Olifants Preliminary Reconciliation Strategy

Study Steering Committee Meeting No 2
24 November 2010

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

The Status quo of the water balance and water quality in the study area

- The Reserve
- Current Water Availability
- Current Water Requirements
- Water Balance
- Water Quality
- Groundwater

The Status quo of the water balance and water quality in the study area

The Reserve

The Status quo of the water balance and water quality in the study area

Current Water Availability

Water Resource

Management Zone	Yield from Major Dams (1 in 50 year) (million m^3/a)	Yield from Farm Dams and Diffuse Sources (million m^3/a)	Transfers In (million m^3/a)	Total (million m^3/a)
Upper Olifants	262	128	228	**618**
Middle Olifants	56	71	1	**227**
Lower Olifants	150	49	3	**202**
Total	**567**	**248**	**232**	**1047**

The Status quo of the water balance and water quality in the study area

Current Water Requirements

Water Requirements

Management Zone	Irrigation (million m^3/a)	Domestic, Industrial and Mining (million m^3/a)	Power Generation (million m^3/a)	Total (million m^3/a)
Upper Olifants	254	133	228	**615**
Middle Olifants	126	63	0	**189**
Lower Olifants	161	57	0	**218**
Total	**541**	**253**	**228**	**1022**

The Status quo of the water balance and water quality in the study area

Water Balance

Water Balance (with Ecological Reserve)

Management Zone	Total Water Resource (million m^3/a)	Water Requirement (million m^3/a)	EWR (million m^3/a)	Water Balance (million m^3/a)
Upper Olifants	618	612	80	-74
Middle Olifants	227	167	51	+9
Lower Olifants	202	218	69	-85
Total	**948**	**997**	**200**	**-150**

Water Balance - After Completion of De Hoop Dam (with Ecological Reserve)

Management Zone	Total Water Resource (million m^3/a)	Water Requirement (million m^3/a)	Ecological Reserve (million m^3/a)	Water Balance (million m^3/a)
Upper Olifants	618	612	80	-74,00
Middle Olifants	128	167	51	-90,00
Lower Olifants	202	218	69	-85,00
Total	**948**	**997**	**200**	**-249,00**

The Status quo of the water balance and water quality in the study area

Water Quality

The Status quo of the water balance and water quality in the study area

Groundwater

Lithology	Area within Catchment (km^2)	Average Borehole Yield (ℓ/s)	Average Range of Depth of Water Level (mbgl)	Typical Borehole Depth (m)	Aquifer Type	Groundwater Quality DWA Class
Karoo age siltstone and sandstone	7 250	<0.5 0.5 – 2 along dyke contacts	5-20	30-60	Intergranular and fractured	0-1 Occasionally 2
Delmas dolomite	210	0.1 - > 50	3-68	100-250	Fractured and karst	0 Pockets of NO_3 due to agriculture
Pretoria Group quartzite and shale (Bronkhorstspruit area)	1 230	< 0.5 – 2	20-30	40-100	Intergranular and fractured (shale) Fractured (quartzite)	0
Waterberg Sandstone and Quartzite	3 275	< 0.5 Occasionally > 3	<10 - >40	40-120	Fractured	0
Nebo granite	6 630	< 0.5 Up to 2 in fracturing	10-20	40-100	Intergranular and fractured	0-1 Isolated NO_3 in settlements Isolated F
Rhyolite and felsite	2 675	< 0.1 Occasionally < 0.5	10-50	70-150	Fractured	0
Basalt (Springbok flats) and KNP	2 730	2 – 5 Sometimes > 10	10-50	50- > 150	Intergranular and fractured	1 NO_3 problem in Springbok Flats

Lithology	Area within Catchment (km^2)	Average Borehole Yield (ℓ/s)	Average Range of Depth of Water Level (mbgl)	Typical Borehole Depth (m)	Aquifer Type	Groundwater Quality DWA Class
Clarens SST	2 830	1-2	10-20	30-70	Intergranular and fractured	0
Mudstone and shale (Irrigation) Sandstone (Ecca)		> 0.5	10-20	802-120	Intergranular and fractured	2 or 3
Norite and gabbro	5 800	0.5 – 2 Occasionally > 5	10-20	30-80	Intergranular and fractured	0 or 1 Isolated NO_3 in settlements
Pretoria Group quartzite and shale Escarpment areas	6 200	0.5 – 2 Occasionally up to 5	<10 - >40	40-150	Fractured	0
Dolomite	1 615	< 1 - > 5 Potentially > 20	0 - >50	30-250	Fractured and karst	0 Pristine in many areas
Black reef quartzite	2 120	0.5 – 2 > 5 in dolomite	10-30	50-100	Fractured	0 Pristine in many areas
Granite (Lowveld)	9 200	0.5 – 2 Occasionally > 5	5-15	30-80	Intergranular and fractured	1 Isolated NO_3 in settlements

Map 5 Olifants River WMA: Major Aquifer Distribution

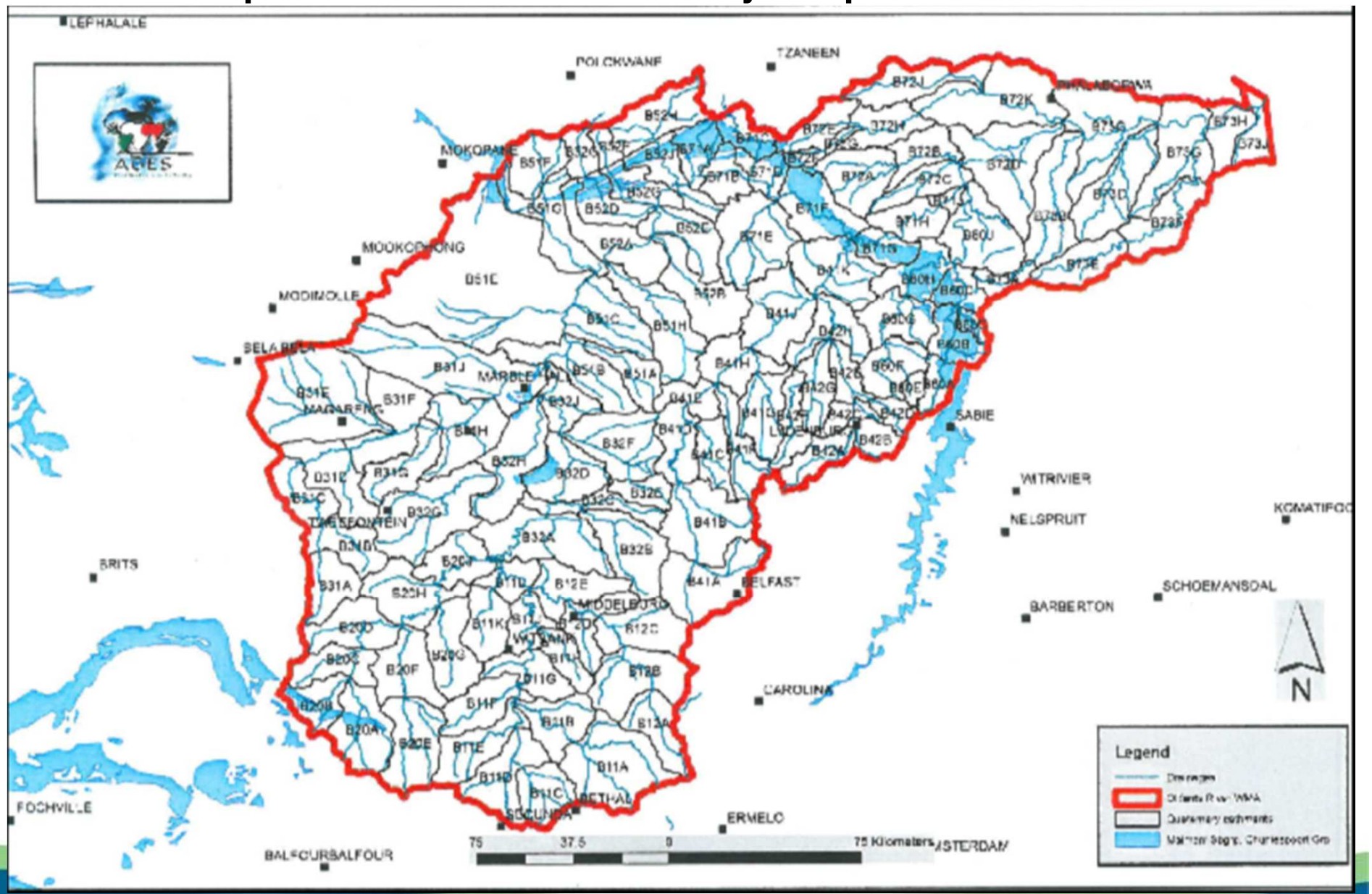
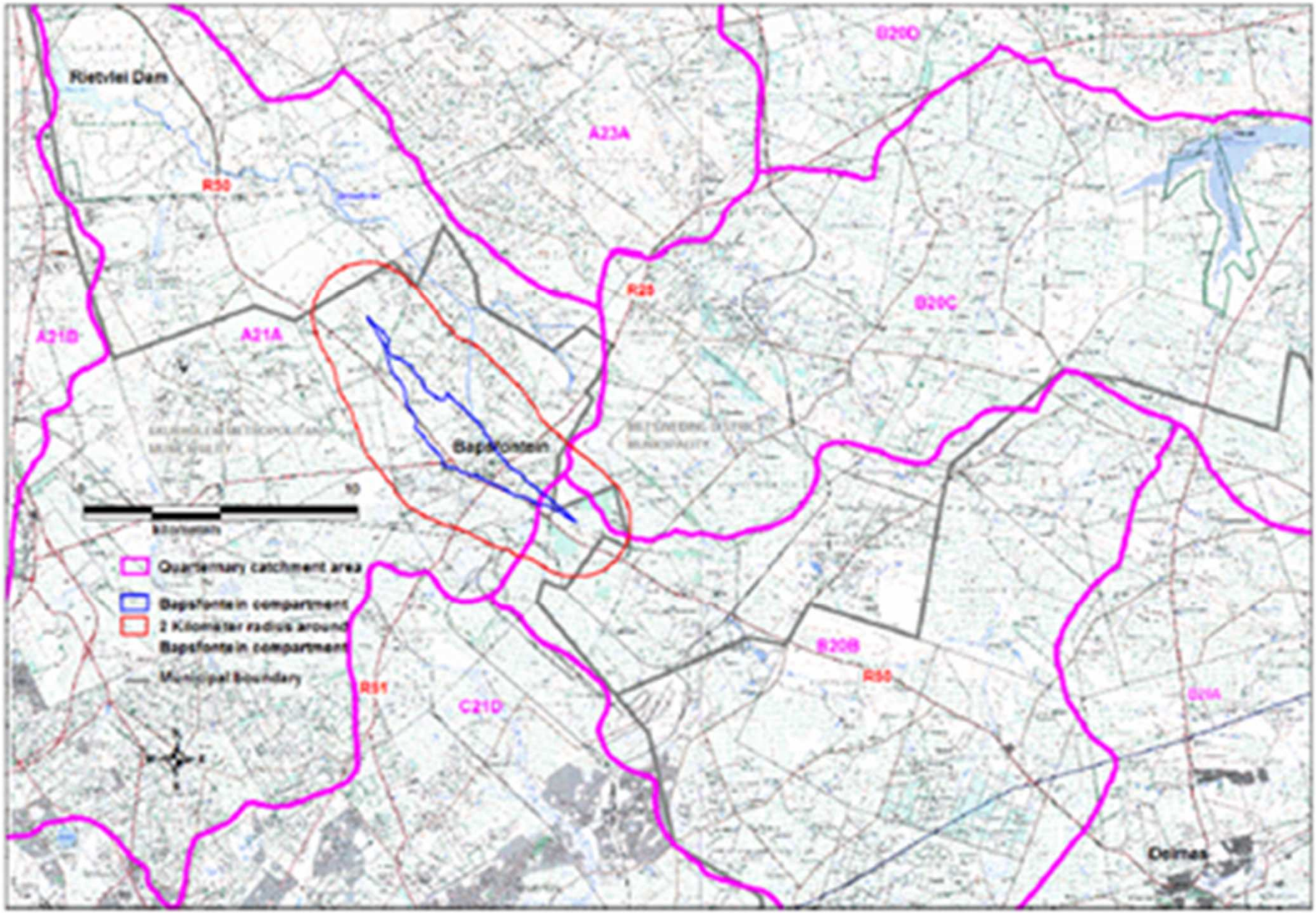


Table 12: Groundwater reserve determination for Bapsfontein compartment

Groundwater Reserve	
BAPSFONTEIN COMPARTMENT	m^3/a
Recharge =	619 275
Groundwater Abstraction(excluding BHN) =	2 500 000
Basic Human Need (BHN) from GW =	40 000
Groundwater outflow from area =	0
Groundwater Inflow into area =	505 800
Extra GW allocation possible =	-1414 925


Rietvlei Dam
A23A
B20D
R30
R25
B20C
A21D
A21A
Bapsfontein
10
kilometers
Quarternary catchment area
Bapsfontein compartment
2 Kilometer radius around
Bapsfontein compartment
Municipal Boundary
R51
C21D
B20B
R50
B20A
Delmas

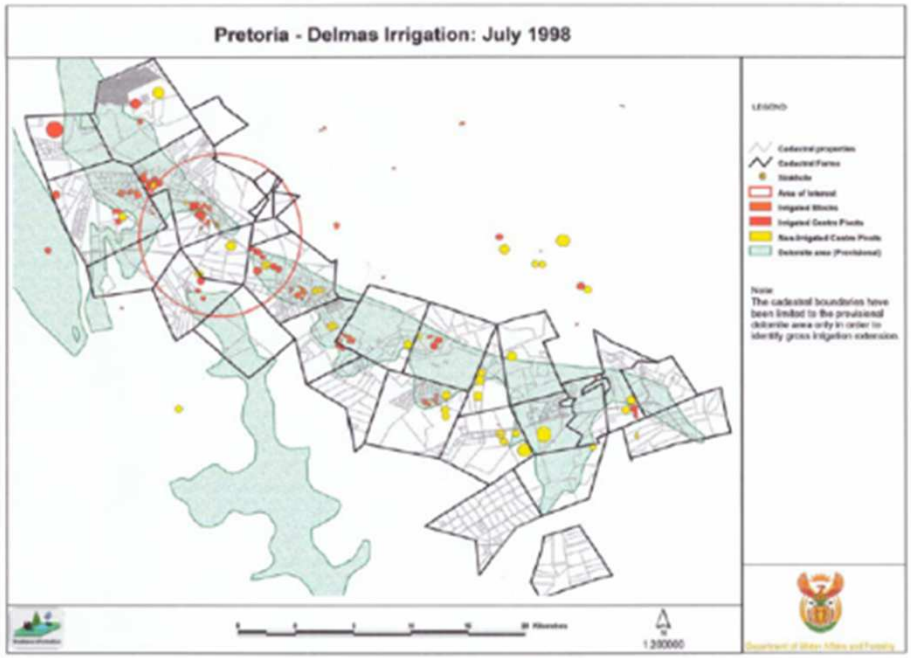


Figure 14. Pretoria – Delmas Irrigation: July 1998 (A. L. Nel, DWAF).

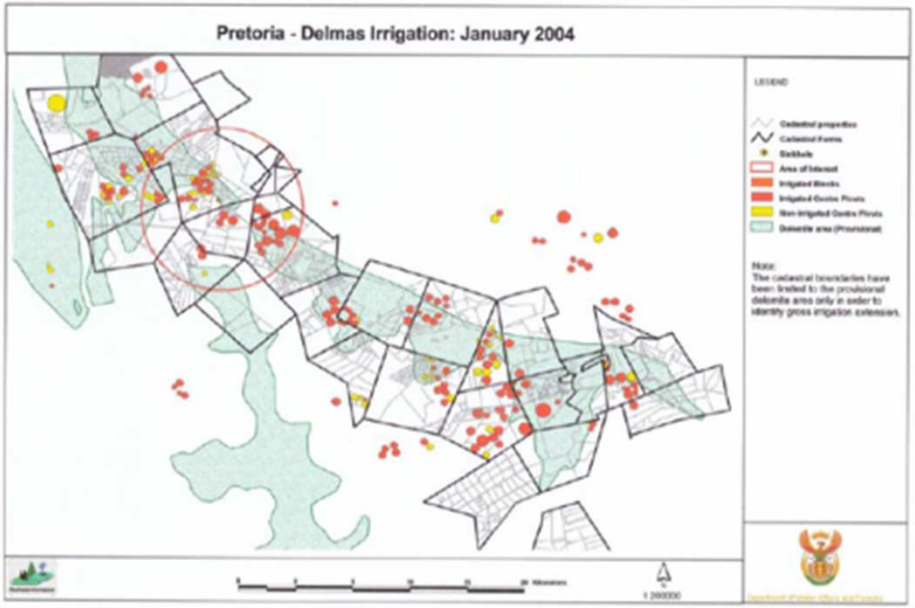


Figure 15. Pretoria – Delmas Irrigation: January 2004 (A. L. Nel, DWAF).

Plate 3: Aerial view of No.1 main Sinkhole that fell at Bapsfontein on the 28th of January 2004 dated 2004.02.05

Plate 6: Ground view of No.1 main Sinkhole dated 2004.03.01

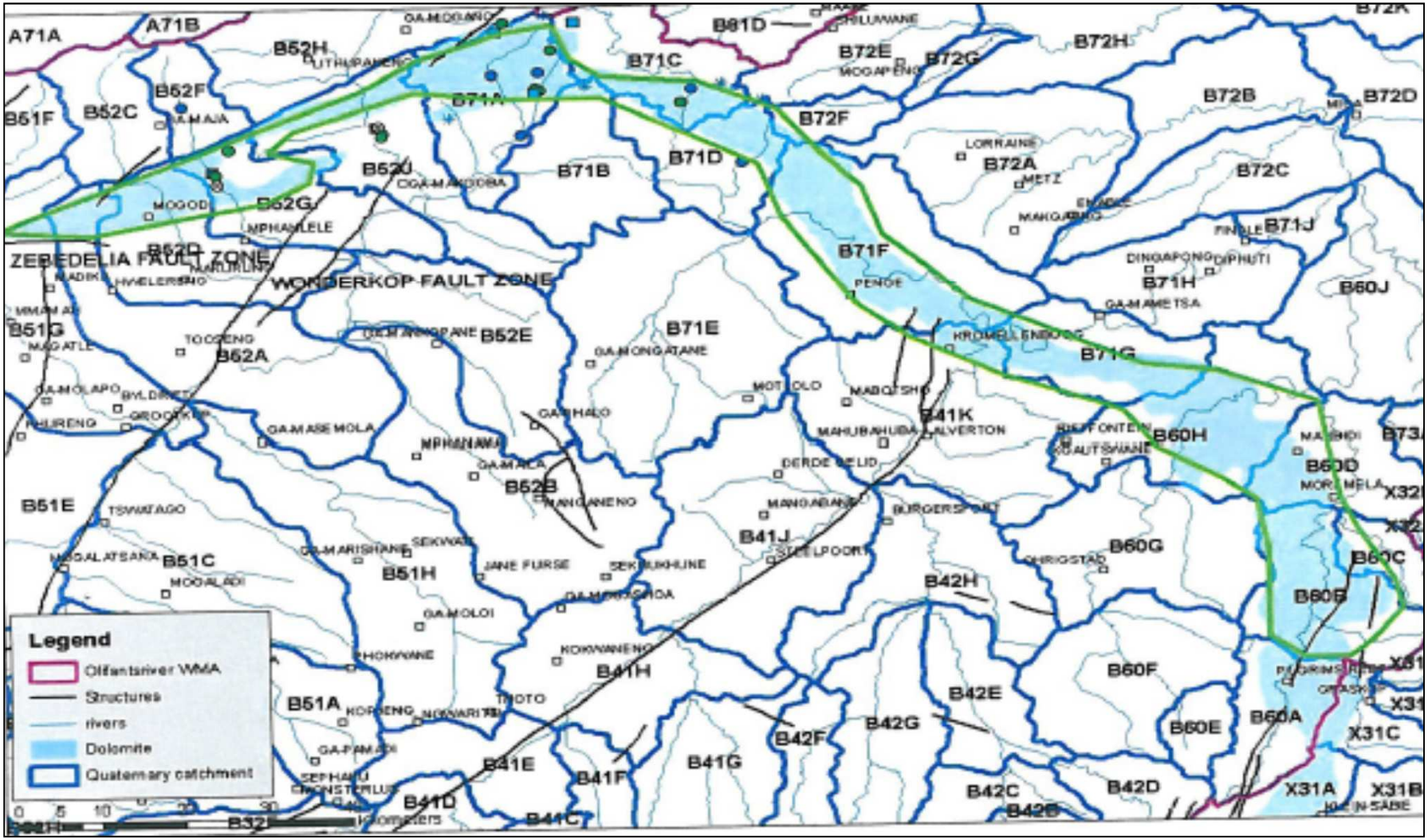


Figure 23 Quaternary catchments and rivers to delineate sub catchments: Escarpment dolomite

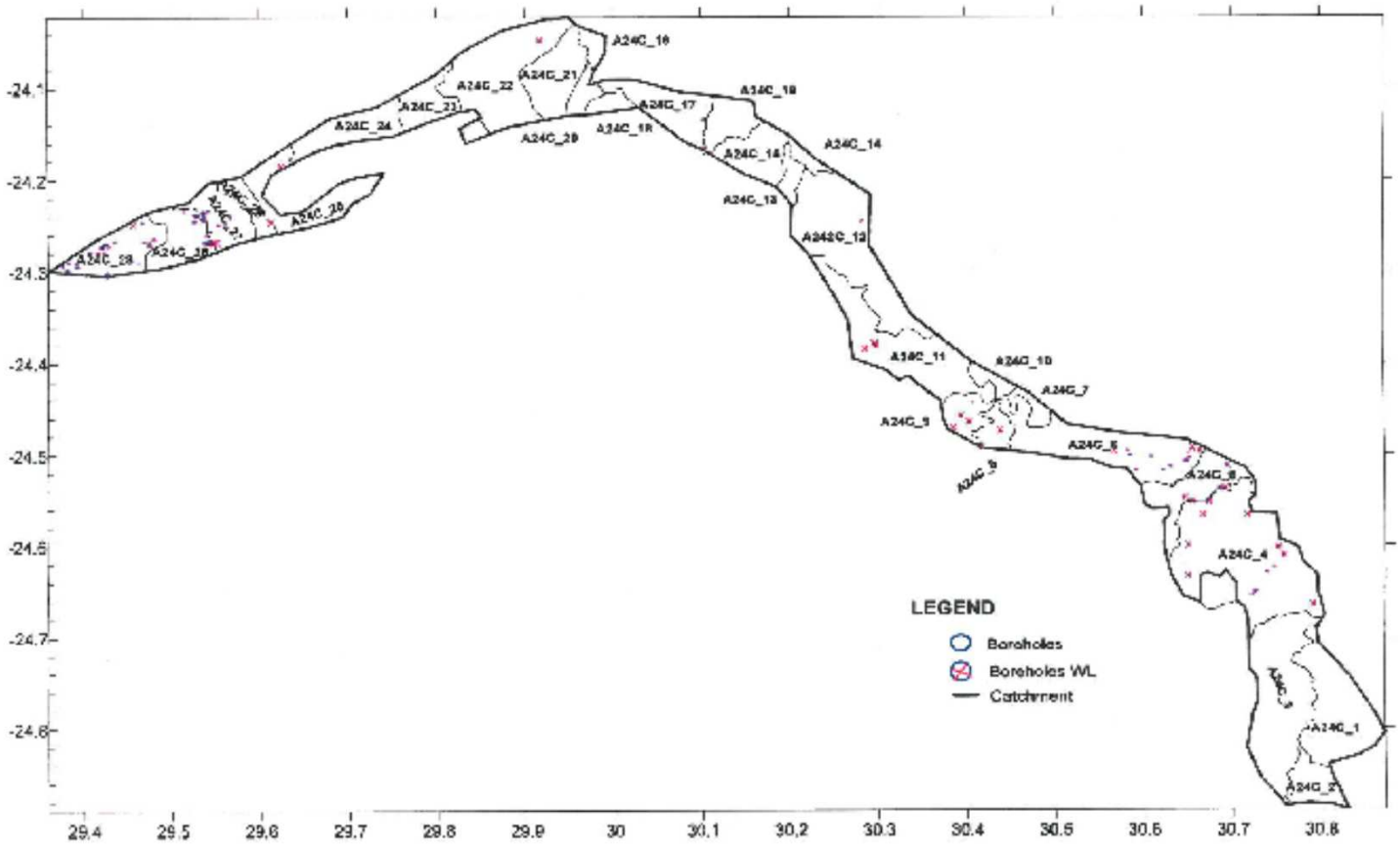
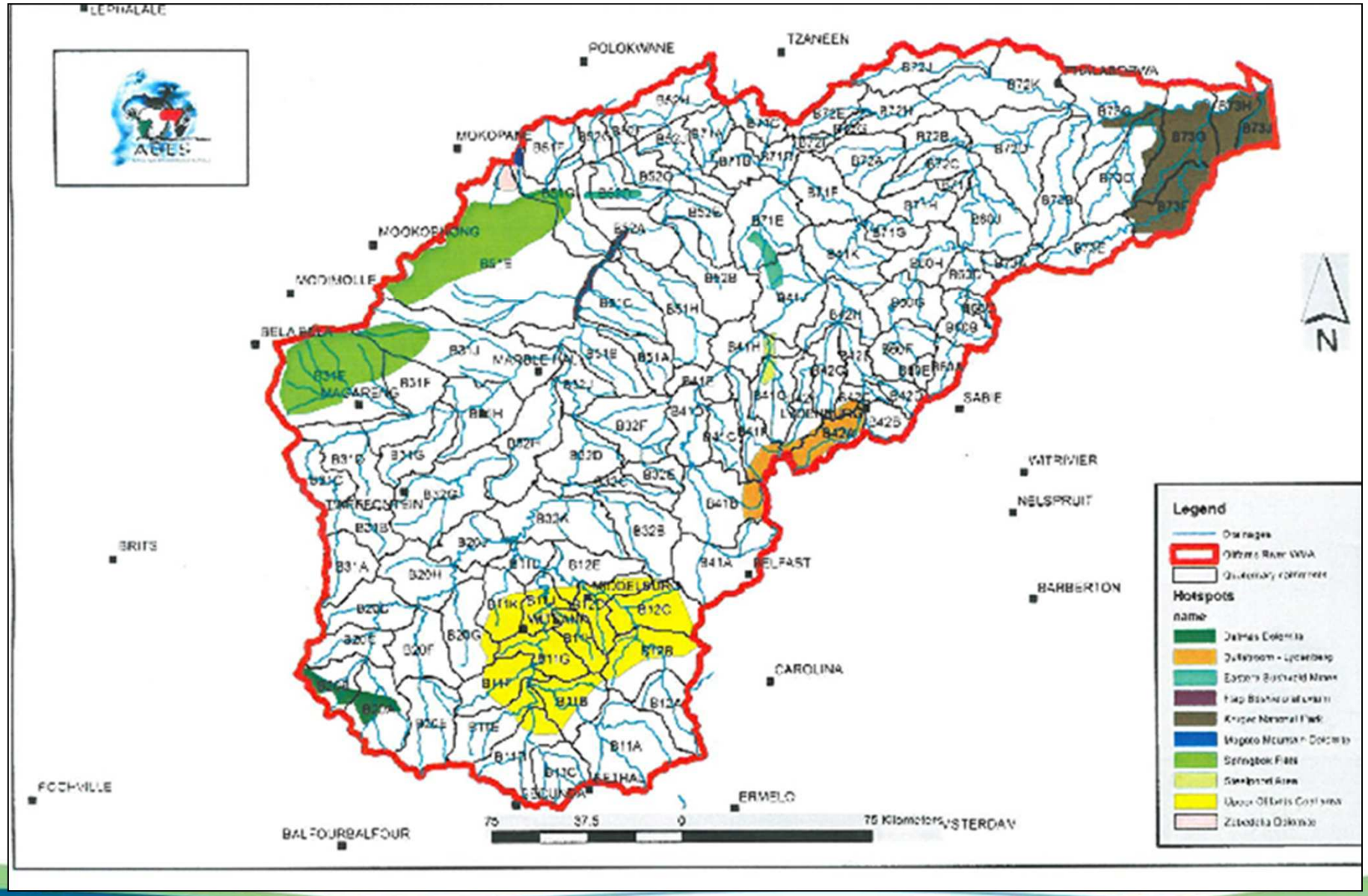
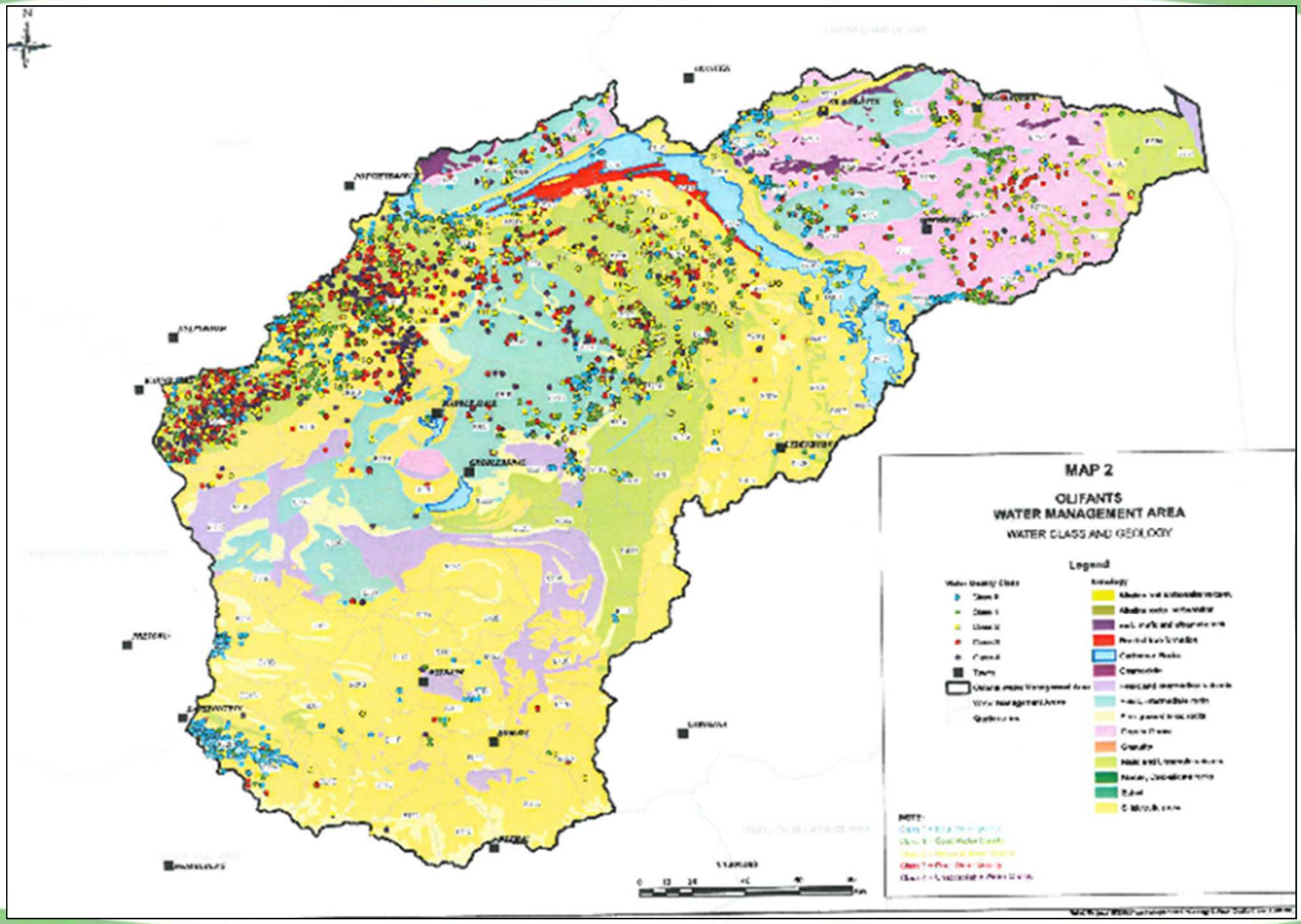


Figure 24 Dolomite sub catchment delineated from quaternary catchment and rivers

Figure 24 Dolomite sub catchments delineated from quaternary catchment and rivers

Map 11 Olifants River WMA: Hotspots




MAP 2
OLIFANTS
WATER MANAGEMENT AREA
WATER CLASS AND GEOLOGY
Legend

Future Water Requirements

Future Water Requirements

- Domestic water requirements are expected to grow by about 3% per annum.
- Mining water requirements are expected to grow significantly due the expansion of platinum mines.
- Growth in the irrigation sector is not expected to grow due to the rapidly increasing cost of water and the cost of pumping.
- A large component of future water requirements is the transfer of water to Mokopane and Polokwane.

Future Water Balance

Management Zone	Total Water Resource (million m^3/a)	Water Requirement (million m^3/a)	EWR (million m^3/a)	Water Balance (million m^3/a)
Upper Olifants	618	648	80	-110
Middle Olifants	227	214	51	-38
Lower Olifants	202	230	69	-97
Total	**948**	**1092**	**200**	**-245**

- Includes the De Hoop Dam

Reflection on the Water Situation in the Olifants WMA

- Implications if no intervention measures are implemented
- Water allocation principles

Reflection on the Water Situation in the Olifants WMA

Implications if no interventions measures are implemented

Implications – No Interventions

Water Quantity

- Upper and Lower Olifants already experience a water deficit – 169 million m^3/a
- These water deficits will grow over time
- Middle Olifants will turn into a water deficit soon
- Effects of climate change have not been studied – this may worsen the situation

Implications – No Interventions
(Continued)

Water Quality

- Water quality expected to deteriorate, i.e. noticeable upward trends in:
  - EC
  - Ammonia
  - Phosphates
  - PH
  - Chlorides
- Level of deterioration will vary from quaternary to quaternary.

Typical Symptoms – No Interventions

- Water rationing during droughts will become more frequent, i.e. assurance of supply will be affected.
- Waterborne diseases (e.g. Cholera) will increase among rural population that use raw water directly from river.
- Water might become unfit for recreational activities (e.g. swimming) in certain areas.
- Aquatic life, fauna and flora numbers might reduce in certain hot spot areas.

Conclusions – No Intervention

- No intervention scenario is not acceptable!
- Available water needs to be re-allocated.
- Water quality problems need to be addressed.

Foundational Objectives for Setting Water Allocation Principles

- Achieve sustainable development i.e. balance the social and economic benefits with the protection of the environment.
- Recognise the international obligations: Adhere to the SADC Protocol in terms of fair and equitable sharing of the Water Resource.

Reflection on the Water Situation in the Olifants WMA

Water allocation principles

Suggested Water Allocation Principles

Principle 1: Water for BHN must be made available

Principle 2: Environmental status of the Olifants Catchment need to be maintained and where necessary improved.

Principle 3: Water for strategic use for the benefit of the country (e.g. water supply to power stations) must receive priority above any other economic development

Principle 4: Improve household food security and create employment opportunities in rural areas

Principle 5: Encourage economic growth within the policy parameters of the government

Possible Reconciliation Options

- Reducing water requirements
- Increasing water supply
- Water quality options

Possible Reconciliation Options

Reducing water requirements

Possible Reconciliation Options: Reducing Water Requirements

- Water Conservation and Demand Management
- Rainwater Harvesting
- Water reuse and recycling
- Setting assurances of supply
- Compulsory licensing
- Water trading
- System operation rules

Water Conservation and Water Demand Management

Water Conservation:

The minimisation of loss or waste, the care and protection of water resources and the efficient and effective use of water.

- Water Quality Management
- Social awareness and education
- Rehabilitation of a water resource
- Dam storage optimisation
- Removal of alien invasive plants
- Drought Management
- Water demand management measures

Water Demand Management: Irrigation Sector

- Bulk infrastructure upgrading, e.g.:
  - Repair and seal concrete linings
  - Install water meters
- More efficient irrigation after farm edge supply, e.g.:
  - Improved scheduling
  - Change to crops which use less water but yield higher incomes

Water Demand Management: Urban / Industrial Sector

- Loss Management, e.g.:
  - Pressure management
  - Leak detection and repair
- Improved efficiency, e.g.:
  - Public awareness
  - Pricing and payment collection

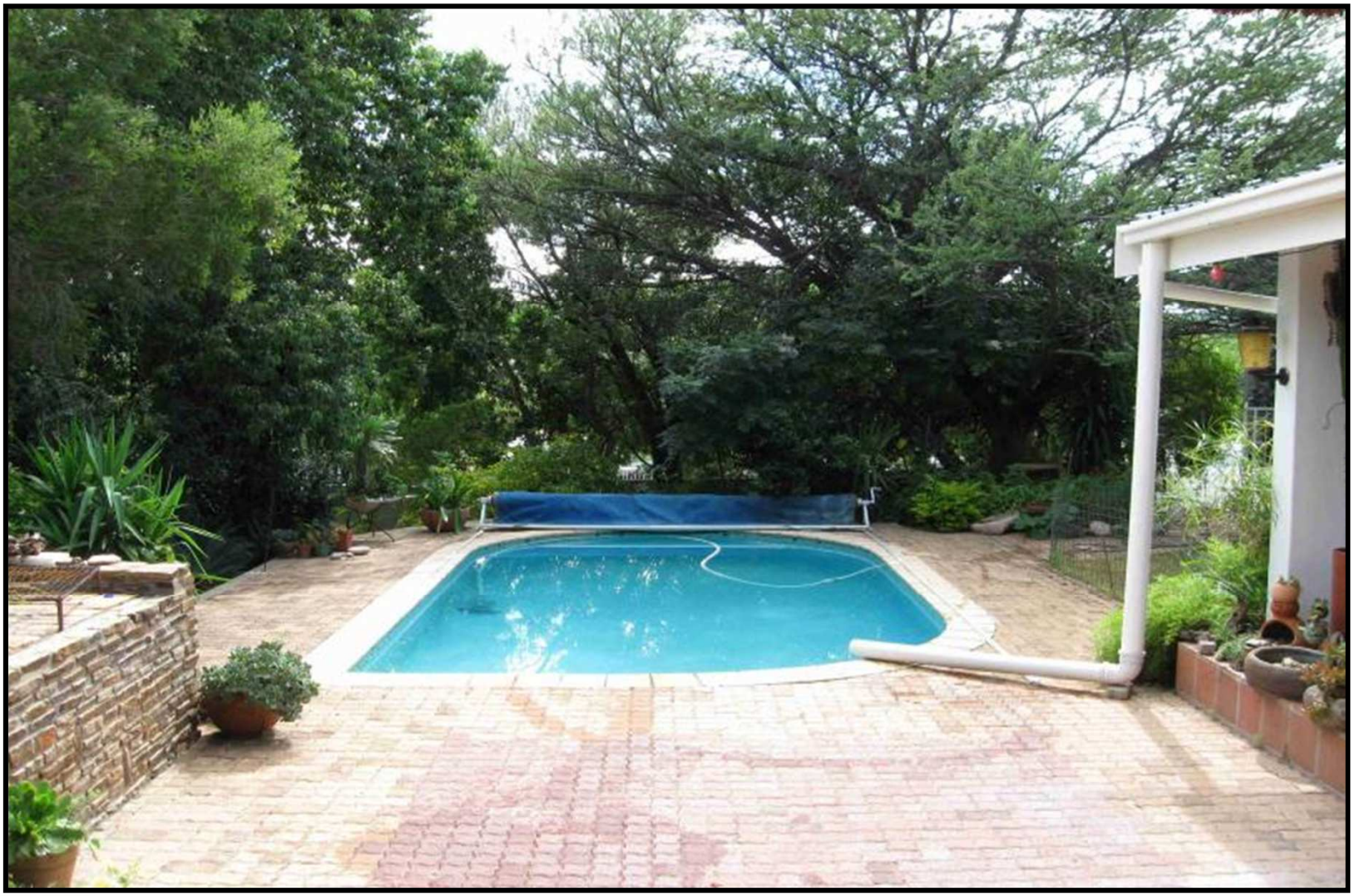
Water Demand Management: Mining

- Little scope: Perception is that mines maintain high water use efficiencies.
- Reuse of water in the mining sector is important.
- Mines are encouraged to use groundwater, where available.

Rainwater Harvesting

- Option comprises the collection of rainwater from the roof tops.
- Existing water supply can be augmented with this option.
- The option description focuses on urban middle to high income groups.
- The option can also be applied in rural areas, but it will be less efficient there because of the smaller on average roof top area.

Rainwater Harvesting



Water Reuse and Recycling

- Acid Mine Water Treatment Plants
- Reuse of sewage effluent
  - Mobile sewage treatment plants for irrigation of municipal sports fields, golf courses, gardens, etc.

Water Reuse and Recycling

Setting Assurances of Supply

- Objective:

  To enable further water allocations by encouraging existing water users to accept lower assurances of supply
- Current by accepted assurances of supply:
  - Power generation in SA: 99,5%
  - Domestic water use: 98%
  - Industrial water use: 98%
  - Irrigation: 80%

Setting Assurances of Supply
(Continued)

- Possible incentives:
  - Lower water use charges
  - Financial compensation in times of water shortages

Compulsory Licensing

Procedure described in NWA (S43 – S48)

- Water users can be instructed to apply for licences
- Minister then considers all licence applications and water availability
- Available water is then re-allocated in a fair and equitable manner

Water Trading

- Objective:

  To reduce water requirements of existing water users in order to re-allocate water or to meet the environmental water needs

- Two possible processes of surrendering water entitlements, i.e.:
  - Through legislation, e.g. compulsory licensing (SA only: S43 – S48 of the SA NWA)
  - Creating a willing seller / buyer platform

Water Trading *(Continued)*

Typical water seller / buyer platform:

- A WR Authority (Government, ARA-Sul, ICMA, RBA, etc.) adds a levy to the water charges of all its water users.
- The income of this additional levy is then ring fenced with the specific purpose of buying out water entitlements from willing sellers.
- By applying WCDM, water users can surrender a portion of their water entitlement without sacrificing any yearly profits.

System Operating Rules

- Will include all schemes within the study area.
- This option entails the development of operating rules, which consider the conjunctive use of all resources within a systems context.
- Would enable curtailments in times of drought to be applied effectively and consistently throughout the catchment.

Possible Reconciliation Options

Increasing water supply

Possible Reconciliation Options

Water quality options

Short Term Effects

Implementation arrangements and public engagement

Implementation Arrangements and Public Engagement

- Strategy must be implemented by the institutions and companies within the study area.
- DWA will facilitate the process.

Implementation Arrangements and Public Engagement *(Continued)*

- DWA Regional Office
- ESKOM
- Mines
- Municipalities
- Industries
- Organised Agriculture

Funding

- Mainly own funding from entities
- Subsidies for rainwater harvesting systems from DWA
- Subsidies on water supply infrastructure for WUAs available from DWA

Public Engagement

- DWA Web site
  http://www.dwa.gov.za/Projects/OlifantsRecon/default.aspx
- Public meetings
- Newsletter

Recommendations

Recommendations

- **Developments Options**
  - Continue investigations on dams with a special focus on the Godwinton and Chedle sites which are the best options from an economic point of view.
  - Focus further investigations on the transfer of raw water from Vaal Dam rather than the transfer of treated sewage water from Ekurhuleni.
  - Investigate groundwater development possibilities and recharge volumes of aquifers.
  - Complete investigation on non-conventional water.

Recommendations *(Continued)*

- **Management Options**
  - Start implementing the following:
    - Water trading as alternative to compulsory licensing
    - WCDM in all sectors
    - Removal of IAP
    - Setting up assurances of supply
    - System operating rules

Recommendations *(Continued)*

- **Water Quality Options**
  - Second AMD treatment plant is imminent. Further schemes of this type must be encouraged.