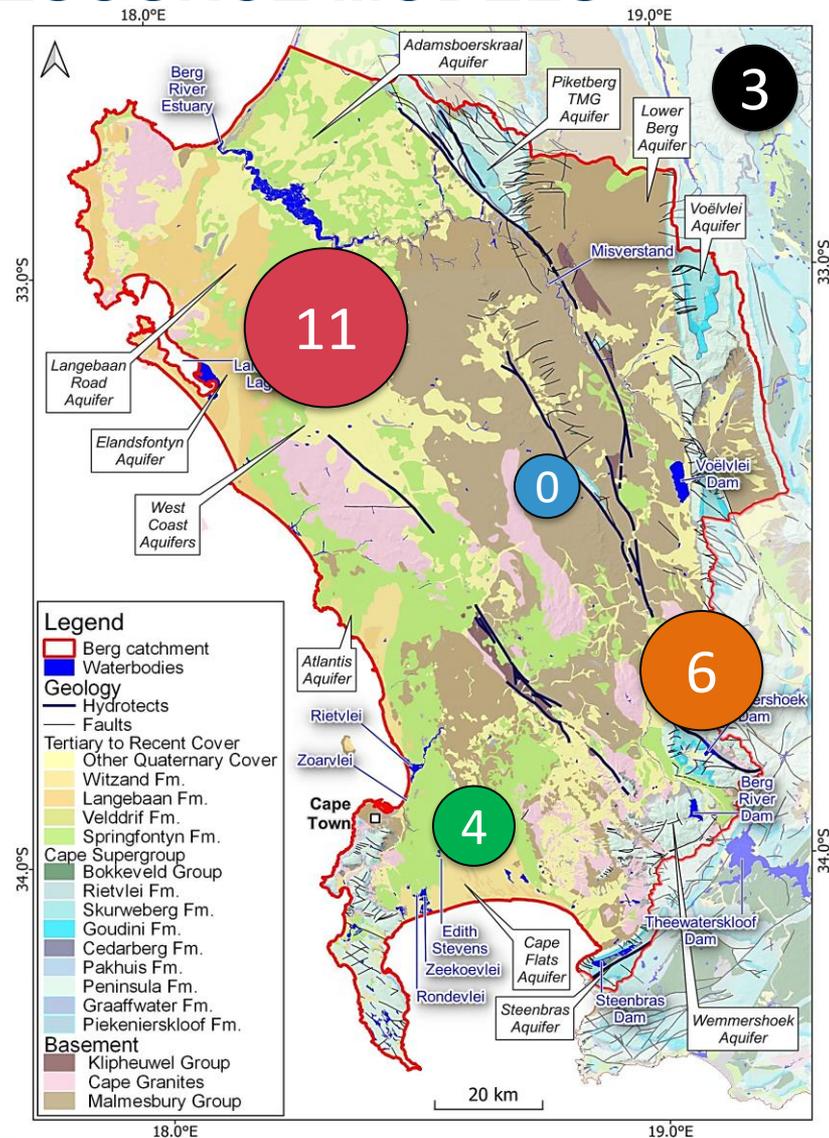
SUMMARY OF WATER RESOURCE MODELS

MODELS GROUPS

1. Regional (3)
2. West Coast Aquifer (11)
3. Cape Flats Aquifer (4)
4. TMGA (6)
5. Basement (0)

SUITABILITY OF MODELS

1. Not suitable models
 - Desktop Assessments
 - Conceptual
 - Storage/Yield
 - Water Balance
 - Hydrological
2. Suitable models
 - Analytical
 - Numerical
 - Black Box



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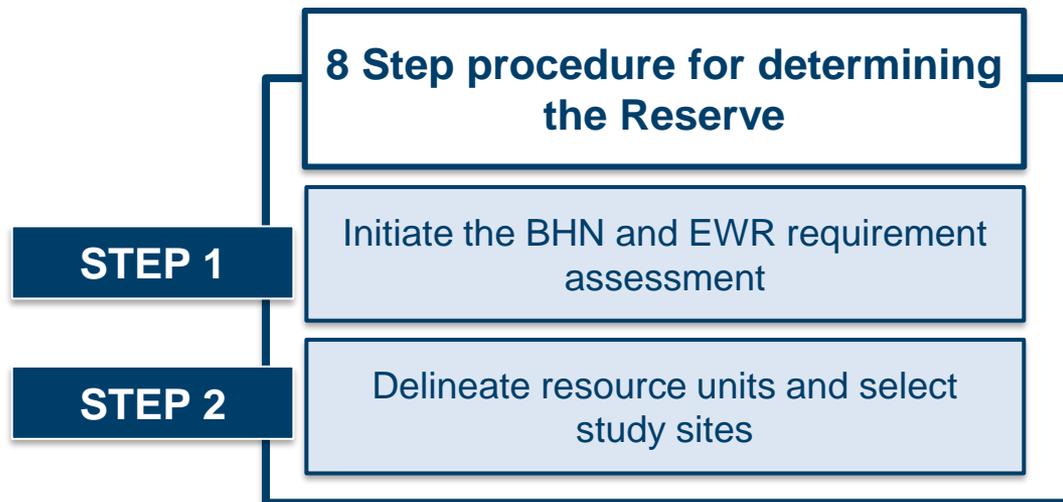
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STEP 2: DELINEATE RESOURCE UNITS & SELECT STUDY SITES

Because of the number of factors to be considered, setting resource unit boundaries will probably be an iterative process requiring modification until all component requirements have been accommodated.



STEP 2: DELINEATE RESOURCE UNITS & SELECT STUDY SITES

GRU DELINEATION CONSIDERATIONS

PHYSICAL CRITERIA

- a) Existing aquifer boundaries
- b) Geology (Basement, TMG, Sandveld)
- c) Structural geology (major faults, folds & hydrotects)
- d) Topography & Geomorphology
- e) Aquifer boundary conditions (where water enters, flows through, and exits the systems)
- f) Hydrology (major rivers, water bodies and quaternary catchments)

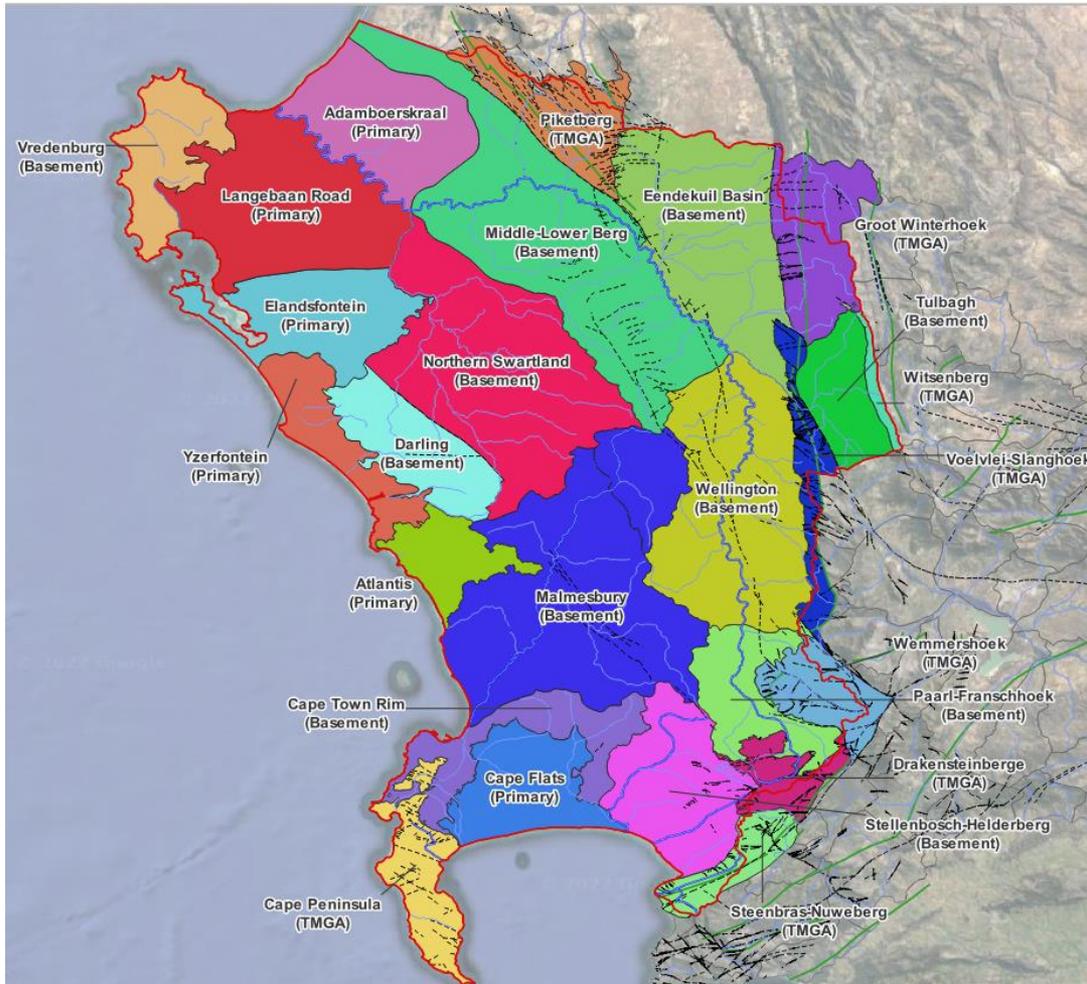
MANAGEMENT CRITERIA

- a) Existing river nodes, EWR sites, estuary nodes, estuary EWR sites, GRUs class
- b) Groundwater use

FUNCTIONAL CRITERIA

- a) Groundwater-surface water interactions (its role in sustaining hydrological, ecological conditions e.g., groundwater-dependent wetlands)

STEP 2: DELINEATE RESOURCE UNITS & SELECT STUDY SITES



PRIMARY SAND GRUs

1. Cape Flats (Primary)
2. Atlantis (Primary)
3. Yzerfontein (Primary)
4. Elandsfontein (Primary)
5. Langebaan Road (Primary)
6. Adamboerskraal (Primary)

TABLE MOUNTAIN GROUP GRUs

7. Cape Peninsula (TMGA)
8. Steenbras-Nuweberg (TMGA)
9. Drakensteinberge (TMGA)
10. Wemmershoek (TMGA)
11. Voelvlei-Slanghoek (TMGA)
12. Witsenberg (TMGA)
13. Groot Winterhoek (TMGA)
14. Piketberg (TMGA)

BASEMENT GRUs

15. Cape Town Rim (Basement)
16. Stellenbosch-Helderberg (Basement)
17. Paarl-Franschoek (Basement)
18. Malmesbury (Basement)
19. Wellington (Basement)
20. Tulbagh (Basement)
21. Eendekuil Basin (Basement)
22. Middle-Lower Berg (Basement)
23. Northern Swartland (Basement)
24. Darling (Basement)
25. Vredenburg (Basement)

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CAPACITY BUILDING PROGRAMME

Task	Description	Period
2.1	Gap Analysis and Water Resource Model Inventory: data collection, review, and analysis	June 2022
3.1	GRU delineation	August 2022
3.4	Water Resource Modelling: 1 week groundwater modelling training. Aspects will include: <ul style="list-style-type: none"> • groundwater modelling (conceptual, numerical etc.), • recharge estimation per delineation (GRU), • baseflow estimation per delineation (GRU), • groundwater component/contribution to baseflow and groundwater quality 	January 2023
3.8	Reserve Determination: Attend Final Reserve Determination stakeholder engagement workshop to observe how it is determined and update the reserve reporting based on stakeholder input.	January 2024

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DISCUSSION



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THANK YOU

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