REPORT No. PWMA 19/000/00/0304

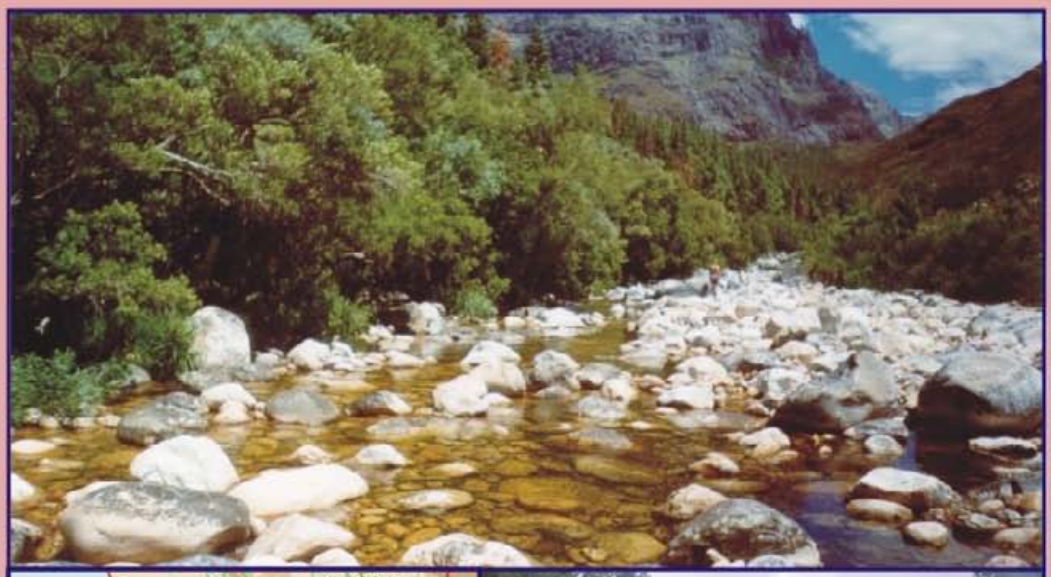
DEPARTMENT:WATER AFFAIRS AND FORESTRY

DIRECTORATE: NATIONAL WATER RESOURCES PLANNING

BERG
WATER MANAGEMENT AREA

INTERNAL STRATEGIC PERSPECTIVE

VERSION 1 : JANUARY 2004



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DEPARTMENT OF WATER AFFAIRS AND FORESTRY

BERG WATER MANAGEMENT AREA

INTERNAL STRATEGIC PERSPECTIVE

Version 1

January 2004

Department of Water Affairs and Forestry
Directorate National Water Resource Planning

DEVELOPMENT OF INTERNAL STRATEGIC PERSPECTIVE
FOR THE
BERG WATER MANAGEMENT AREA (WMA No 19)

APPROVAL

Title	:	**Berg Water Management Area: Internal Strategic Perspective**
DWAF Report No	:	P WMA 19/000/00/0304
Consultants	:	Ninham Shand in association with Umvoto Africa, Jakoet & Associates, and Tlou & Matji
Report Status	:	Version 1, January 2004
Version Controller	:	Mr B van Zyl (Catchment Manager Berg WMA)
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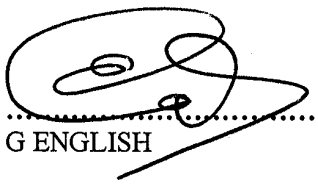

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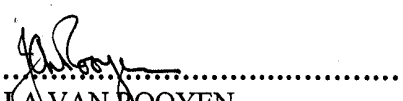

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REFERENCE

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INVITATION TO COMMENT

This report will be updated on a regular basis until it is eventually superceded by the Catchment Management Strategy. Water users and other stakeholders in the Berg River WMA and other areas are encouraged to study this report and to submit any comments they may have to the Version Controller (see box overleaf).

ELECTRONIC VERSION

This report is also available in electronic format as follows:

- DWAF website:
  - Intranet: http://dwaf-www.pwv.gov.za/documents/
  - Internet: http://www.dwaf.gov.za/documents/
- On CD which can be obtained from DWAF Map Office at:
  157 Schoeman Street, Pretoria (Emanzini Building)
  +27 12 336 7813
  mailto:apm@dwaf.gov.za

  or from the Version Controller (see box overleaf)

The CD contains the following reports (all available on DWAF website)

- Berg WMA Internal Strategic Perspective (*This Report*)
  (Report No: P WMA 19/000/00/0304)
- The National Water Resource Strategy, First Edition, 2004
- The Berg WMA - Overview of Water Resources Availability and Utilisation
  (Report No: P WMA 19/000/00/0203)
- The Berg WMA – Water Resources Situation Assessment
  (Report No: P WMA 19/000/00/0101)

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BERG WATER MANAGEMENT AREA

INTERNAL STRATEGIC PERSPECTIVE

EXECUTIVE SUMMARY

1. INTRODUCTION

The Berg Water Management Area (WMA) is situated in the extreme southwest corner of South Africa and falls entirely within the Western Cape Province. It derives its name from the largest river within its boundaries, namely the Berg River. The WMA borders on the Olifants/Doring WMA to the north and on the Breede WMA to the east. It borders on the Atlantic Ocean and Indian Oceans to the west and south respectively.

2. WATER LEGISLATION AND MANAGEMENT

The **National Water Act** of 1998 (NWA) is the principal legal instrument relating to water resource management in South Africa. It is now being incrementally implemented. The NWA introduces far-reaching concepts such as the **National Water Resource Strategy** (NWRS), the First Edition of which will be published in the first quarter of 2004. This NWRS is being progressively developed to set out policies, strategies, objectives, plans, guidelines, procedures and institutional arrangements for the protection, use, development, conservation, management and control of the country's water resources.

The delegation of water resource management from central government to catchment level, as provided for in the NWA, will be achieved by establishing a Catchment Management Agency (CMA) for each WMA and each CMA will progressively develop a Catchment Management Strategy (CMS), within the general framework set by the NWRS. Until such time as the CMA is established and is able to manage the water resources within the WMA according to its CMS, the Regional Offices (ROs) of the Department of Water Affairs and Forestry (DWAF) will continue to manage water resources according to the Internal Strategic Perspective (ISP).

3. INTERNAL STRATEGIC PERSPECTIVES

This document presents DWAF's Internal Strategic Perspective (ISP) or view on how it intends managing the water resources within the Berg WMA during the period leading up to the establishment of a CMA and the development of a CMS by the CMA. The ISP will inter alia provide a consistent basis for the Western Cape Regional Office to process requests for new water use licences.

After internal approval, the Department will obtain comment on the ISP from local authorities, Water User Associations (WUAs), other water related organisations and the public. This will take place through the RO's established liaison structures (forums) and through normal contact with water users in the execution of its duties. This ISP document will be updated periodically

until the CMA for the Berg WMA is fully functional and has prepared a CMS. All updates to the document will be authorised by the RO, and the task of managing version control will be the function of the Catchment Manager for the Berg WMA.

The ISP has been compiled by referring to policy documentation, legislation, regional planning, departmental guidelines and relevant water related studies, and is also based on interviews and communications with DWAF's regional managers, as well as staff in relevant Head Office directorates.

The yield balances quoted in this report are the same as those contained in the First Edition (2004) of the NWRS. More detailed figures appear in Report No P WMA 19/000/00/0203, Berg Water Management Area, which was compiled as part of the NWRS process.

The ISP does not assume to address all possible issues. This is a living document and further improvements will be made and strategies developed as new issues arise.

4. INTEGRATED WATER RESOURCE MANAGEMENT

As part of the implementation of Integrated Water Resource Management (IWRM), in line with the requirements of the NWA, DWAF is following a process that will include:

- development of the ISPs;
- verification of existing lawful use;
- determination of water availability at acceptable confidence levels; and
- determination of Ecological Reserves at high confidence levels.

An iterative and interactive process will also follow where public participation will play a role in determining water resource and water use reconciliation options. This will be handled by DWAF until the CMA can take over.

The following aspects of water resource management will be encompassed within the broad process of IWRM:

- caring for the environment and where possible, enhancing ecological integrity;
- keeping society at the forefront of all decision making;
- affording the correct level of attention to addressing water quality issues in relation to both surface and groundwater;
- managing groundwater as an integral part of the total water resource;
- taking cognisance of the recreational and social use of dams and rivers; and
- forging ways to improve co-operative governance with other authorities towards more effective water resource management.

5. SUB-AREAS OF THE BERG WMA USED IN THE NWRS

For the purposes of reviewing the available yield, the Berg WMA was divided into three sub-areas. These correspond with the so-called areas of interest used in the NWRS, namely the Upper Berg, Lower Berg and Greater Cape Town sub-areas (see Figure iii).

Figure iii – The Areas of Interest of the Berg WMA as defined in the NWRS
(Ref**:** National Water Resource Strategy – Appendix D19 – Berg WMA)

The further sub-division of the WMA into eight sub-areas was necessary to facilitate the identification of issues and concerns that would require detailed strategies. This is discussed in Chapter 3 of this report and summarised in Paragraph 21 of this Executive Summary.

6. TOPOGRAPHY, RAINFALL AND LAND USE

The topography of the Berg WMA varies considerably, with consequential impact on the climate of the region. Rainfall is highest in the southern mountain ranges where the mean annual precipitation is as high as 3 000 mm per annum, whilst the north-west part of the WMA immediately inland of the coast, receives as little as 300 mm per annum. There is intensive irrigation in the Upper Berg River and Lower Berg River sub-areas and in parts of the Greater Cape Town sub-area (Eerste River and Lourens River catchments).

7. ECONOMIC ACTIVITY

The Berg WMA is the economic hub of the Western Cape, with the dominant commercial and industrial activities taking place in Cape Town and the developing West Coast (Saldanha/ Vredenburg in the Lower Berg sub-area). Approximately 12% of the Gross Domestic Project (GDP) of South Africa originates from within this WMA, mainly in the Greater Cape Town sub-area.

8. POPULATION

Of the total Berg WMA population, estimated at 3 247 000, 95% reside in urban areas, with 87% concentrated in the Greater Cape Town sub-area (Ref: Berg WMA - Overview of Water Resources Availability and Utilisation)

9. WATERWORKS

The Berg WMA is predominantly supplied with water via the Western Cape Water Supply System (WCWSS). Paragraph 12 of this Executive Summary describes the integrated operation of the WCWSS. In addition to supplying the City of Cape Town (CCT), the system also augments the local supply schemes of the towns of Paarl, Wellington, Stellenbosch, Saron and the West Coast District Municipality. The system also supplies water to irrigators along the Berg and Eerste Rivers.

Bulk water supply infrastructure is mostly owned and operated by the CCT. DWAF however also own and operate some of the infrastructure within the WCWSS, whilst some local authorities own and operate local supply schemes themselves. Wastewater treatment works (WWTWs) are largely owned and operated by the CCT, other local authorities and the Department of Public Works (WWTWs at prisons).

10. WATER QUALITY

The natural geology (shales) and agricultural return flows introduce elevated salinities in the middle and lower reaches of the Berg River and in the Diep River. This impacts on industrial water use and on crop selection. Many of the urban rivers of Cape Town serve as conduits for discharging treated effluent to sea and whilst they cannot be rehabilitated, their condition should at least be maintained at levels that will not introduce adverse health and social impacts.

11. GROUNDWATER SITUATION

Groundwater resources are available from primary aquifers along the coastal plain as well as from deeper rock-fractured and confined aquifers, of which the TMG holds the most potential for development. Groundwater is currently utilised from the primary aquifers near Atlantis and on the Cape Flats as well as from deeper aquifers in the Swartland. Monitoring networks to facilitate monitoring of aquifer systems and in particular the interaction between the surface and groundwater resource, are inadequate.

12. THE WESTERN CAPE WATER SUPPLY SYSTEM (WCWSS)

The WCWSS supplies the CCT and other water service providers (WSPs) and WUAs (irrigators) in the Berg and Eerste River catchments. Existing storage dams and the future Berg Water Project form part of this integrated system, operated in such a manner that spills from the storage dams are minimised. The Berg Water Project, comprising the Berg River Dam (formerly known as Skuifraam Dam) and Supplement Scheme, a run of river pumping scheme, has been approved and will be completed by 2007. The WCWSS is co-operatively managed by the CCT and the Department's RO. The majority of towns in the Berg WMA are either wholly or partially supplied with water from this integrated scheme.

A committee comprising DWAF and all major stakeholders reviews the system storage and projected demands annually on 1 November and decides whether or not restrictions need to be recommended for the following year. Other operational challenges include the need for close co-operation with authorities such as Eskom, varying water quality, and the operation of the Riviersonderend–Berg River Tunnel system which provides the means of transferring water from the Breede WMA into the Berg WMA.

The main schemes currently supplying water into the WCWSS include the Palmiet River Government Water Scheme (Breede WMA), the Upper and Lower Steenbras Dams, Wemmershoek Dam and the off-channel Voëlvlei Dam. The latter is filled by diverting water out of the Klein Berg River, the Leeu River and the Twenty-Four Rivers. Theewaterskloof Dam in the Breede WMA is the largest dam within the WCWSS and water from it is transferred into the Berg WMA via the Riviersonderend-Berg River Tunnel System. This dam will also store water pumped from the Berg River Dam during winter, for transfer back into the WCWSS during summer.

13. FUTURE WATER DEMANDS ON THE WCWSS

Through the Western Cape Planning Model Committee, historical and projected future demands on the WCWSS have been determined, based on operating rules established by that same Committee. Whilst these do not reflect the total water requirement for the entire Berg WMA, the projections for the WCWSS are nevertheless consistent with the future water requirement projections contained in the NWRS. The CCT will soon embark on a new requirements study in collaboration with DWAF. It is evident that even with significant water conservation and demand management (WC/DM) measures planned by the CCT, the existing supplies to the region are likely to come under pressure of restrictions until the Berg Water Project is completed and additional interventions to augment the supply may be required soon after 2010.

14. FUTURE RECONCILIATION INTERVENTIONS FOR THE WCWSS

All studies undertaken to date by DWAF and the CCT recommend that WC/DM should be implemented before any other reconciliation interventions are considered. Furthermore it is recommended that increased re-use of treated effluent should be seriously considered as an option. Both surface and groundwater schemes have been studied at varying levels of detail, including the development of schemes in the adjacent Breede WMA, for supplying water into the WCWSS.

The Table Mountain Group Aquifer appears to have potential and the CCT has commissioned a study leading towards the establishment of a pilot wellfield. Augmenting the supply of water into Voëlvlei Dam appears to be a favourable future option within the Berg WMA. The Breede River Basin Study has identified the Michell's Pass Diversion and the Upper Molenaars Diversion as the most favourable options for augmenting the WCWSS out of the Breede WMA.

15. LOCAL SUPPLY SCHEMES

The majority of urban users are supplied through the various regional schemes encompassed within the WCWSS. Smaller schemes at local level supplement the supply to certain towns such as Paarl and Wellington. A few small towns rely on local sources only (Tulbagh and Porterville, for example). The supply to Tulbagh is particularly stressed in summer, due to insufficient run of river yield from the Moordenaarskloof. Strategies for reconciling supply and demand for the small towns are discussed in Section 1 of Part 2 of this report.

16. WATER REQUIREMENTS AND USE FOR THE YEAR 2000

The water requirements in the Berg WMA, at 98% of assurance of supply, are shown below. The urban requirement constitutes approximately 57% of the total and irrigation approximately 41%. The remaining 2% is the rural requirement. The NWRS currently reflects a negligible impact of afforestation on the 1:50 year yield. The requirements are shown in the following table:

WATER USER SECTOR	2000 REQUIREMENTS – 1:50 YEAR LEVEL OF ASSURANCE (x 10^6 m^3/a)			
	GREATER CAPE TOWN	UPPER BERG	LOWER BERG	TOTAL
Irrigation	46	202	53	**301**
Urban	343	23	23	**389**
Rural	5	4	5	**14**
Afforestation	0 (2)	0 (4)	0	**0 (6)**
TOTAL	**394**	**229**	**81**	**704**

Quantities in brackets are suggested changes to the NWRS figures and refer to impact on yield only. Total streamflow reduction is 26 million m^3/a.

17. CURRENT YIELD BALANCE FOR THE BERG WMA (YEAR 2000)

The best estimate of yield balance is contained in the NWRS and given below:

COMPONENT	YIELD BALANCE (YEAR 2000)			
	GREATER CAPE TOWN	UPPER BERG	LOWER BERG	TOTAL
Local yield	108	322	52	**482**
Transfers in	269	32	18	**194**
Transfers out	0	125	0	**0**
Local requirements	394	229	81	**704**
Balance	**(17)**	**(0)**	**(11)**	**(28)**

Brackets around numbers indicate a negative balance (shortfall).

The results indicate an overall shortfall of 28 million m^3/a for the WMA with a shortfall of 17 million m^3/a for the Greater Cape Town area. It is recommended that a further reduction in yield of 8 million m^3/a be allowed, to take account of the impact on yield of alien plant infestation (2 million m^3/a) and of afforestation (6 million m^3/a). These impacts are considered to be more realistic than the negligible (zero) impacts currently used in the NWRS yield balance. The overall shortfall will then increase to 36 million m^3/a. This in no way alters the conclusions drawn and recommendations made in the NWRS, but it will remove the erroneous notion that invasive alien plants and afforestation have virtually no impact on yield.

18. PROJECTED FUTURE YIELD BALANCE SCENARIOS

The NWRS has developed two scenarios with respect to future requirements:

- A *Base Scenario* with projected water requirements in the Year 2025 of 830 million m^3/a resulting in a shortfall of 68 million m^3/a. This is based on a high scenario of population growth, increased standards of water services and no general increase in irrigation requirements.
- A *High Scenario* with projected water requirements in the Year 2025 of 1 306 million m^3/a resulting in a shortfall of 510 million m^3/a. This is based on a high scenario of population growth, high standards of water services (socio-economic development), a strong increase in the economic requirements for water and no general increase in irrigation requirements.

The impact of HIV/AIDS, future economic growth trends and changes in sectoral requirements all impact on the estimate of future requirements. Further requirement scenarios will have to be revisited and real time monitoring will be necessary to determine the growth scenario that actually develops.

19. OTHER UNCERTAINTIES INFLUENCING THE YIELD BALANCE OF THE BERG WMA

A number of uncertainties exist which may impact on the reconciliation of availability and requirements. These include:

- Hydrology - the system analysis is currently based on a mix of hydrology, some as old as 1988. Since then there has been a significant increase in irrigation usage which has impacted on present day runoff. It is therefore necessary that the system yield be confirmed for planning purposes, by utilising the most up-to-date data.

- Irrigation use - the taking up of currently unexercised allocations by farmers would place further stress on the system and capping limits for irrigation have been introduced to the system model. However approximately 50% of the irrigation requirement in the Berg WMA, lies outside of the system (farmers own sources and run of river) and is more difficult to control. Future scenarios considered in the NWRS assume zero growth in irrigation requirement and do not take cognisance of currently unexercised water allocations. The legal status and extent of unexercised allocations, as well as their potential impacts on the yield balance will have to be investigated urgently.

- Reserve requirement - implementation of the Reserve would have a significant impact on the potential yields of existing and future schemes, however most estimates of the ecological component of the Reserve are provisional at this stage. It is important to do a comprehensive Reserve determination for the Berg WMA and develop an appropriate implementation strategy.

- Changes in land use – the ongoing reduction of forestry areas in the Berg WMA and the removal of invasive alien plants should result in increases in runoff which will in turn influence yields and the implementation programme of future supplementary schemes.

- Impact of WC/DM – the extent of water that may become "freed up" through WC/DM remains uncertain, particularly in the agricultural sector which is most vulnerable to the impacts of long hot summers and dry winters.

- Climate change - the effects of global warming could cause a possible 10% reduction in streamflow in the Western Cape by 2015. The actual effects of climatic change could have an influence on the implementation programme of future supplementary schemes.

Taking cognisance of the yield balance shown previously and the list of uncertainties above, it is imperative that a study to consider and develop revised reconciliation strategies for the WCWSS be undertaken as soon as possible. Thereafter the strategies should be updated at regular intervals.

20. RECONCILIATION INTERVENTIONS

Reconciliation interventions to be considered to meet the longer term growth in the water demand of the Berg WMA include:

- Increased re-use of treated effluent (only 10 to 12% of treated effluent discharged by the wastewater treatment works (WWTW) in the WMA is currently re-used).
- Water Conservation and Demand Management by local authorities and irrigators.
- Development of the groundwater resource, particularly that of the very deep confined Peninsula aquifer of the TMG. The TMG potential is currently being investigated by the CCT with the intention of developing a pilot wellfield.
- Aquifer Storage Recovery offers a zero evaporation storage option by injecting surplus surface water into an aquifer for subsequent abstraction.
- Re-allocation of water through progressive implementation of compulsory licensing, to meet the Reserve and/or equity requirements.
- Re-allocation of water through trading of existing water use authorisations.
- Improved management of the WCWSS, notably the releases from Voëlvlei Dam into Misverstand Weir.
- Clearing of invasive alien plants.
- Development of new surface water supply schemes.
- Desalination of sea water, although expensive, has unlimited potential.

With the possible exception of desalination the effect of the Reserve could be a major factor in the relative feasibility of supplementary schemes.

Early planning of future water schemes is essential to ensure an adequate supply to sustain the Berg WMA, the economic hub of the Western Cape, as it may take as long as ten years or more for schemes to be studied, approved and implemented. It is essential that all options should be

regularly reviewed or investigated in order to develop and update the most effective programme of implementation. The implementation of a Reconciliation Strategy for the Western Cape System is required so as to investigate current and future requirements and to evaluate the potential reconciliation interventions that could be implemented to meet those requirements.

21. THE EIGHT ISP SUB-AREAS

Chapter 3 presents an overview of the water resources management perspective of the Berg WMA, for each of the eight management units (sub-areas) used to identify issues and concerns that would require detailed strategies. These sub-areas are shown in Figure iv.

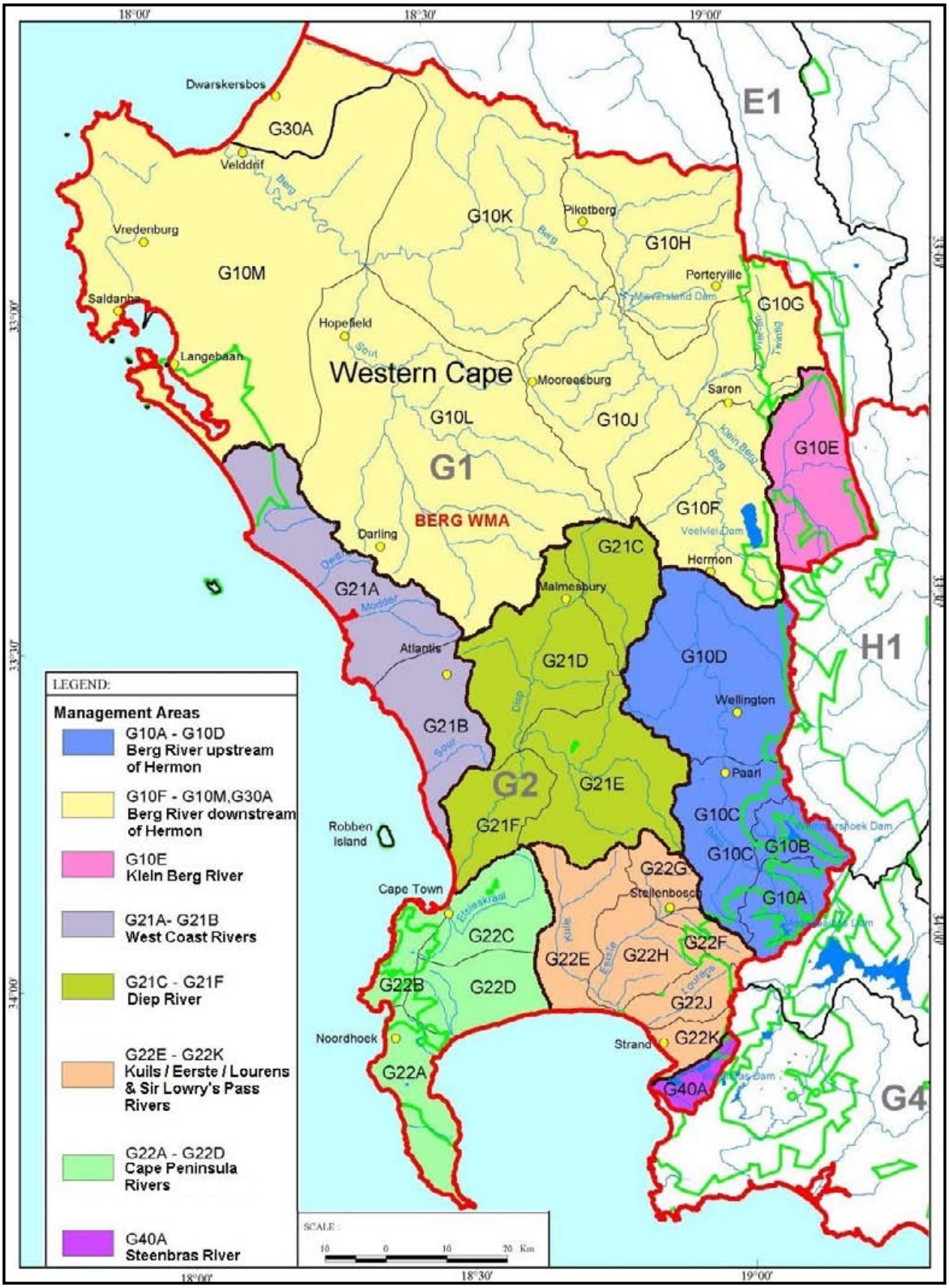

Figure iv – The Eight Management Units (sub-areas) of the Berg WMA

22. INTRODUCTION TO THE ISP STRATEGIES

The strategies contained in this document were developed to give effect to the NWA and the NWRS.

The ten broad strategy groups, referred to as **Main Strategies,** cover all currently identified water management activities of the DWAF RO and the requirements of the NWA and the NWRS. These are:

(i) Yield balance and reconciliation strategies address the need relating to the existing uncertainties and information gaps in the availability of surface water and groundwater, the possible reconciliation interventions (increased re-use of treated effluent, for example), the supply to local authorities and the potential for the development of the groundwater resource in the Berg WMA. This WMA is the economic hub of the Western Cape and as such reliable estimates of the available water resource are essential for future planning. There is therefore an urgent need to carry out an updated integrated water resource planning study in the Berg WMA. Four strategies were developed, namely:

- ⇨ Reliability of the Yield Balance
- ⇨ Reconciling Water Supply and Demand
- ⇨ Groundwater
- ⇨ Aquifer Storage Recovery and Artificial Aquifer Recharge

(ii) Water resource protection strategies address the need to achieve the protection of water resources to ensure their continuing availability for human use by leaving enough water of appropriate quality in rivers and streams to maintain their ecological functioning. This will be achieved by classification of freshwater bodies and determination of their human and environmental Reserves, setting resource quality objectives for freshwater bodies, addressing water quality management, pollution control, sanitation and solid waste management. The following four strategies were developed:

- ⇨ Reserve and Resource Quality Objectives
- ⇨ Siting of New Developments
- ⇨ Solid Waste Management
- ⇨ Water Quality

(iii) Water use management strategies address the objectives of equity of access to water, and sustainable and efficient use thereof. This will be achieved through conditions of water use imposed through authorisations. These will include general authorisations (GAs) to manage water use, verification of the legality of existing water use, processing and issuing of new water use authorisations, point source pollution control, changing land use and water pricing. It is important to note that in the absence of GAs for surface water abstraction in the Berg WMA, the administration and processing of many minor individual licence applications would be unnecessarily time consuming and costly.

Eight water use management strategies have been developed, namely:

- ⇨ Implementing Schedule 1
- ⇨ General Authorisations
- ⇨ Verification of Existing Lawful Use
- ⇨ Licensing
- ⇨ Pollution Control
- ⇨ Changing Land Use: Forestry
- ⇨ Changing Land Use: Clearing of Invasive Alien Plants
- ⇨ Water Pricing Strategy

(iv) Water conservation and demand management strategies are required as an alternative to further augmentation of water supply by developing physical infrastructure. Attention needs to be devoted to managing the demand for water, encouraging the efficient and effective use thereof, minimising loss or waste of water and creating a water conservation and demand management culture within all water management and water services institutions, and among water users. These strategies will address urban and agricultural conservation measures and water demand management as well as the potential increased use of treated effluent. The CCT has implemented a pilot project in which pressure reduction in urban supply networks has shown potential for significant savings. The following three strategies have been developed:

- ⇨ Water Conservation and Demand Management: Water Services
- ⇨ Agricultural Water Conservation and Demand Management
- ⇨ Effluent Re-use

(v) Integration and co-operative governance strategies address the establishment and nurturing of co-operative relationships with other South African Government Departments, local authorities and water service providers for co-operative data collection, information sharing, sharing of visions and plans, capacity building and support and co-operative making of joint decisions. The integrated manner in which the WCWSS is operated illustrates the important relationship between the CCT, DWAF and other stakeholders. This strategy further aims to alleviate poverty by addressing the inequities of the past relating to water, *inter alia* relating to resource poor farmers and by support rendered to water related land reform initiatives. Management of water resources must also take environmental legislation into account. Three strategies were developed, namely:

- ⇨ Support to Resource Poor Farmers
- ⇨ Co-operative Governance
- ⇨ Managing the Environment

(vi) Institutional development and support strategies address the fundamental transformation of water resources management and governance, to appropriate and representative regional and local institutions. Such institutions include any organisation or person who fulfils the functions of a water management institution. Water User Associations (WUAs) and the Berg CMA are such organisations. The current and potential future sources of supply to local authorities is described in detail in the:

- ⇨ Supply to Local Authorities Strategy

(vii) The **Social** strategy addresses various social aspects and mitigation of environmental and social impacts to ensure improved overall water management and decision-making, while complying with environmental legislation. It includes public participation issues such as education and capacity building, community awareness and public consultation and participation. It also addresses the implementation of employment equity and gender issues and communications relating to water.

(viii) Waterworks development and management strategies address the ongoing need to economically and safely manage the existing water resources infrastructure. They also address the need for integrated operation and planning of the existing WCWSS and its interface with the future Berg Water Project. Strategies for recreation relating to dams, rivers, lakes and estuaries, and for disaster management planning are addressed. The following seven strategies were developed:

- ⇨ Strategy for System Management and Reconciliation
- ⇨ The Theewaterskloof Tunnels
- ⇨ Implementing the Berg Water Project
- ⇨ Strategy for the Lower Berg
- ⇨ Operation During Extreme Drought
- ⇨ Recreation on Dams and Rivers
- ⇨ Public Health and Safety

(ix) Monitoring and information management strategies address the monitoring of, collection of and data capturing of water resource related information from surface freshwater bodies and groundwater. Resulting information will enable the introduction of water billing and will ensure compliance with water authorisation conditions and the control of all water users. Issues relating to information systems and information access and requirements are also addressed. Three strategies were developed, namely:

- ⇨ Abstraction Control
- ⇨ Monitoring Networks and Data Capture
- ⇨ Information Management

(x) Implementation strategies address the need for a consolidated approach within DWAF to the implementation and ongoing management of the ISP process. This will formalise the implementation, so that delegated responsibilities and a programme of implementation can be drawn up according to priorities set in the ISP. The ISP is a developing process and the document will be reviewed on a regular basis and strategies will be amended, updated or added so as to achieve the management objectives for the Berg WMA. One strategy was developed, namely:

⇨ ISP Implementation

Under each of these main strategy groups, the specific strategies particular to the Berg WMA have been identified and developed. Frameworks for 34 strategies have been developed. As additional strategies are identified through the implementation process (including feedback from stakeholders), this document will be updated by the Department.

For each strategy, the following aspects are addressed:

- ***Management objectives*** in terms of the envisaged solutions for the Strategy;
- ***Background information;*** stating the relevant issues, problems, uncertainties and gaps in information;
- ***Strategic Approach*** as to a correct management procedure or solution to a problem in terms of the DWAF's management perspective for the ISP-area;
- ***Actions required*** to implement the strategy and the responsible organisations or persons;
- ***Responsibility***. The responsible implementing authority and contact persons are named;
- ***Priority*** in terms of the ISP rating system (1 – 5, where 1 is of highest priority);
- ***Interfaces*** with related strategies and other WMAs and ISP management areas and the identification of other major role-players and their functions. Relevant reports and documents are listed.

BERG WATER MANAGEMENT AREA

INTERNAL STRATEGIC PERSPECTIVE

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LIST OF ABBREVIATIONS

AAR	Artificial Aquifer Recharge
ASR	Aquifer Storage Recovery
BWP	Berg Water Project
CAGE	Citrusdal Artesian Groundwater Exploration
CCT	City of Cape Town
CMA	Catchment Management Agency
CMS	Catchment Management Strategy
CNCB	Cape Nature Conservation Board
DEADP	Department of Environmental Affairs and Development Planning
DEAT	Department of Environmental Affairs and Tourism
DECAS	Department of Environment Affairs, Culture and Sport
DWAF	Department of Water Affairs and Forestry
GAs	General Authorisations
GDP	Gross Domestic Project
IAC	Irrigation Action Committee
IDP	Integrated Development Plan
IFR	Instream Flow Requirements
ISP	Internal Strategic Perspective
IWRM	Integrated Water Resource Management
ℓ/c/d	litres per capita per day
m^3/a	cubic metres per annum
m^3/s	cubic metres per second
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
mg/*l*	milligrams per litre
NWA	National Water Act
NWRS	National Water Resource Strategy
RO	Regional Office (DWAF, Western Cape Regional Office)
SFRA LAAC	Streamflow Reduction Activities Licence Assessment Advisory Committee
SUP	Sustainable Utilisable Potential
TCTA	Trans Caledon Tunnel Authority
TINWA	Team for Implementation of the National Water Act
TMG	Table Mountain Group
WCDM	West Coast District Municipality
WC/DM	Water Conservation and Demand Management
WCSA	Western Cape System Analysis
WCWSS	Western Cape Water Supply System
WfW	Working for Water
WMA	Water Management Area
WRPM	Water Resources Planning Model
WRSA	Water Resources Situation Assessment
WSA	Water Service Authorities
WSAM	Water Situation Assessment Model
WSDP	Water Services Development Plan
WSP	Water Service Provider
WTW	Water Treatment Works
WUA	Water User Association
WWTW	Wastewater Treatment Works
x 10^6 m^3/a	million cubic metres per annum