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Volume 3 of 7
Appendix B

DEPARTMENT OF WATER AFFAIRS AND FORESTRY
Directorate: National Water Resource Planning

WESTERN CAPE WATER SUPPLY SYSTEM: RECONCILIATION STRATEGY STUDY

Scenario Planning for Reconciliation of Water Supply and Requirement

Appendix B: Starter document for Selection of Intervention Workshop

FINAL

June 2007

CITY OF CAPE TOWN | ISIXEKO SASEKAPA | STAD KAAPSTAD

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UWP CONSULTING

WESTERN CAPE RECONCILIATION STRATEGY STUDY

INITIAL SCREENING OF OPTIONS WORKSHOP
4 August 2005

WORKSHOP STARTER DOCUMENT

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1. Western Cape Water Supply System (WCWSS)

1.1 INTRODUCTION

The WCWSS supplies the City of Cape Town (CCT) and other water user associations (irrigators) in the catchments of the Berg and Eerste Rivers. The WCWSS also supplies water to irrigators in the Riviersonderend catchment area of the Breede WMA.

1.2 THE MAIN DAMS

The main storage dams are the DWAF dams, *Theewaterskloof* (in the Breede WMA, which also serves irrigators in the Riviersonderend valley) and *Voëlvlei*, the *Wemmershoek*, *Upper Steenbras* and *Lower Steenbras Dams* owned by CCT and the future *Berg River Dam* that will initially be owned by the Trans Caledon Tunnel Authority (TCTA) and later transferred to DWAF.

Located in a winter rainfall area, characterised by wet winters and dry summers, the dams are filled during the wet winter months (April to September) when about 90% of the annual runoff occurs and water demands comprise only about 30% of the annual demand.

During the dry summer months (October to March) inflows to the dams are small and irrigation demands and garden watering demands in the urban areas are large. Approximately half of the storage in the dams is required to store water during the winter in order to meet the high water demands during the summer. The other half of the dams' storage is required to provide long-term carry over storage for droughts.

1.2.1 The Benefits of an Integrated Scheme

The dams are operated in an integrated manner to minimise spillage during the wetter years and thus to maximise the stored water available for essential uses during droughts. The effects of droughts are mitigated by progressively restricting supplies during droughts, with less essential users provided at lower assurance of supply, being more severely restricted. During the winter filling of the dams, the demands are shifted onto those dams that appear more likely to spill. This minimises the occurrence of the situation where one dam spills while there is storage available in another dam.

The CCT has co-operated to help minimise spillage by :

- introducing additional capacity in its water treatment works and bulk water pipelines to enable flexibility in the allocation of the demands on the different dams and to provide interconnectivity between the various sources.
- reducing the demands on their own dams (Wemmershoek and Steenbras), although there might be short-term benefits for them to use water from their own dams preferentially, and only use the other dams as backup during drier periods. However, this would increase spills and reduce the system yield.
- DWAF has also introduced one system tariff for the CCT which also allows the City greater flexibility.

Figure 1 shows the layout of the WCWSS.

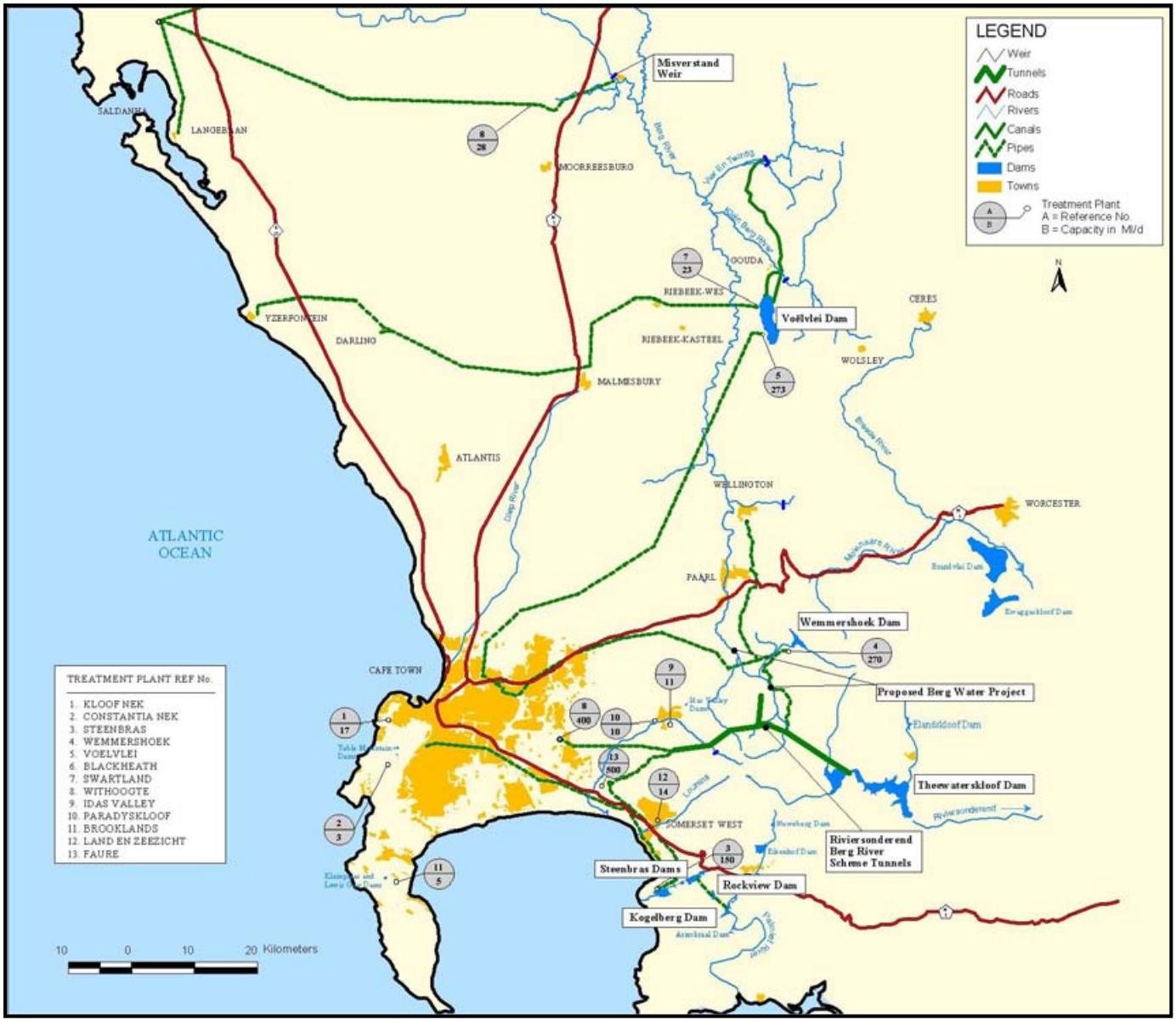
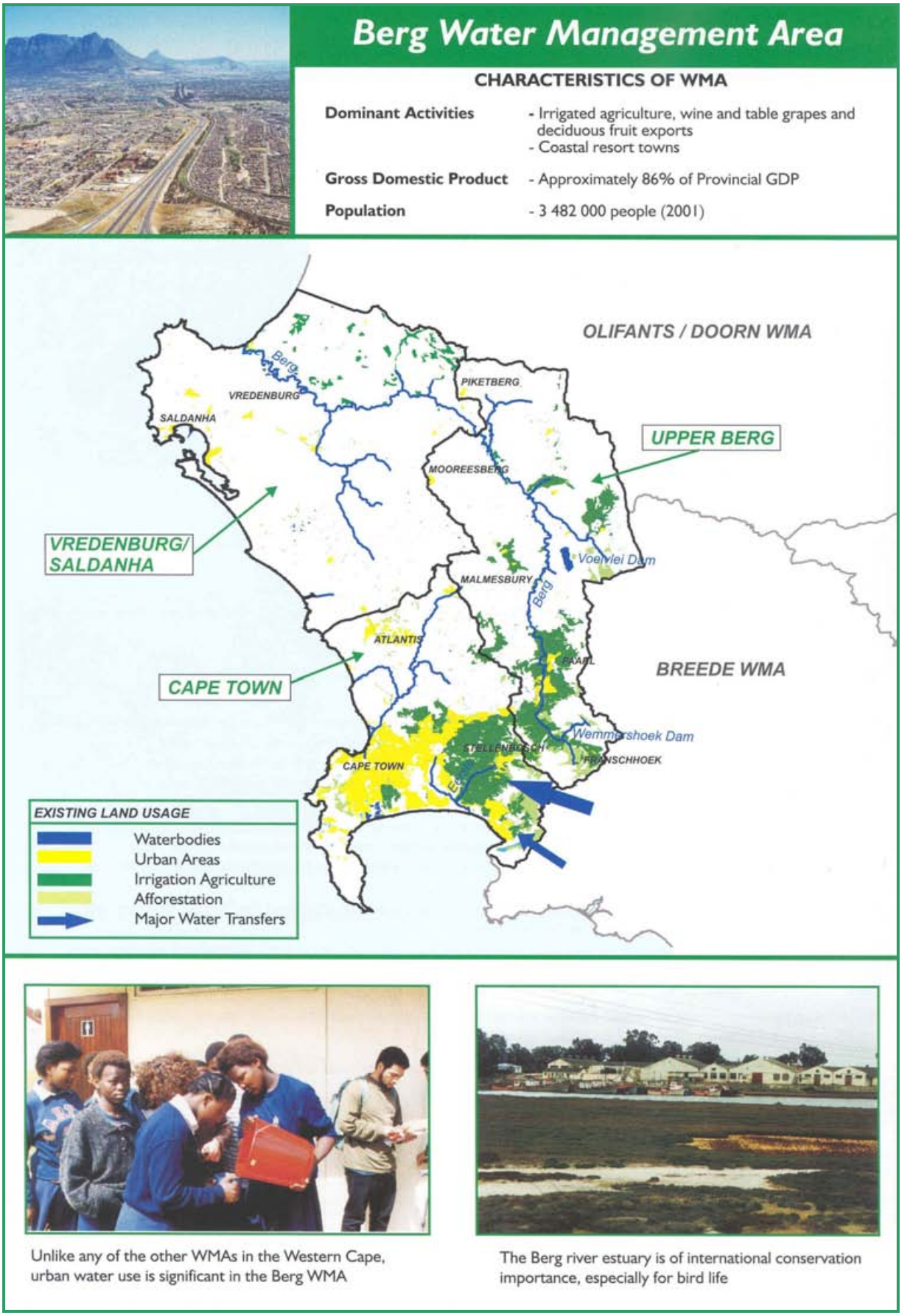
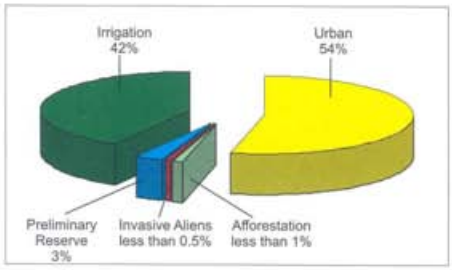


Figure 1 The Integrated Western Cape Water Supply System

2. Overview of the Berg WMA Study Area



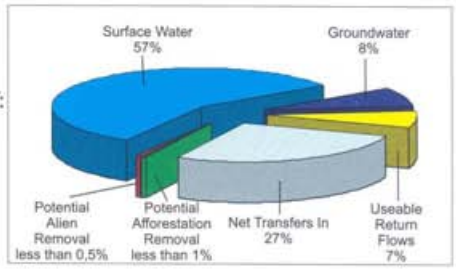
CONSUMPTIVE WATER USE
(745 million m³ per annum)



Current shortfall:
36 million m³ per annum

Natural Mean Annual Runoff:
1 429 million m³ per annum

WATER SUPPLY
(709 million m³ per annum)



- Urban and agricultural water usage comprise 54 % and 42 % of consumptive usage respectively, with 27 % being imported from the Breede WMA
- The Berg Water Project (Berg River Dam and Supplement Scheme) is currently being built to alleviate the current water stress in the WMA

STRATEGIC PERSPECTIVES IN THE BERG WMA:

- The Western Cape System Model of the major water supply components must be updated regularly
- The Berg River Reserve must be modelled to determine its impact on the availability of water
- Develop water quality management strategies for the middle and lower Berg River
- Licenses for new irrigation expansion in the Berg WMA must be continuously considered with preference given to water trading
- Reuse of treated wastewater remains an important future source for the Cape Metropolitan Area

WATER SUPPLIES : STATUS & DEVELOPMENT POTENTIAL

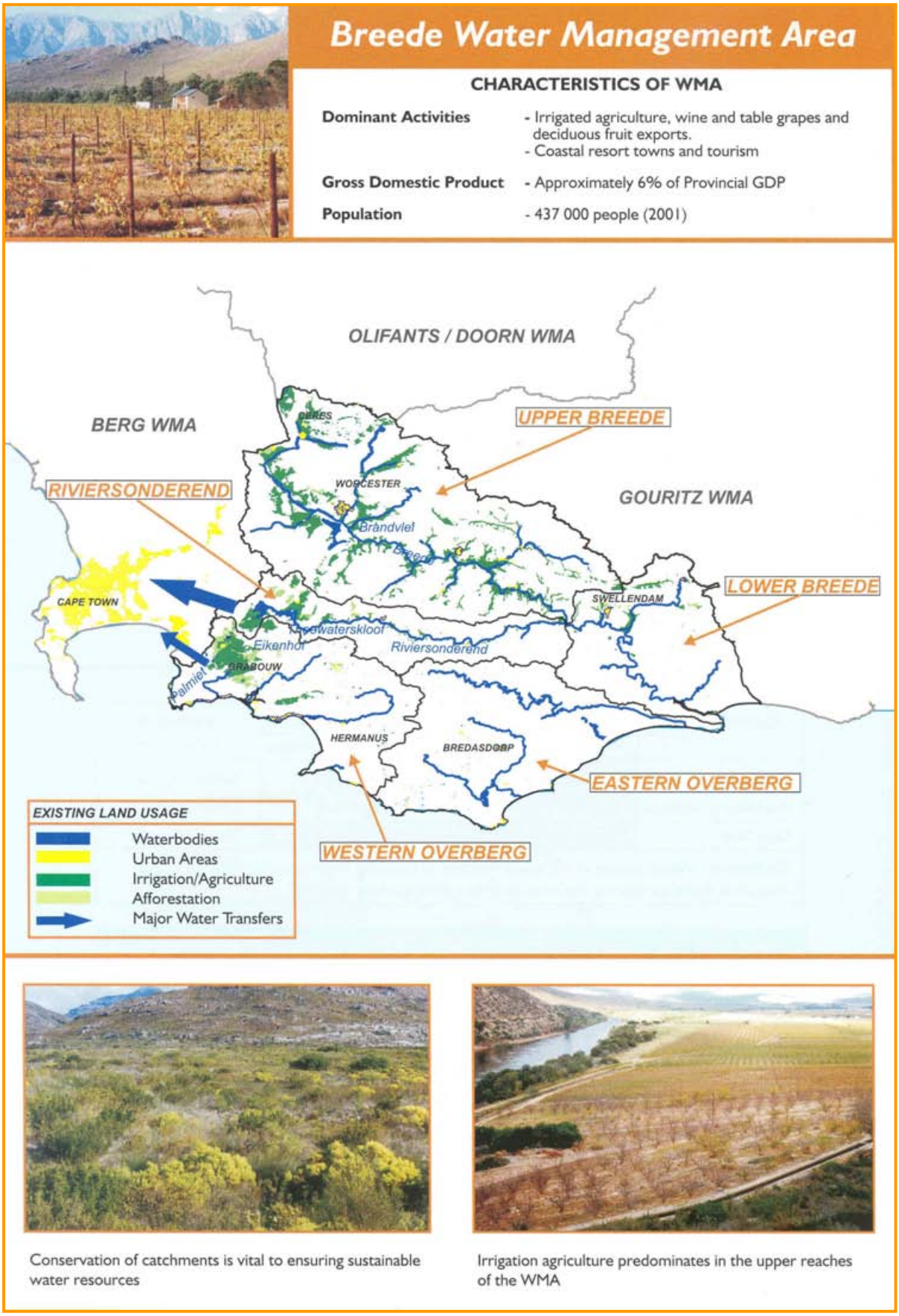
Catchment	Existing Supplies	Development Potential		Potential Future Use
		Surface Water	Ground Water	
Upper Berg	Restricted	Voëlvlei	Limited	Urban / Agriculture
Vredenburg/ Saldanha	Restricted	Limited	Limited	Urban / Industry
Cape Town	Restricted	Moderate & Re-use	Moderate	Urban / Industry

Concerns - Water quality in the lower reaches of the Berg River and the effect of water resources development on the ecological functioning of the estuary.

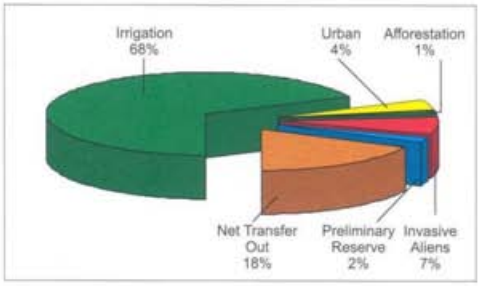
WATER USAGE

Potable Water	-	8% of people substandard (2001)
Water Services Provider/Authority	-	City of Cape Town West Coast DM (District Municipality)
Additional Water Services Authorities		6 B-municipalities + Winelands DM
Irrigation Boards	-	15
Water User Associations	-	1 established to date
Projects for Resource-Poor Farmers		5
Working for Water (2004/2005)	-	Budget R5 million

3. Overview of the Breede WMA Study Area



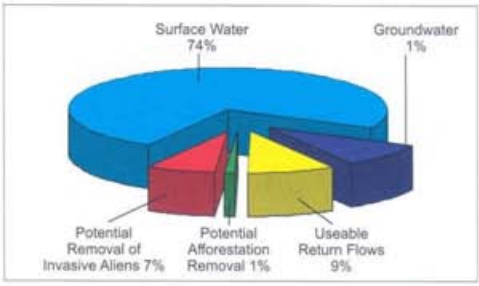
WATER USAGE / PRELIMINARY RESERVE
(1071 million m³ per annum)



Current Surplus:
19 million m³ per annum

Natural Mean Annual Runoff:
2 472 million m³ per annum

WATER SUPPLY
(1090 million m³ per annum)



- Irrigation comprises 68% of the total consumptive water use and water exports 18%
- Many coastal resort towns are located in water scarce areas
- Decisions regarding the implementation of the final Reserve, particularly in the Riviersonderend catchment will greatly influence the availability of water to other water use sectors

STRATEGIC PERSPECTIVES IN THE BREEDE WMA:

- The potential transfer of additional water into the Berg WMA must be investigated
- The available surplus of 19 million m³ per annum shall be for meeting increasing urban water requirements
- Off-channel storage and controlled groundwater development shall be the preferred options for irrigation expansion
- Improved salinity management in the middle and lower Breede River remains a high priority
- Applications for water use licenses shall require a component of the use to be by Resource Poor Farmers
- Groundwater shall be the preferred resource for local municipal water supply augmentation

WATER SUPPLIES : STATUS & DEVELOPMENT POTENTIAL

Catchments	Existing Supplies	Development Potential		Potential Future Use
		Surface Water	Ground Water	
Upper Breede	Moderate surplus	Moderate	Moderate	Agriculture/Export
Lower Breede	Moderate surplus	Moderate	Limited	Agriculture
Riviersonderend	Balanced	Moderate / (Lower catchment)	Moderate	Agriculture
Western Overberg	Balanced	Moderate	Moderate	Coastal Towns/Export
Eastern Overberg	Balanced	None	Limited	Coastal Towns

Concerns - Salinity in lower reaches of the Upper Breede limits further agricultural development in this area.

WATER USAGE

Potable Water (2001)	-	6% of people substandard (2001)
Water Services Provider/Authority	-	Overberg DM (District Municipality)
Additional Water Services Authorities	-	8 B-municipalities + Cape Winelands DM
Irrigation Boards	-	68
Water User Associations	-	13 established to date
Projects for Resource Poor Farmers	-	27
Working for Water (2004/2005)	-	Budget R13 million

KEY FINDINGS OF THE BERG WMA INTERNAL STRATEGIC PERSPECTIVE

The Berg WMA Internal Strategic Perspective (ISP) identified the urgent need to conduct this reconciliation study of Western Cape Water Supply System as demands are expected to exceed the supplies, including those from the Berg Water Project, by about 2012, as indicated in Figure 2.

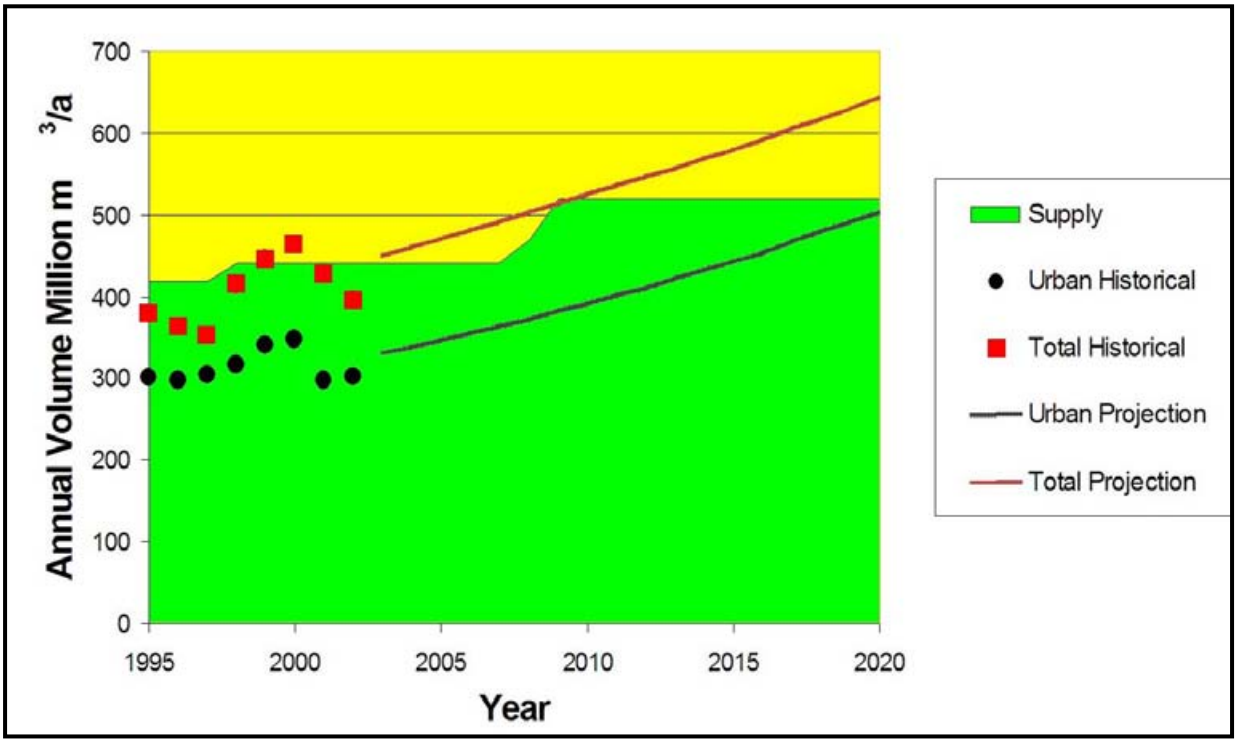


Figure 2 Historical and Projected Water Demands on the Western Cape Water Supply System

Therefore, the ISP identified the need to review all previously identified options and particularly the re-use of effluent as large volumes of wastewater currently flow into the sea. The possible development of the Table Mountain Group Aquifer as a supply is currently being investigated by the City of Cape Town.

As the implementation of a new scheme from identification to completion may take up to five years, it is essential that the most likely future augmentation options and sequence of implementation be determined as soon as possible.

KEY FINDINGS OF THE BREEDE WMA INTERNAL STRATEGIC PERSPECTIVE

Drawing on the recently completed Breede River Basin Study (BRBS, 2003) and the Breede WMA Internal Strategic Perspective (ISP, 2004), the following key findings are presented. These represent a summary of those findings which have a significant bearing on the water resources planning within the Berg WMA.

The Reserve

The Breede River has one of the higher estuary requirements (53% of the natural MAR) of the large rivers in the country. Despite the high preliminary Ecological Water Requirement of 975 million m^3/a, the resulting impact on the present day yield (1 in 50 year) is only 16 million m^3/a. This is due to the fact that:

i The current Ecological Water Requirements for the Lower Breede River (Class "C") and its estuary (Class "B") are almost entirely met through present day flow conditions. Meeting the few seasonal shortfalls accounts for the relatively small impact on the present day yield.

ii The ISP recommends that the Riviersonderend River be retained at a Class "E" (its present ecological status), at least for the interim. Were the river to be rehabilitated to a Class "D" (the scientific recommendation of the BRBS), the resulting impact on yield would be about 85 million m^3/a, with much of that having to be provided through releases out of Theewaterskloof Dam. The yield from the dam is already fully allocated and compulsory licensing would be required to resolve the over-allocation. The CCT and irrigators dependent on water from the dam would then need to curtail use (cutting back on farming and other economic activity) or develop other sources to offset this impact.

A decision on the Reserve implementation in the Riviersonderend River should be supported through the development of Reserve implementation scenarios. A well-informed public participation process will then follow, leading to a decision on the Reserve and Resource Quality Objectives for the river. In the interim, the status quo will be maintained as the management class.

Potential Transfer Schemes

The following potential transfer schemes from the Breede WMA to the Berg WMA were identified in the Breede River Basin Study and the ISP :

Transfer Scheme Name	Potential Yield (Mm^3/a)	Comment
Michell's Pass Diversion	53	Diverts water into Voëlvlei Dam via a canal at Michell's Pass, but additional pumping capacity required at Brandvlei to maintain status quo. **FAVOURABLE** for transfer.
Upper Molenaars Diversion	27	Diverts water to either Berg River Dam or Wemmershoek Dam, but additional pumping capacity required at Brandvlei to maintain status quo. **FAVOURABLE** for transfer.
Augmenting Theewaterskloof Dam out of Brandvlei Dam	33	Transfers would be from Brandvlei Dam to Theewaterskloof Dam, then via the existing RSE tunnel to the Berg WMA. This option limits further irrigation development in the Breede WMA. **NOT FAVOURABLE** for transfer.
Increased transfers from the Palmiet River	25	Transfers would be via the existing Palmiet Pumped Storage Scheme. **FAVOURABLE** for transfer.

As indicated in the above table, the three provisionally preferred transfer schemes are the Michell's Pass Diversion, the Upper Molenaars Diversion and the increased transfers from the Palmiet River.

Potential local schemes

The Breede River Basin Study and the ISP also identified the more favourable schemes for augmenting the existing irrigation supplies. However, the requirements of the Ecological Reserve will probably limit the extent of development of the water resources of the Breede for local usage and transfer to between 90 and 140 million m^3/a. The upper limit would be possible if the recommended river classes were adopted, with the exception of the Riviersonderend River (maintained at status quo). All invasive alien plants would also need to be removed.

4. The Screening Workshop

4.1 INTRODUCTION

The Western Cape Reconciliation Strategy study will produce a long-term strategy for the management of reconciling water supply with demands from the Western Cape Water Supply System (WCWSS) area. The study will *inter-alia* recommend options to reconcile demand with supply. Two screening processes will be undertaken as part of the study. At the Preliminary Screening Workshop, all previously documented water conservation and demand management and other intervention options, along with all documented potential augmentation schemes will be evaluated, along with new/recently identified options. Options identified through the public participation process have been incorporated.

From the Preliminary Screening Workshop a scope of work will be drawn of studies that need to be investigated further at reconnaissance/pre-feasibility level, which will be documented in the Inception Report. Once the required investigations have been done (over approximately a six-month period), the second Screening Workshop will be held, where options will be ranked. Following that, the Reconciliation Strategy will be written.

The study will serve to identify those development options that warrant further study (at feasibility level). In doing so, the future investment made by the Department into undertaking more detailed studies could focus on those options most likely to be socially, economically and environmentally acceptable.

4.2 OBJECTIVES OF THE PRELIMINARY SCREENING PROCESS

The objectives of the initial screening workshop are to:

- Identify schemes that require no further evaluation.
- From existing information, assess the acceptability of the various options identified in previous studies in terms of technical, financial, environmental and social criteria;
- Ascertain which intervention or development options or combinations thereof would warrant further investigations at reconnaissance or pre-feasibility level, and what aspects should be investigated in this study;
- Augment the existing information with specialist inputs from the DWAF and other key stakeholders.

Some issues to consider during the evaluation of options are :

- The importance of additional storage;
- The speed and cost of implementing a large scheme versus a number of smaller schemes;
- The ability of the Western Cape Water Supply System to accommodate the additional yields that could be made available.

4.3 STARTER DOCUMENT

This Starter Document provides information for discussion purposes. The content is based on available documentation, which for the purposes of this workshop provides information that can be used for strategic level decisions. It is anticipated that the workshop participants will provide further information and critically review the information contained in the Starter Document, which has been drawn from disparate sources, is based on different assumptions and is of varying detail, age and confidence.

It is important to note that for each option presented in this document, an attempt has been made to estimate the yields after allowance for the best available estimate of the Reserve. It is however acknowledged that provisional Reserve estimates present a degree of uncertainty. Nevertheless, an attempt is made to at least show a reasonable order of magnitude of its potential impact.

The purpose of this document is to provide adequate background material to facilitate informed discussion at the Screening Workshop in order to confirm the development options that may warrant further investigation.

4.4 ATTENDANCE

It is anticipated that the workshop will be attended by identified DWAF staff, the consultant team and supporting specialists, CCT officials, representatives from National and Provincial Government Departments and representatives from the Berg and Breede WMAs, identified through the Public Participation Process, and Study Steering Committee members.

4.5 ANTICIPATED OUTCOMES OF THE SCREENING WORKSHOP

Following the screening workshop, a draft Screening of Options Report will be prepared based on this starter document and the information derived from the workshop. The draft Screening of Options Report will be distributed to all participants for their review and further inputs. A public meeting will be held, as part of the Public Participation Process, where the findings of the workshop will be presented to the public. Opportunity will also be provided for the public to comment. All comment will then be assimilated into the Study Report.

4.6 SCREENING OF OPTIONS

The screening of the various identified development options would be based on a number of criteria, namely:

- potential scheme yields, inclusive of the impact of the Reserve;
- updated financial cost estimates and unit reference values (URVs);
- socio-economic implications;
- ecological implications.

Non-starter options should be quickly identified, and criteria under which such options would be considered again will be identified. Each criterion will be assigned a colour-coded rating, based

on how favourable the option is rated for those particular criteria. A three tier rating system is envisaged as follows :

- Favourable
- Moderately favourable
- Unfavourable

The following diagram illustrates three hypothetical cases :

SCHEME NAME	CRITERIA					
	Non-Starter	Yield	URV	Socio-economic	Environmental	Available Information/ Technology
Scheme 1	Y					No previous implementation
Scheme 2						
Scheme 3						

Those operations which appear to be obvious non-starters will be flagged. Comment will also be required as to the extent of available information and whether the technology has been successfully utilised previously.

4.7 OVERVIEW OF POTENTIAL DEVELOPMENT OPTIONS

In Section 5, an overview of each potential scheme is provided and information on the various criteria is provided for comment and discussion. Figure 3 shows the approximate position of each potential scheme in relation to the existing water resources infrastructure.

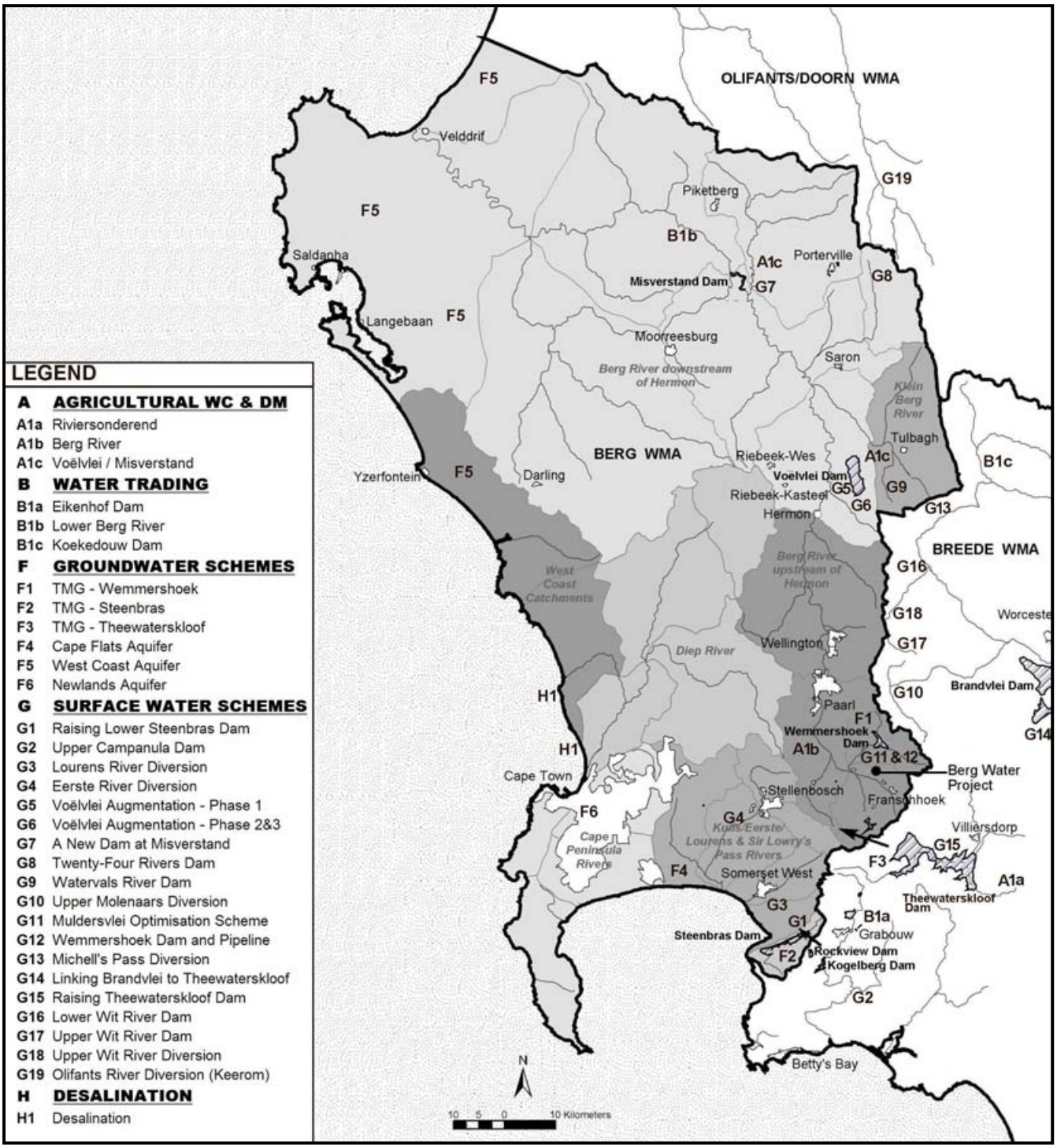


Figure 3 Locality Map

5. Potential Augmentation Options

The following potential augmentation options are presented in this document. The information is drawn from various existing reports. Whilst the base information differs in the extent and reliability of information, it nevertheless represents the latest available sources of information for each option.

Section A: AGRICULTURAL WATER CONSERVATION AND DEMAND MANAGEMENT

Section B: WATER TRADING

Section C: CHANGES IN LANDUSE

- C1: Removal of Invasive Alien Plants
- C2: Removal of Commercial Forestry

Section D: WATER RE-USE

- D1: Use of Treated Wastewater for Local Irrigation and Industrial Use
- D2: Use of Treated Wastewater for Commercial Irrigation, Exchange with Irrigation Schemes Fresh Water Allocation
- D3: Use of Treated Wastewater forPotable Use
- D4: Dual Reticulation Network

Section E: URBAN WATER CONSERVATION AND DEMAND MANAGEMENT

- E1: Introduction to Water Demand Management Options
- E2: Leakage Detection and Repair
- E3: Leakage Repair Beyond the Meter
- E4: Pressure Management
- E5: Use of Water Efficient Fittings
- E6: Elimination of Automatic Flush Urinals
- E7: Adjustment of Water Tariffs, Metering, Credit Control
- E8: User Education
- E9: Promotion of Grey Water Usage
- E10: Rainwater Tanks
- E11: Promotion of private boreholes and wellpoints

Section F: GROUNDWATER SCHEMES

- F1: TMG - Wemmershoek
- F2: TMG - Steenbras
- F3: TMG - Theewaterskloof
- F4: Cape Flats Aquifer
- F5: West Coast Aquifer
- F6: Newlands Aquifer

Section G: SURFACE WATER SCHEMES

- G1: Raising Lower Steenbras Dam
- G2: Upper Campanula Dam
- G3: Lourens River Diversion
- G4: Eerste River Diversion
- G5: Voëlvlei Augmentation - Phase 1
- G6: Voëlvlei Augmentation - Phase 2&3
- G7: A New Dam at Misverstand
- G8: Twenty-Four Rivers Dam
- G9: Watervals River Dam
- G10: Upper Molenaars Diversion
- G11: Muldersvlei Optimisation Scheme
- G12: Wemmershoek Dam and Pipeline
- G12: Michell's Pass Diversion
- G14: Linking Brandvlei to Theewaterskloof
- G15: Raising Theewaterskloof Dam
- G16: Lower Wit River Dam
- G17 Upper Wit River Dam
- G18: Upper Wit River Diversion
- G19: Olifants River Diversion (Keerom)

Section H: DESALINATION

- H1: Desalination

Section I: OTHER SCHEMES

- I1: Water transfers from the Congo River
- I2: Water transfers from the Orange River
- I3: Towing of icebergs
- I4: Other options arising from public meetings