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Groundwater Use:
The Planning Perspective

Presented by: Fanus Fourie

SYMPOSIUM
on Groundwater and Municipalities
(Potchefstroom)
15 - 16 October 2012

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Content

- Government's Perspective on Groundwater
- Groundwater Use status
- Groundwater Availability
- Planning Assistance (Guidelines, Tools, Maps)
- Groundwater Quality
- Institutional Issues

Minister's Perspective on Groundwater (Budget Speech 2011)

"*Groundwater remains an important source of water*"

"*started to implement a strategy aimed at exploiting groundwater but groundwater is*:

- Underdeveloped
- Underutilized as catalyst for job creation and economic development
- Not adequately explored as a strategic resource
- Municipalities not adequately trained in groundwater management

National Government Outcomes - Outcome 10

- Specifically 'Outcome 10: Output 1
  - Enhanced Quality and Quantity of our Water Resources: Diversification
  - DWA required to report on the increase in groundwater utilisation
    - Target to increase groundwater utilisation by 1% a year

National Water Resource Strategy v2

NWRS-2 sets out the strategic direction for water resources management in the country over the next 20 years, with a particular focus on priorities and objectives for the period 2013 – 2017.

- Maximising the use of local resources through groundwater development
- This resource is presently underutilized
- Protection of water resources encompasses management of quality and quantity of both surface water and groundwater and protection of the habitats
- Groundwater in South Africa is an important resource for all sectors
- The development of this resource will be crucial for sustaining water security

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Groundwater Strategy - Aim

Groundwater is recognised as an important strategic water resource in South Africa, within an **integrated water resource management** approach.

The knowledge and use of groundwater is increased along with the capacity to ensure **sustainable management**.

Better **groundwater management** programmes are developed and **implemented** at required water resource management levels, tailored to local quantity and quality requirements.

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Groundwater Use

2004 – NWRS1 – 1 088 million m^3

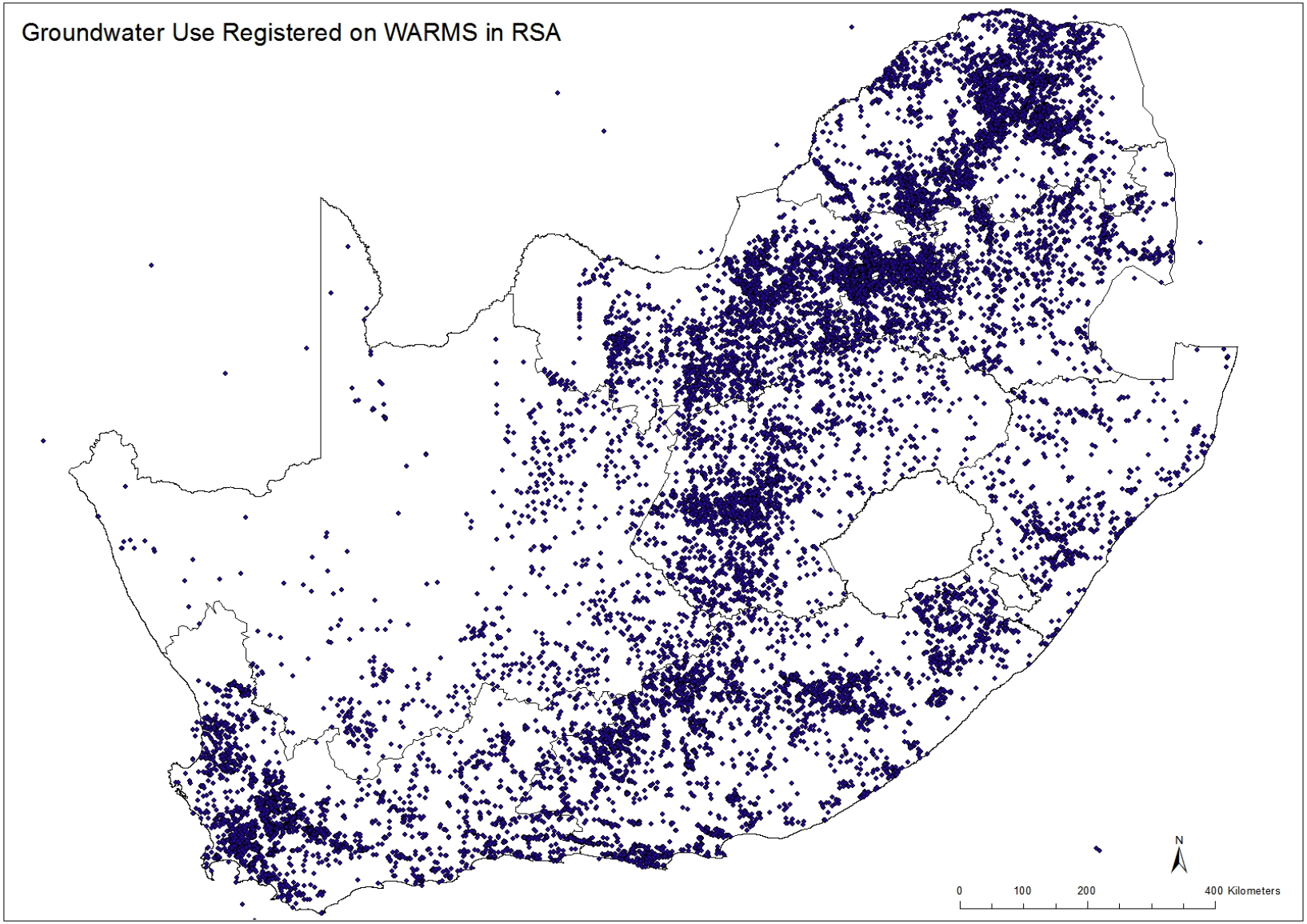
2011 – WR2005 – 1 771 million m^3

2012 – WARMS – 2 466 million m^3

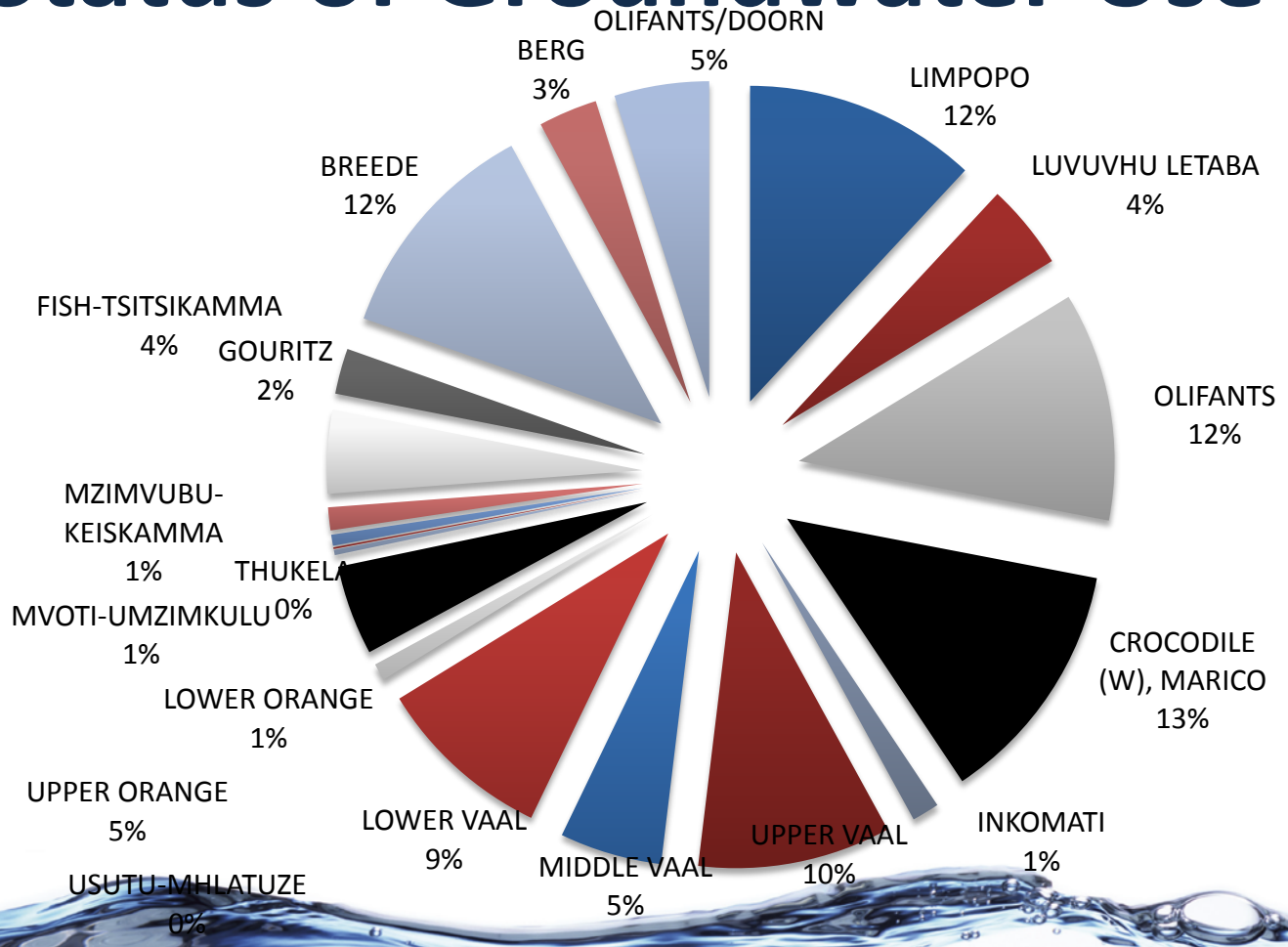
Increase of 39% - 7 years

Can be 3 000 million m^3 - 69%

Groundwater Use - Registered



Status of Groundwater Use - WMA



Registered volumes Groundwater Use per WMA in RSA

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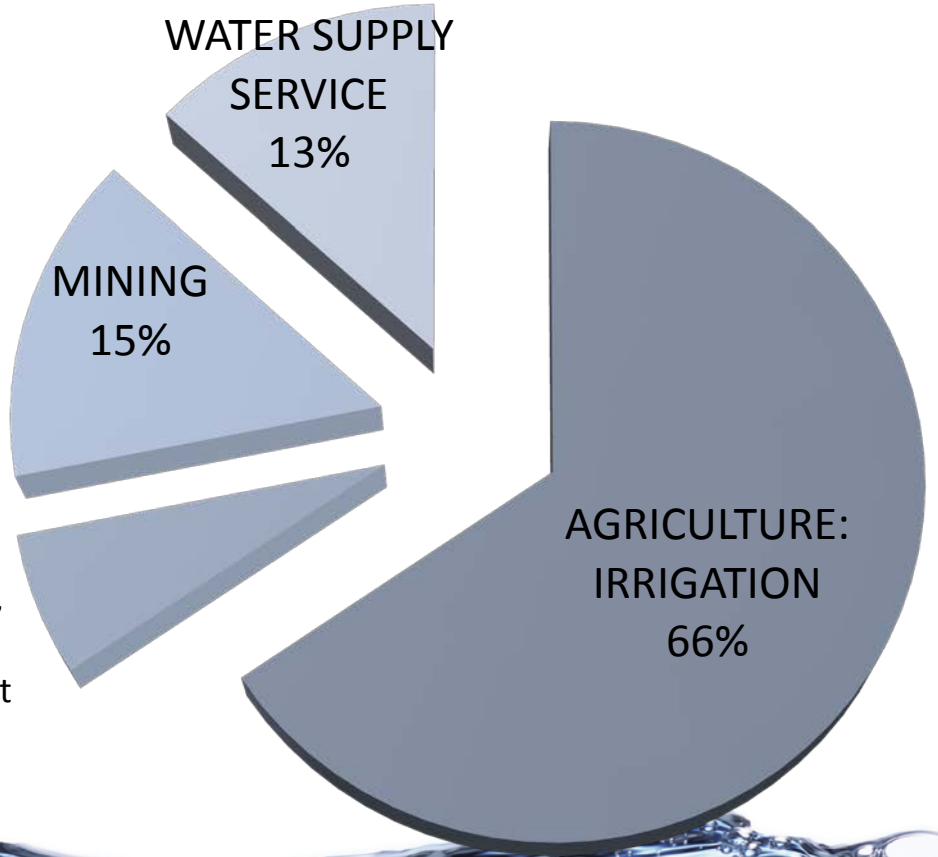
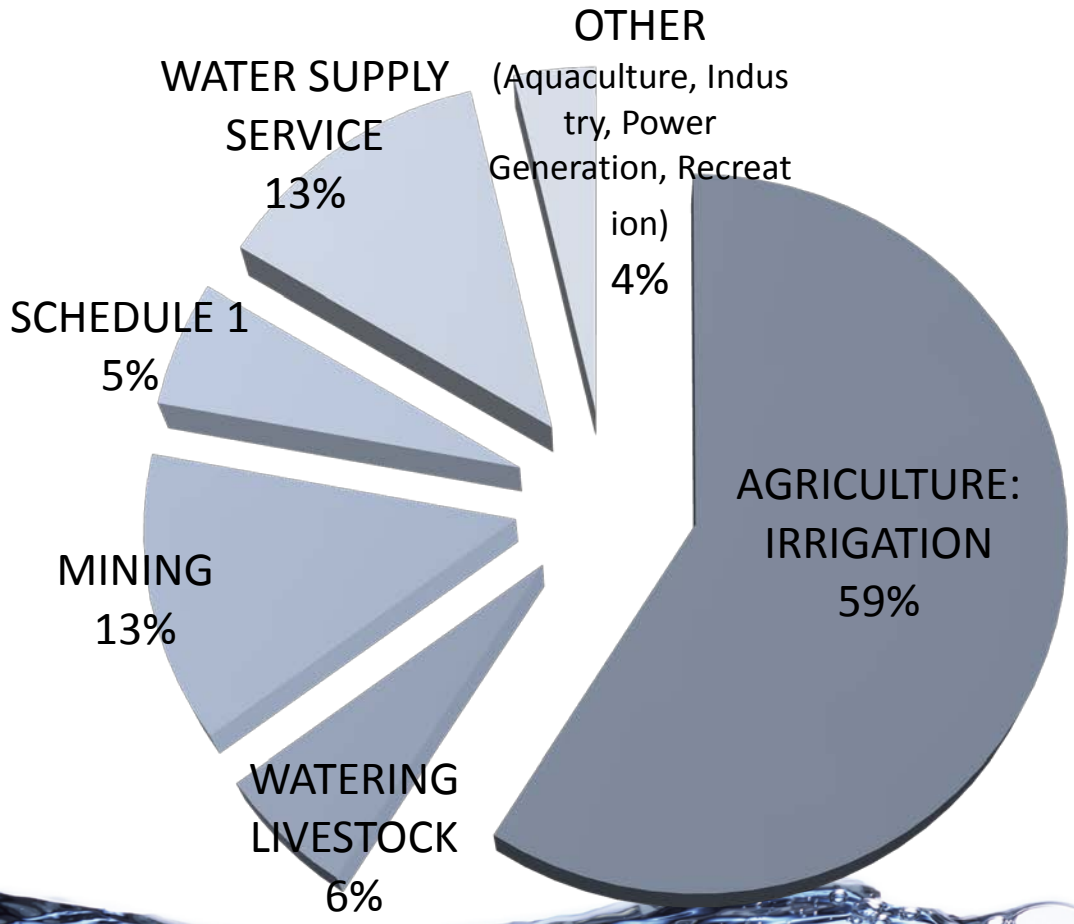
Status of Groundwater Use - Sector



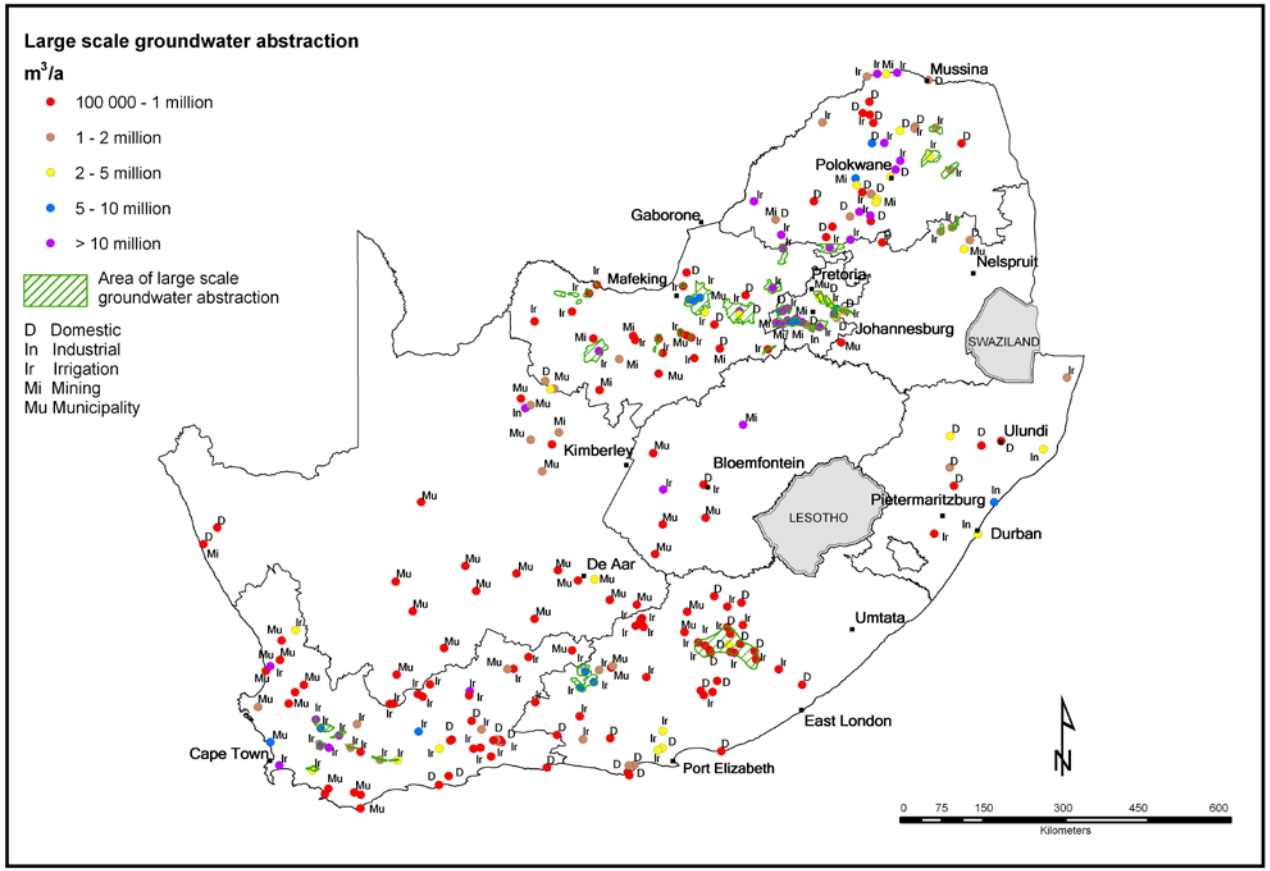
Current Registered Water Use per Sector in RSA

Status of Groundwater Use - Sector



More realistic Water Use per Sector in RSA

Groundwater Use - Large users



Pretoria

- •Fountains 1905
- •60 Million L/day or 14,9 Million m^3/a

Johannesburg

- •11 Million L/day

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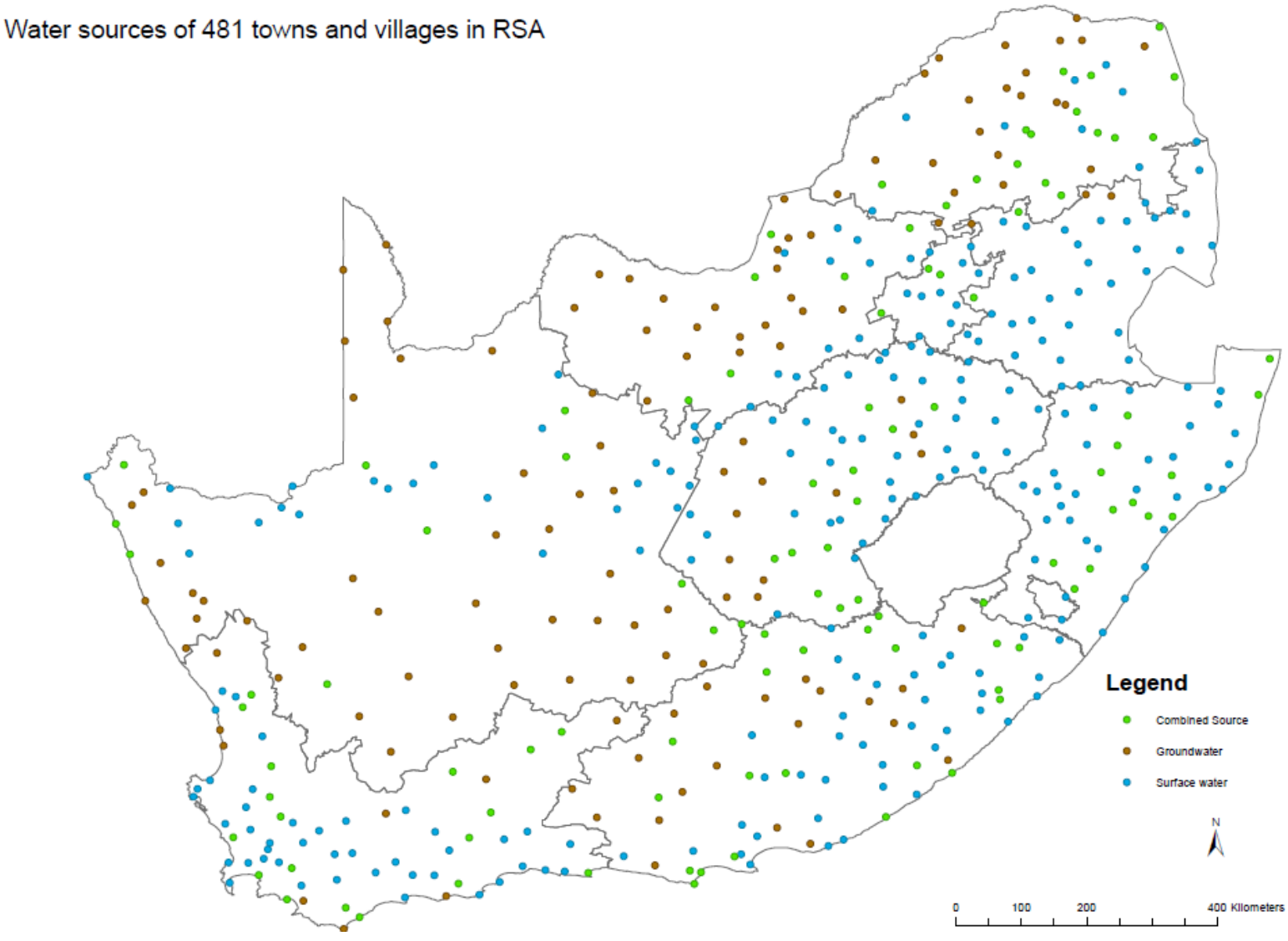
Groundwater Use – Water Supply



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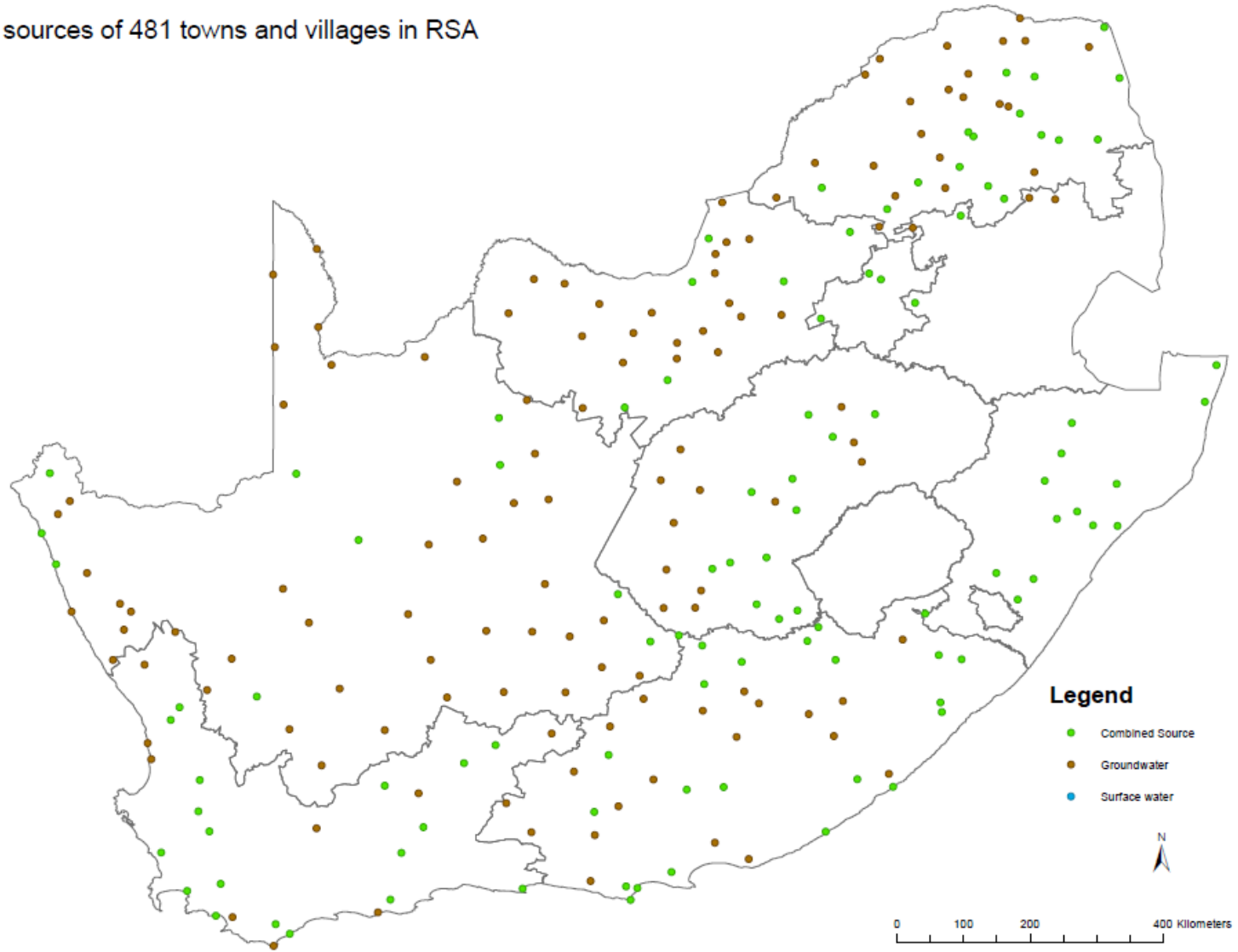
Groundwater Use – Water Supply

Water sources of 481 towns and villages in RSA



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Groundwater Use

Number of Towns and Villages (Sources water) – 23 297

	Urban	Rural	Total
Groundwater	22%	59%	53%
Combined	34%	34%	34%
Surface water	44%	7%	13%

Available Groundwater - million m^3

- Average Groundwater Resource Potential – 47 727
- Average Groundwater Exploitation Potential – 19 073
- Potable Groundwater Exploitation Potential – 14 802
- Utilisable Groundwater Exploitation Potential –

Normal – 10 345 Dry – 7 530

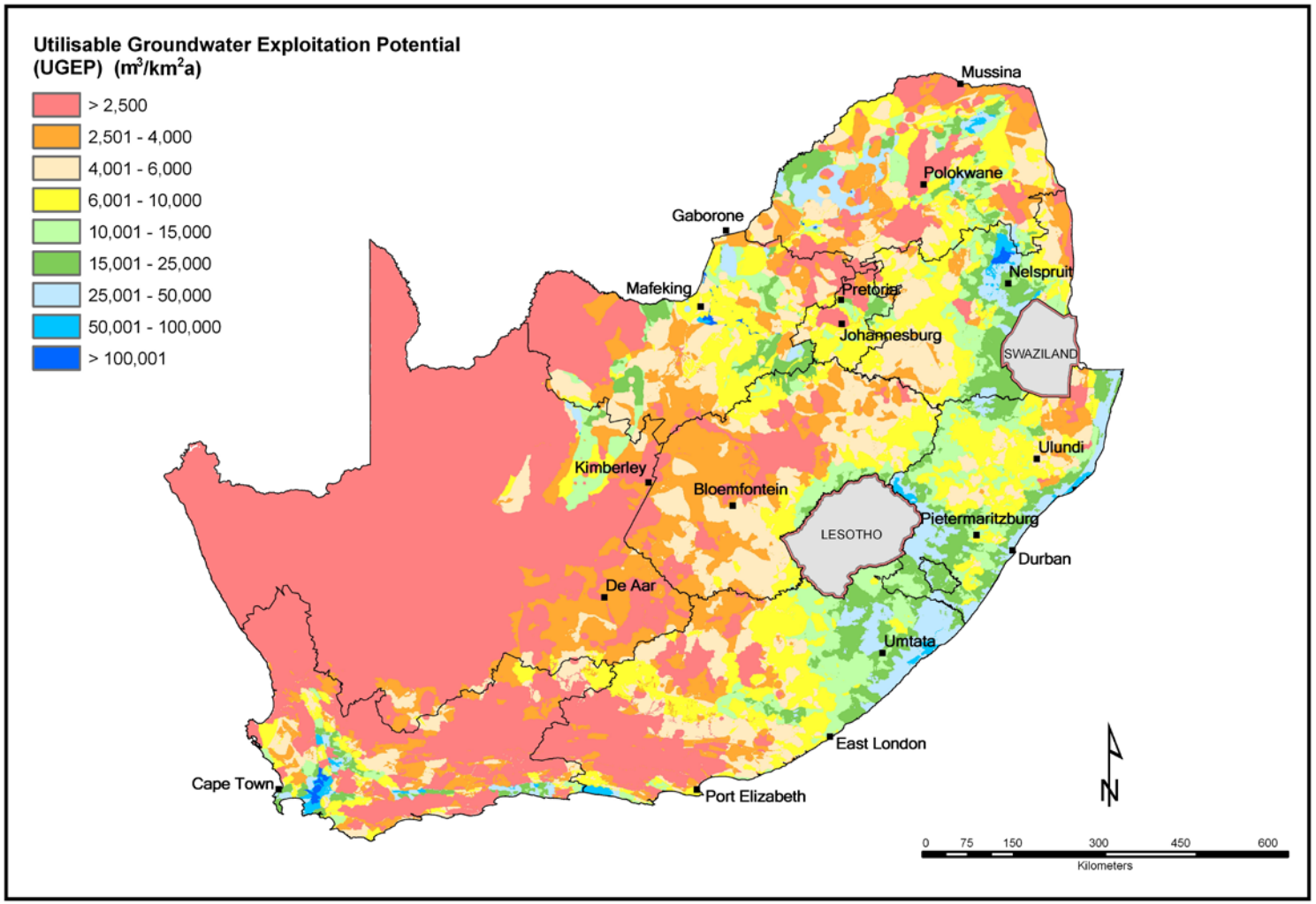
Maps in the GRA II

Utilisable Groundwater Exploitation Potential

Aquifer Yield

2 500 m^3/km/a
= 6.8 ℓ/ha/d

10 000 m^3/km/a
= 0.31 ℓ/s/km^2



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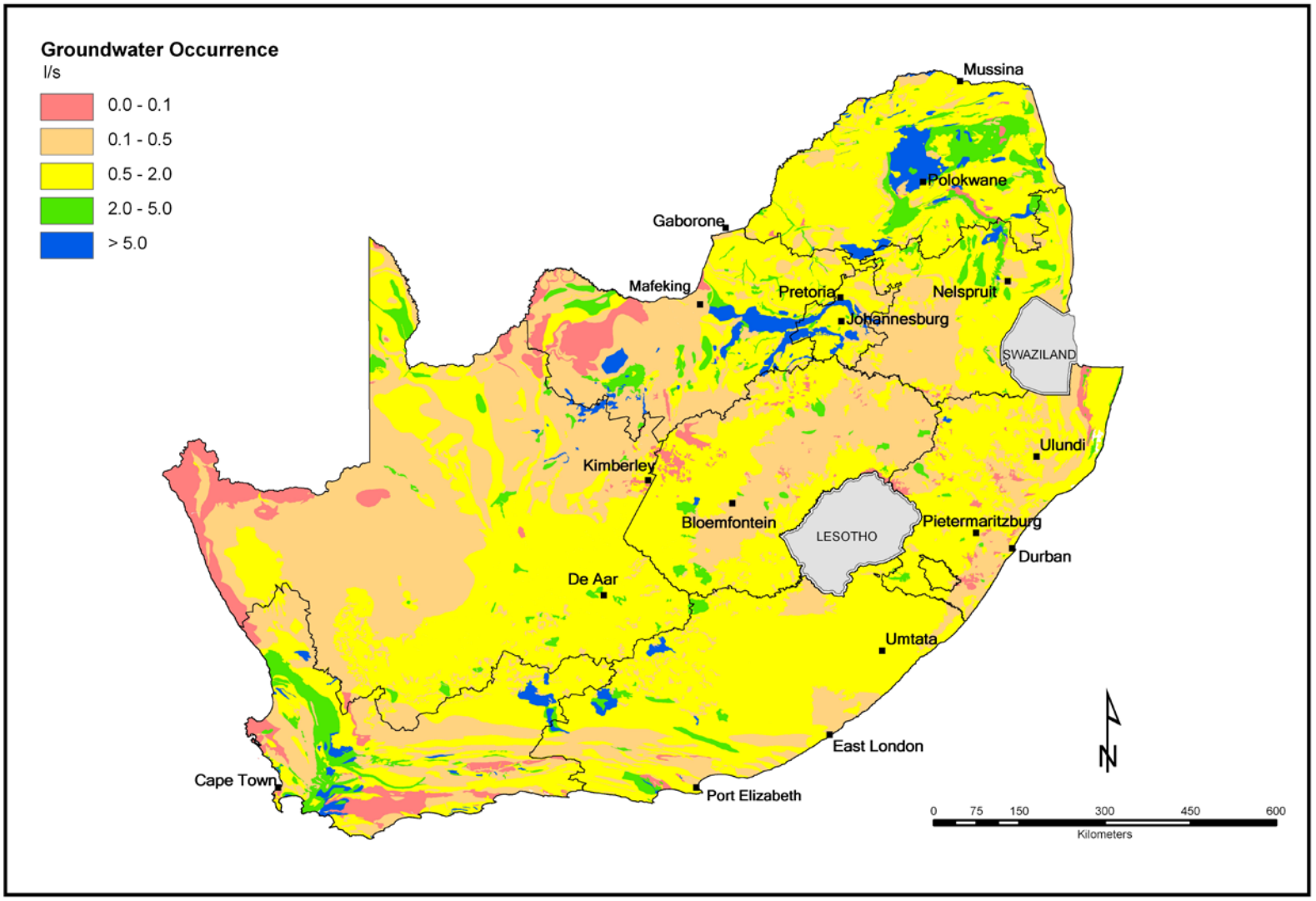
Maps in the GRA I

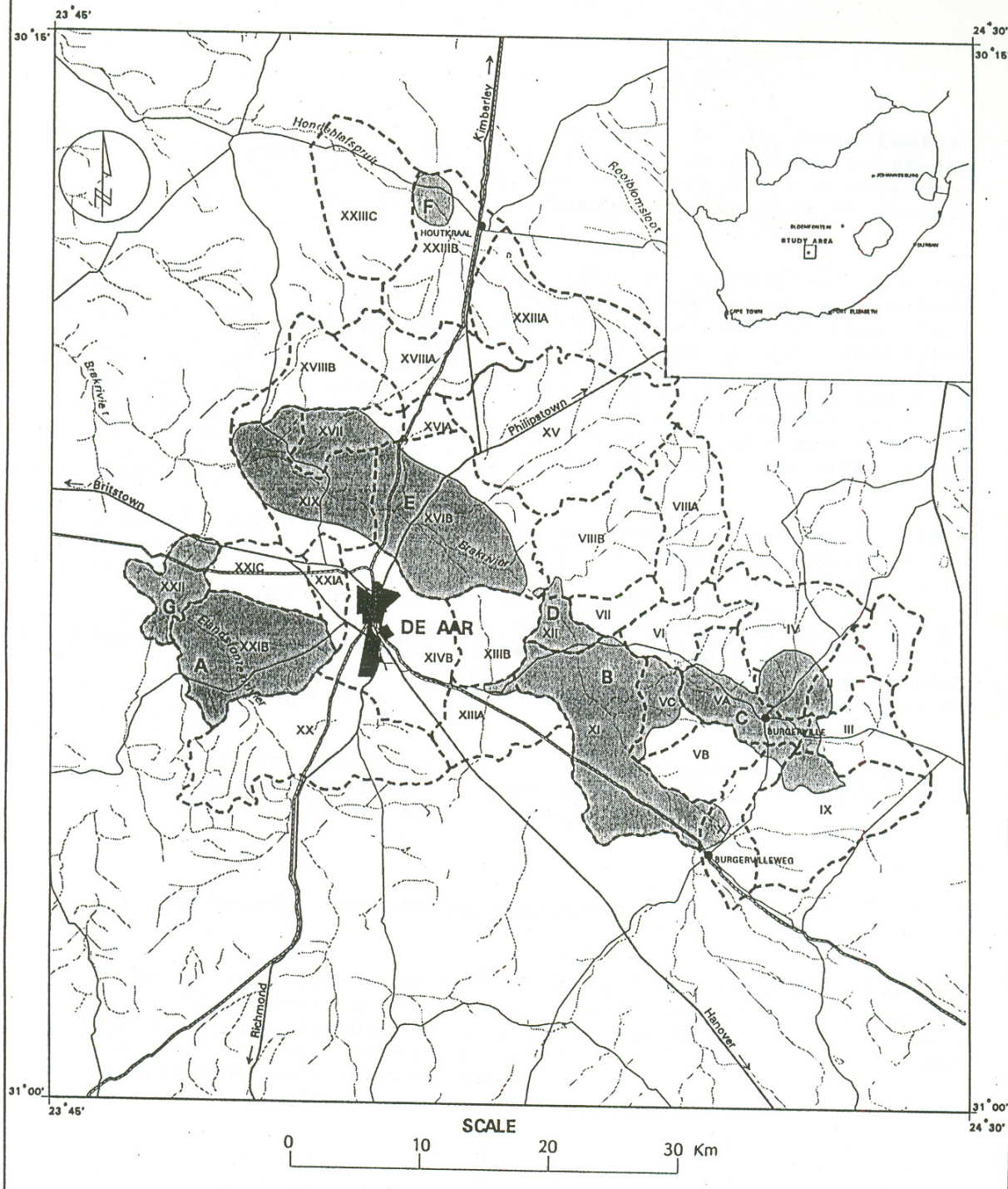
Groundwater Occurrence – Borehole yield



But what

De Aar

- Require 2.7 mi
- 2.7 million m³/
- 86 l/s = 1 108k
- 30km x 36km =



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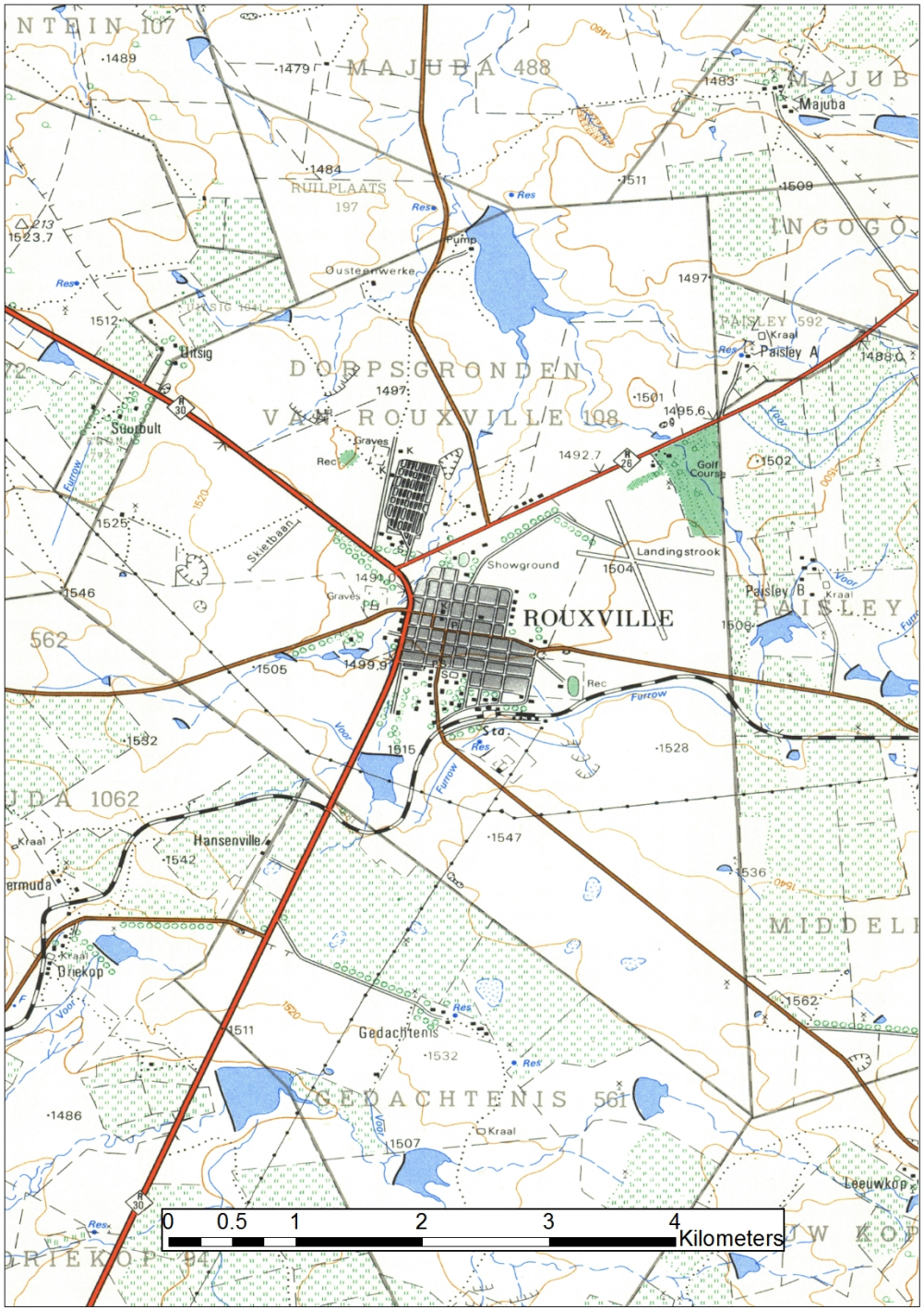
But what does

Rouxville

- Require 0.67 million
- 0.67 million m^3/a = 2
- 21 l/s = 112km^2 rech
- 11km x12km = 112kr



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Over Abstraction

Lorca earthquake 'caused by groundwater extraction'

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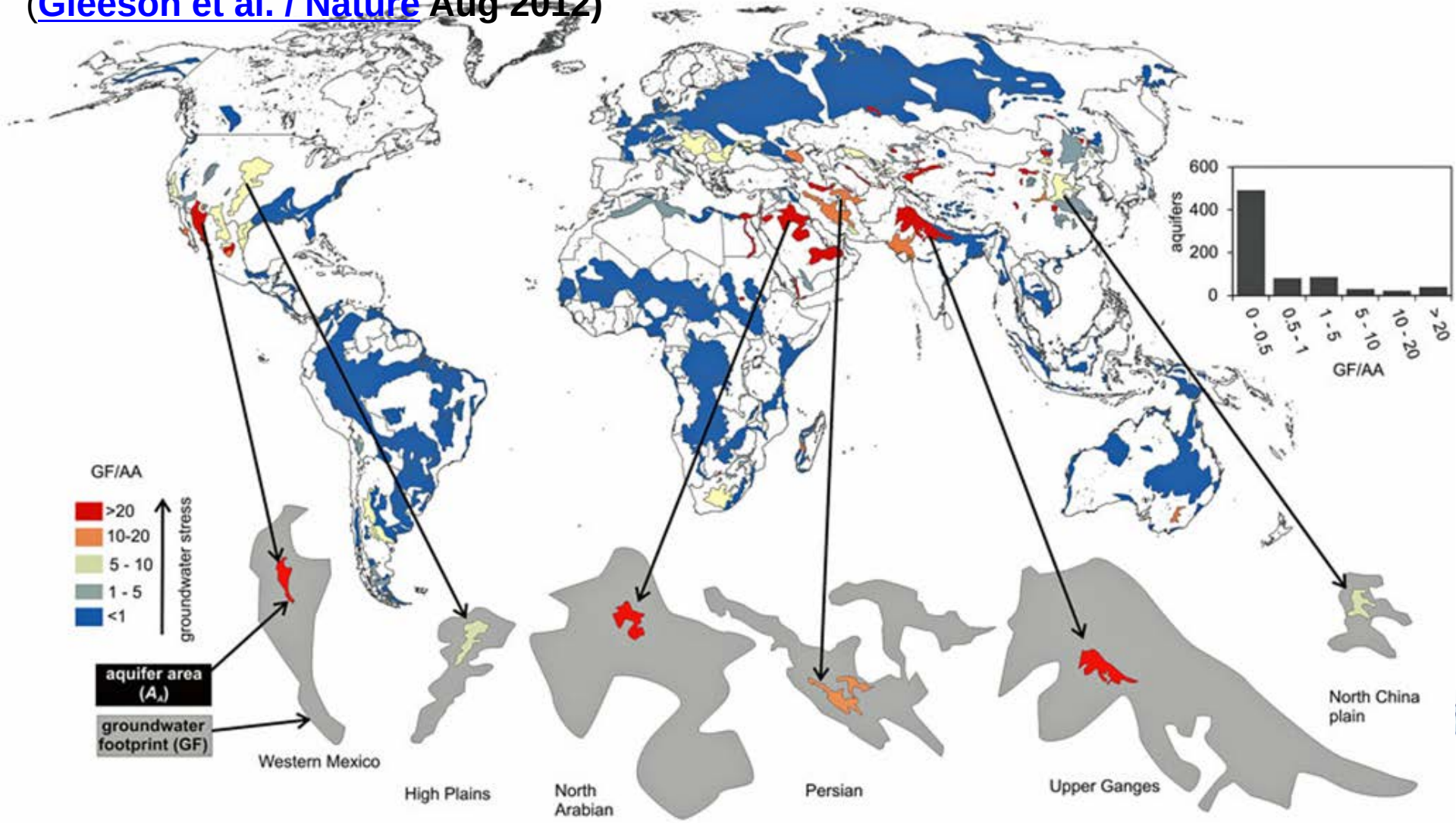
Over abstraction - Groundwater Footprint

(Gleeson et al. / Nature Aug 2012)



Over abstraction - Groundwater Footprint

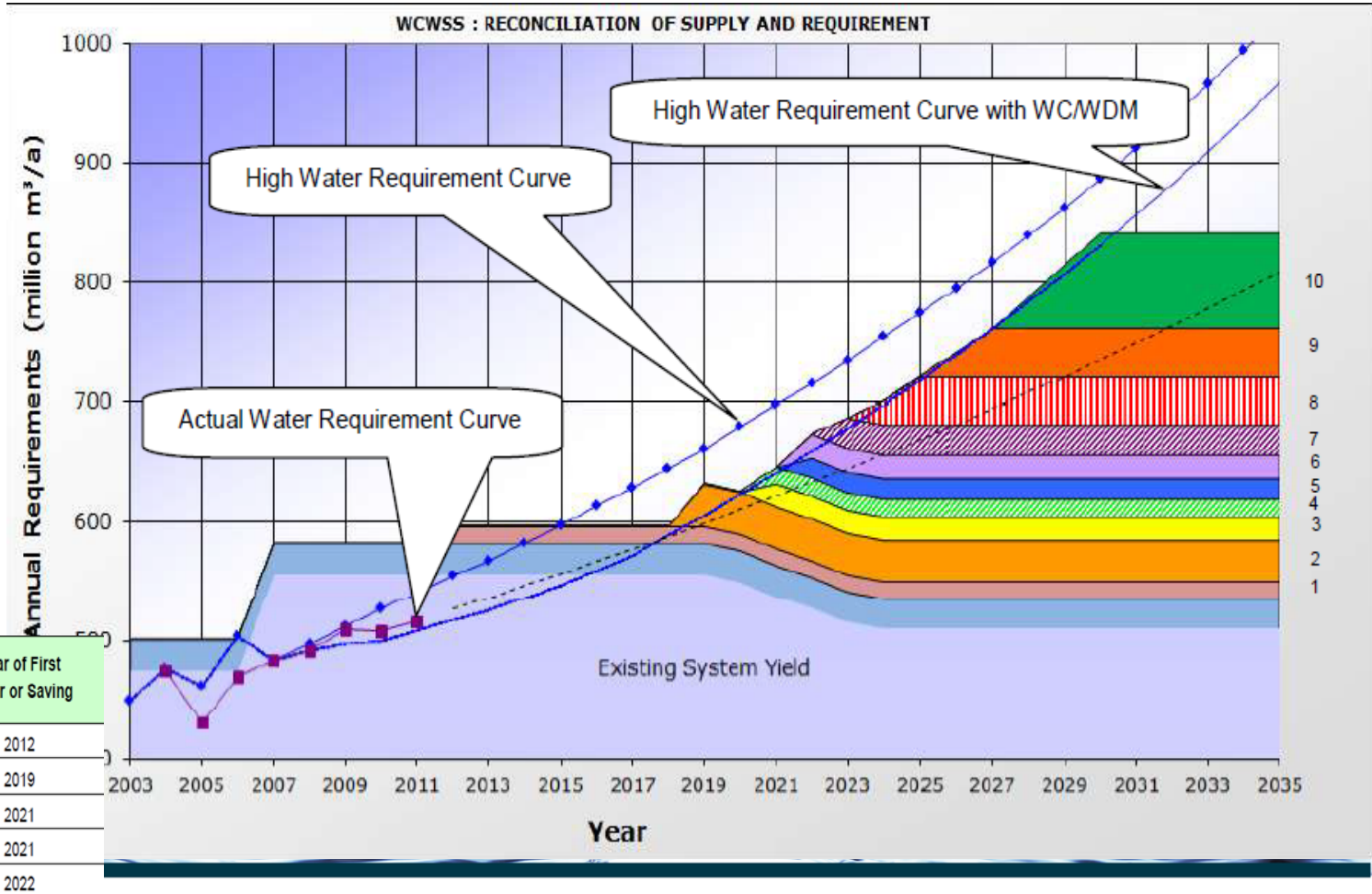
(Gleeson et al. / Nature)

Planning Assistance

- Reconciliation Studies
- Conjunctive use
- Maps
- Guidelines
- Tools
- Methodologies

Reconciliation Studies

Western Cape Water Supply System

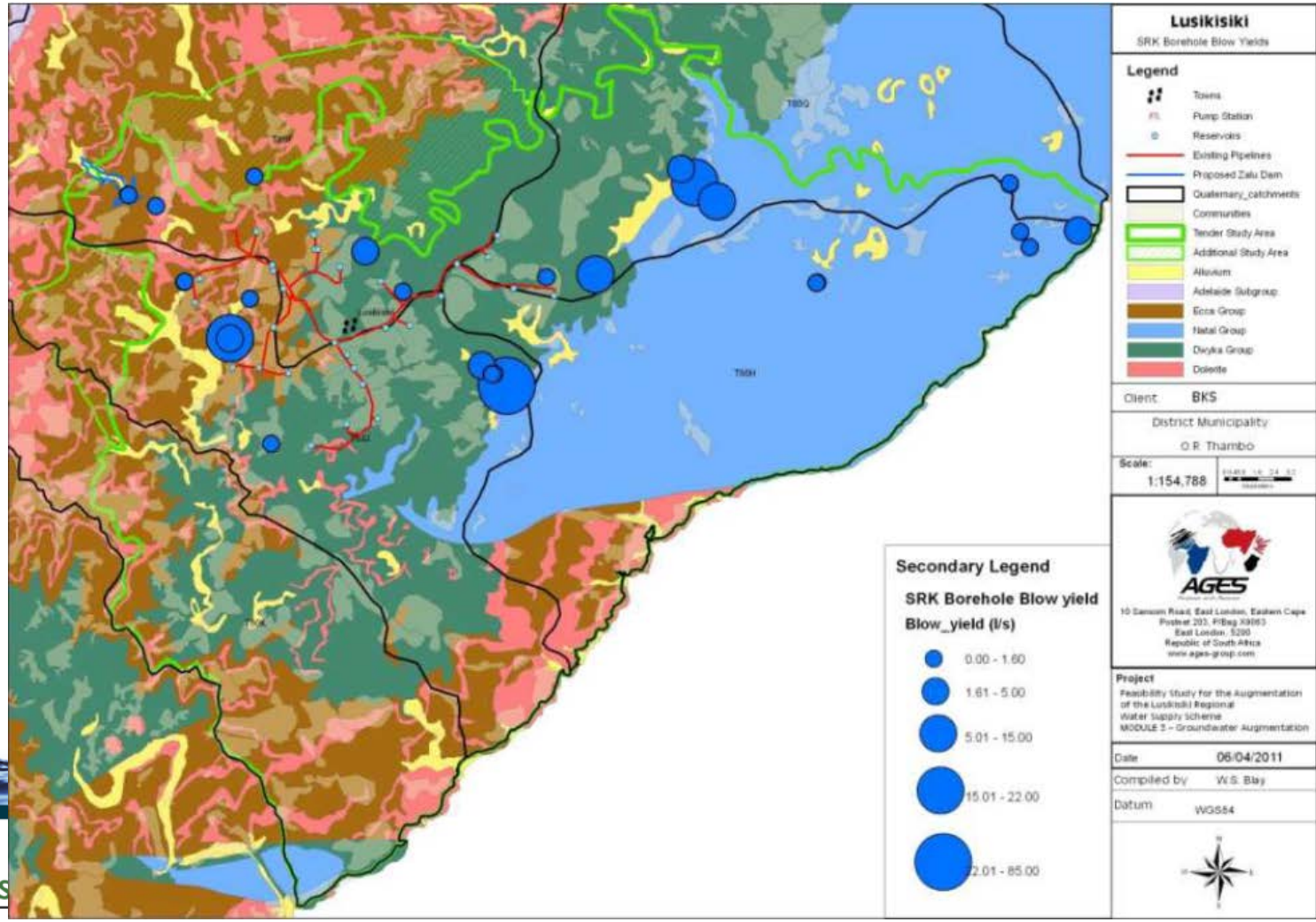


No	Intervention	Year of First Water or Saving
1	Optimise System Operation	2012
2	Voëlvlei Phase 1	2019
3	Lourens	2021
4	DWA:ASR: West Coast	2021
5	Cape Flats Aquifer	2022
6	TMG Scheme 1	2022
7	Raise Lower Steenbras	2023
8	Re-use Generic 1	2024
9	Re-use Generic 2	2026
10	Desalination	2028

Conjunctive Use

Lusikisiki
Water scheme

Bulk water
infrastructure
Surface and
groundwater



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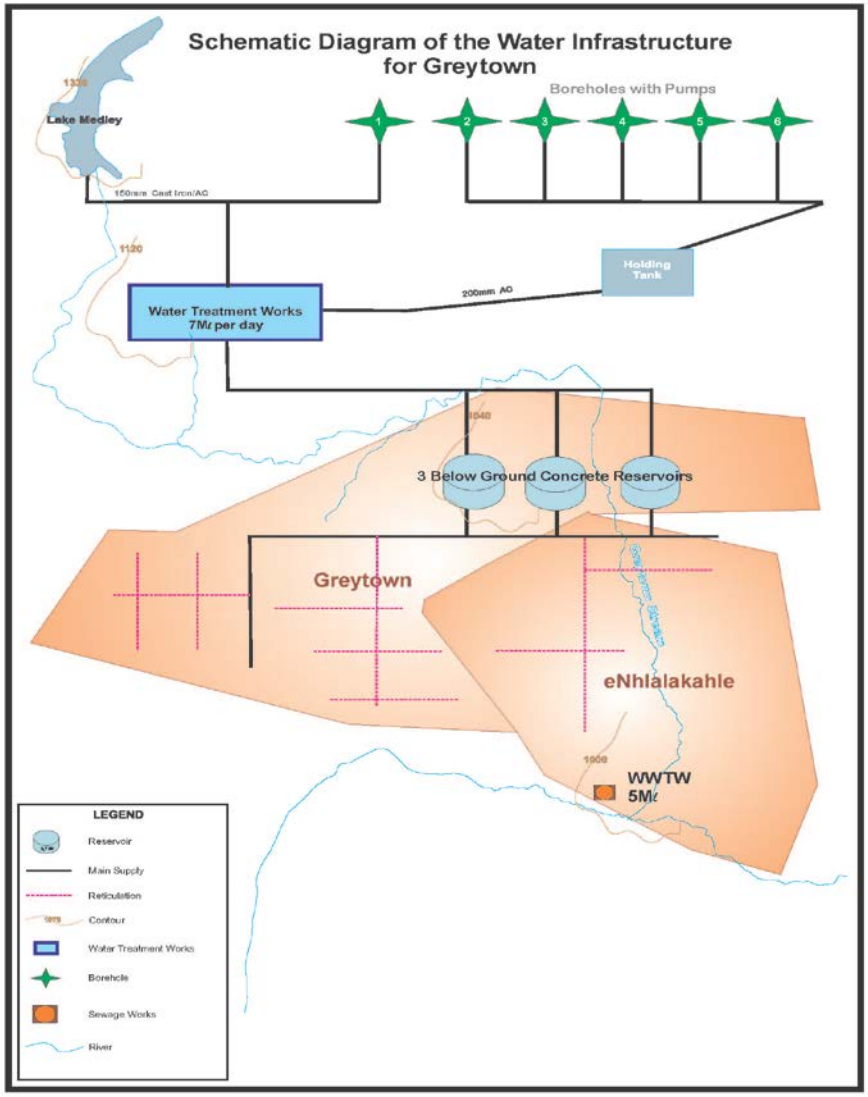
Conjunctive Use

Example:

Greytown - KZN
Water scheme

Dam +
boreholes



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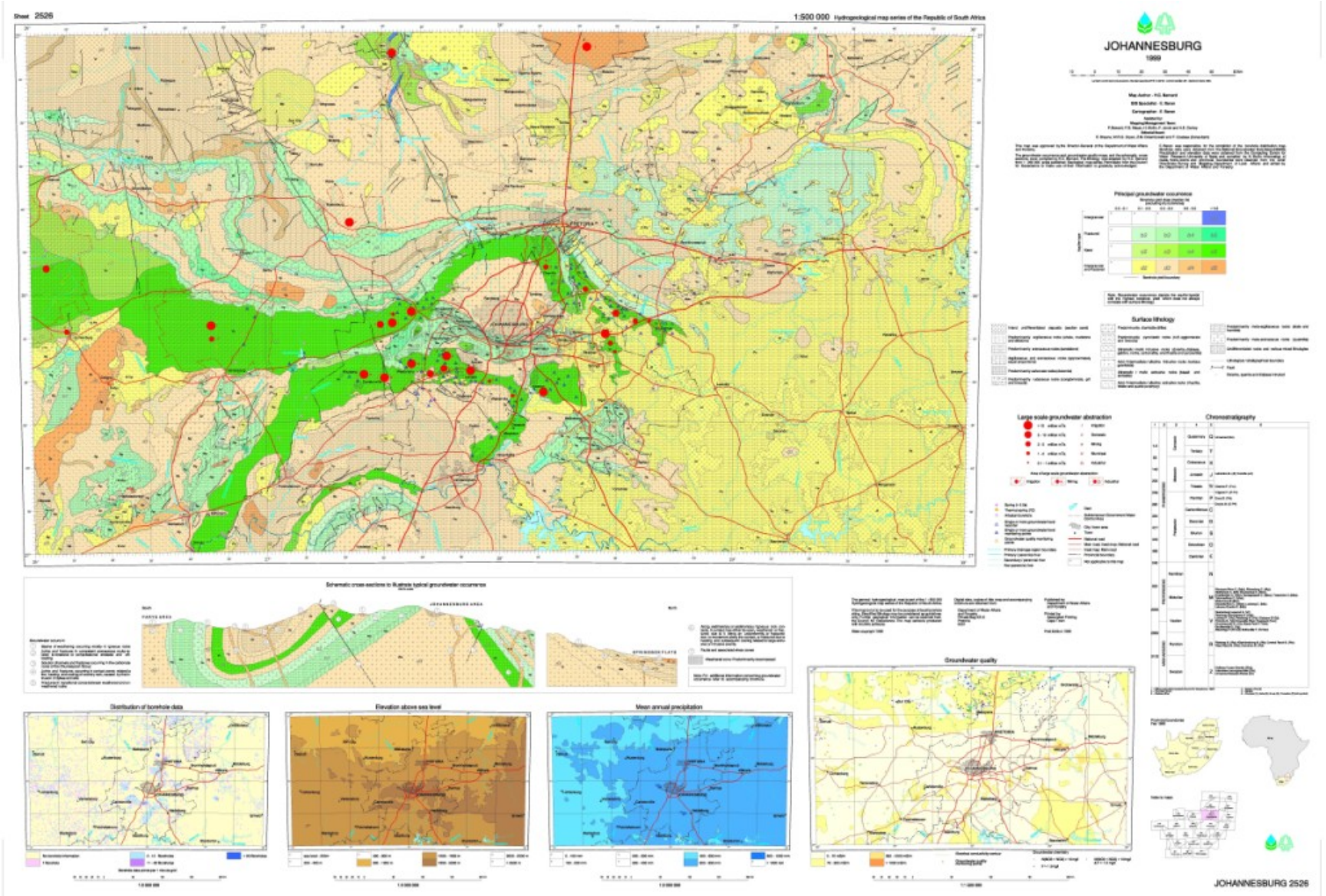
Maps of GRA I


Sheet 2526
1:500 000 Hydrogeological map series of the Republic of South Africa
JOHANNESBURG
1999
Principal groundwater occurrence
Surface lithology
Large scale groundwater abstraction
Chronostratigraphy
Groundwater quality
Distribution of borehole data
Elevation above sea level
Mean annual precipitation
JOHANNESBURG 2526

DWA Guideline

"**A Guideline for the Assessi**
of Groundwater Resources

•DWA website at www.dwa.gov.z

•A lack of effective assessment, p
groundwater resources can resul
water users, but also to significar
systems themselves.

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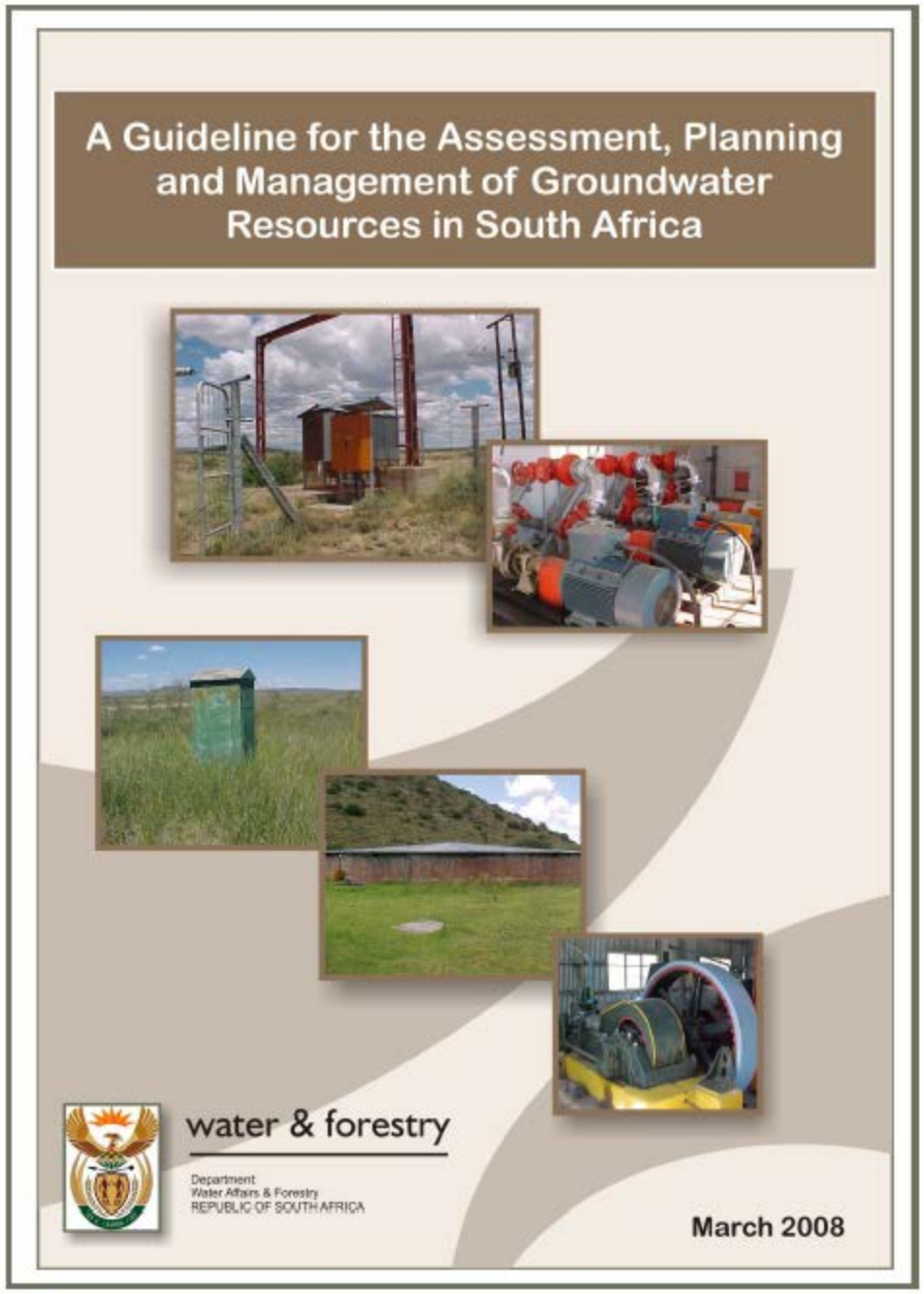


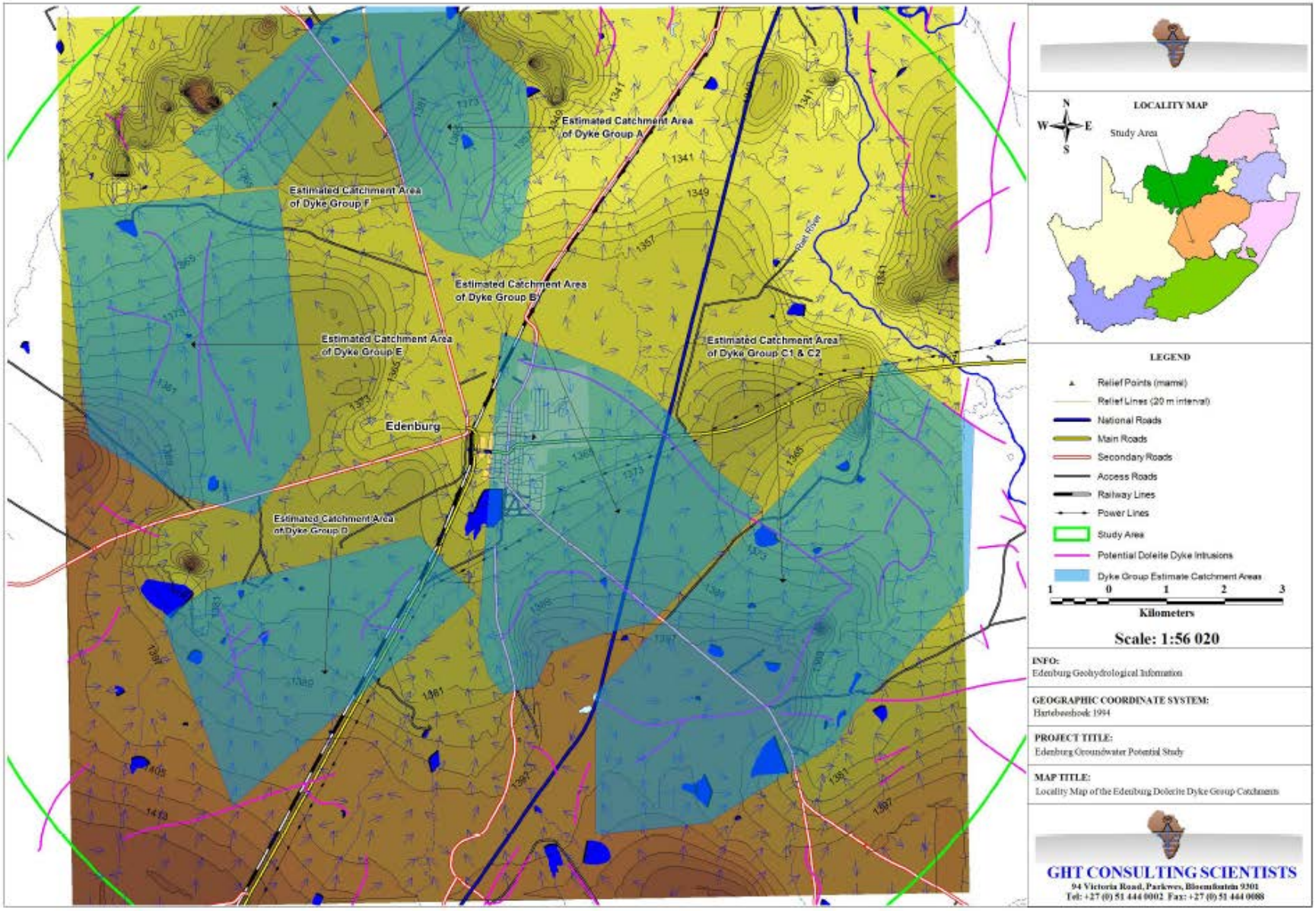
NORAD Toolkit

Consists of a collection of documents, software and maps

Aimed at improving the management of groundwater at municipal level in South Africa

http://www.dwa.gov.za/Groundwater/NORADtoolkit.aspx

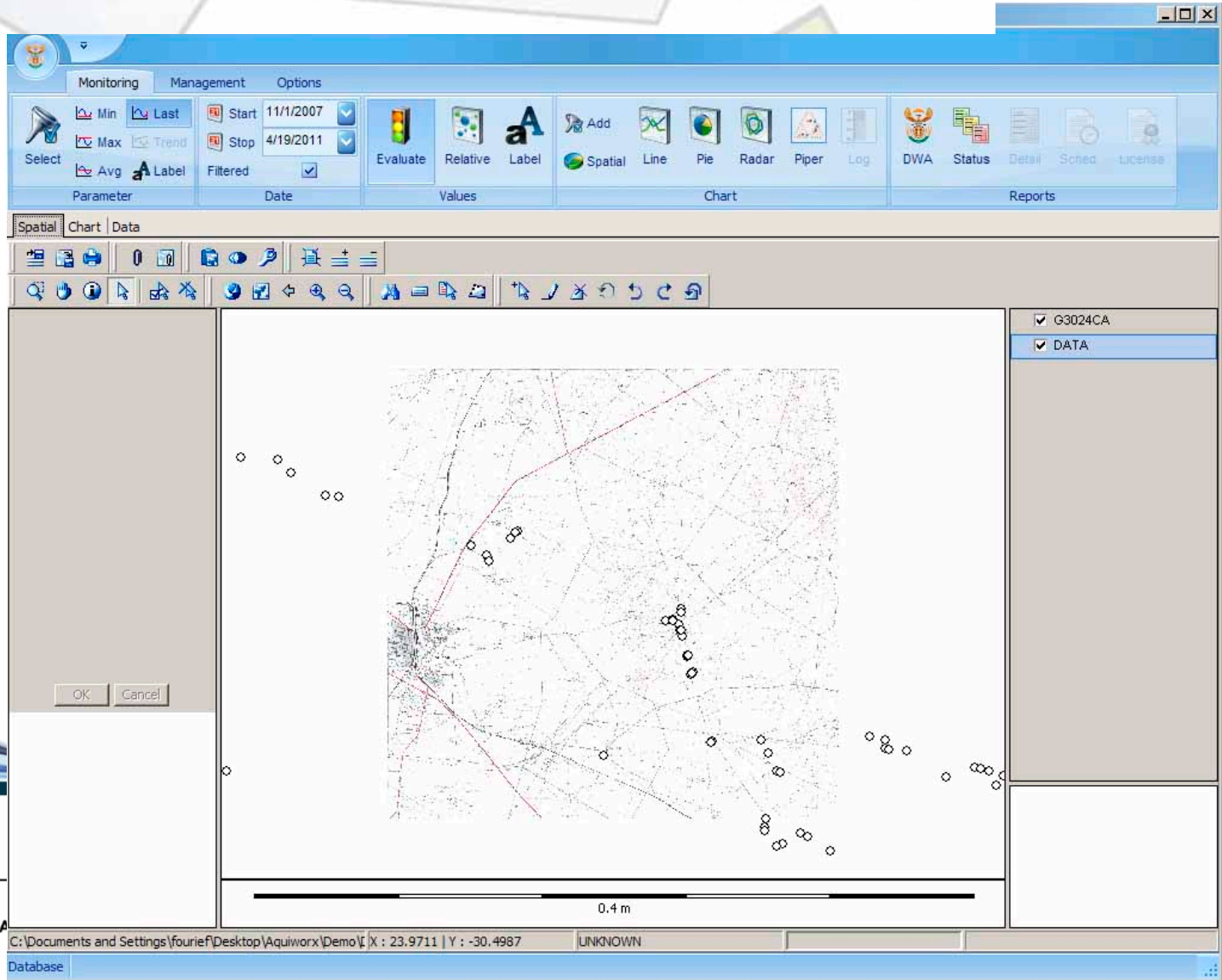
• A Framework for Groundwater Management of Community Water Supply,
•Decision Making Framework for Municipalities,
•Groundwater Monitoring for Pump Operators,
•Guidelines for Protecting Boreholes and Wells,
•Guidelines for Protecting Springs,
•Guidelines for Protecting Groundwater from Contamination,
•Implementing a Rural Groundwater. Management System


Estimated Catchment Area of Dyke Group A
Estimated Catchment Area of Dyke Group F
Estimated Catchment Area of Dyke Group B
Estimated Catchment Area of Dyke Group E
Estimated Catchment Area of Dyke Group C1 & C2
Estimated Catchment Area of Dyke Group D
Edenburg
Vaal River
LOCALITY MAP
N
W
E
S
Study Area
LEGEND
Relief Points (mamsl)
Relief Lines (20 m interval)
National Roads
Main Roads
Secondary Roads
Access Roads
Railway Lines
Power Lines
Study Area
Potential Dolerite Dyke Intrusions
Dyke Group Estimate Catchment Areas
1 0 1 2 3
Kilometers
Scale: 1:56 020
INFO:
Edenburg Geohydrological Information
GEOGRAPHIC COORDINATE SYSTEM:
Hartebeesthoek 1994
PROJECT TITLE:
Edenburg Groundwater Potential Study
MAP TITLE:
Locality Map of the Edenburg Dolerite Dyke Group Catchments
GHT CONSULTING SCIENTISTS
94 Victoria Road, Parkwes, Bloemfontein 9301
Tel: +27 (0) 51 444 0002 Fax: +27 (0) 51 444 0088

AQUIWORX

Department of Water Affairs - Aquifer Monitoring and Management System

Groundwater Management Tool



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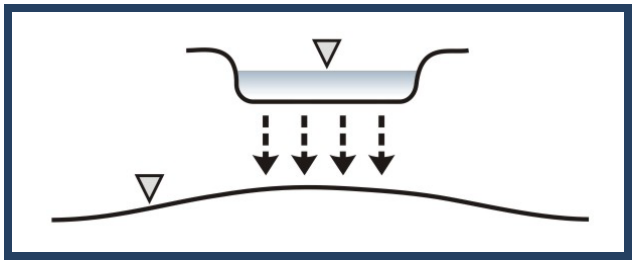
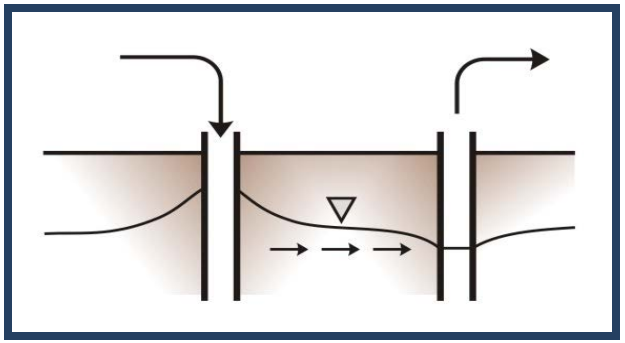
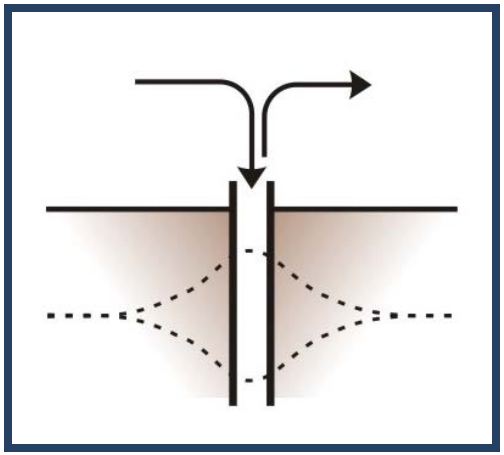
Artificial Recharge

•Artificial recharge is the process whereby surface water is transferred underground to be stored in an aquifer

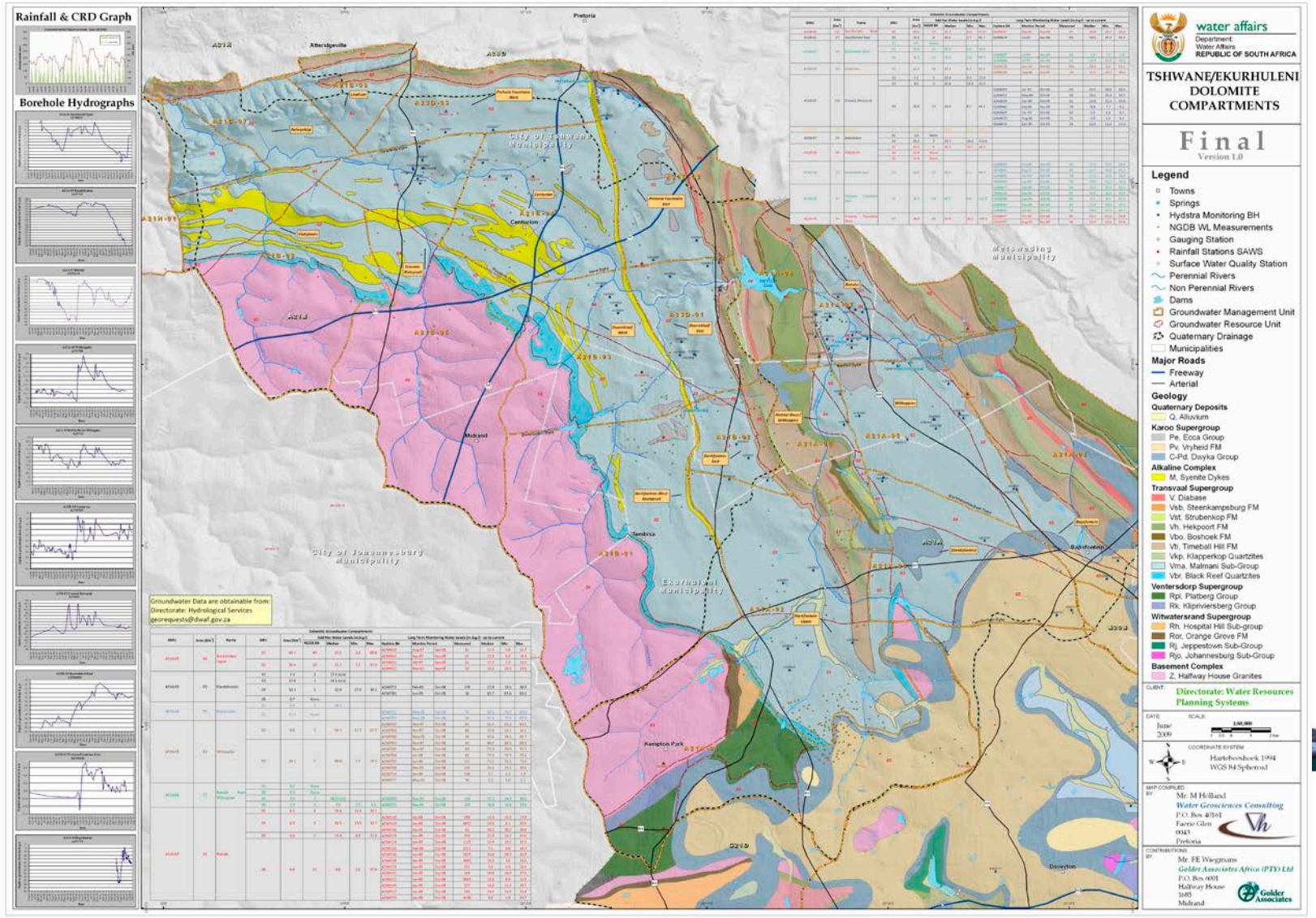
www.artificialrecharge.co.za







Dolomitic Compartment Maps



Groundwater Quality

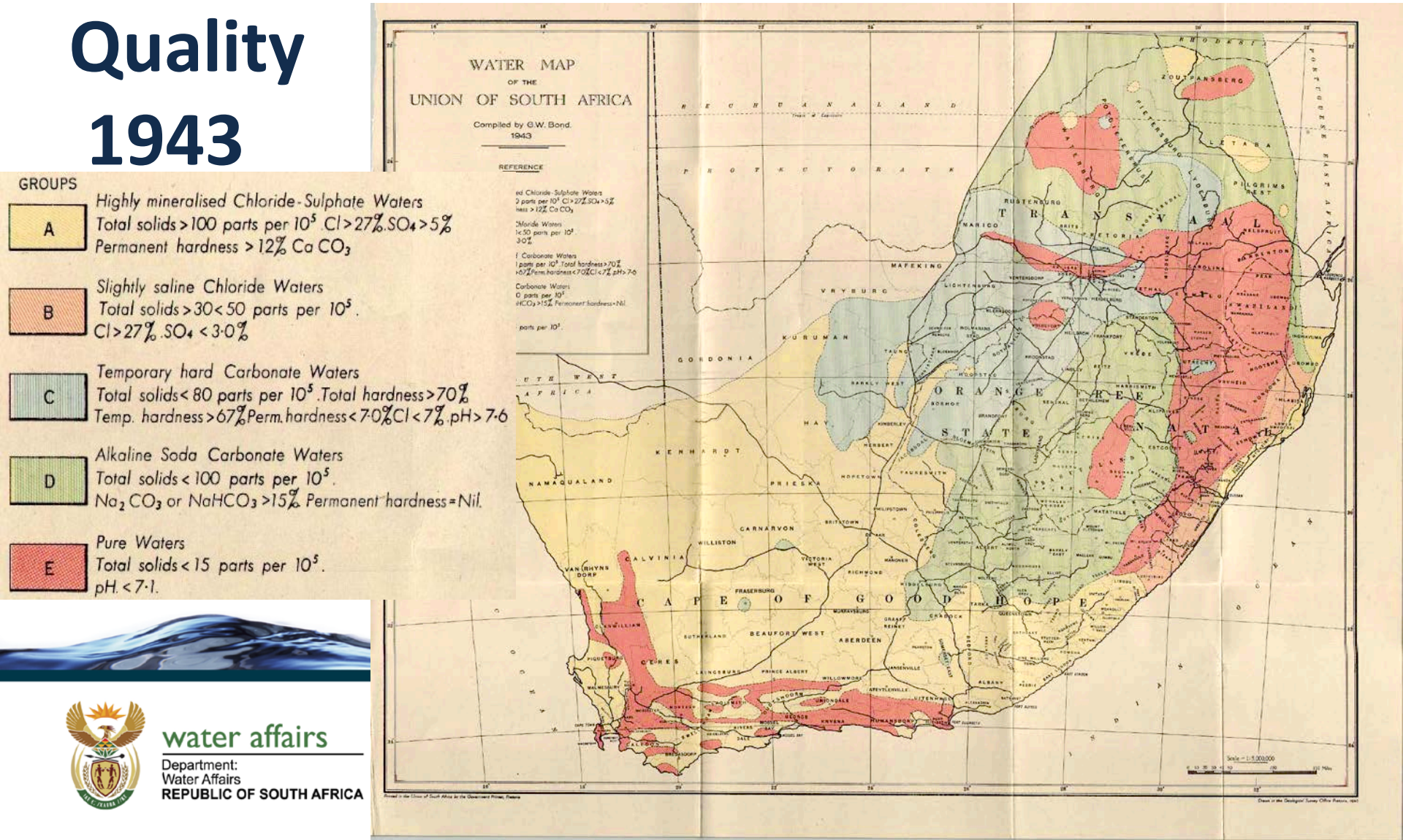
Question?

Why is groundwater handled different than surface water?

Are we drink surface water without purifying to drinking water standards ?

But the quality of groundwater must be at drinking water standard otherwise it is unusable?

Groundwater Quality 1943



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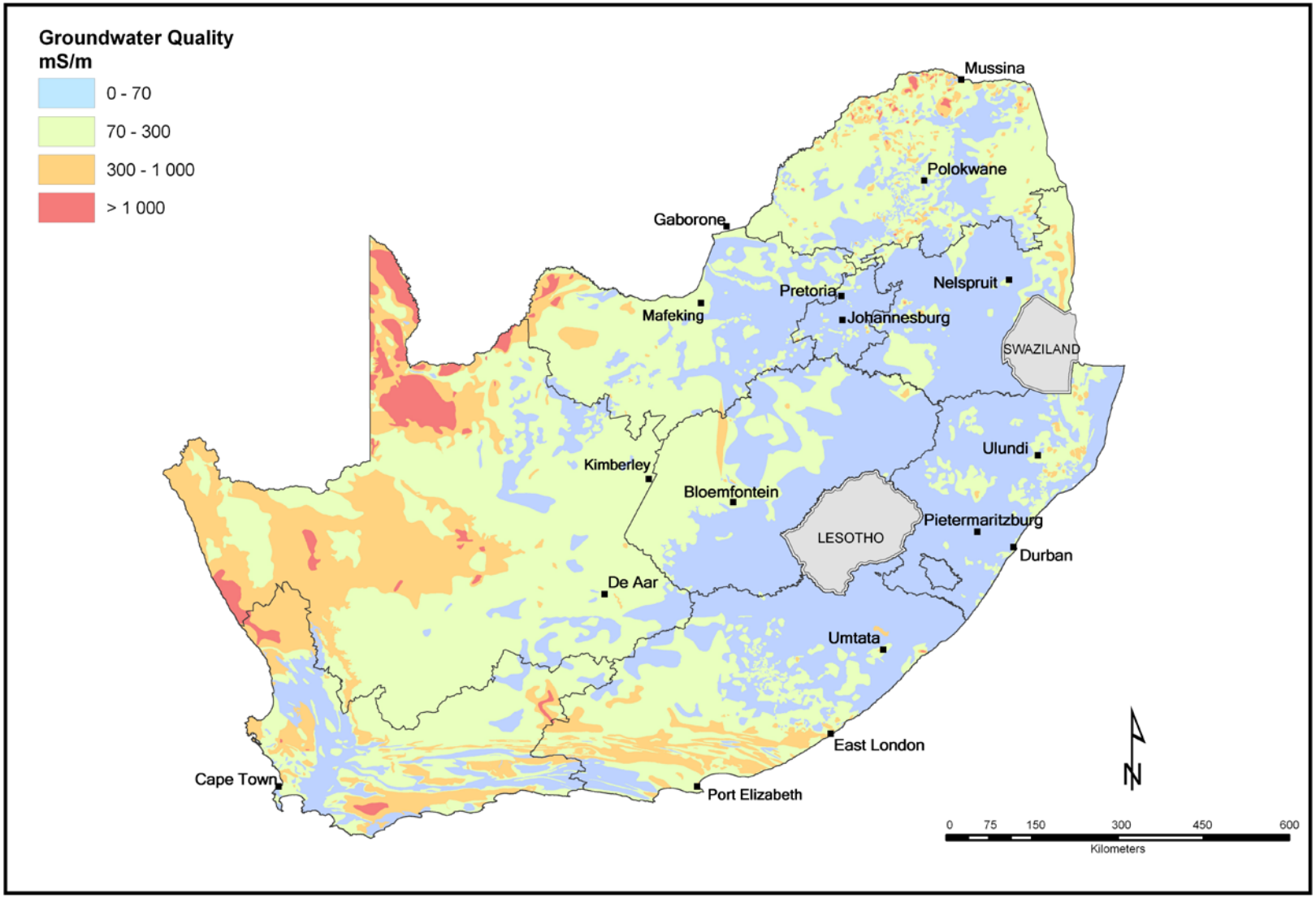
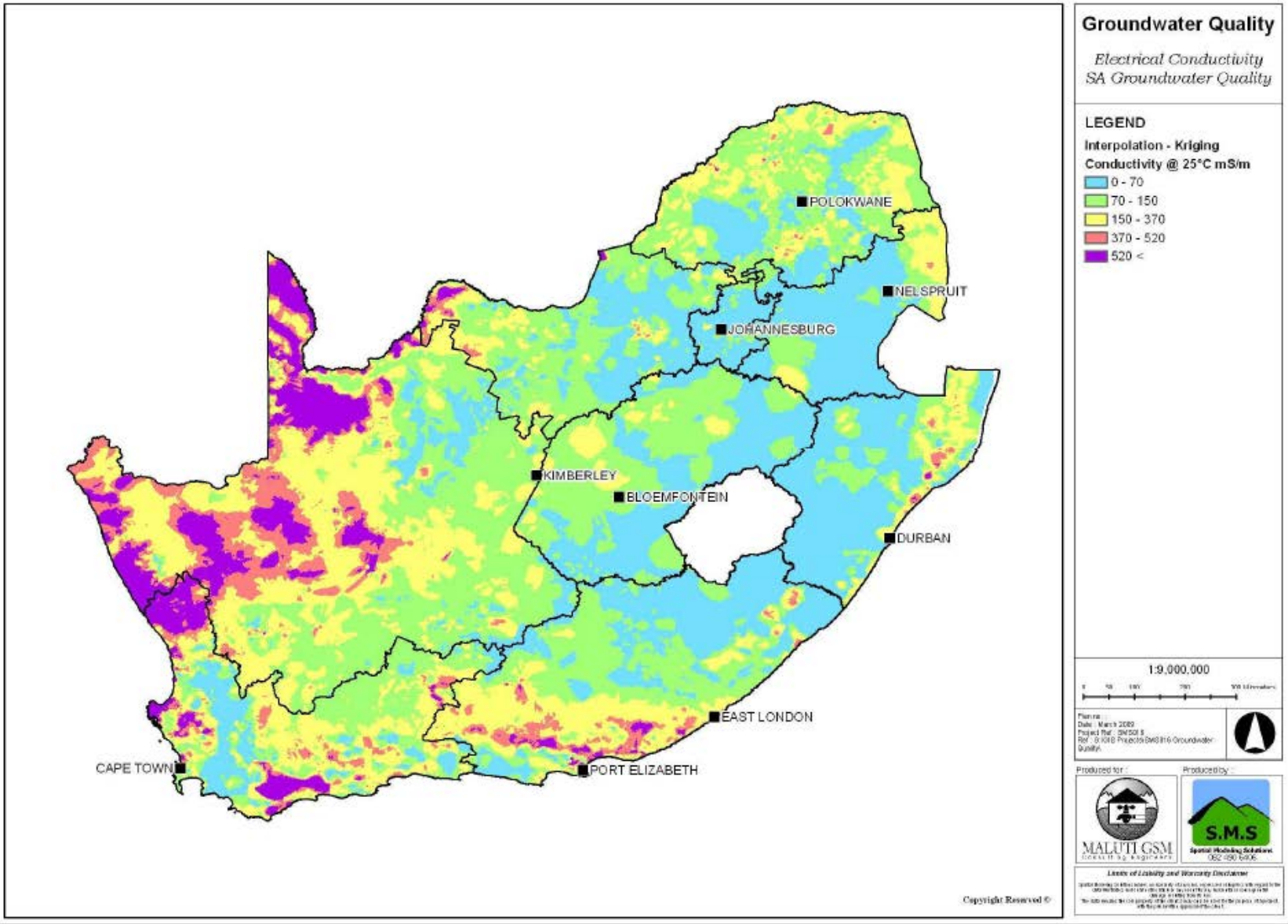
Groundwater Quality - GRA I



Groundwater Quality – WRC 2011

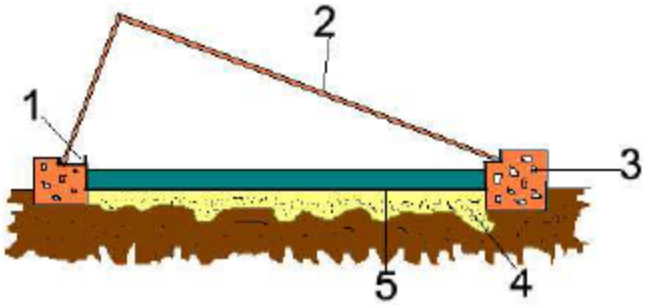


Groundwater Quality - Desalination

High cost?

High technology driven ?

Solar Stills
= 3.5 liter/m^2/day
= Low maintenance



Legend:

1 – lip channel
2 – glass / perspex cover
3 – containment
4 – foundation
5 – feed water reservoir

Solar electricity-operated reverse osmosis plant
= 15m^3/day

Institutions

Institutional Capacity

- Water management institutions must be structured and mandated in such a way that groundwater development and management can be optimally achieved. The challenge is adequate institutional functioning and support.

- Public – private partnerships must be establish to manage aquifer system and well field

Institutions: Water Supply Models

Victoria West:

- Farmer is WSP. Supply water to reservoir from private well field.

De Aar:

- Buy farm/property with groundwater (buy of registered water right)

Kenhardt:

- Incentives for groundwater from farm (servitude, land management)

Bloem Water:

- Operate municipal well field and develop own groundwater (Private Service Provider)

Thank you