REPORT No: P WMA 19/000/00/0507
Volume 1 of 7

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

WESTERN CAPE WATER SUPPLY SYSTEM: RECONCILIATION STRATEGY STUDY

Reconciliation Strategy

FINAL

June 2007

CITY OF CAPE TOWN | ISIXEKO SASEKAPA | STAD KAAPSTAD

Submitted by:
Ninham Shand (Pty) Ltd in Association with
UWP Consulting (Pty) Ltd

NINHAM SHAND
CONSULTING SERVICES

UWP CONSULTING

DEPARTMENT OF WATER AFFAIRS AND FORESTRY

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Ninham Shand (Pty) Ltd
P O Box 1347
Cape Town
8000

Tel : 021 - 481 2400
Fax : 021 - 424 5588
e-mail : hydro@shands.co.za

UWP Consulting (Pty) Ltd
P O Box 9311
Centurion
0046

Tel : 012 - 664 9230
Fax : 012 - 664 7870

REPORT TITLE	:	Reconciliation Strategy
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AUTHORS	:	E. Van der Berg M. Killick A. Anderson
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Approved for the Study Team :

.....
NINHAM SHAND (PTY) LTD

.....
UWP CONSULTING (PTY) LTD

Approved for the Department of Water Affairs and Forestry :

.....
I THOMPSON
Study Manager

.....
J A VAN ROOYEN
Director : NWRP

WESTERN CAPE RECONCILIATION STRATEGY STUDY

VOLUME NUMBER	REPORT TITLE	
1	**Reconciliation Strategy**	✓
2	Determination of Future Water Requirements	
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THE WESTERN CAPE WATER SUPPLY SYSTEM RECONCILIATION STRATEGY

EXECUTIVE SUMMARY

Introduction to the strategy

The objective of the Reconciliation Strategy is to ensure reconciliation of future water requirement with the supply from the Western Cape Water Supply System (WCWSS). The Strategy will include regular review of future water requirement scenarios and reconciliation interventions to meet the water requirement, for the next 25 years. The specific objectives of the strategy are the following:

- Provide guidance on decisions to be made (at various levels of decision-making and at varying or increasing confidence levels, as more information becomes available) that will steer the course of actions and events necessary for effective reconciliation - to be able to continue along the appropriate implementation scenario;
- Ensure adequate public involvement and understanding of the strategy as well as how it will influence future decision making;
- Ensure that key stakeholders[1] reach consensus on the strategy, accept their own and others' individual roles and responsibilities, and are well informed about the protocols and processes for co-operative governance and strategy implementation;
- Put in place timeous preparatory measures and actions, and assign roles and responsibilities; and
- Monitor to obtain current data and information and update the strategy accordingly.

The strategy provides a decision support framework and tools, which will enable timely decisions on water resource interventions to meet the future water requirement. It will recommend a programme of studies, and other investigations considered necessary, to support the strategy. This will ensure that the necessary infrastructure or other interventions are timeously investigated to the appropriate level of detail. To facilitate this, a dynamic strategy, regularly reviewed and supported by monitoring, needs to be developed.

Strategy Themes

This Strategy details the strategic approaches to issues raised by water resource planners and includes an implementation plan to address strategic requirements. It addresses actions, programmes/ timing and responsibilities, as well as providing a decision-support tool. Nine broad strategy groups, called themes, which cover all current and future strategic activities, were identified and developed. These themes are the following:

- Water requirements;
- Water use efficiency;
- Water availability and system operation;
- Comparison of requirement and availability;
- Selection of interventions and decision-making process;
- Water resources protection and management;
- Stakeholder engagement;
- Monitoring and information management; and
- Strategy implementation and performance assessment.

The figure on the next page provides an overview of the strategy deliverables. A summary table of the strategy themes, showing theme objectives, sub-themes and key issues is included at the end of the executive summary.

[1] In this document, the term stakeholder refers to individuals, groups of individuals or organisations that have an interest, are affected by or can affect the outcome of an initiative. The approach to stakeholder engagement is discussed in more detail in Chapter 9.

The strategy was designed to facilitate input from stakeholders and the public. **Figure 1.3** outlines how the public was informed throughout the process. Three newsletters inviting feedback on the study were distributed to a mailing list of Interested and Affected Parties. In addition, four public meetings were held in different locations in the WCWSS. The Stakeholder Engagement Theme summarises how public involvement and co-operative governance should be integrated into the reconciliation process. The aim of stakeholder engagement is to enhance the quality of decision-making and operations through creating mutual understanding, a common vision and supportive actions amongst and between the stakeholders. Awareness raising and education on how to limit negative impacts on the system are a priority.

Overview of the Western Cape Water Supply System

The WCWSS provides water to the communities of Greater Cape Town, Stellenbosch, Paarl and Wellington, as well as to towns on the West Coast and in the Swartland region. Irrigators along the Berg and Eerste rivers and irrigators and urban users in the Riviersonderend catchment, in the Breede Water Management Area (WMA), also receive water from the system. The major water user from the WCWSS is the urban sector within the City of Cape Town (CCT).

The main storage dams supplying this system are Theewaterskloof, Voëlvlei, Wemmershoek and the Upper and Lower Steenbras Dams. The Berg Water Project (BWP) is currently under construction[2]. The water storage in the system is evaluated towards the end of the wet season (no later than November 1st), to assess whether or not supplies must be restricted for the following year, to ensure that sufficient water remains for the more essential uses, were a drought to occur. The dams are operated as an integrated system to minimise spillage and maximise storage during drought months.

Operational challenges include the need for close co-operation between the DWAF and CCT and with authorities such as Eskom, management of varying water quality, and the operation of the Riviersonderend–Berg River Tunnel system, that provides the means of transferring water from the Breede WMA into the Berg WMA.

System water balance perspective

The yield of all existing sources within the WCWSS is currently 475 million m^3/a. The BWP, which is due to come on line in 2007, will provide an additional 81 million m^3/a to the yield of the system, thus increasing the total system yield to 556 million m^3/a.

In 2000, following below average rainfall, water restrictions were introduced when the requirement exceeded the water availability (at the 98% level of assurance, corresponding to a one in 50-year chance of not meeting the full requirement). Following a severe drought the winters of 2003 and 2004, water restrictions were again introduced towards the end of 2004. During 2007, the BWP will increase the availability by about 81 million m^3/a and therefore water restrictions are not likely to be required during the following few years, under average runoff conditions.

[2] The Berg Water Project is comprised of two parts, the Berg River Dam and the Supplement Scheme. The dam will be constructed to a final gross storage capacity of 126,4 million m^3 and includes a pump station and pipeline to pump water into the nearby Riviersonderend tunnel system. The Supplement Scheme would abstract water, when available, that enters the Berg River from tributaries downstream of the dam and pump it back about 9 km for storage in the dam.

WCWSS Reconciliation Strategy deliverables

Executive summary

- Summary of strategy
- Summarised theme tables

Background and introduction

Theme Chapters

- Water requirements
- Water use efficiency
- Water availability and system operation
- Comparison of requirements and availability
- Selection of interventions and decision-making process
- Water resources protection and management
- Stakeholder engagement
- Monitoring and information management
- Implementation and performance monitoring

Each theme includes:

- Introduction to theme
- Key Issues
- Approach
- Actions per key issue
- Responsibility per action
- Programme/ timing per action

Supporting Reports

- Determination of future water requirements
- Scenario planning for reconciliation of supply and requirement (Appendix B: Workshop starter document)
- Additional investigations WC/WDM
- Reclamation of treated effluent for potable supplies
- Additional investigations regarding water re-use

Toolkits

- Water requirement model
- WCWSS Recon Planning Support Tool

If the water requirement grows as projected for the High Water Requirement Curve (as discussed in the Water Requirements Theme) then the total requirement will increase to an estimated 560 million m^3/a by 2011. The additional yield of 81 million m^3/a, provided by the BWP, will bring the total system yield to 556 million m^3/a. This yield will thus be fully utilised by 2011.

With the successful implementation of the WC/WDM interventions contained in the CCT draft WC/WDM strategy, the requirement for further interventions would be delayed until 2015. Without implementation of the WC/WDM interventions, 2011 is likely to be the next key milestone date for implementation of the next intervention, to reconcile requirement and supply. Strategies and approaches related to WC/WDM (including urban and agricultural water use efficiency, agricultural water use efficiency and the use of treated effluent) are further discussed in the Water Use Efficiency Theme.

System operation and management

Managing the risk of water supply failure is an important underlying objective of the Strategy. Obtaining optimum yields requires that the system being operated in such a way that the risk of overflows from the dams of the WCWSS are minimised. This necessitates close co-operation between the DWAF and the largest Water Services Provider, CCT, which adjusts its requirement from the various dams to minimise the likelihood of one dam spilling while there is storage available in another dam. Water quality in the WCWSS is very important in reconciling supply and requirement in the short, medium and long term. The DWAF and the CCT have to work together to ensure that the catchments surrounding the water resources are managed to protect and improve water quality, while at the same time ensuring that WWTWs can cope with adverse water quality. Strategies related to system operation and risk management are discussed in the Water Availability and System Operation Theme.

Monitoring is a requirement and key element of each theme within this strategy and forms an integral part of operating and managing the WCWSS. The Monitoring and Information Management Theme outlines an integrated approach for monitoring the different components of the system.

The Classification process will have an impact on system management. The outcome of the Classification process is a set of Management Classes for significant water resources, plus their Resource Quality Objectives (RQO) (including the ecological Reserve) and monitoring specifications and obligations, and these are binding on all authorities or institutions when exercising any power, or performing any duty under the National Water Act (NWA). A programme is required to phase in the water needs to meet the ecological Reserve requirements. This should include monitoring programmes that ensure that the objectives of the environmental releases are met and adapted if the releases are not effective. Strategies to give effect to these provisions are discussed in the Water Resources Protection and Management Theme.

Identification and selection of interventions for further consideration

The WCWSS Reconciliation Strategy Study will identify future water requirement scenarios that will be studied to reconcile supply with the requirement of the system over the next 25 years. In addition, it is possible that certain interventions that are selected for further study may be found to be unsuitable or may be delayed in the process of obtaining the required authorisations. It is therefore important that enough interventions are selected so as to ensure timely implementation of interventions to meet the future requirement.

The Strategy outlines two selection processes:

- **A study selection process:** To identify interventions requiring additional studies (at feasibility or pre-feasibility level). The selection is based on comparing intervention scenarios. The information obtained from the studies will inform the final selection process.
- **A final selection process:** This comprises a process to recommend the most suitable intervention for implementation. This process was not carried out during the scope of the current study but recommendations have been made on the approach to the process.

The steps in each of the processes are discussed in the Selection of Interventions and Decision-making Process Theme. It is likely that there will be a number of possible interventions which will need to be evaluated against the various criteria at regular intervals, so that the most advantageous interventions can be selected within the required timeframes. To support the selection processes, a planning support tool, called the WCWSS Reconciliation Planning Support Tool (RPST), was developed during the study. This tool should be utilised to assist in making decisions on how best to meet the future water requirement.

In selecting possible interventions for further study the following recommendations arose:

- In order to ensure the reconciliation of supply and requirement over the longer term, studies at an appropriate level (feasibility or pre-feasibility) should be initiated in 2007.
- The CCT's WC/WDM strategy and programme must be implemented in order to ensure that no shortage of supply exists prior to the implementation of the next intervention.
- A feasibility study is required to determine the long-term potential of WC/WDM.
- In order to ensure the reconciliation of supply and requirement over the longer term, studies are required for the supply interventions listed in the Table below.
- To ensure a comparative evaluation, all interventions, where very little data exists (specifically in terms of yield and cost), should be studied at reconnaissance level.
- The information supporting the RPST should be updated on a regular basis.
- An integrated effluent re-use policy is requited for the CCT. This would also include the conceptual design of various effluent re-use interventions.
- The integrity of the Voëlvlei pipeline should be assessed by the CCT, as the condition of this pipeline may impact on the viability of implementing specific interventions (e.g. Voëlvlei Augmentation, Michell's Pass Diversion).
- The CCT should proceed with the TMG Aquifer Feasibility Study and Pilot Project, as the TMG Aquifer has been identified as a potentially significant water source for future years.
- The CCT should proceed with the implementation of a pilot desalination plant is order to learn lessons for ultimate large scale desalination, understand the pre- and post-treatment processes, and obtain a better understanding of the actual operating and capital costs associated with desalination.
- Due to the potential impact of climate change, DWAF should initiate a pre-feasibility study on the potential impact of climate change on the reconciliation of supply requirement.

Implementation of the Strategy

In order to maintain the strategy, keep it relevant, and to adapt it in response to changing factors from the outside, regular revision and adequate financing is necessary. A number of institutions are involved in the planning and operation of the WCWSS. These institutions should take part in the strategy revisiting process, should be consulted and should take the responsibility to steer the strategy in the right direction.

There are currently two committees that have responsibility regarding advising and operating the WCWSS, These committee are:

- The Western Cape Water System Consultative Forum: This group of people usually meets once or twice a year to discuss the water situation of the system (by the end of winter) and to advise the DWAF's Regional Director on the need and level of curtailments for the following year. During droughts this groups meets more often.

- The operational committee for the WCWSS: This committee meets on an *ad hoc* basis regarding operational issues such as water transfers required to maximise water usages, tunnel shut down requirements, issues arising from metering, etc. The committee currently comprises of the owners and operators of the WCWSS.

It is recommended that a Strategy Committee be established with the following objectives:

1. To ensure that the strategy is relevant and updated,
2. To monitor and co-ordinate the implementation of the relevant actions identified in the strategy, and
3. To make recommendations on long-term planning activities required to ensure reconciliation of requirements and supply in the WCWSS area (i.e. recommending a feasibility study for a particular intervention to ensure timely implementation).

The mandate and scope of work for the Strategy Committee should be clearly defined, with the necessary memorandums of understanding in place from appropriate spheres of government. To ensure timely decisions, the mandate, scope of work and lines of reporting of the Committee should be drawn up. In light of the new activities emerging from the Strategy, the Strategy Committee would also be responsible for assisting to clarify the role of the operational committee for the WCWSS. To support the work of the Strategy Committee, an Administrative and Technical Support Group should be established. Activities and issues related to the implementation of the strategy are discussed in the Strategy Implementation and Performance Assessment Theme.

Summary of interventions recommended for further study

Interventions Selected for Additional Study	
CCT WC/WDM Strategy and Programme	Michell's Pass Diversion
WC/WDM Adjustment of water tariffs, metering and credit control	Newlands Aquifer
WC/WDM Eliminate auto flush urinals	Cape Flats Aquifer
WC/WDM Promotion of private boreholes and wells	DWAF West Coast Aquifer Recharge (Langebaan Road Aquifer)
WC/WDM Leakage detection and repair	Upper Wit River Diversion
WC/WDM Use of water-efficient fittings	Raising Steenbras Lower Dam
WC/WDM User education	Lourens River Diversion Scheme
Voëlvlei Phase 1	Treated effluent re-use
Upper Molenaars Diversion	

SUMMARY STRATEGY TABLES: Summarised sub-themes and key issues by theme

Water requirements

To address aspects relating to the bulk use of raw water, including estimation of future water use through the development of urban and agricultural water use scenarios, and the management of current and future allocations

Water requirement scenarios
a. Future urban requirement scenarios b. Future agricultural requirement scenarios

Water use efficiency

To address aspects relating to urban and agricultural water use efficiency including the identification of potential water saving measures, setting targets and objectives as well as interventions. The potable and non-potable use of treated wastewater is also addressed

Urban water use efficiency	Agricultural water use efficiency	Water re-use
a. Defining WC/WDM targets and objectives b. WC/WDM interventions for water use efficiency	a. Improving efficiency	a. Defining targets and objectives for water re-use b. Interventions for water re-use

Comparison of requirement and availability

To address the reconciliation of water requirement and availability in order to identify potential future shortfalls in supply

Determining the water balance
a. Determine the water balance

Water availability and system operation

To address the current annual water availability from the WCWSS as well as the requirement for optimal use of existing water resources and bulk infrastructure, Ecological Reserve-related operating rules and operational management

Water availability	Operational management
a. Quantification of water resource availability	a. System operation b. Operating rules as they pertain to the Resource Quality Objectives c. System maintenance d. Development of Early Warning Systems to minimise risk

Selection of interventions and decision-making process

The identification, evaluation and selection of interventions to reconcile supply with requirement, and the provision of information to support the decision-making process

Study Selection Process	Final Selection Process
a. Identifying interventions for consideration b. Selection of interventions for further study c. Undertake studies to support selection process	a. Selection process at feasibility level

Water resource protection and management

To ensure sustainable use from current and future water sources, reservation and preservation of future water source options, as well as monitoring needs

Water resource management systems and data	Sustainable utilisation	Monitoring
a. Determination of management classes for water resources and RQOs b. Ecological Reserve requirements	a. Sustainable use of the water resources b. Impacts of water quality on the WCWSS water resources	a. Water Resource Protection Monitoring

Monitoring and Information Management

To facilitate effective monitoring, data capturing processes and information and knowledge management to ensure sustainable water resource planning and management

WCWSS Regional Monitoring and Data Management	Information & Knowledge Management	Co-ordination of monitoring activities
a. Monitoring Framework & Programme b. Data management	a. Information management b. Knowledge management	a. Co-ordination of activities

Strategy Implementation and Performance Assessment

To address the establishment and financial responsibilities of the committee tasked with implementing the strategy as well as to address the performance monitoring, and revision processes for the strategy

Establishment of a Strategy Committee

Stakeholder engagement

To engage with stakeholders at various tiers of government and with water institutions, raising awareness of water-related issues and building capacity of officials, politicians, stakeholders and the public

Co-operative governance	Stakeholder awareness raising and capacity building	Legally required participation
a. Engaging with National Government and parastatals b. Engaging with provincial authorities c. Engaging with regional and local authorities d. Engaging with water institutions	a. Engaging with other Stakeholders	a. Legal processes

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- Scenario Planning for Reconciliation of Supply and Requirement
- Overview of Water Conservation and Demand Management in the City of Cape Town
- Treatment of Effluent to Potable Standards for Supply from the Faure Water Treatment Plant
- Overview of Water Re-use potential from Wastewater Treatment Plants
- Summary Report

ABBREVIATIONS AND ACRONYMS

AsgiSA	Accelerated and Shared Growth Initiative for SA
AIDS	Acquired immunity deficiency syndrome
BWP	Berg Water Project
CARA	Conservation of Agricultural Resources Act
CCAW	Co-ordinating Committee for Agricultural Water
CCT	City of Cape Town
CMA	Catchment Management Agency
CMC	Cape Metropolitan Council
CMS	Catchment Management Strategy
D:EA&DP	Department of Environmental Affairs and Development Planning
DEAT	National Department of Environmental Affairs and Tourism
DLA	Department of Land Affairs
DM	District Municipality
DOA	Department of Agriculture
DOH	Department of Housing
DWAF	National Department of Water Affairs and Forestry
EFR	Ecological flow requirement
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EPP	Emergency Preparedness Plans
EWR	Ecological Water Requirements
GA	General Authorisation
GIS	Geographical information system
IAP	Invasive Alien Plants
IB	Irrigation Board
IDP	Integrated Development Plan
IFR	Instream Flow Requirements
ISP	Internal Strategic Perspective
IWRM	Integrated Water Resource Management
IWRP	Integrated Water Resource Planning
LUPO	Land Use Planning Ordinance
MAR	Mean Annual Runoff
MEC	Member of the Executive Council
MIG	Municipal Infrastructure Grant
MinMEC	Meeting between national Minister and the nine provincial MECs
MOU	Memorandum of Understanding
NEMA	National Environmental Management Act
NGA	National Groundwater Archive
NHRA	National Heritage Resources Act
NPV	Net Present Value
NWA	National Water Act
NWRS	National Water Resource Strategy
RBRTS	Riviersonderend-Berg River Tunnel System
RDM	Resource directed measures
RED	Regional Energy Distributor
RO	Regional Office of DWAF
RPST	Reconciliation Planning Support Tool
RQO	Resource Quality Objectives
SALGA	South African Local Government Association
SMIF	Special Municipal Infrastructure Fund
TCTA	Trans Caledon Tunnel Authority
TMG	Table Mountain Group
TOR	Terms of Reference
TWK Dam	Theewaterskloof Dam
UAW	Unaccounted for Water

WAAS	Water Availability Assessment Study
WARMS	Water Use Authorisation and Registration Management System
WC/WDM	Water conservation and water demand management
WCRSS	Western Cape Reconciliation Strategy Study
WCWSS	Western Cape Water Supply System
WDM	Water Demand Management
WECLOGO	Western Cape Local Government Organisation
WfW	Working for Water
WMA	Water Management Area
WMP	Water Management Plan
WMS	Water Management System
WSA	Water Service Authorities
WSDP	Water Service Development Plan
WUA	Water User Association
WUE	Water Use Efficiency
WTW	Water Treatment Works
WWTW	Waste Water Treatment Works

THE WESTERN CAPE WATER SUPPLY SYSTEM RECONCILIATION STRATEGY

1 BACKGROUND AND INTRODUCTION

1.1 The need for a strategy

The rapidly growing water requirement of the Western Cape, driven by population growth and strong economic growth within all sectors, has necessitated the development of a strategy to be used as a decision-support framework, that will enable timely and informed decisions on interventions necessary to meet the future water requirement for the *Western Cape Water Supply System* (WCWSS, also hereafter referred to as "*the system*") until 2030. This will ensure that a programme of studies and other investigations, considered necessary to support the strategy are recommended timeously and that the necessary interventions are investigated to the appropriate level of detail.

The Department of Water Affairs and Forestry (the DWAF), as the custodian of the country's water resources, and the City of Cape Town (CCT) as the main water user, initiated a study for the compilation of a *Reconciliation Strategy for the Western Cape Water Supply System (WCWSS* - hereafter referred to as "*the strategy*") in early 2005. The strategy builds upon the *Western Cape System Analysis* study, completed between 1989 and 1995, and other more recent water resource planning studies, undertaken by DWAF and the CCT.

The process of developing the strategy is described in **Section 1.3.**

1.2 Vision and objectives of the strategy

1.2.1 Vision

Achieving reconciliation of water supply and requirement for the DWAF, CCT, local authorities and urban and agricultural water users in a water-scarce area. To supply water at adequate levels of assurance within the constraints of affordability and at appropriate levels of service to users, whilst ensuring protection of current and possible future resources, and the efficiency of the operation and management of the WCWSS, in an integrated and sustainable manner.

1.2.2 Objective

The objective of the strategy is to ensure reconciliation of future water requirements with the supply from the WCWSS. The strategy will promote regular review of future water requirement scenarios (covering a range of estimates) and the reconciliation interventions for meeting these requirements over the next 25 years. The strategy will:

- Provide a guide to allow decisions to be made (at various levels of decision-making and at varying or increasing confidence levels, as more information becomes available) that will steer the course of actions and events necessary for effective reconciliation;
- Ensure adequate public involvement and understanding of the strategy as well as how it will influence future decision making;
- Ensure that key stakeholders reach consensus on the strategy, accept their own and others' individual roles and responsibilities, and are well informed about the protocols and processes for co-operative governance and strategy implementation;
- Put in place timeous preparatory measures and actions, and assign roles and responsibilities; and
- Monitor to obtain current data and information and update the strategy accordingly.

1.2.3 The Study Area: Western Cape Water Supply System

The geographical area to which the strategy applies is shown in **Figure 1.1**. The current area supplied from the WCWSS is included, as well as potential sources of future supply and areas that may be affected by the interventions proposed in this strategy. The WCWSS serves more than 3 million people and provides water to the communities of CCT and certain Overberg, Boland, West Coast and Swartland towns, as well as irrigators along the Berg, Eerste

and Riviersonderend Rivers. Urban use within the CCT is the largest water use from the WCWSS.

The system consists of bulk infrastructure components, owned and operated mainly by the DWAF and CCT, as well as by Eskom. Existing storage dams and the newly constructed BWP form part of this integrated system. The DWAF's Regional Office and CCT co-operatively manage the WCWSS.

The total historical maximum unrestricted water use, measured to date, in the supply area of the WCWSS was 499 million m^3/a. The current water requirement is less than the historical maximum due to the recent imposition of water restrictions and the implementation of WC/WDM measures by the CCT and other water service authorities. The future water requirement is anticipated to grow at approximately 2% to 3% per annum. This growth rate can be reduced with the implementing of water demand management initiatives by the CCT and other water service authorities. The current yield from the WCWSS is 475 million m^3/a. The shortfall between requirement and available supply as a result of a drought in the winter of 2003 and 2004, necessitated the imposition of water restrictions. The Berg Water Project (BWP) is currently nearing completion and will be integrated into the system during 2007. This project will meet the growing water requirement until 2011, where after supply and demand interventions will be required to meet the future water requirements.

All previous water requirement scenario studies have identified economic growth and population growth as the main drivers of higher growth in water requirements. The main economic activities in the Berg and Breede Water Management Areas (WMAs) are irrigated agriculture, namely wine production, table grape and deciduous fruit exports, as well as tourism. Between 1999 and 2005 the average economic growth for the Western Cape varied between 4% and 5.2%. For the next three years it is predicted to be above 4%. If realised, this economic growth could potentially impose pressure on the development of water infrastructure.

Water is currently transferred from the Breede WMA to the Berg WMA. Further transfers will have to be evaluated in terms of the economic benefit to urban users in the Berg WMA, compared to that of the mainly agricultural users in the Breede WMA.

1.2.4 The main dams and infrastructure

The two main storage dams (Theewaterskloof and Voëlvlei dams) supplying the WCWSS are owned by the DWAF. The DWAF also owns the Palmiet Pumped Storage Scheme dams, while Eskom owns the penstocks and power station. CCT owns the Wemmershoek, Upper Steenbras and Lower Steenbras Dams. The BWP, which is presently under construction, will initially be owned by the Trans Caledon Tunnel Authority (TCTA) and will later be transferred to the DWAF.

The DWAF's Riviersonderend-Berg River Tunnel system conveys water from the catchment of the Riviersonderend River into the catchments of the Berg and Eerste Rivers, where some of the water is released for irrigation and the balance is conveyed by pipeline to CCT's water treatment works. Pipelines from the other dams and treatment works also convey water to the City.

The estimated replacement values of the bulk water supply and reticulation infrastructure, supplying some 310 million m^3/a to CCT and of the corresponding wastewater infrastructure are approximately R16.5 billion and R6.5 billion respectively, i.e. a total of about R23 billion. The cost of the BWP will be about R1.4 billion. High levels of expertise and skills are required to plan, manage and maintain these essential and valuable assets.

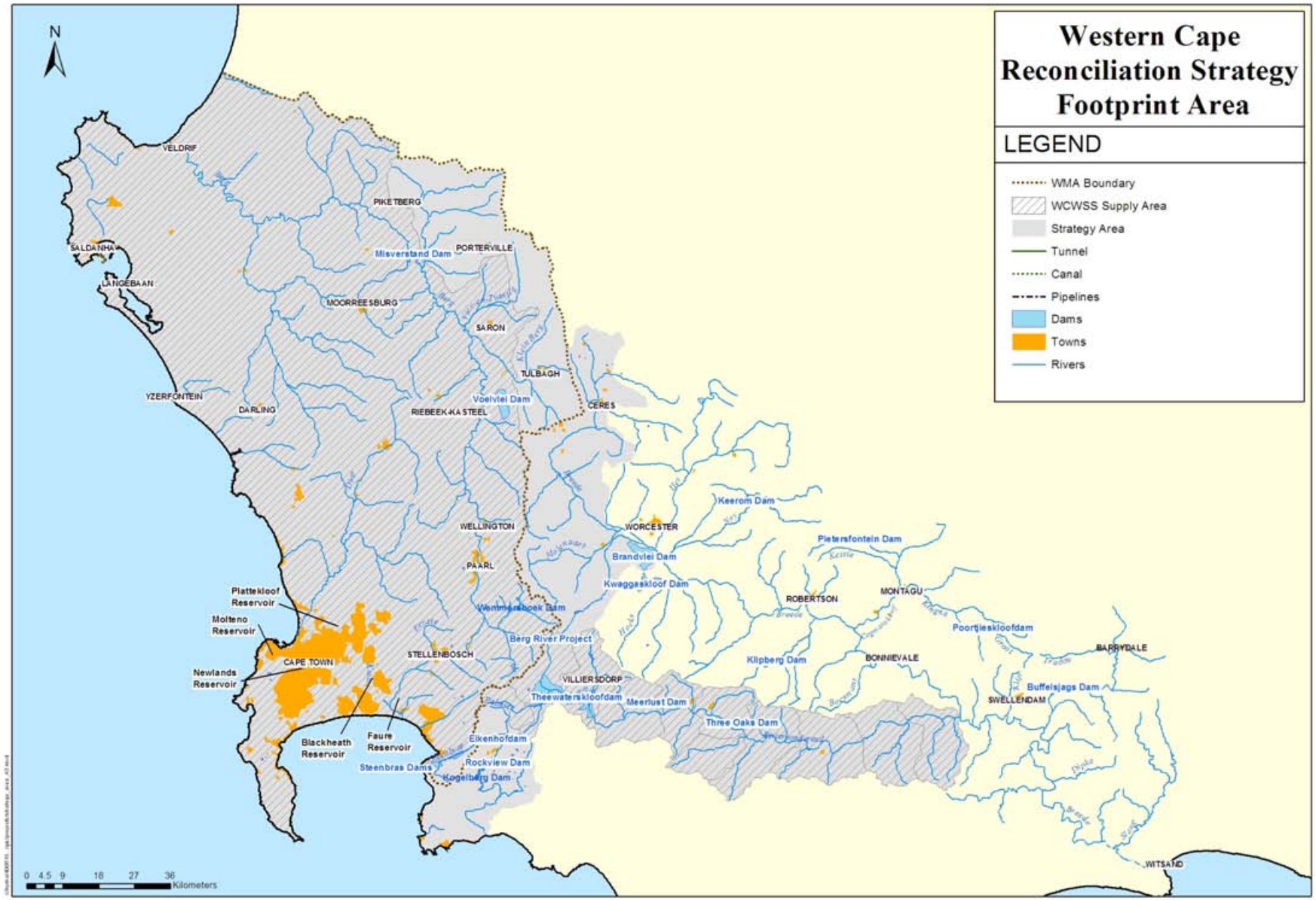

Figure 1.1 Geographical area covered by the strategy

1.2.5 Operation of the Western Cape Water Supply System

As the WCWSS is situated in a winter rainfall area, characterised by wet winters and dry summers, the dams are filled during the wet winter months, from May to October, when about 90% of the annual runoff occurs and the water requirement comprises only about 30% of the annual requirement. During the dry summer months, from November to April, inflows to the dams are small and irrigation and garden watering requirements in the urban areas are large. Approximately 50% of the dams' storage volumes are required for storage during the winter so that the high water requirement during the summer can be met. The remaining 50% of the dams' storage volume is required to provide long-term carry-over storage for periods of drought.

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 assessed with the DWAF's water resources system model and are managed by progressively restricting supplies. The Director General of the DWAF imposes these restrictions after consultation with all Water User Associations (WUA) and water service providers and authorities.

1.2.6 Risk Management

Managing risk (specifically the risk of water supply failure) is an inherent theme underlying the Strategy. Risk management aims to reduce the system's vulnerability to hazards and to increase the coping capacity of the system as much as possible within existing constraints.

The system components are subject to a number of potential risk factors. These relate to particular social, economic, physical and environmental vulnerabilities as well as those occasioned by natural hazards such as floods, droughts and seismic events. Failure in supply, arising from social and economic vulnerability could be a result of ageing infrastructure, poor maintenance, malfunctions, incorrect operation, electricity supply failure or poor (institutional) governance and co-operation. Pollution, natural mineralisation, eutrophication and poor water quality can also present a risk for urban users and irrigators and often arise because of environmental vulnerability to a particular threat. Risk can be increased or decreased, depending on decisions or actions. Risk management, with respect to the operation and maintenance of existing infrastructure and the development of early warning systems, is specifically addressed in the Water Availability and System Operation Theme, and **Appendix D** contains additional input on risk reduction and disaster management which is relevant to the entire strategy.

1.3 Development of the Strategy

1.3.1 Outcomes of the Strategy

The strategy will provide a decision-support framework to assist in making timely decisions (at various confidence levels, as more information becomes available) on water resource and WC/WDM interventions, to meet the future water requirement of the system during the following two decades. Different scenarios to meet the water requirement are presented. Based on these scenarios, a range of interventions are identified which require additional studies to facilitate the informed selection of future interventions. Alternative interventions which can offer flexibility in planning will also be identified, so that changes in the projected water requirement scenarios can be accommodated. **Figure 1.2** depicts the strategy components and deliverables.

Timely preparatory measures, assignment of roles and responsibilities and consequent actions are required to ensure implementation of appropriate interventions. The strategy is designed to respond to changes in water use patterns and to take into account variations in climate that could impact on water supply scenarios. In order to facilitate an adaptive approach regular review, supported by monitoring, is required.

WCWSS Reconciliation Strategy deliverables

Executive summary

- Summary of strategy
- Summarised theme tables

Background and introduction

Theme Chapters

- Water requirements
- Water use efficiency
- Water availability and system operation
- Comparison of requirements and availability
- Selection of interventions and decision-making process
- Water resources protection and management
- Stakeholder engagement
- Monitoring and information management
- Implementation and performance monitoring

Each theme includes:

- Introduction to theme
- Key Issues
- Approach
- Actions per key issue
- Responsibility per action
- Programme/ timing per action

Supporting Reports

- Determination of future water requirements
- Scenario planning for reconciliation of supply and requirement (Appendix A: Workshop starter document)
- Additional investigations WC/WDM
- Reclamation of treated effluent for potable supplies
- Additional investigations regarding water re-use

Toolkits

- Water requirement model
- WCWSS Recon Planning Support Tool

Figure 1.2 WCWSS Reconciliation strategy deliverables

Adequate public involvement is essential and key stakeholders must have an opportunity to reach consensus on broad responsibilities, and the need to accept individual responsibilities. The strategy has been designed to facilitate input from stakeholders and the public into the selection and screening of interventions, so that the DWAF and the CCT are able to make informed decisions on the management and development of the WCWSS. Co-operative governance is an important component underlying effective implementation. The strategy must therefore be well aligned with many regional and local initiatives, such as the Provincial Growth and Development Framework (further discussed in the Stakeholder Engagement Theme).

1.3.2 Development approach

In a water-scarce region, such as the Western Cape, with a potentially changing climate and increasing competition for scarce resources, water resources planning can no longer rely on past trends but must adopt a proactive, adaptive, long-term planning approach. The strategy is a move away from traditional water management approaches towards adaptive management. Adaptive management acknowledges that nature is in a continual state of flux and that our understanding of ecosystem functioning is not always complete, requiring a management approach that cannot depend on a perfect knowledge base. Adaptive management follows an iterative process utilising well-planned interventions that can respond to anticipated ecosystem responses and thus "learn-by-doing."

The strategy emphasises the importance of designing a process to support sustainable, integrated management, based on the most reliable information to date, rather than simply focusing on once-off selection of interventions to augment supply. The strategy will be a living document, to be continuously improved as estimates of water requirement, water availability and resource development options become better understood and are more reliably quantified.

1.3.3 Strategy development process

A stakeholder workshop to obtain buy-in and guidance on the strategy content, composition and format was held on 25 January 2006. After a series of working sessions by the Technical Focus Group (including officials from the DWAF, CCT, Western Cape Provincial Department of Agriculture and the consultant team), a draft strategy was developed in September 2006. Nine strategic themes, which encompass current and proposed future activities to address the various key issues, were identified and developed. **Table 1.1** lists the objectives for the nine themes. The themes are the following:

- Water requirements;
- Water use efficiency;
- Water availability and system operation;
- Comparison of requirement and availability;
- Selection of interventions and decision-making process;
- Water resources protection and management;
- Monitoring and information management;
- Stakeholder engagement; and
- Strategy implementation and performance assessment.

An early draft of this strategy was presented to the Project Steering Committee in early 2006. Comments and suggestions from the Steering Committee members were included in this version and proposed additional tools have been developed and included. Copies of the draft strategy were circulated to a wider group for review in September 2006. This included the DWAF, CCT, Steering Committee members and the Berg and Breede-Overberg CMA Reference Groups. Presentations of the draft strategy were also made to the Berg and Breede-Overberg CMA Reference Groups.

A *Technical Focus Group* participated in a series of workshops between August and October 2006. The objective of the workshops was to develop approaches to implementing the activities outlined in the *Draft Strategy*. The implementation tables in the Strategy list the actions, responsibilities and programme for addressing key issues in each theme. The Strategy represents the outcome of these workshops as well as revisions to the *Draft Strategy,* based on the feedback obtained from the Steering Committee and engagement with stakeholders.

Figure 1.3 outlines how the public was informed throughout the process of developing the strategy. Three newsletters inviting feedback on the study were distributed to a mailing list of Interested and Affected Parties (I&AP). Copies of the newsletters are included in **Appendix A.** In addition, four public meetings were held in different locations in the WCWSS. **Table 1.2** lists the dates and locations of the public meetings which were held.

Table 1.1 The strategy themes and objectives

Theme	Objective
Water requirements	To address aspects relating to the bulk use of raw water, including estimation of future water use through the development of urban and agricultural water use scenarios, and the management of current and future allocations
Water use efficiency	To address aspects relating to urban and agricultural water use efficiency, the identification of potential water saving measures, including the re-use of water, setting targets, objectives and interventions and monitoring the ongoing sustainability thereof
Water availability and system operation	To address the annual water availability from the WCWSS, as well as the requirement for optimal use of existing water resources and bulk infrastructure, ecological Reserve-related operating rules and operational management
Comparison of requirement and availability	To compare water requirement and availability in order to identify potential shortfalls in supply with the view to ongoing reconciliation
Selection of interventions and decision-making process	The identification, evaluation and selection of interventions to reconcile supply with requirement, and the provision of information to support the decision-making process
Water resource protection and management	To ensure sustainable use from current and future water sources, reservation and preservation of future water source options, as well as monitoring needs
Stakeholder engagement	To engage with stakeholders at various tiers of government and with water institutions, raising awareness of water-related issues and building capacity of officials, politicians, stakeholders and the public
Monitoring and Information management	To facilitate effective monitoring, data capturing processes and information and knowledge management to ensure sustainable water resource planning and management
Strategy implementation and performance assessment	To address the establishment and financial responsibilities of the committee tasked with implementing the strategy as well as to address the performance monitoring, and revision processes for the strategy

Table 1.2 Public Meetings

Public meeting no	Date	Venue
1	31 May 2005	Velddrif Town Hall
1	1 June 2005	Bellville Civic Centre
1	2 June 2005	Paarl Town Hall
2	24 November 2005	Durbanville Town Hall
3	19 July 2007	Durbanville Town Hall

1.3.4 Identification and selection of interventions for further consideration

Different interventions will be needed to reconcile increases in water requirements with supplies. These interventions could include WC/WDM, re-use of treated wastewater, eradication of invasive alien plants, trading of water use authorisations, sea water desalination, new groundwater and surface water resource development schemes and non-flow related interventions (e.g. rehabilitation of riparian edges). As the implementation of large supply projects can take up to ten years or more from feasibility study to completion, it is essential that potential future sources of supply be confirmed

as soon as possible. At a workshop held during August 2005, a widely representative stakeholder forum considered all known potential interventions to reconcile the future water requirement and supply for the WCWSS. The results of his workshop continue to inform key aspects of the study. The Selection of Interventions and Decision-making Process Theme outlines the selection processes and recommendations arising from this process. Further information on the selection process is documented in the **Strategy Report: Scenario Planning for Reconciliation of Supply and Requirement.**

1.3.5 Implementation of the strategy

There are currently two committees that have responsibility regarding advising and operating the WCWSS. These committees are:

- The Western Cape Water System Consultative Forum: This group of people usually meets once or twice a year to discuss the water situation of the system (by the end of winter) and to advise the DWAF's Regional Director on the need and level of curtailments for the following year. During droughts this groups meets more often.

- The operational committee for the WCWSS: This committee meets on an *ad hoc* basis regarding operational issues such as water transfers required to maximise water usages, tunnel shut-down requirements, issues arising from metering, etc. The committee currently comprises of the owners and operators of the WCWSS.

The following two committees were identified as having significant responsibilities for implementing different aspects of the strategy:

The *Operational Committee* is the existing committee described above and will continue with the existing functions.

The *Strategy Committee* is a new committee that will be established on approval of the strategy. The committee will be responsible for:

1. Ensuring that the strategy is relevant and updated,
2. Monitoring and co-ordinating the implementation of the relevant actions identified in the strategy, and
3. Making recommendations on long-term planning activities required to ensure reconciliation of supply and requirement in the WCWSS supply area (i.e. recommending a feasibility study for a particular intervention to ensure timely implementation).

It is foreseen that this Committee will only meet once or twice a year.

In light of the activities identified in this Strategy, the Strategy Committee will also assist in defining the roles of existing committees, such as the operational committee. To support the work of the *Strategy Committee*, an *Administrative and Technical Support Group* will be established. This group will monitor the strategy inputs more regularly.

In addition, the following institutions have been identified as having responsibility in implementing the strategy:

- Local Authorities,
- CCT,
- DWAF RO,
- DWAF National,
- Provincial Dept of Agricultural and
- WUAs

Further detail on the implementation and performance assessment of the strategy is discussed in the Strategy Implementation and Performance Assessment Theme.

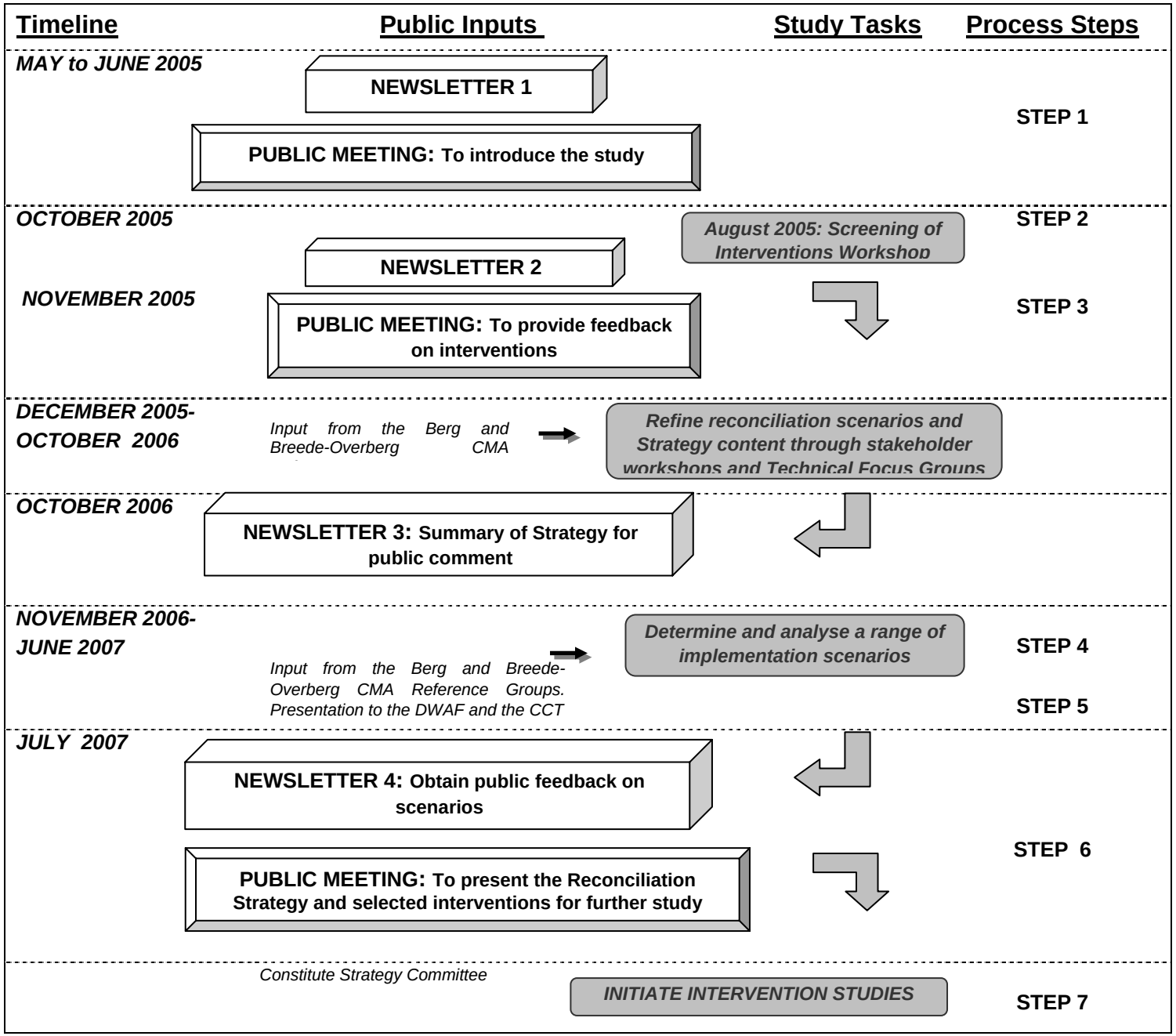

Figure 1.3 Summary of how the public was informed throughout the process of developing the strategy

2. WATER REQUIREMENTS

Objective
To address aspects relating to the bulk use of raw water, including estimation of future water use through the development of urban and agricultural water use scenarios, and the management of current and future allocations

2.1 Introduction

Current water requirement

The highest recorded unrestricted water use of users within the WCWSS area to date is 499 million m^3/a. The total unrestricted water use from the WCWSS in the 2005/06 year was estimated to be 465 million m^3/a. The largest proportion of water (63% in 2004) is supplied to urban users (domestic and industrial) within the CCT. A much smaller proportion of water (5% in 2004) is supplied to the towns of Stellenbosch, Paarl and Wellington, as well as to towns on the West Coast and in the Swartland region. Some urban users in the Riviersonderend catchment, in the Breede WMA, also receive water from the system, as well as rural users for stock watering and domestic use.

The sectoral water use pattern for 2006 was as follows:

Urban:	310 million m^3/a *(67% of the total)*
Irrigation estimated :	154 million m^3/a *(33% of the total)*
TOTAL	**465 million m^3/a**

In 2006, approximately 33% of the total volume of water supplied by the WCWSS was used by irrigators along the Berg and Eerste Rivers and along the Riviersonderend in the Breede WMA.

2.2 Historical water use

Historical water use by the CCT is marked by stepped declines between 1976 and 1977 and again between 1995 and 1996. **Table 2.1** shows the three distinct periods of water requirement growth rates, characterised by a similar slope.

Table 2.1 Three distinct periods of water requirement growth rates

Period	*Water requirement growth rate (%)*
1972 – 1976	5.9
1977 – 1990	4.4
1991 – 2000	2.9 – 3.9

In the year 2000, the water requirement from the system totalled 499 million m^3/a. Due to below average winter rainfall, shortfalls were experienced and restrictions were introduced. The 2000 restrictions resulted in a reduction in water use, followed by a progressive return to the relatively higher water usage levels by 2004 (476 million m^3/a), when a severe drought was experienced and restrictions were again imposed. In 2006, the total water use from the system reduced to 465 million m^3/a as a result of the measures introduced during restrictions.

Historically, the annual water requirement has generally increased consistently over time, with the exception of the restriction periods experienced post 2000. The historical water requirement is shown in **Figure 2.1.**

The Reconciliation Strategy addresses how to build on the success of water demand management measures introduced during restrictions and prevent the recurrence of water wastages or inefficient water use by some sectors of the population that often reoccur once restrictions are lifted.

Current allocations in the WCWSS

Current allocations to the agricultural sector are not fully utilised at present. This is in part because the high-value crops, such as deciduous fruit trees and vines, require a high level of assurance of water supply in order to produce the quality and size of fruit the export market dictates. Many irrigators have not developed their water use to their full irrigation allocations every year, as current agreements allow them, but rather manage their water to obtain the same higher assurance of supply as urban users during drought years.

The agricultural sector can if they wish continue to "grow" until they reach their "capped allocation". During compulsory licensing, the DWAF will licence the agricultural sector based, on their historic maximum water use up to that point in time (provided the agricultural usage did not exceeded the capped allocation).

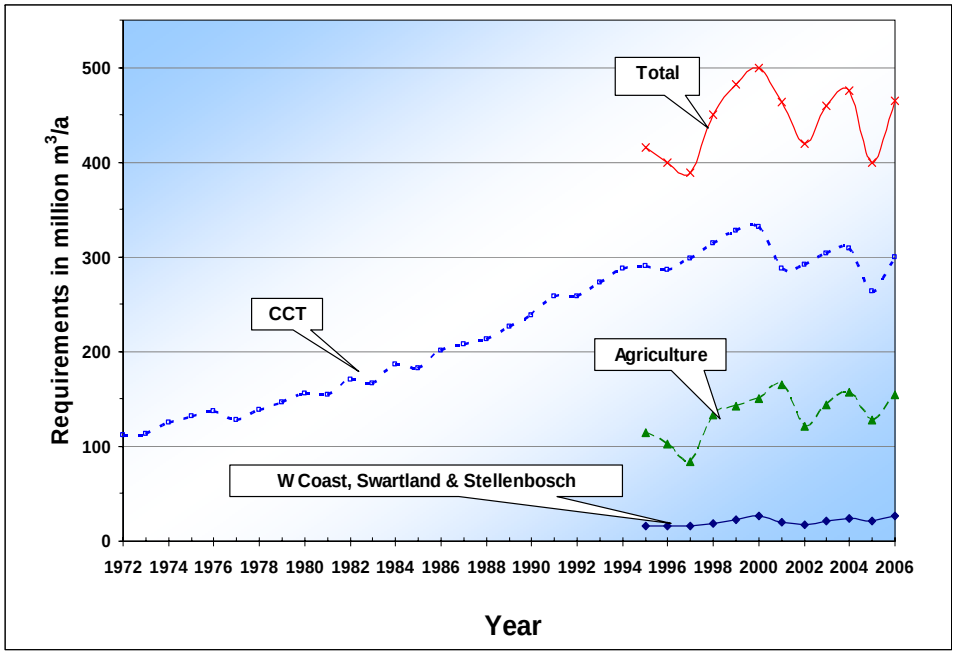

Figure 2.1 Historical water use (Data for Agriculture, W Coast, Swartland and Stellenbosch not available before 1996)

The agreement between DWAF and CCT (see **Appendix B**), states that "*upon compulsory licensing, the responsible authority shall take into account CCT's temporary allocation as an existing lawful water use and the investment already made by the City in respect of such water use, including the development of infrastructure and payment of water resource development costs.*" CCT has a fixed allocation of 90 million m^3/a from Theewaterskloof Dam. According to the agreement, CCT was also granted an additional temporary allocation by the DWAF, in 1989, based on the portion of the agricultural sector allocation, which was not being utilised, until such time as agriculture utilises the portion.

The uptake of current allocations for irrigation use is difficult to predict, as approximately 50% of the irrigation water requirement in the Berg WMA lies outside of the WCWSS (farmers' own sources and run-of-river abstractions), is weather dependent and is not easily predictable and manageable. This is not only a disadvantage, but also serves as an advantage for the other users, as surplus water is retained in the storage dams and is then available the following year.

2.3 Water requirement forecast models

Previous water requirement models

During 2004/2005, the CCT updated their estimated future urban water requirement from the system until 2015. This study was called "*City of Cape Town: Review of the Long-Term Urban Water Demand*" and made use of population projections until 2015. The model developed during that study was based on several parameters with the primary inputs being population growth and economic growth. Updated future water requirement scenarios have been developed as part of the WCWSS Reconciliation Strategy Study using an updated water requirement forecast model. A summary of how this model was used and outputs produced are provided below. For additional information see the Strategy Report entitled **Determination of future water requirements**.

Updated water requirement model

Based on the historic trends in terms of water demand, population and economic growth rates, an MS-Excel-based forecasting methodology was developed. The model was developed to estimate growth in bulk water requirement for the CCT as this is where the main growth is anticipated. Although outside of the Greater Cape Town area, the CCT supplies bulk water to Drakenstein and Stellenbosch Municipalities. The model includes a percentage increase in bulk water supplies to these municipalities.

The growth in agricultural water use is assumed to be the same for all water requirement scenarios and is therefore not included in the forecast model. The future irrigation requirement has been assumed to grow at a constant rate of 2% per annum up to the capping limit, which is defined by the current allocations.

The water requirement scenarios are dictated by the following assumptions:

1. Forecasted economic growth rates
2. Forecasted population growth rates
3. The base year (start date for forecasting)

1. Forecasted Economic growth rates

For the period 1998 to 2003, the economic growth rates for the Greater Cape Town Area followed a trend similar to the National average. In 2003, the Greater Cape Town Area showed a marked increase of 5.22% in the regional equivalent of the National Gross Domestic Product. This was followed by a decrease in the subsequent year to 4.01% (lower than the Western Cape and National GDP).

For the City of Cape Town, economic growth between 1990 and 2000 averaged at 2.6% per annum. Since 2000, the economic performance of Cape Town has been weak relative to other metropolitan areas. The performance prior to 2000 was higher than the National average due to the structure of the national economy (low national growth, a declining Rand and a big post democracy increase in tourism and agricultural exports). According to the City of Cape Town's Integrated Development Plan (IDP), the economic performance of Cape Town over the past decade has been 'totally inadequate to address the challenges of poverty".

Based on historical trends and future potential, Cape Town's economic growth rate between 2000 and 2010 is projected to average between 4.0% and 4.5% per annum. There is also a drive to reach a sustainable growth rate of 6% as proposed by AsgiSA. The CCT has subscribed to meet this target.

The economic growth of the Western Cape is attributed to the strong growth in the service industry (particularly the financial services industry), the demand for resources by the Indian and Chinese economies and the overall improvement in the national economy.

In accordance with the Institute of Futures Research (IFR), a low economic growth rate of 4% was used in the model. A high economic growth rate of 4.5% will be used for the period 2006 to 2010 and the AsgiSA 6% will be used for the remainder of the period.

2. Population growth rates

Two forecasting studies on population growth rates, IFR (2003) and Dorrington (2005) have been completed for the CCT. The two forecasts differ in that the IFR study has migration as implicit and the Dorrington forecasts have HIV/AIDS as implicit. The IFR proposes a high scenario, based on no HIV/AIDS and a low scenario, which includes HIV/AIDS. Dorrington provides a low, middle and high scenario based on migration patterns.

The Dorrington (2005) projection has HIV/AIDS as implicit and has a high, middle and low scenario based on different migration patterns:

- The high scenario assumes that migration continues at the present rate,
- The middle scenario assumes that migration reaches an equilibrium, and
- The low scenario assumes that the migration pool from the Eastern Cape decreases significantly.

A copy of the full report produced by Dorrington (2005) is included as an Appendix to the Strategy Report entitled **Determination of future water requirements.**

Dorrington's (2005) high and low growth scenarios have been used for the forecasting scenarios. The Dorrington (2005) population projections are also the population projections that have been officially adopted by the City of Cape Town. The population growth rates in **Table 2.2** were used to determine the water requirement scenarios.

Table 2.2 Population growth rates used to determine the water requirement scenarios

	Low (%)			*High (%)*		
Range	2006-2011	2011-2016	2016-2021	2006-2011	2011-2016	2016-2021
Dorrington (2005)	0.16	0.36	0.70	1.12	1.38	1.74

The population growth for Stellenbosch and Drakenstein Municipalities is projected to continue to grow in spite of declining fertility rates and increasing mortality rates as a result of HIV/AIDS. The projected population increase of 37% to 690 000 by 2021 is primarily as a result of continued in-migration.

Based on population projections, the following conclusions can be made regarding the water requirement in the WCWSS:

- The total number of households in the five municipalities is projected to increase from 129 654 in 2001 to 193 048 - an increase of 49%. This will increase the requirement for potable water in the region.
- By 2021, the population of the City of Cape Town is projected to increase by 44%, while the number of households is expected to increase by 56% (Dorrington, 2005). This will have significant impacts on the availability of, and requirement for, potable water.
- However, because of the demographic impact of the HIV/AIDS epidemic (i.e. increasing mortality rates and declining life expectancies at birth) and declining fertility rates (as a result of urbanisation, higher educational attainment levels, improving living standards and increased use of contraceptives), the growth of the population of the CCT and the number of households is projected to be significantly smaller than in the absence of the AIDS epidemic.
- Although the Western Cape still has the lowest HIV prevalence rates in the country, the rates will increase significantly during the next decade, resulting in rising mortality rates and increasing numbers of AIDS-sick people in need of medical care and hospitalisation, which could increase the demand for water.

3. Base year

From the historic data presented in **Section 2.2** above there was some debate regarding the most appropriate year from which the forecasting should commence but it was decided that:

- 2003 will be used as the base year for the high water requirement scenario.
- 2006 will be used as the base year for the low water requirement scenario.

2.4 Methodology on which the model is based

Using the agreed base year, population and economic growth rates outlined above, water requirement scenarios were developed using the following methodology.

Residential water requirement

The prediction of the future water requirement was based on the number of water connections and the average water requirement per connection. The water connections were derived from the household census data and the average water requirement from historic water use data. The future water requirement of residential users was determined by initially escalating the number of connections (taking into consideration household growth due to new connections and changes in requirement of existing users based on population growth). The projected number of water users was then multiplied by the per-household consumption to give the projected water demand. This water requirement was then escalated/ deflated by taking into account price elasticity and changes in tariffs. The total future water requirement by residential users was provided as an output.

Non-residential water requirement

In the non-residential element of the model the following users are accounted for:

- Commercial;
- Schools and sport's institutions;
- Tourism;
- Residential institutions;
- Heavy industry;
- Government and municipality;
- Agricultural; and
- Small users.

The future prediction for non-residential water requirement was determined by escalating the present water usage by either the economic growth rate or the population growth rate. Usage by schools, sport's institutions and residential institutions were escalated by the population growth rate. All other users were escalated by the economic growth rate.

2.5 Water requirement output

Two future water requirement scenarios were developed using the model. The outputs are graphically presented in **Figure 2.3**. These future water requirement scenarios exclude the potential impact of implementing WC/WDM interventions

The graph illustrates that the range between the high and low water demand scenario is pronounced. The average growth in water demand for the high scenario is 3.09%, while the low scenario is 1.43%. The average of the two scenarios is approximately 2.26%. A comparison of the average growth in water demand with the population and economic growth rates is provided in **Table 2.3**. For illustrative purposes, **Figure 2.2** shows CCT's low water requirement. This is CCT's commitment to DWAF in accordance with the 2001 WDM strategy (the curve therefore includes WDM interventions).

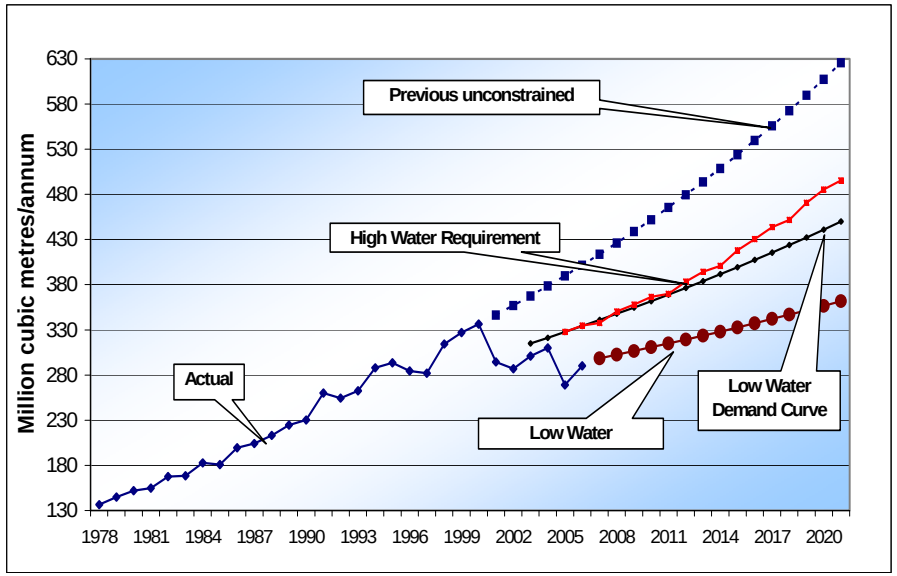

Figure 2.2 Actual and forecast bulk water requirement for the CCT

Table 2.3 Comparison of the average growth in water demand with the population and economic growth rates

Growth Scenario	*Average growth in water demand (%)*	*Population growth rate (%)*			*Economic growth rate (%)*	
	2006 - 2030	2006-2011	2011-2016	2016-2030	2006-2010	2010-2030
High	3.09	1.12	1.38	1.74	4.5	6
Low	1.43	0.16	0.36	0.70	4	4

2.6 Future Water Requirement in the WCWSS

The future water requirement projections which were determined in the forecast model, applied only to bulk water supplied by the City of Cape Town. For purposes of reconciling the supply and requirement for the whole of the WCWSS, the following assumptions were made with regard to the other users of water from the WCWSS:

- The future irrigation requirement has been assumed to grow at a constant rate of 2% per annum up to the capping limit, which is defined by the current allocations. The actual growth in the requirement will however mainly depend on the Rand exchange rate and international markets.
- The forecast growth rate in the urban water requirement for the West Coast and Swartland towns is 6% per annum.

Figure 2.3 shows the high and low water requirement scenarios for the whole of the WCWSS.

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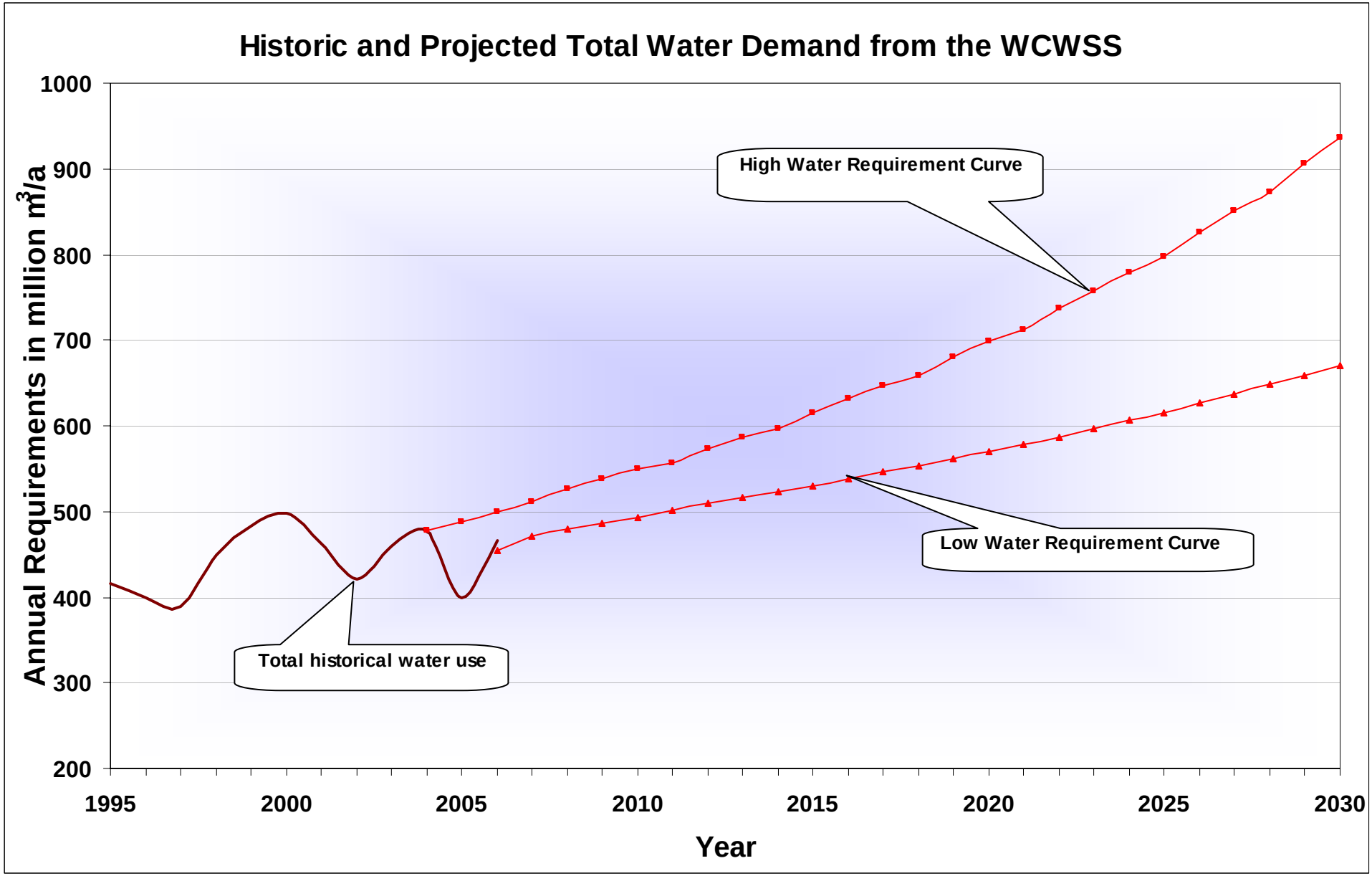

Figure 2.3 Projected high and low future water requirement scenarios for the whole WCWSS update without showing supply

2.7 Implementation Table

The strategic approach to implementing the actions required under the "Water Requirement" theme are outlined in **Table 2.4.**

Table 2.4 WATER REQUIREMENTS: Summary of key issues, approaches, actions, responsibilities and programme

Key issue	Approach	Action	Responsibility	Programme/priority
a. Future urban requirement scenarios ***Objective:*** To determine the current and range of future water requirements for planning purposes for all urban uses	i) Obtain the best information to support, review, monitor and determine when it is appropriate to update scenarios (use indicators including information from the WSDPs) ii) Ongoing improvement of methodologies to determine requirements iii) Plan for the stated water use service levels outlined in accepted WSDPs iv) Determine appropriate levels of supply and risk for different sectors and their respective users (Link to Stakeholder Engagement Theme)	Keep records of monthly water use by sector (including stand-alone industries)	Local Authorities	At least monthly
		A summary of monthly water use should be communicated to the Strategy Committee (Link to Water Availability and System Operation Theme)	DWAF RO	Annually
		Ensure that there is an appropriate population projection, number of households and economic growth (based on updated census data or other factors) for metro system area.	CCT	At least 5 year cycle (in accordance with census data or as required)
		Ensure that there are appropriate population projections, number of households and economic growth (based on updated census data and other factors) for non-metro system area	Local Authorities	At least 5 year cycle (in accordance with census data or as required)
		Summary of integrated population projection, number of households and economic growth communicated to the Administrative and Technical Support Group	DWAF RO	At least 5 year cycle (in accordance with census data or as required)
		Define and update monitoring indicators and thresholds of acceptable change so as to prompt timely review of projections	Administrative and Technical Support Group	As requested by the Administrative and Technical Support Group

Key issue	Approach	Action	Responsibility	Programme/priority
		Update the model methodology and parameters (including sectoral breakdown) of the future water use requirements tool	Administrative and Technical Support Group	As requested by the Administrative and Technical Support Group
		Summary of the information from WSDPs that affects the cumulative future water requirement of other towns in the system to be submitted to the Administrative and Technical Support Group	DWAF RO (Berg and Breede WMA managers)	Annually
		Discuss implications of altering assurance of supply with different sectors (Link to Comparison of Requirement and Availability Theme)	Administrative and Technical Support Group	Annually
		Water requirement scenarios to be updated	Administrative and Technical Support Group	As required
b. Future Agricultural requirement scenarios ***Objective:*** To determine the current and range of future water requirements for planning purposes for all agricultural uses from the WCWSS	i) Promote better understanding of water use by the agricultural sector through • Promote metering (surface and groundwater) by all users to understand uptake, conjunctive use and patterns of abstraction (Link to Water Resource Protection and Management Theme) • Ensuring an understanding of the impacts of climate change • Ensuring an understanding of the rate of growth in use (uptake) and controlling factors - up to full allocation; • Management of assurance of supply from	Engage with WUAs/IBs to promote benefits and create incentives for metering and disincentives for non-metering	Provincial Department of Agricultural	Ongoing
		Communicate climate change research priorities to WRC and other research institutions	Administrative and Technical Support Group	As necessary
		Review and update requirement scenarios based on the findings of WAAS study (climate change impact sub study of Berg River)	Administrative and Technical Support Group	On completion of Berg WAAS study

Key issue	Approach	Action	Responsibility	Programme/priority
	system dams vs. supply from farm dams; • Track the extent of water trading out of the agricultural sector; • Regular review of previous assumptions and updating of scenarios.	Summary of new licensing approvals (including trading within and between sectors) to be submitted to the Administrative and Technical Support Group	DWAF RO	Every 6 months
		Get agreement on implications of altering assurance of supply with different sectors	Strategy Committee and Administrative and Technical Support Group	Annually
		Understand how water allocated to the agricultural sector is used (use during drought years) and how these coincide to relevant assurances of supply (such as existing agreements e.g. Berg River Dam agreement)	Administrative and Technical Support Group	On approval of the strategy and annually
		Verification of actual use and planned utilisation of unused allocations where needed should be undertaken to understand existing and future agricultural use better (for Berg WMA and Riviersonderend catchment)	DWAF:RO	As required
		Need to have improved river release monitoring, specifically on the Berg and Riviersonderend area (Link to Water Availability and System Operation Theme)	WUAs	Ongoing
		Water requirement scenarios to be updated	Administrative and Technical Support Group	As required

2.8 Recommendations

Agricultural users will be allowed to increase their use up to their capped allocations, while water trading for beneficial uses will be supported and encouraged.

The importance of realistic forecasting of future water requirements cannot be overemphasised. It is recommended that the estimates of future water requirements for the high water requirement curve, as shown in **Figure 2.3,** be used for planning purposes. Monitoring, comparing and continually refining the methods of projecting future requirements is an integral part of implementing the Strategy.

2.9 Responsibilities

The responsibility for estimating future water use lies with the authority responsible for providing water to each sector. The overall responsibility lies with the DWAF. However, the CCT and other water service authorities have the responsibility for determining their future water uses, and the Provincial Department of Agriculture has the responsibility to interpret the real water needs for that sector, based on sound national, social and economic objectives and optimised irrigation practices.

3. WATER USE EFFICIENCY

Objective

To address aspects relating to urban and agricultural water use efficiency, the identification of potential water saving measures, including the re-use of water, setting targets, objectives and interventions and monitoring the ongoing sustainability thereof

3.1 Introduction

Water is a scarce resource in the WCWSS area and it is therefore essential to use it efficiently to ensure sustainable availability and supply into the future. The National Water Act (1998) and the Water Services Act (1997) emphasise the importance of WC/WDM in support of environmental sustainability, social-economic equity and water use efficiency. To ensure that all water institutions reflect this commitment, the DWAF has developed a *National Water Conservation and Demand Management Strategy*, supported by three sectoral strategies for i) agriculture, ii) water services, and iii) industry, mines and power generation.

The development of a water demand management strategy is also a key requirement of the WSDP, which is required under the Water Services Act.

Definitions

Water Conservation (WC) focuses on the protection and efficient use of water resources. *Water Demand Management (WDM), as a component of WC,* focuses on achieving the most beneficial and efficient solution to water services from various perspectives, including social and financial.

Water wastage refers to distribution losses (leakages) and user wastage (e.g. leaks within users' properties and taps left open), whilst *inefficient water use* is water that could by saved through the use of efficient technologies and practices that align with sector benchmarks and best available practices. Examples include retrofitting of plumbing fittings and pressure management. Currently, the unit water use in the domestic, industrial and agricultural water user sectors is often higher than the accepted international norms for such uses.

As both WDM and WC require a fundamental shift in users' perception of the value of water, these initiatives require a clear understanding of the needs and patterns of use of the various users and therefore, user education and participation will play a fundamental and continuous role in implementing these initiatives.

Financial benefits of WC/WDM

The CCT's WC/WDM Strategy estimates that effective implementation of WC/WDM measures could postpone further water augmentation interventions by as much as ten years. Based on estimates contained in the strategy, the potential benefit of WC/WDM could therefore defer bulk capital costs over the next ten years.

3.2 Existing WC/WDM initiatives implemented by the CCT

Policy and Strategy Development

In 1999, the CCT initiated the Integrated Water Resources Management Study, the outcome of which clearly indicated that WC/WDM interventions are the most feasible for reconciling requirement and supply. In 2001, CCT developed a WC/WDM Policy and Implementation Strategy. Institutional restructuring and other competing priorities between 2002 and 2004 impacted on the implementation of WC/WDM initiatives. However, in 2004 a 10-point strategy, including both output and input goals, was developed in partnership with the DWAF, to augment the original 2001 strategy. It was intended that this comprehensive WC/WDM strategy, including an eight-year budget, be developed for implementation from 2005. However, the 2004/05 drought delayed completion of the strategy, with the focus being shifted to drought mitigation measures. As a result, the strategy is currently being reviewed and should be approved by council in 2007.

Successful WC/WDM projects

The following successful WC/WDM projects have been implemented by CCT's Water Demand Management Branch:

- **Pressure management projects:** Two pressure management projects were completed in the last financial year, which reduced excess pressure in a supply zone, thereby reducing losses through leaks. These pressure management projects were implemented in Mfuleni (a saving of 36 Ml/month) and Gugulethu (a saving of 48 Ml/month).

- **Leak repair projects:** The Mfuleni Integrated Leaks Project was undertaken and an initiative entitled Fixit Leaks Programme was initiated.
- **Effluent re-use:** A major extension of the Potsdam Treated Effluent Re-use scheme was completed which included a new intake chamber, two new pump stations, a filtration plant, 4 km of pipeline and a 40 Ml storage reservoir. This scheme is able to re-use 17 Ml/day of treated effluent, saving on the same amount of potable water use.
- **Community Awareness projects:** The awareness and education campaign 'Hlonipha Amanzi' is primarily run in informal Settlements. The aim is to ensure that households, on fully serviced plots, are aware of the benefits of increased water use efficiency. This is a proactive way of promoting reducing water wastage.

For more detail regarding programmes and initiatives implemented by the CCT refer to the Strategy Report entitled **Additional WC/WDM investigations**.

Impact of WC/WDM initiatives

In 2003/04 the average annual daily demand (AADD) for water in the City of Cape Town was 850 Ml/day. When severe level 2 water restrictions (20% water restrictions) were introduced in 2004/05, the AADD dropped to 737 Ml/day. In 2005/06 the water restrictions were partially relaxed, while still maintaining several Water Demand initiatives, the AADD climbed again to 796 Ml/day, still well below the peak demands of two years earlier. The variation is caused by many factors including people's reaction to the change in restriction levels, how much winter rain is received as well as the WDM projects and programmes undertaken.

When the construction of the BWP was approved by the Minister of Water Affairs and Forestry, the project was approved as a parallel process to the CCT implementing WC/WDM. In the "Raw Water Supply Agreement" entered into between the DWAF and the CCT, the CCT committed itself to implementing WC/WDM measures and to achieving a "Low Water Demand Curve". The target set by the DWAF in terms of the Low Water Demand Curve was beaten by 13% in the CCT's 2005/06 financial year.

3.3 WC/WDM initiatives in other WSAs

Other WSAs in the region, in response to the findings of the IWRP Study, have also initiated various WC/WDM interventions with success. The ability of WC/WDM to realise significant estimated savings is linked to the capacity and commitment of the respective water services institutions to vigorously plan, implement and monitor WC/WDM interventions.

3.4 Urban Water Use Efficiency

The Potential for WC/WDM

Unaccounted for Water (UAW) includes reticulation losses through leaks and inaccurate meters as well as water used by non-paying consumers. The CCT WC/WDM Strategy estimates that the total unaccounted for water is estimated at 23.3% or 186 Ml/day (67 Mm^3/a) of total water demand. This includes bulk losses, reticulation losses and apparent losses. The overall minimum night flow in CCT, which is an indicator of the extent of leakage and wastage in the system, is estimated to be 20% to 35% of the total average requirement. The following initiatives, apart from educating users on efficient water use practices, have been identified as being viable for reducing *water wastage*:

- Pressure management during low-use periods in areas of high losses;
- Repair and management of leaks;
- Replacement of automatic flush urinals; and
- Metering of use, effective tariff collection and credit control coupled to appropriate service levels.

About 50% of the total water requirement in the CCT is taken-up by domestic users. Water for gardening and toilet flushing accounts for about 35% and 30% respectively of all domestic use within the CCT, and are therefore key target areas for enhancing *water use efficiency* by:

- Installing and using water-efficient fittings;
- Grey water use;
- Waterwise gardening;
- Pressure management; and
- Tariffs, metering and credit control.

The new WC/WDM Strategy provides estimates of the total extent of *water wastage* and *inefficient* use within CCT, and the potential savings **(Table 3.1)**:

Table 3.1 Estimates of *water wastage* and *inefficient* use within CCT

Area of intervention	Current extent (Ml/day)	Potential saving (Ml/day)
Wasted water (leaks)	148	37
Inefficient use	210	63

In CCT's Draft WC/WDM strategy it is estimated that with appropriate interventions, the requirement of new users can on average be reduced by 25% per annum, when compared to current unit use. It is further estimated that WC/WDM measures could reduce total water requirement from an estimated current amount of 797 Ml/day (290 Mm^3/a) to 539 Ml/day (197 Mm^3/a). This possibility represents a specific future water demand intervention scenario for very effective WC/WDM measures. **Table 3.2** lists the type of activities that will achieve these potential savings.

Table 3.2 Activities to achieve WC/WDM goals

Inefficiency component	Max savings (Ml/day)	Target savings (Ml/day)	Savings target	Activity to achieve saving	Primary necessity
Reduction of unaccounted water (leaks only)	93	56	60%	Reticulation management	Financial sustainability of Council
Inefficient water use in poor areas	39	29	75%	Reticulation management	Financial sustainability Affordability to Council
Inefficient water use of business/ industry	77	62	80%	- Behaviour change - Retrofitting - Leak repair	Water resource considerations
Inefficient domestic water use	149	112	75%	- Behaviour change - Retrofitting - Leak repair - Effective tariff	Water resource considerations
Total	**358 (130,6 Mm^3/a)**	**259 (94,5 Mm^3/a)**			

Targets for WC/WDM

The CCT has proposed the following five goals for their draft WC/WDM strategy:

Goals resulting in the direct reduction of the water requirement :

- By 2010, CCT must reduce non-revenue water requirement (i.e. un-billable water lost through leakage) to below 20% of average total requirement;
- By 2010, water wastage by users should be reduced to below 2% of the total requirement and most users should achieve acceptable water efficiency benchmarks by 2015; and
- By 2007, CCT will reduce the projected potable water requirement by 20%.

Goals focusing on creating an enabling institutional environment :

- By 2007, CCT must ensure and maintain ongoing effective management systems and implement integrated water resource planning in all decisions regarding water resources augmentation, bulk infrastructure development and water efficiency projects; and
- CCT must adopt WC/WDM as one of its key water service delivery strategies, give priority to its implementation and ensure an ongoing adequate enabling environment.

In order to effectively measure progress, water efficiency benchmarks need to be developed and more emphasis should be placed on obtaining additional WC/WDM data to allow metering of water use across different sectors and geographical areas.

3.5 Agricultural Water Use Efficiency

The Potential for WC/WDM

Irrigation accounts for an estimated 31% of total water use in the WCWSS. Irrigation losses can be significant if inefficient irrigation methods are practiced. At the Screening of Interventions Workshop, held in August 2005, the following interventions for agricultural water demand management were evaluated:

- River release management;
- Improved metering;
- Lining of farm dams;

- Changing crop type;
- Improving irrigation practices and technologies; and
- Introducing deficit-irrigation.

When evaluated under financial, socio-economic and environmental criteria, only river release management and metering were regarded as viable. There is a perception that farmers, especially in the Berg River, already use efficient irrigation systems, but due to uncertainty in the sector this needs to be clarified. Currently, water available, due to increased on-farm water efficiency by farmers, can be taken up by expansion of their own irrigated areas, and does not become available to the system. The trading of water allocations to other sectors has been identified as a potential area for further investigation and could be used as an incentive to promote efficient use.

Very limited metering of irrigation usage currently takes place within the WCWSS area. Metering from source to point of abstraction and then to field application was identified as important to properly understand the extent of utilisation and of losses. This would help to define the potential benefits of WC/WDM, to control abstractions and usage by irrigators, and to bill for water actually used.

Under the National WC/WDM Strategy for the agricultural sector, WUAs are required to develop Water Management Plans (WMP). The development of these plans will assist in monitoring current water use practices and may provide opportunities to encourage a reduction in the agricultural water requirement.

Targets for WC/WDM

No targets currently exist for WC/WDM in the agricultural sector.

3.6 Re-use of water

The use of effluent, treated to varying quality standards, is referred to as the re-use of water.

Potential Water Reuse

At present, about 60% of all the water used by CCT enters the sewer networks as wastewater. This wastewater is then treated and either re-used (currently estimated to be about 10%) or is discharged to the sea as treated effluent (currently 90%). The treated effluent that ultimately ends up in the sea is often disposed of through rivers and vleis, with significant environmental impact. The need to make use of this potential water source and to address the negative environmental impacts is obvious.

The following interventions were identified for the *Use of Treated Effluent:*

Effluent treated to non-potable standards:

- Local irrigation of parks and sports fields;
- Gardening, toilet flushing and industrial use;
- Commercial agriculture;
- Berg River exchange.

Effluent treated to potable standards:

- Indirect use by methods such as aquifer recharge; and
- Direct use by means of varying treatment processes (with or without blending with water from “conventional” sources).

The following initial investigations were used to estimate potential yields for the respective user categories:

- CMC - Strategic Evaluation of Bulk Waste Water "Water Reclamation – A Strategic Guideline" - 1999;
- CMC - IWRPS "potential for the use of treated wastewater within the CMA" - 2001; and
- CCT - "Investigation into the distribution of treated effluent" - 2003/2004.

The investigations undertaken to date for the CCT identified the following potential re-use:

- Non-potable use: 50.2 million m^3/a;
- Potable use: 74.6 million m^3/a (based on current identified interventions).

The total potential yields for each WWTW are displayed in **Table 3.3.**

The extent of possible re-use is dependent on the source of the effluent (whether it is of domestic or industrial origin, the latter usually containing

heavy metals), and on the level of treatment (and cost thereof) for each water use sector. There are significant issues pertaining to the use of treated effluent that have not been adequately addressed to date, including social acceptability, possible health risks and operational issues.

For more information regarding the use and potential treatment of effluent refer to the Strategy Reports entitled:

1. Case Study : Treatment of effluent for potable supply from the Faure Water Treatment Plant, and
2. Overview of water re-use potential from wastewater treatment plants.

Targets for Water Re-use

The CCT has undertaken various investigations in this regard and the former CMC did adopt a short to medium-term objective of zero wastewater return flows during the summer months. This objective has however not been vigorously pursued to date, and the projects that have been initiated have largely been implemented on an *ad-hoc* basis and have, in most instances, been initiated by the private sector. Treated effluent is used for aquifer recharge at Atlantis on the West Coast. The extent of investigations and initiatives undertaken by the other WSAs in the study area is limited.

3.7 Implementation Table

The strategic approach to implementing the actions required under the Water Use Efficiency Theme are outlined in **Table 3.4.**

Table 3.3 Potential yields for the use of treated effluent from selected CCT wastewater treatment works (million m^3/a)

WWTW	Rated hydraulic capacity	Average annual flow[3]	Identified Potential yield[4]					Total identified potential yield	Existing re-use
			Irrigation/ industrial[5]	Local agriculture[6]	Commercial agriculture[7]	Aquifer recharge[8]	Potable[9]		
Bellville	19.9	19.6	4.7	0.0	0.0	0.0	0.0	4.7	2.1[10]
Kraaifontein	6.4	2.7	0.5	2.0	0.0	0.0	0.0	2.5	2.3
Scottsdene	4.4	2.8	0.5	1.8	0.0	0.0	0.0	2.3	1.9
Athlone	38.3	30.4	10.2	0.0	0.0	0.0	0.0	10.2	1.5
Cape Flats	73.0	54.6	2.5	0.0	0.0	0.0	40.0	42.5	0.8
Borcherds Quarry	12.8	10.2	3.4	0.0	0.0	0.0	0.0	3.4	0.0
Parow	0.4	0.6	0.3	0.0	0.0	0.0	0.0	0.3	0.2
Gordons Bay	1.1	0.9	0.3	0.0	0.0	0.0	0.0	0.3	0.0
Macassar	19.7	13.7	2.2	0.0	1.8	0.0	8.9	13.0	0.6[11]
Zandvliet	22.6	17.5	0.8	0.0	3.3	0.0	16.3	20.4	0.0
Mitchell's Plain	17.5	11.3	1.1	0.0	0.0	0.0	9.3	10.4	0.0
Melkbos	2.0	0.7	0.7	0.0	0.0	0.0	0.0	0.7	0.4
Potsdam	11.7	11.7	6.5	4.1	0.0	0.0	0.0	10.6	1.7[12]
Wesfleur (domestic)	2.9	2.2	0.0	0.0	0.0	2.1	0.0	2.1	0.6
Wesfleur (industrial)	2.2	1.8	0.4	0.0	0.0	0.0	0.0	0.4	0.0
Simons Town	1.8	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wildevoël Vlei	5.1	3.1	0.9	0.0	0.0	0.0	0.0	0.9	0.0
TOTAL	**242.8**	**171.9**	**35.1**	**7.9**	**5.1**	**2.1**	**74.4**	**124.7**	**11.6**

3 This represents the true potential yield as opposed to the identified potential yield.

4 This represents yields of schemes that have already been identified and therefore does not equal the average annual flow.

5 The source of information for the identified potential for local irrigation and industrial use is the Bvi Study "Investigation into the Distribution of Treated Effluent" of 2003/04. However, where the industrial potential as determined in the IWRPS exceeds that determined in the Bvi Study, the greater value has been used.

6 The source of information for the potential for local agriculture is based on the Bvi Study.

7 The source of information for the potential for commercial agriculture is based on the IWRPS study by CCT.

8 The source of information for the potential for aquifer recharge is based on the Bvi Study.

9 The source of information for the potential for potable use is based on the work undertaken in the Reconciliation Strategy Study. Based on comments recently received, the range for potable use varies from 22 million m^3/a to 70 million m^3/a. This differs from the figures in the table because they are based on average summer return flows as opposed to annual average flows. The figures in the table are effluent volumes (not reclaimed/potable water volumes) and there is usually a loss in volumes due to the need to treat the effluent.

10 A project to use treated effluent from the Bellville WWTW, for industrial purposes, has just been completed. Current usage is however unknown at this stage.

11 A project to convey treated effluent from the Macassar WWTW, to a proposed housing development (old AECI property), has recently been initiated.

12 A project to use treated effluent from the Potsdam WWTW, for agricultural and industrial purposes, has just been completed. Current use is unknown at this stage.

Table 3.4 WATER USE EFFICIENCY: Summary of key issues, approaches, actions, responsibilities and programme

Key issue	Approach	Action	Responsibility	Programme
Urban water use efficiency				
a. Defining WC/WDM targets and objectives ***Objective:*** Determine the potential for and factors influencing WC/WDM.	i) Refinement of existing strategies, including the setting of benchmarks/targets, according to national guidelines, including • Determine appropriate targets based on the results of recent pilot studies • Establish a meter management database • Determine sustainability of existing savings through WC/WDM • Ensure that adequate information on water use efficiency is collated at local authority level and is interpreted correctly • Establish, approve and regularly review an urban WC/WDM policy, strategy and programme • Promote the inclusion of WC/WDM measures in WSDPs • Implement a scorecard of local authority's water use efficiency compared to set benchmarks/targets ii) The DWAF to provide guidance to local authorities w.r.t. • Setting achievable targets • Monitoring and reporting on progress through the WSDP • WC/WDM information management	Obtain national and international benchmarking standards and findings from recent pilot studies and adapt to local circumstances	Local authorities, DWAF	On completion of strategy with regular updates
		Improve metering, data categorisation, accessibility and management	Local authorities	On completion of strategy with regular updates
		Determine sustainability of existing WC/WDM savings by comparing existing use and WC/WDM interventions/parameters against agreed benchmarks/targets	Local authorities	When information is available with ongoing updates
		Develop/refine WC/WDM plan to achieve benchmarks/targets	Local authorities	When information available with ongoing updates
		Provide guidance, support and assistance to Local Authorities in developing and implementing WC/WDM plans	DWAF	On completion of strategy and ongoing
		Develop appropriate means for local authorities to report monthly progress against benchmarks/targets in order to monitor sustainability of existing WC/WDM initiatives	DWAF Local authorities	On completion of the strategy
		Collate system-wide water use information from Local Authorities into one report for use by the Strategy Committee	DWAF	At least quarterly

Key issue	Approach	Action	Responsibility	Programme
		Monitor how closely the WC/WDM targets and objectives that are the responsibility of DWAF and Local Authorities are met	Strategy Committee	At Strategy Committee meetings
b. WC/WDM interventions for water use efficiency ***Objective:*** Achieving the targets set for WC/WDM	i) Establish a process and methodology for selecting and sequencing WC/WDM interventions (Link to Selection of Interventions and Decision-making Process Theme) ii) WC/WDM Public awareness raising (Link to Stakeholder Engagement Theme) iii) Promote existing WC/WDM interventions at local authority level iv) Keep track of the effectiveness of interventions v) The DWAF to provide guidance to local authorities w.r.t. specific interventions • Phased implementation • Information management	Undertake feasibility studies to investigate resources (budget and human resources), factors (water savings, implementation times and certainty of savings) and cost-benefit ratios of various WC/WDM interventions	Local Authorities, DWAF	Ongoing
		Empower and guide local authorities to select and implement WC/WDM interventions (taking cognisance of results of the Strategy's selection process) (Link to Selection of Interventions and Decision-making Process Theme)	DWAF	On completion of the strategy
		Implement selected WC/WDM interventions	Local Authorities	On completion of the strategy
Agricultural water use efficiency				
a. Improving efficiency ***Objective:*** Enhanced agricultural water use efficiency	i) Improve understanding of actual agricultural water use and efficiency ii) Use incentives to promote more efficient agricultural water use iii) Improve management of releases for irrigation; iv) Encourage improved on-farm efficiency v) Support IAP clearing programmes (Link to Water Availability and System Operation Theme, Water Resource Protection and Management Theme)	Undertake a study to understand potential water use efficiency savings by agriculture in the Berg and Riviersonderend WMAs, including: operational releases, control of abstraction, the use of tariffs, WMPs, metering, on farm water use efficiency, etc.	DWAF	On completion of strategy

Key issue	Approach	Action	Responsibility	Programme
		Select and implement appropriate measures that emerged from the above study in accordance with the selection process	Determined by the outcomes of the study	On completion of the study
		Develop appropriate means for WUAs/IBs to report progress against benchmarks/targets identified in WMPs to DWAF	DWAF	On completion of the strategy
		Provide system-wide feedback to the Strategy Committee on progress in achieving benchmarks/targets	DWAF	At least quarterly
Water reuse				
a. Defining targets and objectives for water re-use ***Objective:*** Determine the potential for and factors influencing water re-use.	i) Develop strategies and set targets for water re-use, including • Determine appropriate targets based on the results of recent studies, national and international practice • Determine sustainability/acceptability/ effectiveness of existing re-use schemes • Ensure that appropriate information on water re-use is collated at local authority level • Periodically review water re-use policy, strategy and implementation plans • Promote the inclusion of water re-use in WSDPs • Monitor the extent of water re-use by local authorities against set targets ii) The DWAF to provide guidance to local authorities w.r.t. • Reviewing/enhancing existing guidelines for water re-use	Review the legal framework governing water re-use, the health and environmental implications of its use in various applications and develop appropriate guidelines	DWAF	On completion of the strategy
		Review sustainability / appropriateness of existing re-use schemes and national and international best practice	Local Authorities	On completion of the strategy
		Undertake a survey of the social acceptability of water re-use (including potable use) and investigate incentives to promote re-use	Local Authorities	On completion of the strategy
		Develop strategies, targets and implementation plans for water re-use	Local Authorities	On completion of the strategy
		Maintain a database of the quantity and quality of effluent from WWTWs and the extent of existing re-use	Local Authorities	Record daily and update annually

Key issue	Approach	Action	Responsibility	Programme
	• Developing strategy • Setting achievable targets • Monitoring and reporting on progress through the WSDP • Information management	Provide guidance, support and assistance to Local Authorities in developing strategies, implementation plans and setting targets for water re-use	DWAF	On completion of strategy and ongoing
		Develop appropriate means for local authorities to report progress against targets	DWAF Local Authorities	On completion of the strategy
		Collate system-wide water re-use information from Local Authorities into one report for use by the Strategy Committee	DWAF	At least quarterly
		Monitor the extent of water re-use against targets	Strategy Committee	On completion of the strategy
b. Interventions for water re-use ***Objective:*** Achieve the targets set for water re-use	i) Establish a process and methodology for selecting and sequencing water re-use interventions (Link to Selection of Interventions and Decision-making Process Theme) ii) Review social acceptability and keep stakeholders informed of developments (Link to Stakeholder Engagement Theme) iii) Monitor the effectiveness/ appropriateness/ sustainability of interventions iv) The DWAF to provide guidance to local authorities w.r.t. specific interventions • Phased implementation • Information management	Undertake feasibility studies to investigate possible re-use interventions for various uses, including the environmental, health & operational impacts as well as the savings and social acceptability of such interventions	Local Authorities, DWAF	Ongoing
		Empower and guide local authorities to select and implement re-use interventions (in cognisance of the Strategy's intervention selection process) (Link to Selection of Interventions and Decision-making Process Theme)	DWAF	On completion of the strategy
		Implement selected re-use interventions	Local Authorities	On completion of the strategy

3.8 Recommendations

The effectiveness of WC/WDM, and water re-use, is closely linked to the commitment and capacity of the institutions implementing these measures. The responsible institutions must therefore be appropriately structured and staffed and there must be sufficient political buy-in to assign the necessary resources to undertake the required studies and interventions. Interventions must be monitored and evaluated on an ongoing basis, in order to assess their effectiveness. The WSDPs of local authorities must list the WC/WDM initiatives that are being implemented as well as the associated targets.

WUAs should be encouraged to develop WMPs, as required under the National WC/WDM Strategy for the agricultural sector. WC/WDM activities covered in WMPs should include appointing adequate numbers of water bailiffs for improved timing of operational releases, regular checking and maintenance of infrastructure and installation and maintenance of meters.

A detailed study should be undertaken across the full potential water re-use interventions. This should include an assessment of social acceptability and possible health risks and should be followed by the development of a detailed implementation process and plan. Realistic strategies and targets for water re-use should be included in WSDPs. The regulatory framework for re-use needs to be strengthened.

3.9 Responsibilities

The responsibility for implementing WC/WDM within the urban environments resides with the respective WSAs, whilst the Provincial Department of Agriculture (or the respective water user associations) would be responsible in the agricultural sector. The respective WSAs would be responsible for implementing water re-use initiatives.

The DWAF and the CMAs have the overall responsibility for providing support to the respective authorities and for monitoring their ongoing effectiveness.

4. WATER AVAILABILITY AND SYSTEM OPERATION

Objective

To address the annual water availability from the WCWSS, as well as the requirement for optimal use of existing water resources and bulk infrastructure, ecological Reserve-related operating rules and operational management.

4.1 Quantification of water availability

Table 4.1 shows that the existing sources of the WCWSS can yield about 475 million m^3/a (at a risk of failing on average once in 50 years to supply this full requirement). The Berg Water Project (BWP), which is due to commence supplying water in 2007, will provide an additional 81 million m^3/a to the yield of the system, increasing the total to 556 million m^3/a. The main dams and system infrastructure are shown in **Figure 4.1**.

The interim ecological Reserve has been implemented in the Palmiet Catchment and has placed operational constraints on transfers. The ecological Reserve for the Berg River, immediately downstream of the Berg River Dam, has also been defined. The ecological Reserve low flows and flood releases, of up to 200 m^3/s, will be made from the multilevel outlet structure at the dam according to pre-determined, agreed-upon procedures.

4.2 System operation

Managing the risk of water supply failure is an important underlying objective of system operation and maintenance. The realisation of the yields shown in **Table 4.1** depends on the system being operated in such a way that the risk of overflows from the dams of the WCWSS are minimised. This necessitates close co-operation between the DWAF and the largest Water Services Provider, CCT, which adjusts its requirement from the various dams, so that the ratio of storage available to the probable median winter inflow at each dam is similar. This minimises the likelihood of one dam spilling while there is storage available in another dam.

A more detailed description of risk management is provided in **Appendix D.**

Table 4.1 Main schemes of the WCWSS

Scheme	Gross capacity (10^6 m^3)	Net 1:50 year system yield (10^6 m^3/a)	Owner	User
Palmiet: Kogelberg & Rockview	17(1)	22.5	DWAF/ Eskom	CCT/ Eskom
Upper Steenbras	32(2)	40	CCT	CCT
Lower Steenbras	34			
Wemmershoek	59	54	CCT	CCT/ Drakenstein
Voëlvlei	172	105	DWAF	CCT/ W Coast/ irrigators
Theewaterskloof	480	219	DWAF	CCT/ Stellenbosch/ irrigators
TWK compensation	-	14	-	-
Berg run-of-river	-	21	-	-
TOTAL EXISTING	**777**	**475**		
Berg Water Project: Berg River Dam Supplement Scheme	127	56 25	TCTA (DWAF)	CCT/ others/ irrigators/ Overberg
TOTAL	**904**	**556**		

1) Storage used by Palmiet Pumped Storage Scheme.
2) 3 x 10^6 m^3 of storage used by Steenbras Pumped Storage Scheme

Towards the end of each winter rainfall season (October to November), when the reservoirs are at their fullest, the WRYM and WRPM (the Water Resources Yield and Water Resources Planning Models) are used to assess whether or not supplies must be restricted for the following year, to ensure that sufficient water remains for the more essential uses such as basic human needs and industry, were a drought to occur.

The levels of restrictions imposed on the various users depends on the allocations and required assurances of supply. Requirements are progressively curtailed during droughts to correspond with these average levels of assurance of supply.

4.3 Water Quality

Water quality in the WCWSS is very important in reconciling supply and requirement in the short, medium and long term. Due to poor water quality in the Voëlvlei Dam, the CCT's WTP cannot currently operate at full capacity. This means that the resource from the Voëlvlei Dam cannot be optimally utilised and should the problem not be addressed could impact on the development of future water resource interventions in the area. Planning for water quality problems has to be addressed by both the DWAF and the CCT. The DWAF has to ensure that the catchments surrounding the water resources are managed and the CCT has to plan to ensure that its WTPs can cope with adverse raw water quality conditions.

4.4 Implementation Table

The strategic approach to implementing the actions required under the Water Availability and System Operation Theme are outlined in **Table 4.2**

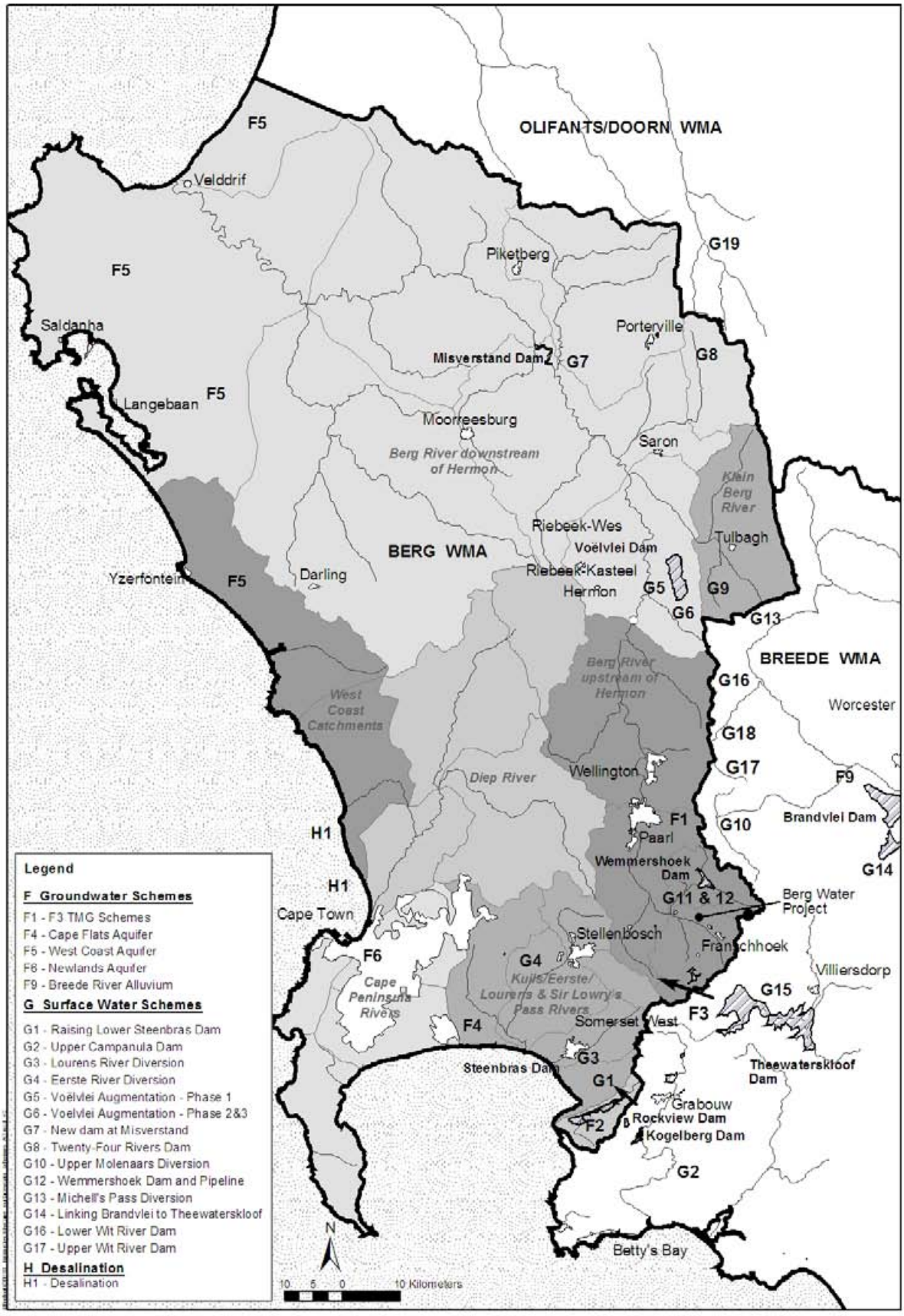

Figure 4.1 The Western Cape Water Supply System. The numbers correlate with the intervention descriptions used in the Screening Workshop document
(See Strategy Report: Scenario planning for reconciliation of supply and requirement)

Table 4.2 WATER AVAILABILITY AND SYSTEM OPERATION: Summary of key issues, approaches, actions, responsibilities and programme

Key issue	Approach	Action	Responsibility	Programme
Water availability				
a. Quantification of water resource availability ***Objective:*** To improve the reliability of water resource related information	To ensure that there is appropriate information on the water availability of a suitable quality for the WCWSS in order to undertake appropriate planning and modelling by (Link to Monitoring and Information Management Theme) i) Regularly updating water availability from the water resources of the WCWSS through system modelling ii) Regularly updating water availability from the catchments and aquifers which could provide future water to the WCWSS iii) Prioritising and addressing the most significant uncertainties, for example Class, RQOs, ecological Reserve implementation and climate change iv) Identifying additional monitoring requirements, especially surface water-groundwater interaction, baseline groundwater data, and groundwater usage v) Obtaining relevant new technologies that add value, e.g. remote sensing techniques vi) Improving data for WARMS and accessibility thereof for planning and management purposes	Expand data collection to support integrated water resource modelling, including surface water, groundwater, water quality, climate and usage (Link to Water Requirements Theme and Monitoring and Information Management Theme)	DWAF/CCT	Ongoing
		Update system yield and reliability using the System Models of the present and future WCWSS	DWAF	Annually
		Update and improve WARMS, WMS, NGA data, and Hydstra (hydrological database system) to improve the system models (Link to Monitoring and Information Management Theme)	DWAF	On completion of Strategy
		Update change in land use and associated water impact in the model (e.g. agricultural input parameters, IAPs, etc.) (Link to Monitoring and Information Management Theme)	DWAF	As required by key indicators
		Undertake model development to facilitate integrated water resource assessments for surface water and groundwater	DWAF	On completion of Strategy

Key issue	Approach	Action	Responsibility	Programme
		Utilise/ Develop/Configure appropriate models for reconnaissance level assessments of water resource availability from interventions	DWAF	As required for updating selection of interventions
		Prioritise and assess the implications of classification process, and climate change (Link to Water Resource Protection and Management Theme)	DWAF	On approval of Strategy
		Ensure that the planning model is consistent with the system yield	DWAF	On completion of Strategy
		Be informed or request update on changes of system yield	Strategy Committee	As required
		Facilitate linkage between the way in which the WCWSS is operated and the system yield	DWAF	On completion of Strategy
Operational management				
a. System operation ***Objective:*** Optimise the use of available water and infrastructure in a sustainable manner	i) Operate the WCWSS to minimise spillage, maximise use of available storage and manage the dam levels during periods of drought by the progressive curtailment of requirements through the imposition of water restrictions ii) Optimal use of aquifers and groundwater storage iii) Future administrative actions by DWAF, including but not limited to, the granting of water use licences and conclusion of agreements with other users, should take into account that the BWP is an integral component of the Western Cape Water System as a whole, and benefits all users of the Western Cape	Improve the flexibility of treatment and conveyance capacity to respond to changes in demand or disasters	CCT/DWAF	Ongoing
		Improve the utilisation of existing storage and infrastructure (including aquifers), before developing new sources, e.g. full utilisation of the storage from	DWAF/CCT	Ongoing

Key issue	Approach	Action	Responsibility	Programme
	Water System. iv) Where possible, future water resource developments within the Western Cape should form part of the Western Cape Water System. v) Any new additional infrastructure must be combined and operated as part of an integrated system where practical vi) The operators of the WCWSS should ensure the equitable and efficient operation of the WCWSS as a system, with consideration of existing agreements	Upper Steenbras Dam, BWP and Kleinplaas Dam		
		Develop MOUs with providers of strategic services e.g. ESKOM to ensure that priorities are agreed and back-up plans are established	CCT/ DWAF	On completion of Strategy
		Ongoing analysis and dissemination of information to ensure optimal WCWSS operations (Link to Monitoring and Information Management Theme)	DWAF/CCT	Ongoing
		Operators and bulk water users should regularly review the water availability from the WCWSS and the need for curtailment	DWAF/CCT	Biannually
		Resolve how the system will be operated, for example in terms of the BWP agreements and future infrastructure	DWAF/CCT	Ongoing
b. Operating rules as they pertain to the Resource Quality Objectives (RQOs)	i) Plan for phasing in of the ecological Reserve/RQO requirement for existing infrastructure by co-ordinating with the compulsory licensing processes ii) The phasing in must take cognisance of the development of new affordable interventions. iii) Approaches should be developed for co-operative monitoring, management and utilisation of aquifer systems (Information and recommendations from	Agree on practical and mutually acceptable timeframes and operating procedures for implementing and phasing in of the ecological Reserve/RQO requirement for existing infrastructure of the WCWSS	DWAF/CCT	Prior to and during Classification processes

Key issue	Approach	Action	Responsibility	Programme
Objective: To meet the requirement of the RQOs	the Berg River Baseline monitoring needs to be considered) (Link to Water Resource Protection and Management Theme)	Plan for the management of future water resource interventions to achieve ecological Reserve/RQO requirements	DWAF/CCT	Ongoing
c. System maintenance ***Objective:*** Maintain system infra-structure to provide a reliable and sustainable supply and minimise the risk of disruption	i) Ensure adequate planning and implementation so that routine maintenance, assessment and replacement of existing infrastructure is undertaken to minimise the risk of disruption of supply	Undertake assessments of key strategic infrastructure (e.g. Theewaterskloof Tunnel, Voëlvlei pipeline etc) and use this to inform the selection of future interventions (Link to Selection of Interventions and Decision-making Process Theme)	DWAF/CCT	Ongoing
d. Development of Early Warning Systems to minimise risk **Objective:** To enable timely response to disasters associated with the disruption of supply	iii) Depending upon the assessment of the risk of disruption of supply, an early warning system should be developed. This could include: ▪ Ensuring good monitoring and interpretation ▪ Ensuring adequate forecasting and prediction as well as timeous and inclusive planning; (i.e. observe, model and forecast) ▪ Ensuring people-centred early warning systems ▪ Ensure communication systems to those most at risk or vulnerable ▪ Develop systems policy and practises that are linked to emergency management and operational capabilities ▪ Ensure that research, analysis and reporting on emerging risks are integrated into emergency warning systems; ▪ Undertaking regular disaster management trial runs to test preparedness (Link to monitoring aspects of the Water Availability and	Design early warning system(s) for threats associated with the disruption of supply	DWAF/CCT	As soon as possible
		Collate and evaluate relevant monitoring information to support early warning system (Link to Monitoring and Information Management Monitoring Theme)	DWAF/CCT	Upon design of early warning system
		Secure adequate modelling and forecasting capacity for various threats	DWAF/CCT	Upon design of early warning system
		Review/revise/update communication systems to support effective dissemination of early warnings for diverse threats	DWAF/CCT	Upon design of early warning system

Key issue	Approach	Action	Responsibility	Programme
	Operation Theme and the Water Resources Protection Theme and Monitoring Theme).	Identify required studies and research needed to support effective early warnings for threats associated with the disruption of supply	DWAF/CCT	Two years after design of early warning system
		Identify required studies and research needed to reduce risk associated with existing infrastructure	DWAF/CCT	Two years after completion of strategy
		Liaise with authorities responsible for disaster management (such as the Provincial Disaster Management Committee) to ensure congruency of risk approach early warning systems	DWAF/CCT	As required

4.5 Assumptions underlying recommendations

Water availability

The availability of water from the WCWSS is based on hydrological analyses conducted in the late 1980s and early 1990s. These analyses are currently being updated by the DWAF. The analyses do not take account of climate change.

The ecological Reserve determinations for the Palmiet River and the Berg Water Project are not final and may change in the future. Implementation of these ecological Reserves is complex and operators will require a high level of skill.

System operation

The ongoing use of the WRYM and WRPM is essential for planning the releases from the complex WCWSS, so as to minimise spillage. The models are also used to plan restrictions so as to minimise the risk of excessive drawdown of the reservoirs during droughts which could compromise the supplies to users.

Increased budgets will be needed to operate an increasingly complicated system and adequate operating budgets must be available to meet the costs associated with releasing water in accordance with environmental needs.

4.6 Recommendations

Water availability

The ongoing monitoring of rainfall, inclusive of patterns and spatial distribution, river flows, spring flows and abstractions are essential to provide good data for extending flow records and for identifying changes or trends that might arise from climate change (See **Box 5.1** for Western Cape Climate change projections).

Monitoring of the benefits of releases for the ecological Reserve on the rivers is also necessary, to ensure that riverine environments are being sustained and that releases in excess of the requirement for sustainability are not being made.

It will also be necessary to develop systems and provide staff with appropriate skills to operate the BWP and particularly to release the required floods from the Berg River Dam in such a way that they coincide with and replicate natural flood events.

The operation of the system could be further improved by monitoring individual abstractions (by installing water meters for surface water use and cumulative flow meters on boreholes and data loggers on selected boreholes) and by speeding up invasive alien plant removal.

It will be valuable to train WUAs in aquifer management, strategy and practice and to allocate budget for the interpretation and modelling of available monitoring data.

System operation

The WRYM and WRPM together with other models have proved to be sound tools for planning water restrictions and should be used in the future.

4.7 Responsibilities

Water availability

The DWAF's Regional Office (RO) and CCT have joint responsibility for managing the operation of the WCWSS. The DWAF's RO is responsible for managing the ecological Reserve releases from the Palmiet Scheme and the future releases from the Berg Water Project.

System operation

The DWAF's RO and CCT are also responsible for operating the WCWSS and the DWAF's RO for operating the WRYM and WRPM to determine the need for restrictions. All water service authorities (WSA) and water user associations (WUA) are responsible for implementing ongoing WC/WDM initiatives and ensuring that their users comply with any curtailments that are imposed.

5. COMPARISON OF REQUIREMENT AND AVAILABILITY

Objective

To compare water requirement and availability in order to identify potential shortfalls in supply with the view to ongoing reconciliation.

5.1 Current and future water balance

Figure 5.1 compares the historical water requirement and a high and a low future water requirement scenario, as described in **Chapter 2**, with the available yields from the WCWSS.

In 2000, following below average rainfall, water restrictions were introduced when the requirement exceeded the water availability (at the 98% level of assurance, corresponding to a one in 50-year chance of not meeting the full requirement). Following a severe drought the winters of 2003 and 2004, water restrictions were again introduced towards the end of 2004. From 2007, the BWP will increase the availability by about 81 million m^3/a and therefore water restrictions are not likely to be required during the following few years, under average runoff conditions.

If the water requirement grows as projected for the High Water Requirement Curve then the total requirement will increase to an estimated 560 million m^3/a by 2011. The additional yield of 81 million m^3/a, provided by the BWP, will bring the total system yield to 556 million m^3/a. This supply will be fully utilised by 2011.

With the implementation of the WC/WDM interventions contained in the CCT draft WC/WDM strategy, the requirement for further interventions would be delayed until 2015. Without implementation of the WC/WDM interventions, 2011 is likely to be the next key milestone date for implementation of the next intervention, to reconcile requirement and supply. When the requirement exceeds the available supply, all the processes for implementing the next intervention should have been completed, including the selection process, feasibility studies, obtaining the necessary approvals, and all the actions and procedures necessary for actual implementation, which may require design and construction. Any delays in these processes are likely to result in the supply exceeding availability and the need for increasingly frequent water restrictions.

Box 5.1 Western Cape Climate Change Projections

Climate change projections for the Western Cape indicate:

- A drying trend from west to east, with a weakening of winter rainfall;
- Possibly increased summer rainfall (mainly in the east of the province);
- A shift to more irregular rainfall of possibly greater intensity, and
- Rising mean, minimum and maximum temperatures across the region.

In order to manage climate change the DWAF and the CCT will have to develop:

1. appropriate short term operational tactics, and
2. long-term strategies.

Themes which address climate change in the Reconciliation Strategy include:

- Water Requirements
- Water Availability and System Operation
- Comparison of requirements and availability
- Selection of interventions and decision-making process
- Monitoring and information management.

Source: D:EA&DP. 2005. A *status quo*, vulnerability and adaptation assessment of the physical and socio-economic effects of climate change in the Western Cape

In order to ensure adequate water availability until 2030 (the selected planning horizon for this study) a number of interventions will have to be implemented. However, in the longer term the future requirement will become more uncertain and it is therefore necessary that flexibility be built into the selection and implementation processes. In addition, it is possible that certain interventions that are selected for additional studies to feasibility level may be found to be unsuitable or may be delayed in the process of obtaining the required authorisations. It is therefore important that enough interventions are selected for additional study so as to ensure timely implementation of interventions to meet the future requirement.

Some of the uncertainties that may impact on the reconciliation of future availability and requirement include:

- The percentage of allocations used by irrigators (particularly for permanent crops), and the risks of restrictions they are willing to take;
- The impact of HIV/AIDS, in-migration of people, future economic growth and changes in sectoral requirement on urban water requirement;
- The effects of climate change, which could cause a reduction in streamflow in the Western Cape, and also influence patterns of use (Climate change projects are discussed in **Box 5.1**);
- The implementation of the ecological Reserve, particularly for existing schemes, and also any changes in the preliminary ecological Reserve, which might affect the yield; and
- Advances in technology and increases in confidence of alternative sources.

2010 Soccer World Cup

The 2010 Soccer World Cup would likely have a very small influence on the requirement from the system. Because the event will take place during early spring, it is expected that the impact of the event on the water balance will be limited. By 2010 there will also still be some surplus yield in the system, with additional yield only required by 2011. Any potential longer-term influence will be catered for within the range of future water requirement scenarios being developed, as part of the current Reconciliation Strategy Study.

5.2 Implementation Table

The strategic approach to implementing the actions required, under this theme are outlined in **Table 5.1**

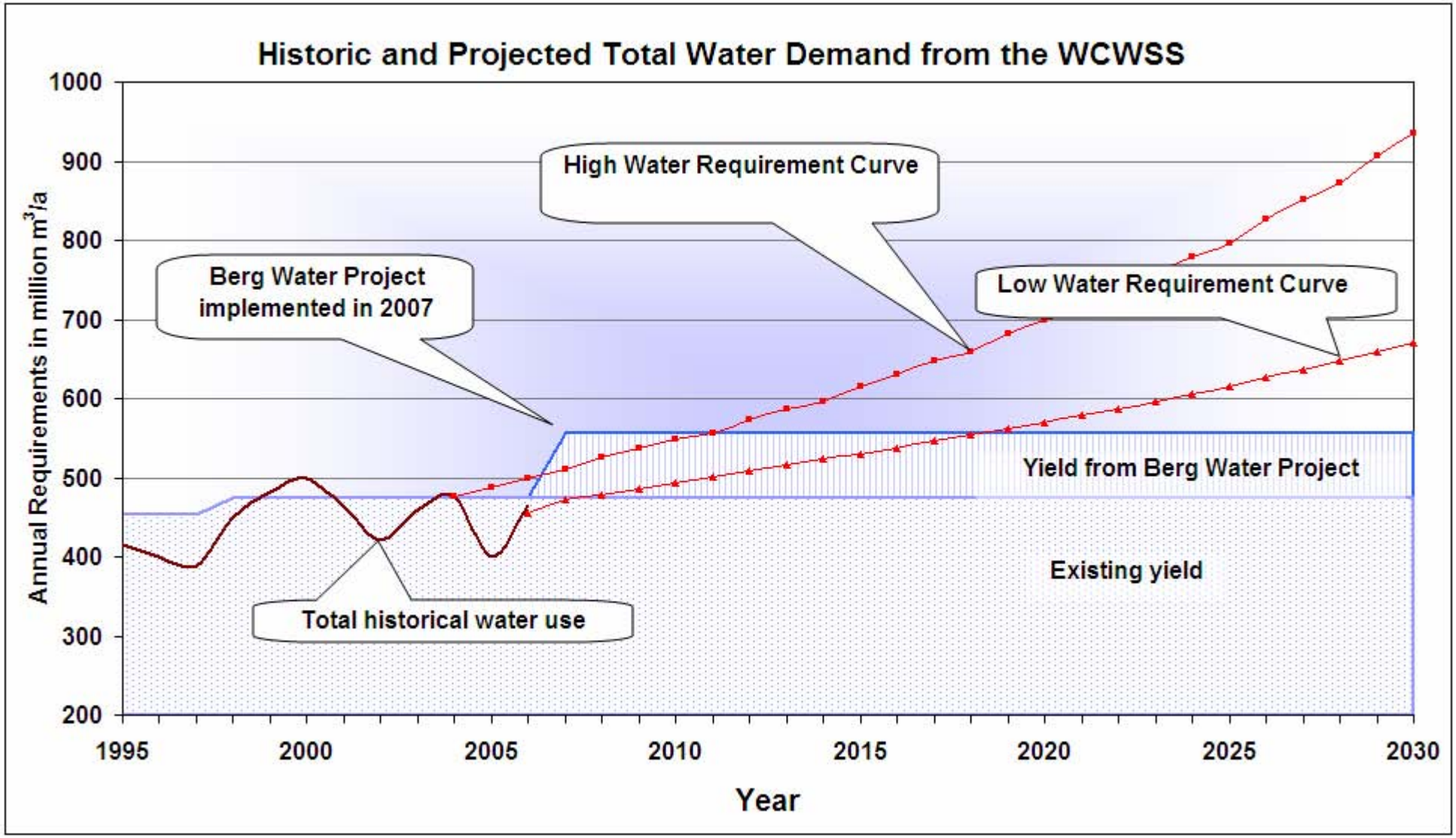

Figure 5.1 Comparison of historical water requirements and a high and a low future water requirement scenarios

Table 5.1 COMPARISON OF REQUIREMENT AND AVAILABILITY: Summary of key issues, approaches, actions, responsibilities and programme

Key issue	Approach	Action	Responsibility	Programme
a. Determining the water balance ***Objective:*** To determine the extent of potential difference between future requirement and supply	i) The availability calculation will be based on the combined system yield of the existing infrastructure, at appropriate levels of assurance; ii) Water supply and requirement must be represented in such a way that they can be directly compared iii) Separate and combined water balance graphs should be provided for urban and agricultural water requirements iv) Where possible, information on all future interventions should be brought to comparable levels of confidence v) Clarify the implementation of assurance supply for different users and sectors (Link to Water Requirements Theme)	If the scenarios have been reviewed, decide on comparison scenario/s to be used for planning of future interventions according to appropriate water requirement curve (Link to Water Requirements Theme)	Administrative and Technical Support Group	As required
		If the scenarios have not been reviewed, compare recently recorded requirements with scenarios for planning purposes (Link to Water Requirements Theme)	Administrative and Technical Support Group	Annually
		Compare the overall requirement from the system with the chosen scenario, and assess the effects of the low and high water requirement scenarios (initially) with the supply available, at the agreed levels of assurance (Link to Water Requirements Theme)	DWAF D: NWRP	Ongoing, at least annually
		Ensure that the process of comparing requirement and supply is easy to understand, (Use the WCWSS RPST) (Link to Selection of Interventions and Decision-making Process Theme)	Administrative and Technical Support Group	Ongoing
		Resolve the allocations to urban and agricultural users regarding assurance of supply (also interpretation of the existing agreement between CCT and the DWAF, and the allocations from the BWP)	DWAF RO and users	As soon as possible

Key issue	Approach	Action	Responsibility	Programme
		Revisit the agreement between CCT and the DWAF regarding CCT's temporary use of water from TWK Dam	DWAF RO and users	As soon as possible
		Interpret and clarify the way the system is operated in terms of assurance of supply for long-term planning. (Link to Water Availability and System Operation and Water Requirements Theme)	Administrative and Technical Support Group	Ongoing
		Investigate system flexibility in terms of ongoing changes in usage patterns and restrictions (Link to Water Availability and System Operation and Water Requirements Theme)	Administrative and Technical Support Group	Ongoing

5.3 Assumptions underlying recommendations

The reconciliation of requirement and availability requires good information on existing supplies and requirement, and on likely future requirement scenarios to be available. Good information on potential future intervention scenarios should further be available, so that an understanding of the most beneficial future reconciliation solutions can be developed.

Another important factor is the trade-off between risk and cost. If limitless funds were available and users were willing to pay the full costs associated with supplying the water, it would be easy to ensure that all water requirements are met. However, this is not a realistic scenario and the strategy must balance risks with costs, while considering the concerns and issues of water users.

5.4 Recommendations

Data on all existing water usage should be collected on an ongoing basis and scenarios of future water use should be regularly updated as recommended in **Section 2.4.** Information on future interventions should be available for assessment with the Water Resource Planning Model (WRPM). The WRPM should be utilised to reconcile supply and requirement and to determine the most appropriate timing of additional interventions. This will require integration of groundwater information into the WRYM and WRPM and the implementation of suitable integrated monitoring infrastructure and data processing interpretation.

The Reconciliation Planning Support Tool (RPST), developed for the WCWSS, should also be utilised to assist in making decisions on how best to meet the future water requirement.

5.5 Responsibilities

The Strategy Committee should be responsible for the comparison of supply and requirement.

6. SELECTION OF INTERVENTIONS AND DECISION-MAKING PROCESS

Objective

The identification, evaluation and selection of interventions to reconcile supply with requirement, and the provision of information to support the decision-making process

6.1 Introduction

One of the main objectives of the Western Cape Water Supply System (WCWSS) Reconciliation Strategy Study (WCWSSRC) is to provide a defendable, documented process for the selection of interventions to supply sufficient water to meet the requirement of the WCWSS until 2030. The process needs to take into account the uncertainties concerning the future water requirement as well as uncertainties in the future yield of existing water resources.

Public participation is a key aspect of the decisions making process and emphasis is placed on a process that is fair and transparent. In addition, the selection of interventions has become more complex, with a wide range of issues to be considered by various stakeholders such as:

- Time required for implementation;
- The unit reference value and other financial parameters for comparing the costs of various interventions and also the cost of water to the consumer;
- Socio-economic and environmental impacts;
- Health risks and the risks posed to fruit export markets that might arise from potential pollution of sources;
- Reduced dependence on the Riviersonderend Berg River Tunnel which could seriously disrupt the supply in the event of a tunnel failure;
- Reduced dependence on sources of supply which might be impacted by climate change, particularly if the change results in drier conditions;
- The importance of dam and/or groundwater storage as this provides a buffer against long-term droughts;
- The energy requirement for interventions and the hidden associated environmental costs. This is a concern nationally and particularly in the Western Cape and could be a potential future constraint;
- The impact of one intervention on another which might preclude interventions on account of infrastructure limitations;
- The different processes needed to investigate and implement surface water and groundwater schemes;
- Flexibility of interventions, e.g. the ability to phase implementation to facilitate gradual increases in requirements;
- Provision of system storage for the maximum drought and annual variation;
- Reduced flexibility during droughts as a result of changes in users and their patterns of use;
- Spreading or reducing risk;
- Capital outlay vs. running costs;
- Ease of integrating new supply interventions into the system;

As mentioned in **Section 5.1**, following the High Water Requirement Curve, the water requirement of the WCWSS is likely to exceed the available supply in about 2011. As the implementation of a major supply-side interventions can take ten years or more from feasibility study to completion, it is essential that potential future interventions be selected as soon as possible in order for the DWAF, the CCT and other water service providers to be able to commence the process of planning future water supply infrastructure or other required interventions.

Most WC/WDM interventions do not require approval from the Minister of Water Affairs and Forestry before implementation and so these interventions can be more easily implemented. WSAs should therefore be encouraged to implement appropriate WC/WDM interventions in order to reconcile supply requirements in the short to medium term.

Previous Studies

A large number of interventions have been identified in previous studies. These studies include the following:

- The Western Cape System Analysis was a comprehensive reconnaissance study that was completed in 1995. It included the

identification and evaluation of a number of surface and groundwater, WC/WDM, water re-use and desalination interventions.

- The CCT's Integrated Water Resources Planning Study was a pre-feasibility study that re-evaluated a few of the more favourable schemes in greater detail;
- The DWAF has conducted a number of studies that identified various schemes, including the Voëlvlei Dam First Phase Feasibility Study, the Breede River Basin Study and the West Coast Study;
- CCT is currently undertaking the Table Mountain Group (TMG) Aquifer Feasibility and Pilot Wellfield Project; and

Box 6.1 Desalination

Advances in desalination technology over the last decade have significantly reduced the cost of desalination. In 2006, the cost of water from the desalination plant in Perth, Western Australia was approximately R5/m^3. The desalination plant planned for the Australian Gold Coast has an estimated cost of approx R9/m^3. A recent WRC Report (Report WRC TT 266/06 dated July 2006) calculated the unit production cost of desalination on the Cape West Coast at R7/m^3. A figure of R6/m^3 was used in this Strategy as the approximate cost of desalination. These unit costs indicate that desalination from a financial perspective is still considerably more expensive than interventions such as WC/WDM, water re-use and other available ground and surface water interventions. However, financial cost comparisons are not the only important consideration and desalination may be favoured because it promotes resource diversification and has lower environmental and socio-economic impacts than conventional supply interventions. Desalination is an energy-intensive process and the costs and environmental impacts of additional energy would also need to be carefully considered and discounted.

The CCT is planning to further investigate desalination technologies and establish a pilot desalination plant well in advance of a large-scale desalination plant. This will ensure that the CCT is in a position to utilise the technology if required and will ensure that the full costs (including pre and post water treatment requirements) and impacts have been considered.

- A study concerning the positioning of a pilot seawater desalination plant for Cape Town has recently been completed by the CCT. (For additional information on desalination see **Box 6.1).**

The proposed selection process includes a review of all previously identified interventions and any additional interventions that may be considered on a common information base.

6.2 Outcomes of the Study

The WCWSS Reconciliation Strategy Study will identify future water requirement scenarios that will be studied to up to 2030 to reconcile supply with the requirement of the system. It is likely that there will be a number of possible interventions which will need to be evaluated against the various criteria at regular intervals, so that the most advantageous interventions can be selected within the required timeframes. In addition, it is possible that certain interventions that are selected for further study may be found to be unsuitable or may be delayed in the process of obtaining the required authorisations. It is therefore important that enough interventions are selected so as to ensure timely implementation of interventions to meet the future requirement.

Proposed decision-making process for selection

The Reconciliation Study includes the following two selection processes:

i. **A study selection process:** To identify interventions requiring additional studies (at feasibility or pre-feasibility level). The selection is based on comparing intervention scenarios. The information obtained from the studies will inform the final selection process. This selection process will be completed in the Reconciliation Study and a set of interventions will be recommended for further study (see **Section 6.3** below).

ii. **A final selection process:** This comprises a process to recommend the most suitable intervention for implementation. This process was not carried out during the scope of the study but key components of the process have been outlined below (see **Section 6.4** below).

To support the selection processes, a planning support tool was developed called the WCWSS Reconciliation Planning Support Tool (RPST). A brief

description of the tool is provided below. Additional information on the tool is provided in the Strategy Report entitled **Scenario planning for reconciliation of supply and requirement.**

WCWSS Reconciliation planning support tool

The need for a graphical tool to provide support for the selection processes was identified and developed during the Study. The tool provides graphical support in selecting interventions. The tool allows the user to compare potential interventions with one another, and with one or more selected future water requirement scenarios. The tool should not be seen as a means of solving the complex decisions inherent in these processes but simply assist decision-makers in understanding and communicating the implications of certain decisions.

The tool is run in MS Excel, with Visual Basic macro-programmes. This tool is interactive, and the user is able to adjust input data. The output is a graph incorporating time-related implementation programmes of interventions and their corresponding influence on the water requirement scenarios. The tool also displays the financial implications of selecting certain scenarios, namely the unit cost of water per intervention selected, the Net Present Value (NPV) and the expected cash flow for a selected suite of interventions.

The tool utilises the following input data sheets:

Water requirement data sheet: The historical water use for the WCWSS, plus a series of projected water requirement scenarios for each year (for the next 25 years) is populated in the Water Requirement Data Sheet.

Intervention Data Sheet: This sheet includes intervention data covering 60 possible water resource and WC/WDM interventions. Each intervention requires the following data:

- Implementation programme with the duration in years (or parts of years to the nearest 0.25 years) (i.e. time to implement each intervention taking consideration of the various approval processes required);
- Yield of each intervention;
- Financial parameters (Unit Reference Value (URV), capital cost and operating cost); and
- Information on various criteria that can be used to compare interventions. These criteria include, *inter alia*, the following:
    - URV,
    - Environmental impact,
    - Socio-economic impact,
    - Health risk,
    - Ability to create additional storage,
    - Facilitates diversification, and
    - Reduces system risk profile.

To assist the user in selecting interventions, the tool includes a basic multi-criteria decision making tool in the Intervention Data Sheet. The user has the flexibility to alter the weighting of the selected criteria and also has the ability to alter the criteria themselves. Five different variables can be compared on this basis. The remainder of the criteria can be utilised for a more qualitative assessment, i.e. interventions can be selected to facilitate the diversification of the resources. Interventions can also be filtered according to particular criteria.

Outputs from the Tool

A future water requirement is selected and interventions are then added so as to make up the identified water balance. A water balance graph is displayed to assist with a reasonable estimate of when projected demand exceeds the available supply and when additional interventions are required. Interventions that have implementation programmes that cannot fit into the available time are red flagged. The total NPV of the selected suite of interventions is also indicated. The outcome of each selection can be saved and later compared. The Strategy Report entitled **Scenario planning for reconciliation of supply and requirement** lists other features of the tool that assist the decision maker in the selection process.

6.3 Study Selection Process

The proposed process and outcomes of the process for selecting interventions for further study is summarised below.

Step 1: Identify interventions

A. List and document all possible interventions to a common base of information.
B. Obtain public input on additional interventions and amend proposed list.
C. Consider the time required to implement each intervention and recommend a likely implementation programme for each intervention.

Step 2: Screen interventions

A. Identify a representative multi-stakeholder group to assist in the screening process
B. Use agreed criteria to screen interventions that have fatal flaws (The criteria used in the Selection of Interventions Workshop are included in **Appendix C**)
C. Maintain a record of screened interventions which could be considered if additional information or technology becomes available
D. Update the implementation programmes taking into account further input

Step 3: Public Review of Selected Interventions

A. Obtain public feedback on the screening process
B. Update the programme and list of interventions

Step 4: Scenario Planning Process

A. Identify a range of possible implementation scenarios using the RPST
B. Analyse the scenarios and document the outcomes

Step 5: Review of selected intervention scenarios by Water Institutions, Authorities and local political representatives

A. Obtain feedback on the scenarios from a multi-stakeholder group, including water institutions, local authorities
B. Revise implementation scenarios, programmes and actions to be taken

Step 6: Obtain public feedback on scenarios

A. Obtain public feedback on the proposed scenario for further study
B. Steering Committee to review comments and update strategy accordingly.

Step 7: Initiate studies

A. Steering Committee to recommend studies to the DWAF and CCT.

Recommendations arising out of the process

During the Reconciliation Strategy Process, the steps outlined above will have been completed. The process up to the end of **Step 4** is documented in the Strategy Report entitled **Scenario planning for reconciliation of supply and requirement**. In carrying out these steps, the following recommendations arose:

1) A Strategy Committee should be formed in order to make recommendations, on an annual basis, on long term planning activities required to ensure reconciliation of requirement and available supply in the WCWSS area.
2) The CCT's 8-year WC/WDM strategy and programme should be implemented in order to ensure that no shortage of supply exists prior to the implementation of the next intervention.
3) The CCT should initiate a feasibility study to determine the potential of additional longer term WC/WDM interventions to be implemented beyond the existing eight year strategy. **Table 6.1** contains a summary of the intervention study start dates and identifies the responsible organizations for initiating the studies.

Table 6.1 Summary WC/WDM intervention study start dates

INTERVENTION	DATE STUDY REQUIRED	STUDY LEVEL REQUIRED	RESPONSIBILITY
CCT 8-year WC/WDM Strategy and Programme	2007	To be implemented	CCT
LONGER TERM WC/WDM INTERVENTIONS			
WC/DM: Adjustment of water tariffs, metering and credit control	2007	Feasibility (yields to be updated)	CCT
WC/DM: Eliminate auto-flush urinals	2007	Feasibility (yields to be updated)	CCT
WC/DM: Leakage detection and repair	2007	Feasibility (yields to be updated)	CCT
WC/DM: Promotion of private boreholes and wells	2007	Feasibility (yields to be updated)	CCT
WC/DM: Use of water efficient fittings	2007	Feasibility (yields to be updated)	CCT
WC/DM: User education	2007	Feasibility (yields to be updated)	CCT

4) Studies at an appropriate level of detail should be carried out for all the supply-side interventions listed in Table 6.1, in order to ensure the reconciliation of supply and requirement.
5) The CCT should proceed with the TMG Aquifer feasibility study and pilot project, as the TMG Aquifer has been identified as a potentially significant water source for future development.
6) The CCT should proceed with the implementation of a pilot sea water desalination plant in order to learn lessons for the implementation of large-scale desalination. It is important to understand the pre- and post-treatment processes, obtain a better understanding of the actual operating and capital costs associated with desalination, as well as any potential environmental impacts. The CCT should also monitor sea water quality along the Western Cape Coastline in order to develop a database of the varying sea water qualities.
7) The CCT and all other WSAs in the WCWSS should develop integrated effluent re-use policies for their areas of jurisdiction and also initiate feasibility studies to determine the full future potential for effluent re-use in their respective areas. There should be close collaboration and integration between all the WSAs in this regard where appropriate. This would include the conceptual design of various effluent re-use interventions, and a comprehensive EIA.
8) The DWAF should initiate an integrated WCWSS effluent re-use study, which would include interventions such as the exchange of Berg River irrigation water.
9) The Strategy Committee should monitor the progress of the CCT's TMG Aquifer Feasibility Study and Pilot Project and after considering the outcomes, takes a decision regarding further feasibility studies on the TMG Aquifer Scheme.
10) All interventions where very little data exists (specifically in terms of yield and cost) should be studied at reconnaissance level, so that a comparative evaluation can be made in the future. These interventions are listed in **Table 6.2**.
11) A study should be undertaken by the DWAF to investigate and assess the implications and costs of implementing the Ecological Reserve on existing water resources schemes.

Table 6.2 Summary of supply intervention study start dates

Intervention	Date Study to Start	Study Level Required	Responsibility
EXISTING FEASIBILITY STUDIES			
TMG Aquifer Feasibility Study	Ongoing	Feasibility	CCT
Pilot Desalination Plant	Ongoing	Feasibility	CCT
TMG Regional Monitoring	Ongoing	Monitoring	DWAF
Invasive Alien Plant Clearance	Ongoing	Ongoing	DWAF
PLANNED FUTURE STUDIES			
Voëlvlei Phase 1 (Note 1)	2007	Update feasibility	DWAF
Michell's Pass Diversion	2007	Pre-feasibility/ Feasibility (Note 2)	DWAF
Newlands Aquifer	2007	Pre-feasibility	CCT
Cape Flats Aquifer	2007	Feasibility	CCT
West Coast Aquifer Recharge (Langebaan)	2007	Pre feasibility	DWAF
Upper Wit River Diversion	2007	Pre-feasibility	DWAF
Raising Steenbras Lower Dam (including pre-feasibility of Upper Campanula Dam)	2007	Pre-feasibility	DWAF/CCT
Lourens River Diversion Scheme	2007	Update Pre-feasibility (as linked to Raising Steenbras Lower)	CCT/DWAF
Upper Molenaars Diversion	2007	Pre-feasibility	DWAF
Effluent Re-use (policy, effluent treated to potable standards, effluent treated for irrigation/industry)	2007	Pre-feasibility	CCT and all WSAs
WCWSS Effluent Treatment Re-use Study	2007	Pre-feasibility	DWAF

Notes :
1. This would include a pre-feasibility study of the Voëlvlei Phase 2 Scheme.
2. Michell's Pass Diversion may have to be carried out at Feasibility in order to make a comparison with Voëlvlei Phase 1.

12) The capacity of the Voëlvlei pipeline should urgently be assessed by the CCT, as the condition of this pipeline may impact on the viability of implementing either the Voëlvlei Phase 1 Scheme or the Michells Pass Diversion Scheme. The cost implications on other supply-side interventions, utilising an additional pipeline from Voëlvlei to the CCT should be assessed.

13) Owing to the potential impact of climate change on the reconciliation of supply and requirement, the DWAF should initiate an impact assessment study in this regard.

14) The Scenario Planning process should be updated on a regular basis to cater for:
- Revised future water requirement projections.
- Updated information on the implementation of the ecological Reserve and the potential for climate change.
- Updated information from recently completed studies (reconnaissance level, pre-feasibility level and feasibility level) for WC/WDM and supply-side interventions.
- Any other change to the input data.
- Revision to the CCT's 8-year WC/WDM strategy.

15) The Strategy Committee must ensure that the following monitoring is undertaken in order to be able to ensure the reconciliation of supply and requirement over the longer term:
- The success of the WC/WDM interventions implemented. This is of particular importance as the volume and implementation date of anticipated water-saving interventions have a significant impact on future supply intervention study start and scheme implementation dates.
- Actual water use (agricultural and urban)
- Population growth and economic growth rate figures in order to be able to develop a better understanding of future water requirements
- Hydrological and geo-hydrological monitoring
- Water quality monitoring

Table 6.3 Summary of intervention where insufficient information is available

Intervention	Timing	Responsibility
Groundwater		
Conjunctive use	To be determined by Strategy Committee	DWAF
Artificial Recharge (ASR)	To be determined by Strategy Committee	DWAF
Artificial Recharge: Breede River Alluvium	To be determined by Strategy Committee	DWAF
Maximise existing infrastructure		
Steenbras Pumped Storage Scheme Intake	2007	CCT
Possible additional off- channel raw water storage at Misverstand Dam	To be determined by Strategy Committee	DWAF
Maximise WCWSS yield		
Operation of Kleinplaas Dam	2007	CCT
Improve Operation of Atlantis Aquifer (See Note 1)	2007	CCT
Other		
Implications of implementing Ecological Reserve on existing water resources	To be determined by Strategy Committee	DWAF
Water Trading	As soon as possible	All WSAs
Non-Flow Related Interventions	To be determined by Strategy Committee	DWAF
Integrated Catchment Management	To be determined by Strategy Committee	DWAF
Integrated WSWSS Re-use Study (incl. Berg River Water exchange)	2007	DWAF
Note 1: Improved management and operation of the Atlantis Aquifer will reduce the reliance placed on Voëlvlei Dam		

Based on an evaluation using the WCWSS RPST, **Table 6.4** lists a set of implementation interventions that are recommended for further study. As listed in **Steps 5 and 6**, additional review by multi-stakeholder groups and the public will be required prior to finalisation of the proposed interventions.

6.4 Final Selection Process

A final selection process will be determined to select the interventions needed to meet the water requirement once it exceeds the available supply in 2011. With the implementation of the WC/WDM interventions contained in the CCT draft WC/WDM strategy, the requirement for further interventions would be delayed until 2015.

The selection process for implementation of interventions will be finalised by the Strategy Committee but will include the following key components:

1. Stakeholder input will be included in various parts of the process including the criteria against which the interventions will be evaluated and compared. (**Appendix C** provides an example of the criteria that could be used).
2. Public participation will constitute a key part of the legal EIA processes required to implement the interventions.
3. The RPST will be used to assist in the decision-making process. To make sure that decisions are based on the best available data, information obtained through the feasibility studies should be continuously incorporated into the RPST.
4. The outcome of important technical decisions will be communicated to the public through public meetings.
5. The Strategy Committee will make recommendation to the Minister of the DWAF on the next supply intervention to be implemented.
6. Information obtained from the studies will be communicated to the public as appropriate.
7. The final decision on the next intervention will be made by the Minister.

6.5 Implementation Table

The strategic approach to implementing the actions required under the Selection of Interventions and Decision-making Process Theme are outlined in **Table 6.5**.

Table 6.5 SELECTION OF INTERVENTIONS AND DECISION-MAKING: Summarised key issues, approach, action, responsibility and programme

Key issue	Approach	Activity	Responsibility	Programme
Study Selection Process				
a. Identifying interventions for consideration ***Objective:*** To identify all potential interventions for reconnaissance level study	i) Use all available relevant information to identify all potential interventions, including previously discarded interventions (Recognise the iterative nature of the selection process and the need to link to other processes outlined in the strategy including Water Requirements Theme, Water Use Efficiency Theme, Water Availability and System Operation Theme, Comparison of Requirement and Availability Theme, Monitoring and Information Management Theme)	Collate available information on all potential interventions from existing studies and reports	DWAF/CCT	As required for selection process
		Identify new interventions not previously identified	DWAF/CCT	As required for selection process
		Evaluate existing information on interventions in order to identify and document fatal flaws	DWAF/CCT	As required for selection process
		Prepare a list of interventions for further consideration, including levels of confidence in available information	DWAF/CCT	As required for selection process
b. Selection of interventions for further study ***Objective:*** To select interventions for further study	i) Ensure that the criteria and process for selecting interventions support sustainable development of the water resources (including environmental, social, economic and institutional aspects and time management) ii) Involve appropriate stakeholders effectively, at the right time in the selection process iii) Maintain a record of the selection process and reasons for results (Recognise the iterative nature of the selection process and the need to link to other processes outlined in the strategy including Water Requirements Theme, Water Use Efficiency Theme, Water Availability and System Operation Theme, Comparison of Requirement and	Review and update approaches, procedures and criteria for selecting interventions	DWAF/CCT	Annually
		Update available information on interventions into the Intervention Data Sheet and Water Requirement Data Sheet in the RPST (Link to Monitoring and Information Management)	DWAF/CCT	As required for selection process
		Develop criteria to evaluate interventions in the tool to meet future requirement scenarios and document the process and outcomes	DWAF/CCT	As required for selection process

Key issue	Approach	Activity	Responsibility	Programme
	Availability Theme, Monitoring and Information Management Theme)	Use the RPST to identify interventions requiring additional study so as to allow flexibility in implementing interventions to meet the requirement	DWAF/CCT	As required for selection process
		Consider existing information and determine the appropriate level of study required (pre-feasibility or feasibility)	DWAF/CCT	As required for selection process
		Disseminate information for engagement with stakeholders and consider feedback (Link to Stakeholder Engagement Theme)	DWAF/CCT	As required for selection process
		Disseminate information and final implementation decisions to stakeholders (Link to Stakeholder Engagement Theme)	DWAF/CCT	As required for selection/implementation process
		Define roles and responsibilities for implementation (Link to Strategy Implementation and Performance Assessment Theme)	DWAF/CCT	As required for selection/implementation process
		Implement selected interventions (Link to Strategy Implementation and Performance Assessment Theme)	DWAF/CCT	As required for implementation process
c. Undertake studies to support the selection processes	i) Identify and undertake studies to provide appropriate information for screening and selection ii) Timeously identify monitoring requirements to inform the decision-making process iii) Ensure that RQOs and environmental/social/ economic considerations are taken into account as early as possible (Link to Water Resource Protection and Management	Identify information and research requirements and gaps, including additional monitoring requirements (Link to Monitoring and Information Management Theme)	Administrative and Technical Support Group	As required for selection process
		Undertake the studies to bring interventions to the agreed levels	DWAF/CCT	As required for selection process

Key issue	Approach	Activity	Responsibility	Programme
Objective: To provide information to allow comparison and selection of interventions on an equal basis at appropriate levels.	Theme) iv) Inform decision-makers about updated findings to facilitate forward-thinking and preparedness (Recognise the iterative nature of the selection process and the need to link to other processes outlined in the strategy including Water Requirements Theme, Water Use Efficiency Theme, Water Availability and System Operation Theme, Comparison of Requirement and Availability Theme, Monitoring and Information Management Theme)	of information		
		Disseminate information for engagement with stakeholders and consider feedback (Link to Stakeholder Engagement Theme)	DWAF/CCT	As required for selection process
Final Selection Process				
a. Selection process at feasibility level ***Objective:*** To select interventions for implementation	i) Ensure that the criteria for selecting interventions support sustainable development of the water resources (including environmental, social, economic and institutional aspects and time management) ii) Involve appropriate stakeholders effectively, at the right time in the selection process iii) Select the most appropriate interventions within the constraints and consequences (e.g. time, costs, environmental, health, legal frameworks) iv) Maintain a record of the selection process for implementation and reasons for results	Finalise the process for selecting interventions	Strategy Committee	On approval of strategy
		Use a transparent decision-making process to guide the selection of interventions to be implemented	DWAF/CCT	As required for selection/implementation process
		Communicate final implementation decisions. (Link to Stakeholder Engagement Theme)	DWAF/CCT	As required for selection/implementation process
		Define roles and responsibilities for implementation (Link to Strategy Implementation and Performance Assessment Theme)	DWAF/CCT	As required for selection/implementation process
		Implement selected interventions	DWAF/CCT	As required for implementation process

6.6 Recommendations

A fair and transparent decision-making process is required to ensure public acceptance of the outcomes of the study. Relevant stakeholders have been given opportunity to comment on the study selection process undertaken during the Reconciliation Study. The proposed final selection process requires further clarification by the Strategy Committee before it is used for final selection of a programme of interventions. It is very important that the process is based on credible refinement of information and knowledge through additional studies, so that selected interventions can be compared on a common basis. The importance of carefully selecting and applying criteria is an important aspect for further discussion by the Strategy Committee.

Since its initiation, the project has emphasised the importance of transparent communication and this should be continued throughout future decision-making processes. All key decisions should be documented and communicated to relevant stakeholders and the public.

6.7 Responsibilities

The Strategy Committee will be responsible for liaising with the required authorities in order to ensure that the studies required for the reconciliation of supply and requirement are carried out. The DWAF, CCT and other WSAs will largely be responsible for studying the selected interventions.

7. WATER RESOURCE PROTECTION AND MANAGEMENT

Objective

To ensure sustainable use from current and future water sources, reservation and preservation of future water source options, as well as monitoring needs

7.1 Introduction

Resource protection

The protection of South Africa's water resources is effected through the National Water Act (NWA) which promotes the principles of sustainability and equity. Equity refers to equal access to water resources and to the benefits from the use of water resources.

The principles encapsulated in the NWA are intended to:

- meet the water needs for current and future generations;
- promote the efficient, sustainable and beneficial use of water in the public interest; and
- protect aquatic and associated ecosystems and their biological integrity.

Specifically, the NWA requires that all *"significant water resources"* (water resources considered significant in the context of sustainable management of the water resources) in South Africa be classified to determine the quantity and quality of water reserved for ecosystem functioning (the ecological Reserve), and to ensure that they are maintained in a minimum state of health related to an acceptable level of functioning.

Processes and management measures to facilitate realisation of the goals of the NWA are being developed progressively within the contexts of, *inter alia*:

- Quality and quantity Resource Directed Measures (RDM; DWAF 1999) for rivers, wetlands, estuaries and aquifers, e.g. the ecological Reserve and Resource Quality Objectives (RQOs). These are requirements for water quantity, quality and habitat and biotic integrity to be maintained in the resource. RQOs may encompass ecological, economic, social and political objectives;
- The National Water Resource Strategy (NWRS; DWAF, 2004);
- Catchment Management Strategies (CMS);
- The National Water Resources Classification System and Process (NWRCS, under development by DWAF).

In essence, these processes will require that a wide range of complex trade-offs be evaluated at a number of different time and space scales before deciding on the future Management Class (and its inherent ecological Reserve) of a resource. These trade-offs will include those between use--and the associated socio-economic benefits and protection, between downstream impacts and upstream uses and *vice versa*, between possible use of resources within a catchment and between catchments, and between possible resource use between different parts of the country (after the DWAF, 2005).

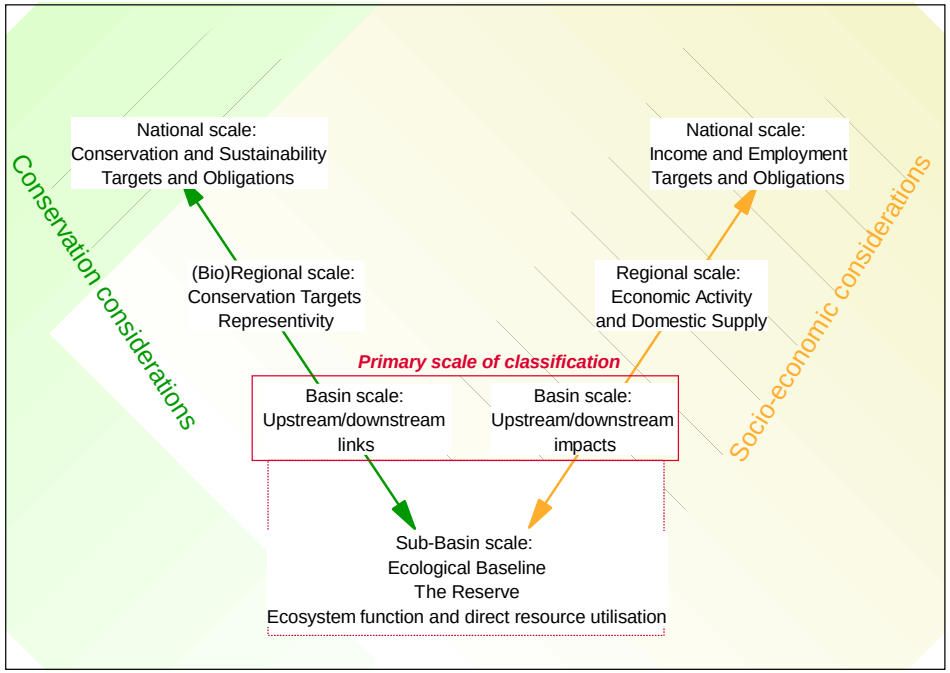

Figure 7.1 Socio-economic and ecological scale issues of relevance in resource classification

The outcome of the Classification Process will be the Minister of Water Affairs and Forestry, or her delegated authority, making a decision on the Management Classes for all significant water resources (rivers, estuaries, wetlands and aquifers), which will be binding on all authorities or institutions when exercising any power, or performing any duty under the NWA.

Chapter 3 of the NWA also makes provision for preliminary determinations of the class of a water resource (based largely on its Present Ecological Status), and hence it's ecological Reserve in the absence of a formal Classification Process. The NWRCS is still under development, and to date no formal classification processes have been undertaken in the Western Cape. Consequently, all ecological Reserve determinations undertaken to date are considered to be preliminary.

In addition to the NWA, the sustainable management of water resources should be carried out in a manner consistent with national environmental policy and within the framework of the National Environmental Management Act (NEMA). This includes actions designed to address recognised water management concerns with the view to optimising the availability of water from systems and/or minimising the costs associated with using water of an inadequate quality. This includes control of damaging land-use practices, pollution and mechanical damage to ecosystems.

The strategy will need to:

- take cognisance of the protection measures promulgated by national-level legislation;
- make provision for meaningful interaction and dialogue within processes established to facilitate implementation of the legislation, specifically CMS's, Classification and NEMA;
- ensure compliance with ecological Reserve allocations and other resource protection measures in operations and in planning initiatives.

7.2 Options for future use

Currently, Spatial Development Plans/Frameworks do not include consideration of future water resource developments, such as e.g. dam developments or raising, access to aquifer storage or conveyance corridors. Consequently, interventions for augmentation of water supplies in the future are not adequately protected, often leading to more costly and less-optimal augmentation interventions having to be developed.

The strategy will need to address incorporation of water resources planning into Spatial Development Plans/Frameworks and other regional and local planning initiatives, through meaningful interaction and dialogue within local and regional processes, such as IDPs and WSDPs. Effect to this could be given through the Classification and Compulsory Licensing processes.

Monitoring

Compliance, operation (including scheme) and resource monitoring activities should form an integral part of water resource management and planning. Data, to facilitate informed decision-making, planning and operation, are required at numerous levels. In some cases, insufficient data are currently available to allow confident high-level planning for the WCWSS, in particular those relating to sustainable use of the area's water resources, e.g. the TMG Aquifer. Similarly, monitoring data is required to evaluate both the impacts on the WCWSS by other users and the effects of the WCWSS operation on the water resources.

The strategy should address the importance of co-ordinating the efforts of various national and regional departments and agencies so as to reduce duplication of effort, promote data sharing, ensure quality control and reporting and address gaps in data collection, relevant to the WCWSS.

7.3 Implementation Table

The strategic approach to implementing the actions required under the Water Resource Protection and Management Theme are outlined in **Table 7.1.**

Table 7.1 WATER RESOURCE PROTECTION AND MANAGEMENT: Summary of key issues, approaches, actions, responsibilities and programme

Key issue	Approach	Action	Responsibility	Programme
Water resource management systems and data				
a. Determination of Management Classes for water resources and RQOs ***Objective:*** Participation in the processes to ensure realistic Management Classes and RQOs for water resources of the WCWSS	i) Engage with formal Classification processes which may influence the WCWSS to ensure • integration of WCWSS requirement into management classes • realistic classification • setting of the relevant RQOs, which are quantifiable and enforceable	**Participate in classification processes that may impact on the WCWSS**	Administrative and Technical Support Group	As required
		Providing WCWSS strategy scenarios for consideration in the Classification processes for the relevant catchments	Administrative and Technical Support Group	As required
b. Ecological Reserve requirements ***Objective:*** To understand the impact of implementing ecological Reserve requirements on water resources of the WCWSS	i) Ensure determination/refinement of the ecological Reserve requirements • For assessing the phasing in of the ecological Reserve for existing infrastructure. • As part of the feasibility studies for future interventions. ii) Phase in the ecological Reserve requirements for existing infrastructure	Identify the ecological Reserve studies for water resources affected by existing infrastructure and potential interventions	DWAF/CCT	Upon approval of Strategy and update when necessary
		Undertake the identified ecological Reserve studies for incorporation into planning initiatives	DWAF/CCT	Upon approval of Strategy
		Participate in the planning for phasing in of the ecological Reserve for existing infrastructure (Link to Water Availability and System Operation Theme)	Administrative and Technical Support Group	Upon approval of Strategy and update when necessary
Sustainable utilisation				

Key issue	Approach	Action	Responsibility	Programme
a. Sustainable use of the water resource ***Objective:*** Protection of surface water resources and aquifers	i) Engage with the development and implementation of relevant Catchment Management Strategies to ensure that they adequately address protection measures relevant to the WCWSS, including: • Ecological Reserve determination (Linked to Classification process) • drafting the allocation schedule (protection of water resource for future interventions) • curtailment of river and wetland destruction, e.g. bulldozing • curtailment of illegal water use • regulation of land use (Refer to NWA Section 12 iii) • curtailment of spread of invasive alien plants • surface and groundwater protection zones • communal well-field development and aquifer management (incl. modelling, monitoring and managing) • regional aquifer management (incl. modelling, monitoring and managing)	Participate in the development of relevant Catchment Management Strategies	Administrative and Technical Support Group and Operational Committee	As required
		Bring non-compliance affecting the WCWSS to the attention of the relevant authority	DWAF and Operational Committee	As required
		Liaise with or take action against non-compliant authorities/users	DWAF/relevant authority	As required
		Assist DWAF with action against non-compliant authorities/users	Operational Committee	As required
		Assist DWAF with supporting authorities where necessary	Operational Committee	As required
		Promote and provide input (as needed) into the prioritisation of IAP clearing programmes, (particularly riparian zones and agricultural land)	Administrative and Technical Support Group	Ongoing

Key issue	Approach	Action	Responsibility	Programme
b. Impacts of water quality on the WCWSS water resources ***Objective:*** Limit the influence of poor water quality on system yield, RQOs and cost to users	i) Engage with DWAF's draft "source management strategy" to protect water resource quality, including • protection of quality of water entering major existing infrastructure and potential future interventions • avoidance of freshening releases. • avoidance of negative impacts on groundwater quality ii) Engage in and support the development of policies and procedures to facilitate inter-government department co-operation in dealing with disputes relating to water containing waste (point and diffuse sources)	Support implementation of DWAF's "source management strategy"	Operational Committee	Ongoing
		Investigate strategies to avoid freshening releases for water quality management, e.g. pollution prevention and riparian buffers	Operational Committee	As soon as possible
		Manage the existing WCWSS infrastructure to achieve RQOs (Link to Water Availability and System Operation Theme)	DWAF/CCT	Ongoing
		Identify those activities posing greatest risk to the WCWSS water resources and the authority for managing those risks	DWAF/CCT	Ongoing
		Insist on a tough approach on any non-compliant waste discharger that affects the water resources of the WCWSS and support appropriate legal action against repeat offenders	Operational Committee	As necessary
		Insist on implementation of existing strategies (e.g. DWAF/ DANIDA) to reduce diffuse- and point-source pollution from e.g. informal settlements, industry and agriculture	Operational Committee	As necessary
		Ensure support to local authorities requiring technical assistance with respect to water resource protection	Operational Committee	Ongoing

Key issue	Approach	Action	Responsibility	Programme
		Assist with targeting available funding mechanisms (MIG, SMIF, etc) to finance required upgrades, especially to WWTWs	Operational Committee	As necessary
Monitoring				
a. Water Resource Protection Monitoring ***Objective:*** Obtain suitable information for the protection of the WCWSS water resources.	i) Ensure that adequate data and information is available for the determination and implementation of the ecological Reserve and the RQOs (Link to Monitoring and Information Management Theme)	Identify monitoring needs based on RDM documentation and any additional requirements pertaining to groundwater and surface water resource protection	DWAF	As required
		Agree on and allocate responsibilities with respect to water resource protection monitoring	Operational Committee	As required
		Ensure creation and maintenance of a database with the relevant data for protection of water resources	Operational Committee	As required

7.4 Recommendations

The importance of Classification cannot be overemphasised. In terms of the NWA, the outcome of Classification is a set of Management Classes for significant water resources, plus their RQOs (including the ecological Reserve) and monitoring specifications and obligations, and these are binding on all authorities or institutions when exercising any power, or performing any duty under the NWA. The management of the WCWSS impacts on the catchments surrounding Cape Town, and those responsible for managing the system should therefore be involved in classification processes in the Western Cape. Classification is also a vehicle that can be used to secure future interventions for augmentation of the WCWSS.

Ensuring sustainable use of the surface water and groundwater resources of or interacting with the system requires significant interaction with the CMAs and other water-related authorities, to ensure awareness of activities. Interaction that is regularly needed should preferably be formalised. The managers of the system have specific responsibilities in terms of sustainable use, and in some instances, where issues are not being addressed, may need to accept additional responsibilities to ensure sustainable use.

There should also be a programme developed to phase in the water needs to meet the ecological Reserve requirements, not only waiting for compulsory licensing. Other government departments and Local Authorities should be persuaded to implement the necessary measures.

Monitoring programmes must be developed, implemented and co-ordinated to ensure that the objectives of the environmental releases are met and adapted if the releases are not effective. Where ecological releases are made,

measures must be in place to ensure that the objectives of the releases are met and that other users do not abstract the water.

7.5 Responsibilities

The DWAF is responsible for the design and implementation of the NWRCS, i.e., the Classification. The DWAF: RDM Chief Directorate also has the responsibility for the technical aspects of ecological Reserve determination, however, finances for ecological Reserve determinations may need to be provided as part of the scheme cost, and be carried out for the DWAF, to reduce delays caused by staff shortages, etc. (ref. Breede ISP). Technical ecological Reserve determinations have been done for most major river systems, and some estuaries, in the WCWSS, and proactive ecological Reserve determinations, based on calibrated models for the area, can be used to extend these to the remaining systems. Ecological Reserves for wetlands and aquifers are also required.

It is likely that many of the responsibilities for ensuring compliance with, for instance RQOs, and monitoring activities will be devolved to the CMAs and the major users in the catchment.

The DWAF is responsible for coordinating and implementing monitoring programmes that capture, store and disseminate data so as to ensure that ecological releases are effective.

8. STAKEHOLDER ENGAGEMENT

Objective

To engage with stakeholders at various tiers of government and with water institutions, raising awareness of water-related issues and building capacity of officials, politicians, stakeholders and the public

8.1 Introduction

The Constitution of South Africa sets out Government's responsibility to provide the public with an opportunity to be involved in governance decisions which affect their lives. This presents an enormous challenge in communicating with a wide range of stakeholders, from the wealthy and empowered to the poor and marginalised, and across all spheres of government, from national to local.

The term "*stakeholder*" refers to individuals, groups or organisations that have an interest, are affected by or can affect the outcome of an initiative. In this case, "*stakeholder engagement*" refers to the ongoing interaction with such role-players, aimed at improving decision-making during the planning, design, implementation and evaluation phases of the WCWSS.

"*Co-operative Governance"* refers to collaboration between government, the private and public sectors and civil society in governing the country. It also refers to collaboration between all spheres of government and organs of state to provide effective, transparent, accountable and coherent government for the republic as a whole (Constitution, 1996). The strategy aims to strengthen co-operative governance, as well as to enhance the opportunities for co-operative governance.

The aim of stakeholder engagement is to enhance the quality of decision-making and operations through creating mutual understanding, a common vision and supportive actions amongst and between the stakeholders.

Three fundamental objectives of stakeholder engagement are:

- To inform stakeholders;
- To improve decision-making; and
- To bring about sustainable development.

Relevant legal obligations to engage with stakeholders are contained in the Constitution, National Water Act, Water Services Act, National Environmental Management Act, Environment Conservation Act and Promotion of Access to Information Act.

For this study, an extensive public engagement process was followed as part of the strategy development. This process has informed the strategy's key issues and approaches. The process has included newspaper advertisements, public meetings, capacity building efforts, newsletters and workshops with key stakeholders. Further to this the Catchment Management Agency processes have been initiated in both the Breede and the Berg WMAs. The Breede-Overberg CMA is awaiting formalisation whilst the Berg Reference Group is still developing its proposal.

The existing owners of the WCWSS, namely CCT and the DWAF, have a good working relationship. Other user groups are also being engaged on an *ad hoc* basis, as required. More formal communication lines and procedures need to be established to enhance operational efficiency, formalise responsibility, and to co-ordinate a coherent communication strategy that changes water use behaviour. Awareness raising and education on how to limit negative impacts on the system are a priority.

8.2 Implementation Table

The strategic approach to implementing the actions required under the Stakeholder Engagement Theme are outlined in **Table 8.1**.

Table 8.1 STAKEHOLDER ENGAGEMENT: Summary of key issues, approaches, actions, responsibilities and programme

Key issue	Approach	Action	Responsibility	Programme
Co-operative Governance				
a. Engaging with national government and parastatals ***Objective:*** To ensure co-operative governance with national government	i) Engagement with the Ministers, and departments required to make decisions regarding water resource interventions, to explain the consequences of taking or not taking intervention decisions ii) Formal engagement with departments whose action or inaction affects the functioning of the WCWSS iii) Engagement with the formal classification process (Link to Water Resource Protection and Management Theme)	Make presentations to relevant agencies (DEAT, DoA, National Infrastructure Agency) on the strategy to obtain endorsement	DWAF CD: IWRP, CCT	On final approvals of strategy,
		Provide updates on the strategy	Administrative and Technical Support Group and Strategy Committee	Annually
		Nominate a representative to sit on the steering committee of the classification studies (Link to Water Resource Protection and Management Theme)	Administrative and Technical Support Group	Once steering committee of relevant classification study is initiated
		Liaise with ESKOM (and REDs) for planning regarding infrastructure (e.g. hydropower stations and co-generation for desalination)	Those responsible for implementing new interventions (DWAF CD: IWRP, CCT)	Annual meetings between DWAF and ESKOM (and REDs)
		Meet and brief with relevant National Ministers (DEAT, DWAF, National Infrastructure Agency) for imminent decisions	Those responsible for implementing new interventions (DWAF CD: IWRP, CCT)	At key decision points (to define on the overall strategy programme)
b. Engaging with provincial authorities	i) Engagement with the MECs and provincial departments required to make decisions regarding water resource interventions, to explain the consequences of taking or not taking intervention	Presentation about strategy to relevant MECs	DWAF CD: IWRP, CCT	On final approvals of strategy
		Encourage representation of D:EA&DP, DOA on the Strategy Technical Committee	DWAF RO & CCT	When committee is established

Key issue	Approach	Action	Responsibility	Programme
Objective: To ensure co-operative governance with provincial government	decisions ii) Formal engagement with provincial departments whose action or inaction affects the functioning of the WCWSS iii) Regular engagement with provincial politicians and officials iv) Active engagement regarding all provincial policies, strategies, plans and programmes that have an influence on the water requirement	Inform officials during the planning process for specific interventions (D:EA&DP, DOA, DLG&H, DOH, DLA, DEAT)	DWAF Regional Office, DWAF CD: IWRP and CCT	Ongoing from the beginning of the planning process
		Meet and brief with relevant MEC's (D:EA&DP, DWAF, DOA) for imminent decisions	DWAF Regional office, DWAF CD: IWRP, and CCT	At key decision points
		Presentation about new interventions to (relevant) MECs prior to public engagement	Those responsible for implementing new interventions (DWAF CD: IWRP, CCT)	Following feasibility phase
		Draft and distribute briefing notes on proposed interventions to MECs offices	Administrative and Technical Support Group	Prior to public release
		Liaise with departments involved in developing provincial strategies and provide agreed strategy committee input	Administrative and Technical Support Group and Strategy Committee	Ongoing
c. Engaging with regional and local authorities ***Objective:*** To ensure co-operative governance with local government	i) Engagement should be guided by the DWAF Public Participation Guidelines ii) Engagement with those responsible in local authority structures, that are required to make decisions regarding water resource interventions, to explain the consequences of taking or not taking intervention decisions iii) Regular engagement with politicians and officials of local authorities iv) Formal engagement with local authorities, whose action or inaction affects the functioning of the WCWSS, e.g. local source development and	Presentation about strategy to WECLOGO	DWAF CD: IWRP, CCT	On final approvals of strategy
		Annual updates to all local authorities on the strategy (e.g. portfolio committee)	Administrative and Technical Support Group and Strategy Committee	Annually
		Meet and brief relevant mayors and municipal managers to highlight issues of concern and identify appropriate responses and responsible officials (e.g. through portfolio committees)	DWAF RO/CMA	As instructed by strategy committee

Key issue	Approach	Action	Responsibility	Programme
	licensing, WWTW upgrading etc.; v) Co-ordination of efforts for information dissemination, where appropriate • (For example: Distribute emergency and risk reduction information, water use efficiency and restriction information via local authority communication routes i.e. through rates bills)	Inform Local Authorities (B and C Municipalities) officials during the planning process	Those responsible for implementing new interventions (DWAF CD: IWRP, CCT)	During feasibility phase
		Brief relevant municipalities on imminent decisions	Administrative and Technical Support Group and Strategy Committee	At key decision points
		Liaise with WECLOGO and Western Cape Disaster Management Committee to highlight issues of concern	DWAF RO and CCT	When appropriate
		Set up system for efficient distribution of common information	Administrative and Technical Support Group	When committee is established
d. Engaging with water institutions (CMAs, WUAs, irrigation boards, water boards, the Infrastructure Agency and research institutions) ***Objective:*** To ensure co-operative governance with water institutions	i) Engagement should be guided by the DWAF Public Participation Guidelines ii) Regular feedback to water institutions regarding the operations, status and planning for the WCWSS iii) Water institutions should be requested to disseminate relevant WCWSS information to their constituencies iv) Formal engagement with water institutions whose action or inaction affects the functioning of the WCWSS	Presentation about strategy to the Breede-Overberg and Berg Reference Groups/CMAs	DWAF RO	On final approvals of strategy
		Liaise with Breede-Overberg and Berg Reference Groups/ CMAs to highlight issues of concern	DWAF RO	When requested by strategy committees
		Inform relevant water institutions on progress of intervention planning	DWAF RO	At key decision points
		Ensure the utilisation of an efficient system to distribute information	Administrative and Technical Support Group	Ongoing

Key issue	Approach	Action	Responsibility	Programme
Stakeholder awareness raising and capacity building				
e. Engaging with other Stakeholders e.g. NGOs, civic bodies, labour unions, lobby groups, residents associations, media and the general public ***Objective:*** To ensure effective communication and participation	i) Engagement should be guided by the DWAF Public Participation Guidelines ii) Providing regular feedback iii) Requesting organisations and institutions to disseminate relevant WCWSS information to their constituencies iv) Where appropriate, information dissemination should be co-ordinated with the Berg and Breede-Overberg CMAs v) Information provided must be updated regularly and must be accessible to the relevant audience vi) Establishment of effective relationships with the media and provision of regular information on water usage, monitoring, catchment management, planning for future requirement, risk education and awareness, and disaster management vii) Engagement with interested parties when testing the acceptability of interventions or levels of service (Link to Selection of Interventions and Decision-making Process Theme)	Set up and keep updated a list of media contacts	Administrative and Technical Support Group	Update annually
		Compile appropriate press releases (for example appreciation of system complexity, bylaws, drought restrictions, reporting water use, availability, water quality issues, raise awareness of long-term planning)	Administrative and Technical Support Group	When requested by strategy committee
		Inform politicians of press releases prior to release	Strategy Committee	Prior to press releases and ministerial briefing
		Provide and update information for CCT and DWAF websites	Administrative and Technical Support Group and Strategy Committee	At least every 6 months
		Ensure that relevant contact details are on all information disseminated	Administrative and Technical Support Group	Ongoing
Legally required participation				
a. Legal processes (e.g. EIAs, licensing and land-use planning) ***Objective:*** To ensure compliance with legal requirements	i) Engagement should be guided by the DWAF Public Participation Guidelines ii) Timely involvement of responsible authorities and adherence to legal requirements	Ensure adherence to the requirements of relevant legislation (e.g. NWA, NEMA, LUPO, CARA, NHRA)	Those responsible for planning or implementing new interventions	As required

8.3 Assumptions underlying recommendations

The strategy considers all parties interacting with those operating and managing the WCWSS, from National Government to water users, to be stakeholders.

The DWAF's *Generic Guidelines for Public Participation* underpins the recommendations regarding stakeholder engagement. Stakeholder engagement should not be used or seen to paralyse the decision-making process not to pursue a particular agenda but rather to enrich it and to secure the common good.

It is assumed that a committee representing the relevant operating bodies, that will be able to direct communication and engagement efforts, will guide the WCWSS. Clear decisions, unambiguous communications and a professional team to operate the system, with the necessary binding contracts, should be in place to ensure effective and efficient service delivery.

8.4 Recommendations

The importance of engagement and communication has been made clear in the challenges currently being experienced by the system. It is recommended that there be regular interactions with national, provincial and local authorities, whose laws or policies influence the use of the system. Further to this, it is recommended that there be regular communication with various water-related structures such as the WUAs, CMAs, irrigation boards, Water Boards, the Infrastructure Agency and research institutions, to enhance the efficiency of the system and to remedy user concerns or misuse.

Ongoing awareness-raising and capacity building is recommended for the interested parties representing civil society, ensuring a common vision and enhanced water conservation and holistic resource management.

In the interim, prior to the completion of this strategy, it is recommended that both the DWAF and the CCT Management Committees review the Strategy to ensure that accepted approaches are incorporated into these organisations' relevant functions and approaches and to initiate urgent actions timeously.

8.5 Responsibilities

The responsibility for engaging with relevant stakeholders lies with the authority responsible for providing water to each sector. The overall responsibility therefore lies with the DWAF. However, all organs of state involved in the WCWSS have an obligation to share the responsibility for communication and capacity building, to ensure informed and transparent decision-making, with respect to their involvement with the system.

9. MONITORING AND INFORMATION MANAGEMENT

Objective

To facilitate effective monitoring, data capturing processes and information and knowledge management systems to ensure sustainable planning and management

9.1 Introduction

Monitoring involves measuring specific parameters to assess the current status and changes over time of those parameters and by implication, the meaning thereof and consequent decisions. Monitoring also includes the provision of information on the progress of implementing a strategy, plan or project so that responsible parties are able to make necessary adjustments to activities, inputs and budgets.

Effective monitoring includes the co-ordination and undertaking of data collection, as well as the management of data, information and knowledge.

Data	is a measure or representation of observed facts in a formalised manner, suitable for communication, interpretation, or processing by human or automatic means.
Information	is derived from data through data analysis and interpretation.
Knowledge	is the understanding of possible consequences based on the information, the context and experience, using a specific line of reasoning.

Correct and accurate data collection and management depends mainly on the experience of the allocated personnel and the capacity/suitability of the selected technology. Information and knowledge management depend very much on the relationships between people and institutions, while data management is largely process and protocol dependent.

There are three elements in a monitoring programme:

- data collection and storage;
- information creation through data processing, analysis, transformation, interpretation and modelling; and
- information dissemination and knowledge improvement for a transparent decision-making process.

Monitoring and the National Water Act

Chapter 14 of the National Water Act (Act 36 of 1998), dealing with "Monitoring, Assessment and Information", envisages the establishment of national monitoring systems that "facilitate the continued and co-ordinated monitoring of various aspects of water resources by collecting relevant information and data, through established procedures and mechanisms, from a variety of sources including organs of state, water management institutions and water users". The National Water Resource Strategy (NWRS; DWAF, 2004) further provides that the national systems "will be designed in such a way that CMAs, once established, will be able to take an appropriate level of responsibility for managing information relevant to their water management areas and, where necessary and feasible, have access to information from adjacent areas with which there are links" (op. cit., p. 103).

Proper decision on all aspect of water resources management should be based upon "reliable, relevant and up-to-date information" that reflects "the integrated nature of water resources, in which the quantity and quality of surface and groundwater are all inextricably interrelated" (NWRS, 2004, p. 103). To promote optimal IWRM decisions, DWAF is "reviewing and, where necessary, revising all data acquisition, monitoring and information arrangements to ensure that all relevant data is collected, verified and stored, and that there is consistency in the data that are common to the various water resource management functions. At the same time, the facility to analyse data and provide information in different ways to meet specific requirements will be retained and improved" (op. cit.).

9.2 Monitoring system for the WCWSS

The design and management of a regional monitoring and information system, for the WCWSS, should be in accordance with the systems of other regional WRM institutions, especially those in related or contiguous catchments, and with the national system.

The strategy addresses the need to co-ordinate monitoring efforts in various aspects of the WCWSS as well as those of national and regional departments and agencies so as to reduce duplication of effort, promote data sharing, ensure quality control, and address gaps in data collection and reporting.

Monitoring is a requirement and key element of each theme within this strategy and forms an integral part of operating and managing the WCWSS. However, the type of monitoring, the required data and frequency, and the purpose for monitoring vary across the themes. Details of how monitoring is addressed in the separate themes is outlined in **Section 9.4** below.

Monitoring needs

Monitoring is required to facilitate informed decision-making, planning and operation at numerous levels e.g.:

- Comparing projected water use (short and long term) with actual use, together with compliance monitoring, actual water availability and scheme operation, form an integral part of managing the WCWSS.
- Furthermore, insufficient monitoring data constrains confident high-level planning for the WCWSS, in particular those relating to sustainable use of the area's water resources, e.g., uncertainty around the implementation of the ecological Reserve.
- Similarly, monitoring is required to evaluate the impacts of WCWSS operation on the water resources and the natural environment, as well as the impacts other users might have on the water availability from and or water quality of the WCWSS.
- The surface water, groundwater, snow, weather systems, rainfall patterns and system operations must be recorded and their interactions modelled.
- Monitoring is an important tool to create confidence in resource management decisions and to reliably inform the public in a transparent manner. This builds trust with stakeholders and the public and facilitates fair water use.

How the WCWSS infrastructure is operated will affect the region's river flow regimes, water chemistry, sedimentation and temperature regimes and, consequently, their fauna and flora. It will also affect the recharge and discharge patterns of different aquifers. While these effects will be mitigated, to a certain extent, by the implementation of the ecological Reserve, it will be necessary:

- to establish whether or not the agreed-on volume, water quality and timing of flows are being released;
- to verify that the overall objectives, i.e. Resource Quality Objectives (RQOs), are being achieved; and
- if the overall objective is not being achieved, to be able to adjust either the Instream Flow Requirements (IFR) or the objective.

Thus, the WCWSS will need to demonstrate compliance with ecological Reserve allocations and other resource protection measures (e.g. RQOs). Population growth, economic growth and socio-economic indicators must be monitored and compared with assumed inputs in the operations and planning models. Demand management must have set benchmarks and measurable indicators against which effectiveness and the cost of the measures can be compared.

9.3 Data Management

The management of data to monitor water resources is an ongoing process. The condition of key ecosystem components are measured routinely and at repeated intervals following an event and the results can then be compared with the same data collected prior to the event. The integrity of the data, the standardisation of collection methodology and equipment are of utmost importance.

The requirements for data management and monitoring are varied and numerous but include:

- accurate monitoring stations; i.e.
  - hydrological gauging points (such as weirs or rated river sections with linked chemical recording points),
  - hydrogeological stations (groundwater level, spring flow, abstraction rates / volumes, EC, pH, temperature, macro, trace and isotopic hydrochemistry),
  - metereological observatories (e.g. rainfall, air and soil temperature, barometric pressure, wind direction and speed, humidity, solar radiation), and
  - biosphere monitoring (e.g. river health indices, vegetation change, microbiological pollutants);
- sophisticated facilities for data management and communication: Computer systems with capacity and open software for current data

storage and access, analytical and report-writing exercises, e-mail, fax machines and telephones;
- access to specialist equipment (e.g., automatic data loggers with remote data transfer, current meters, survey equipment, meters for water-chemistry analysis) and means of maintaining and replacing them;
- appropriate transportation;
- appropriate protection and security on storage and back-up facilities, systems and databases so as to ensure full recovery if data losses do occur; and
- qualified and trained personnel to undertake the installation and maintenance of monitoring equipment, the data collection, handling and storage, and the data management.

9.4 Information and Knowledge Management

The creation and maintenance of an information and knowledge management system for data and information is central to the successful operation and management of the WCWSS. In general, data that is transferred first into information and then into knowledge is done with a specific aim in mind, such as the search for an optimal solution to a specific problem. Whilst such a system is often imagined to require technology, the most critical element is the management of human resources and the relationship between individuals within institutions, representing different institutions and or stakeholder groups.

Central to knowledge management is people-competence. This means that retaining, training and maintaining competent staff becomes a strategic knowledge management issue. Competence has been summarised as comprising three key attributes; education, experience and attitude. While attitude can be learned and or revised, education and experience are usually a matter of time and quality. Another aspect of knowledge management considered whether the environment in which competent individuals work facilitates the application of skills, leadership, creativity and experience to effectively solve problems. Thus, institutional capacity cannot be separated from Information and Knowledge Management.

The strategy must address the reality of a society in transition. A key challenge of such a society is the integration of different value systems into organisational and economic practices. An important aspect of knowledge management is therefore knowledge transfer.
Knowledge management follows the principles of Adaptive Management in that it increases the knowledge base incrementally and supports appropriate and timeous reaction to problems as well as trust of the people in joint planning and action programmes.

- The first step in Information and Knowledge Management is therefore the evaluation of the maturity of the relevant organisations to establish their capacity to take timeous decisions and to act on them and to take the necessary steps to upgrade if necessary.
- The second step is to address and improve competence in terms of education (i.e. qualification), experience and attitude.
- The final and ongoing step is to strategically consider how to retain knowledge as it often rests within key individuals who may not always be available or able to share that knowledge.

The primary objectives of Information and Knowledge Management is:
- to provide a database where information collected within and outside of the WCWSS can be stored;
- to maintain and increase the knowledge base regarding the current status of the WCWSS, the reality of future challenges regarding the available water resources;
- to facilitate quality control of information pertaining to the WCWSS;
- to facilitate improved access to shared information within the WCWSS;
- to ensure transfer of knowledge regarding operations, planning and decision-making within the WCWSS;
- to provide the facts, relevant interpretation and experience base for informed and transparent decision-making processes with respect to operation of the current WCWSS, sustainable use of the water resources and required interventions to meet future demand.

The principles by which the information and knowledge should be managed and released must be established, namely:

- Recognition of copyright and ownership of original base data;
- Recognition of copyright and ownership of derived data (information and knowledge) ;
- Implementation of metadata standards;
- Data sharing standards, like data formats and presentation.
- Ownership of information systems, accessibility, interaction with other systems and protection

9.5 Implementation Table

The strategic approach to implementing the actions required under the Monitoring and Information Management Theme are outlined in **Table 9.1.**

Table 9.1 MONITORING AND INFORMATION MANAGEMENT: Summary of key issues, approaches, actions, responsibilities and programme

Key issue	Approach	Action	Responsibility	Programme
WCWSS Regional Monitoring and Data Management				
a. Monitoring Framework and Programme ***Objective:*** To provide effective regional monitoring networks for undertaking data capture and processing to support the operation and planning of the WCWSS	i) Develop a detailed integrated regional monitoring framework and programme, taking into account the Berg and Breede Internal Strategic Perspectives (ISP), including 1. co-ordinating structures, roles and responsibilities; 2. funding and financial feasibility; 3. identification of data requirements, including o surface o groundwater o ecosystem functioning o water use o socio-economic indicators o economic growth o population growth o effectiveness of demand management 4. data gathering methods and standards 5. data processing methods and standards 6. implementation programmes 7. custodianship of databases 8. auditing of databases ii) Ensure that monitoring databases are accessible to all relevant role players iii) Ensure implementation and performance review of the integrated regional monitoring programme (Link to Strategy Implementation and Performance Assessment Theme)	Assess data requirements for the WCWSS	DWAF/CCT	Upon approval of the Strategy
		Identify additional data requirements and/or monitoring sites and associated infrastructure, equipment and resources	DWAF/CCT	On completion of assessment
		Collate and programme the identified monitoring needs into a coherent and structured system (incl. roles, responsibilities, budget, timing, standards, data format and accessibility, methods and frequency)	DWAF/CCT	On completion of assessment
		Regularly review and update the regional monitoring framework	DWAF/CCT	Annually
b. Data Management	i) Assess data needs throughout the system ii) Ensure continuity of data collection (ensure linkage to the WAAS study and to information and recommendations from the Berg River Baseline	Support the data management actions identified in the Berg and Breede ISPs required to support reconciliation of the WCWSS	Administrative and Technical Support Group	Ongoing

Key issue	Approach	Action	Responsibility	Programme
Objective: To ensure effective management and implementation of monitoring data to support the operation and planning of the WCWSS	Monitoring Study) iii) Facilitate improved storage, manipulation, backup, archiving, dissemination, access to and sharing of data within the WCWSS iv) Facilitate the development and implementation of data sharing policies with other departments, provincial and local government and other organisations v) Review resources required for adequate data collection for monitoring of the WCWSS vi) Ensure security of data through adequate custodian and storage provisions vii) Ensure continuity and timeliness of data collection	Facilitate the identification of data requirements from other departments, provincial and local government and other organisations which influence or are influenced by the WCWSS	Administrative and Technical Support Group	Ongoing
		Confirm ownership and custodianship of databases	DWAF/CCT	Upon approval of the Strategy
		Identify additional information requirements and/or monitoring sites and associated infrastructure, equipment and resources	DWAF/CCT	On completion of assessment
		Ensure that adequate storage, backup and archiving facilities and library systems are available to protect WCWSS data	DWAF/CCT	Ongoing
		Oversee continuity and timeliness of data collection and management	Operational Committee	Ongoing
		Implement the integrated Regional Monitoring Programme	DWAF/CCT	On completion of development of the framework and programme
		Oversee implementation of the Regional Monitoring Programme	Operational Committee	Biannually
Information & Knowledge Management				
a. Information Management ***Objective:*** To facilitate improved generation of and	i) Assess information needs throughout the system ii) Facilitate improved storage, manipulation, backup, archiving, dissemination, access to and sharing of information within the WCWSS iii) Facilitate the development and implementation of information sharing policies with other departments, provincial and local government	Support the information management actions identified in the Berg and Breede ISPs required to support reconciliation of the WCWSS	Administrative and Technical Support Group	Ongoing
		Assess information requirements for the WCWSS	DWAF/CCT	Upon approval of the Strategy

Key issue	Approach	Action	Responsibility	Programme
access to information relevant to the present and future WCWSS.	and other organisations iv) Ensure security of information through adequate custodian and storage provisions v) Ensure continuity and timeliness of information creation, storage and availability	Facilitate the identification of information requirements from other departments, provincial and local government and other organisations which influence or are influenced by the WCWSS	Operational Committee	Ongoing
		Confirm ownership and custodianship of information products	Operational Committee	Upon approval of the Strategy
		Ensure that adequate storage, backup and archiving facilities and library systems are available to protect WCWSS information	DWAF/CCT	Ongoing
		Oversee continuity of information management	Operational Committee	Ongoing
b. Knowledge Management ***Objective:*** To ensure transfer of knowledge regarding operations and planning within the WCWSS	i) Ensure continuity of planning and operational knowledge of the WCWSS through training and documentation of existing sources of knowledge	Compile and regularly update a catalogue referencing all documents pertaining to the WCWSS	DWAF/CCT	Upon approval of the Strategy and updated as required.
		Compile and regularly update a list of professionals and organisations who have had involvement in the operation and planning of the WCWSS	DWAF/CCT	Upon approval of the strategy and updated as required.
		Identify training needs relating to operation and planning of the WCWSS	DWAF/CCT	Upon approval of the Strategy
		Undertake training relating to operation and planning of the WCWSS	DWAF/CCT	As required

Key issue	Approach	Action	Responsibility	Programme
		Identify key individuals, from a suite of disciplines and perspectives, who have generational, institutional and technical insight into managing the WCWSS and capture this knowledge in an appropriate format	DWAF/CCT	Upon approval of the Strategy
		Establish mentorship programme using key individuals to support training programmes	DWAF/CCT	As required
		Document all the various operating modes (to ensure optimal water resource management) of the WCWSS	DWAF/CCT	Upon approval of the Strategy
		Document all aspects relating to the operation and planning of the current and future WCWSS e.g. WRPM/WRYM	DWAF/CCT	Upon approval of the Strategy
		Appoint a service provider to provide technical support to the Strategy Steering Committee	DWAF	On formation of the Committee
Co-ordination of monitoring activities				
a. Co-ordination of activities	i) Develop co-operative, collaborative relationships between all monitoring role-players (Link to Strategy Implementation and Performance Assessment Theme) ii) Facilitate the development and	Facilitate the establishment of MOUs to identify ownership, responsibilities, continuity of data and to ensure co-operation and co-ordination between all monitoring role-players	Operational Committee	Upon approval of the Strategy and updated as required.

Key issue	Approach	Action	Responsibility	Programme
Objective: To ensure co-ordination and co-operation between all monitoring role-players regarding operations and planning within the WCWSS	implementation of a data-sharing policy with other departments, provincial and local government and other organisations and identify the following: • What data should be shared? • Who should have access to it? • What is the integrity of the data to be shared? • What are the standards for data collection	Support the compilation and implementation of a data and information sharing policy with other departments, provincial and local government and other organisations	Operational Committee	As required
		Advise on the development of monitoring and information regulations under the NWA	Administrative and Technical Support Group and Operational Committee	As required

9.6 Illustration of the cross-cutting nature of WCWSS monitoring activities

Monitoring information is required across many of the themes. The following summarises the type of data required for different themes.

Monitoring in the Water Requirements Theme

- Obtaining best information to support, review, monitor and determine when it is appropriate to update water requirement scenarios
- Define and update monitoring indicators and thresholds of acceptable change so as prompt timely review of projections
- Monitor WSA and agricultural water use.

Monitoring in the Water Efficiency Theme

- Develop appropriate means for local authorities to report monthly progress against benchmarks/targets in order to monitor sustainability of existing WC/WDM initiatives
- Monitoring and reporting on progress with WC/WDM through the WSDP
- Monitor the extent of water re-use by local authorities against set targets
- Development of Water Management Plans by WUAS will assist in monitoring current water use practices and may provide opportunities to encourage a reduction in the agricultural water requirement

Monitoring in the Water Availability and System Theme

- Identifying additional monitoring requirements, especially surface water-groundwater interaction, baseline groundwater data, and groundwater usage
- Expand data collection to support integrated water resource modelling, including surface water, groundwater, water quality, climate and usage.
- Need to identify improved technologies to obtain accurate data to inform hydrological models
- Improve data for WARMS and accessibility thereof for planning and management purposes
- To ensure that there is appropriate information on water availability (of a suitable quality) for the WCWSS so as to be able to undertake appropriate planning and modelling
- Improved monitoring of the system to ensure efficient river releases
- Monitor and management of aquifers (including individual abstraction) to ensure that the impact on surface water is within acceptable limits
- Maintain infrastructure and instruments to minimise errors in monitoring and improve accuracy of information
- The ongoing monitoring of rainfall, inclusive of patterns and spatial distribution, river flows, spring flows and abstractions are essential to provide good data for extending flow records and for identifying changes or trends that might arise from climate change

- Collate and evaluate relevant monitoring information to support early warning systems
- Train staff in data collection and interpretation

Monitoring in the Selection of Interventions and Decision-Making

- Monitor the success of the WC/WDM interventions implemented as well as the progress with feasibility studies initiated and take a decision regarding a "fast-tracked" feasibility study
- Use all available relevant information to identify all potential interventions, including previously discarded interventions
- Update available information on interventions into the Intervention Data Sheet and Water Requirement Data Sheet in the RPST
- Timeously identify and undertake studies and monitoring requirements to inform the decision-making process

Monitoring in the Water Resource Protection and Management Theme

- Monitoring data is required to evaluate both the impacts on the WCWSS by other users and the effects of the WCWSS operation on the water resources
- Ensure that adequate data and information is available for the determination and implementation of the ecological Reserve and the RQOs
- Identify monitoring needs, based on RDM documentation, and any additional requirements pertaining to groundwater and surface water resource protection
- Agree on and allocate responsibilities with respect to water resource protection and monitoring
- Ensure creation and maintenance of a database with the relevant data for protection of water resources

Monitoring in the Strategy Implementation and Performance Assessment Theme

- Implementation of the strategy will involving monitoring implementation according to agreed key performance areas
- Technical support teams will be needed to monitor all impacts of water use and water availability and to research new opportunities

Monitoring in the Stakeholder Engagement Theme

- Information should be managed to promote communication with relevant stakeholders
- Information should be updated regularly

9.7 Recommendations

The strategy should address the need to co-ordinate monitoring efforts in various aspects of the WCWSS as well as those of national and regional departments and agencies so as to reduce duplication of effort, promote data sharing, ensure quality control, and address gaps in data collection and reporting. This is best accomplished through the design and effective management of a WCWSS information system.

9.8 Responsibilities

According to the NWA (Section 137), the Minister is responsible for establishing national water resource monitoring systems. The systems must provide for the collection of appropriate data and information to facilitate monitoring of various aspects of water resources, through established procedures and mechanisms, from a variety of sources and in co-ordination with other organs of state, water management institutions and water users

The operators of the WCWSS will be the authorities responsible for accessing and gathering data and managing the information pertinent to the WCWSS. Furthermore, it is likely that many of the responsibilities for water resource monitoring activities and ensuring compliance with, for instance RQOs, will be devolved to the CMAs and the major users in the catchment.

10. STRATEGY IMPLEMENTATION AND PERFORMANCE ASSESSMENT

Objective

To address the establishment and financial responsibilities of the committee tasked with implementing the strategy as well as to address the performance monitoring, and revision processes for the strategy

10.1 Introduction

Any strategy is as good as its practical implementation. Alignment of the key role-players and continuous monitoring is required to ensure performance and compliance in meeting the objective of the strategy, to reconcile future water supply and requirement. The strategy can only be kept alive by a decision-support framework which will enable timely decisions to be made on water resource interventions. Technical support teams will need to monitor all impacts and effectiveness of WC/WDM measures so as to be able to research new opportunities.

The planning scenarios in the strategy rely on certain assumptions and generalisations. In reality, there are often deviations from the adopted planning scenarios. These deviations are often temporary in nature, (i.e. due to weather patterns or major sporting events) and afterwards water use and availability will again follow the long-term predicted trajectories. A deviation can also be a longer term change such as a change in water user behaviour, adaptation to climate change, the introduction of cheaper new technologies, new knowledge or increased confidence in certain types of technologies. In order to maintain the strategy, keep it relevant and to adapt it in response to changing factors from the outside, regular revision and adequate financing is necessary. A number of institutions are involved in the planning and operation of the system. These institutions should take part in the strategy revisiting process, should be consulted and should take the responsibility to steer the strategy in the right direction. The establishment of an appropriate committee and Memoranda of Understanding and Agreements will facilitate this.

The factors that should be taken into account and the institutions that should be part of the implementation and performance assessment are discussed in the following section.

10.2 National Water Act and National Water Resource Strategy

The strategy must fit into the legislative framework at a regional level, and must be in line with national and regional water laws and strategies.

The *National Water Act* (NWA) is the principal legal instrument governing water resource management in South Africa, and is being incrementally implemented. The NWA is supported by other legislation such as the National Environmental Management Act and other Acts.

The *National Water Resource Strategy* (NWRS) is the implementation strategy for the NWA and provides the framework within which the water resources of South Africa will be managed in the future. All authorities and institutions exercising powers or performing duties under the NWA must give effect to the NWRS. This strategy sets 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 Berg and Breede-Overberg CMAs are under development. These strategies will address water resource management at WMA level. Until such time as the CMAs are established and are fully operational, the regional offices of the DWAF will continue managing the water resources in their areas of jurisdiction.

10.3 Regional and local frameworks and plans

It is most important that the strategy has a good fit with the Provincial Growth and Development Framework, Provincial and local Spatial Development Framework, with regional and other Environmental Management Plans, with plans and expectations of the Departments of Agriculture, Land Affairs, the Environment and others. It must also be aligned with the regional IDPs and WSDPs of CCT and the WSAs. Water is very often a constraining factor in

development and co-operative governance planning and implementation is essential in aligning what is planned for with what is possible to be supplied.

The *Raw Water Supply Agreement* between the DWAF and CCT states that the DWAF and the City will engage in joint long-term planning, of which this strategy is an example. The possibility of developing similar joint long-term planning agreements with other provincial government departments should be investigated.

10.4 Relevant water institutions

The DWAF and CCT, as the main owners and operators of the system, are the key role-players. The future BWP, which is under construction, will initially be owned by the Trans Caledon Tunnel Authority (TCTA) and will later be transferred to the DWAF. Eskom plays a role as owner and operator of the hydro-electric Palmiet Pumped Storage Scheme, which includes Rockview Dam.

Once established, the Berg and Breede-Overberg CMAs will play a major role in the implementation of the strategy, especially with regard to the selection and approval of interventions towards reconciliation. The majority of towns in the Berg WMA are either wholly or partially supplied from the system. The West Coast District Municipality and many Swartland and Boland local municipalities are WSAs.

WUAs and the remaining irrigation boards represent irrigators along the Berg and Eerste Rivers and irrigators in the Riviersonderend catchment (in the Breede WMA).

The Overberg Water Board abstracts water from the Riviersonderend to supply water for stock watering and domestic use on farms within the Rûensveld East and Rûensveld West Schemes of the Overberg.

Due to restructuring within the DWAF, the roles and responsibilities are not currently well defined. Although the National Office of the DWAF has been restructured, a new agency for the development, management and operation of State-owned water infrastructure is in the process of being established. Likewise at Regional level, the responsibilities and communication channels between the Western Cape Regional Office, the Southern Cluster Manager and the newly formed Infrastructure Management Agency are not yet clear.

10.5 Other factors that might influence the strategy

In his last “State of the Nations” address the State President indicated that more support from National Government to Local Government is needed. In this context, structures must be created in which the interests of the smaller water users in the system are also represented and supported.

10.6 Existing committees relevant to the WCWSS

There are currently two committees that have responsibility regarding advising and operating the WCWSS. These committees are:

- The Western Cape Water System Consultative Forum: This group of people usually meets once or twice a year to discuss the water situation of the system (by the end of winter) and to advise the DWAF’s Regional Director on the need and level of curtailments for the following year. During droughts this groups meets more often.

- The operational committee for the WCWSS: This committee meets on an *ad hoc* basis regarding operational issues such as water transfers required to maximise water usages, tunnel shut-down requirements, issues arising from metering. The committee currently comprises of the owners and operators of the WCWSS.

A Provincial MinMEC committee, where the Minister of Water Affairs has discussions on water related issues with MECs of the Western Cape Province, is in place. These discussions also include the national Department of Agriculture. They are relevant to the whole Western Cape Province and convene only on a need-basis. The Provincial Liaison Committee (PLC) which feeds information to the MinMEC, meets about three times a year, but is not focussed on the study area only and discusses a much wider range of topics.

10.7 Targets and key performance areas

Implementation of the strategy needs to be done according to key performance areas, to be agreed by the managing bodies, to set targets, to monitor compliance and to ensure an effective strategy.

10.8 Implementation Table

The key implementation aspects relevant to this theme are outlined in **Table 10.1**.

Table 10.1 STRATEGY IMPLEMENTATION AND PERFORMANCE ASSESSMENT: Summarised key issues, approach, action, responsibility and programme

Key issue	Approach	Activities	Responsibility	Programme
a. Establishment of a Strategy Committee ***Objective:*** To ensure implementation and maintenance of the Reconciliation Strategy	i) Refine the Committee's ToR, mandate and obligations ii) Annual reporting to key stakeholders iii) Ensure representation of relevant institutions/agencies on the Strategy Committee iv) Ensure Strategy Committee activities are co-ordinated with other committee functions (i.e. operational committee)	Engage with and make presentations to identified stakeholders to ensure active representation on the Strategy Committee	DWAF CD: IWRP, CCT and RO Director	On final approval of Strategy
		Ensure the appointment of and confirm funding arrangements for the support group	DWAF: NWRP	On final approval of Strategy
		Liaise with the Operational Committee consisting of the owners, operators and users of bulk infrastructure of the WCWSS. (Link to Water Availability and System Operation Theme)	Strategy Committee	On final approval of Strategy and on going
		Ensure appropriate human, technical and financial resources are in place to implement the strategy	All responsible stakeholders	On final approval of Strategy
		Make recommendations on activities required to ensure long-term reconciliation of demand and supply (for example, recommending feasibility studies for specific interventions)	Strategy Committee	As required

		In accordance with the activities outlined in the Strategy, clarify the role of the existing operation committee	Strategy Committee	On final approval of Strategy
		Review and revise the Reconciliation Strategy and ensure monitoring and co-ordination of implementation	Strategy Committee	Annually

10.9 Assumptions underlying recommendations

A multitude of organisations currently own, operate and receive water from the system. The main role-players to date have been the DWAF, CCT and the Provincial Department of Agriculture. Although they would continue to play a significant role in future decisions, other organisations need a forum to ensure that their requirements can be clearly conveyed, that they can make contributions when needed, and are up to date on development and decisions regarding the system.

To assist with decision making, forums and committees should include representation from knowledgeable and involved role-players. Sub-committees or special committees could be formed to attend to specific issues. For effective implementation and performance monitoring, it is important that the proposed Strategy be politically acceptable and that all role-players and stakeholders accept the proposed responsibilities.

10.10 Recommendations

Strategy Committee

A Strategy Committee should be established with the following objectives:

1. To ensure that the strategy is relevant and updated,
2. To monitor and co-ordinate the implementation of the relevant actions identified in the strategy, and
3. To make recommendations on long-term planning activities required to ensure reconciliation of requirement and available supply in the WCWSS area (i.e. recommending a feasibility study for a particular intervention to ensure timely implementation).

The mandate and scope of work for the Strategy Committee should be clearly defined, with the necessary memorandums of understanding in place from appropriate spheres of government. To ensure timely decisions, the mandate, scope of work, lines of reporting of the Committee should be drawn up and approved as soon as possible. The institutions/agencies to be represented on the Strategy Committee are listed **in Table 10.2.**

Administrative and Technical Support Group

To support the Strategy Committee, an Administrative and Technical Support Group should be established to provide scientific and technical support. This support will be facilitated through DWAF: National Water Resource Planning. A scope of work for this support position should be compiled that covers, inter alia, the tasks identified in this strategy.

Table 10.3 summarises the suggested functions of the Strategy Committee and Administrative and Technical Support Group that are drawn from the relevant themes in this Strategy Report.

10.11 Responsibilities

The development of the mandates, obligations and terms of reference for the Strategy Committee and the Administrative and Technical Support Group will be undertaken on completion of the Reconciliation Strategy Study.

Table 10.2 The institutions/agencies to be represented on the Strategy Committee

WC Provincial Government	**(Total 5)**
• Department of Agriculture: 1 representative • Department of Local Government and Housing: 1 representative • Cape Nature: 1 representative • Department of Environmental Affairs and Development Planning: 2 representatives i) Planning branch ii) Environmental branch	
Local Authorities	**(Total 5)**
• City of Cape CT: 3 representatives iii) Bulk water, iv) Wastewater, and v) Water demand management • West Coast District Municipality: 1 representative • Cape Winelands District Municipality: 1 representative	
Department of Water Affairs and Forestry	**(Total 9)**
• Regional Office: 3 representatives i) Institutional support, ii) Regulatory support, and iii) Water sector support • Integrated Water Resource Planning: 3 representatives i) National Water Resource Planning, ii) Options Analysis, and iii) Water Resource Planning System • Water Use Efficiency: 1 representative • Water Resource Infrastructure Branch: 2 representatives	
Catchment Management Agencies (when established)	**(Total 2)**
• Berg CMA : 1 representative • Breede-Overberg CMA: 1 representative	
Water User Associations	**(Total 2)**
• Berg WUA: 1 representative • Breede-Overberg WUA: 1 representative	
	(Total 23)

Table 10.3 Summary of the suggested functions of the Strategy Committee and Administrative and Technical Support Group

Strategy Committee Activities	Theme Reference
Obtain agreement on implications of altering assurance of supply with different sectors	Water Requirement
Monitor how closely the relevant WC/WDM targets and objectives are met	Water Efficiency
Monitor the extent of water re-use against targets	Water Efficiency
Be informed or request update on changes in system yield	Water Availability System Operation
Finalise the process for selecting interventions	Selection of interventions and decision-making
Provide updates on the strategy as required	Stakeholder Engagement
Draft and distribute briefing notes on proposed interventions to MEC's offices	Stakeholder Engagement
Liaise with departments involved in developing provincials strategies and provide agreed strategy committee input	Stakeholder Engagement
Provide annual updates to all local authorities on the strategy (e.g. portfolio committee)	Stakeholder Engagement
Brief relevant municipalities on imminent decisions	Stakeholder Engagement
Inform politicians of press releases prior to release	Stakeholder Engagement
Provide and update information for CCT and DWAF websites	Stakeholder Engagement
Liaise with the Operational Committee as appropriate	Strategy Implementation & Performance Assessment
Make recommendations on activities required to ensure long-term reconciliation of demand and supply	Strategy Implementation & Performance Assessment
In accordance with the activities outlined in the Strategy, clarify the role of the existing operation committee	Strategy Implementation & Performance Assessment
Review and revise the Reconciliation Strategy and ensure monitoring and co-ordination of implementation	Strategy Implementation & Performance Assessment
Administrative and Technical Support Group Activities	
Obtain agreement on implications of altering assurance of supply with different sectors	Water Requirement
Communicate climate change research priorities to WRC and other research institutions	Water Requirement
Understand how water allocated to the agricultural sector is used and how these coincide to relevant assurances of supply	Water Requirement
Review and update requirement scenarios based on findings of WAAS study (including climate change)	Water Requirement
Update water requirement scenarios	Water Requirement
Update the model methodology and parameters of the water use requirements tool	Water Requirement
Define and update monitoring indicators and thresholds of acceptable change to prompt review of projections	Water Requirement
Compare recently recorded requirements with scenarios to guide the choice of scenarios for planning	Comparison of requirement and Availability
Decide on comparison scenario/s to be used for planning of future interventions: low, chosen and high	Comparison of requirement and Availability
Investigate the flexibility of the system in terms of changes in usage patterns and the ability to restrict	Comparison of requirement and Availability
Interpret and clarify the way the system is operated in terms of assurance of supply for long-term planning	Comparison of requirement and Availability
Ensure that the way in which the requirements and availability are compared is user friendly and easy to understand	Comparison of requirement and Availability
Participate in the development of relevant Catchment Management Strategies	Water Resource Protection
Participate in classification processes that may impact on the WCWSS	Water Resource Protection
Promote and provide input into the prioritisation of IAP clearing programmes	Water Resource Protection

Administrative and Technical Support Group Activities Continued	
Participate in the planning for phasing in of the ecological Reserve for existing infrastructure	Water Resource Protection
Compile appropriate press releases	Stakeholder Engagement
Ensure that relevant contact details are on all information disseminated	Stakeholder Engagement
Set up and keep an updated list of media contacts	Stakeholder Engagement
Ensure the utilisation of an efficient system to distribute information	Stakeholder Engagement
Set up system for efficient distribution of common information	Stakeholder Engagement
Brief relevant municipalities on imminent decisions	Stakeholder Engagement
Provide annual updates to all local authorities on the strategy (e.g. portfolio committee)	Stakeholder Engagement
Liaise with departments involved in developing provincials strategies and provide agreed strategy committee input	Stakeholder Engagement
Draft and distribute briefing notes on proposed interventions to MEC's offices	Stakeholder Engagement
Nominate a representative to sit on the steering committee of the classification studies	Stakeholder Engagement
Provide updates on the strategy as required	Stakeholder Engagement
Provide and update information for CCT and DWAF websites	Stakeholder Engagement
Advise on the development of monitoring and information regulations under the NWA	Monitoring and Information management
Support the information management actions identified in relevant ISPs required to support reconciliation of the WCWSS	Monitoring and Information management
Facilitate the identification of data and information from other government agencies and sectors which influence the WCWSS	Monitoring and Information management

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APPENDIX A

COPY OF PUBLIC NEWSLETTERS

Western Cape Reconciliation Study and Berg CMA Process

Newsletter 1 of 3
May 2005

Sien keersy vir Afrikaans

BACKGROUND AND PURPOSE OF THE RECONCILIATION STUDY AND BERG CMA PROCESS

The objective of the Reconciliation Study is to develop future strategies to reconcile projected water demands with the supply from the Western Cape Water Supply System (WCWSS). The Reconciliation Study builds upon the Western Cape System Analysis study undertaken between 1989 and 1995 and other more recent water resource planning studies. This study has been designed to facilitate public input into the selection and screening of options to ensure that the Department of Water Affairs and Forestry is able to make informed decisions on the management and development of the WCWSS.

The Reconciliation Study will also be used to launch the process to establish a Catchment Management Agency (CMA) for the Berg Water Management Area (WMA). The objective of the Berg CMA will be to manage the water resources within the Berg WMA and to involve stakeholders in the protection, use, development, conservation, management and control of these water resources.

This is the first of three Newsletters for the Western Cape Reconciliation Study. The purpose of this Newsletter is to provide an overview of the Reconciliation Study and the process to establish the Berg CMA. The attached Response Sheet provides opportunities for stakeholder input into the initial stages of the Reconciliation Study and the CMA process.

PLEASE NOTE THAT YOU MUST RETURN THE ENCLOSED RESPONSE SHEET TO CONFIRM THAT YOU WISH TO CONTINUE RECEIVING PROJECT INFORMATION.

THE WESTERN CAPE RECONCILIATION STUDY

The Western Cape Water Supply System (WCWSS)

The WCWSS provides water to the communities of Greater Cape Town, Stellenbosch, Paarl and Wellington as well as towns on the West Coast and in the Swartland region. Irrigators along the Berg and Eerste River and irrigators and urban users in the Riviersonderend catchment (in the Breede WMA) also receive water from the system.

The system includes five large dams, namely the Upper and Lower Steenbras and the Wemmershoek Dams owned by the City of Cape Town, and the Voëlvlei and Theewaterskloof Dams owned by the Department of Water Affairs and Forestry. In addition, there are a number of smaller dams and weirs including the Kogelberg, Rockview, Kleinplaas and Misverstand Dams. The Berg Water Project, comprising the Berg River Dam and Supplement Scheme, is under construction and will be integrated into the system by 2007. All these schemes are situated in the Berg WMA, except Theewaterskloof, Kogelberg and Rockview Dams, which are situated in the Breede WMA.

Balancing demand and supply

Currently, agriculture supplied from the WCWSS utilises some 30% of the water, while the urban demand accounts for the remainder. All sectors have implemented water conservation and demand management, and during periods of below average rainfall, are subject to restrictions.

The City of Cape Town is the largest urban water consumer and has implemented a number of the water conservation and demand management initiatives that were recommended in its Integrated Water Resource Planning Study. However, even with these initiatives, it is anticipated that the total urban water demand will increase at approximately 2% per annum. Current projections indicate that existing supplies, including the Berg Water Project, will not be able to meet projected total agricultural and urban demands beyond 2012 (see Figure 1).

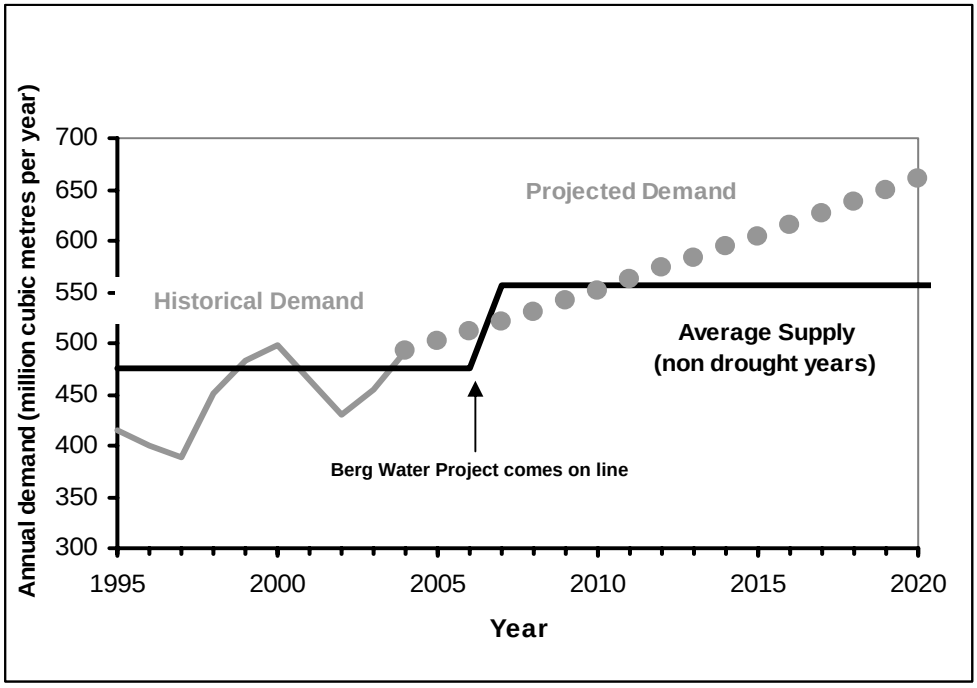

Figure 1: Historical and projected water demand and supply for the Western Cape Water Supply System.

The process of evaluating future Water Demand and Supply Options

Over the next two years a multi-disciplinary team of scientists, economists, biologists, social scientists and engineers will review and investigate a wide range of demand management and supply options. The Department of Water Affairs and Forestry has appointed an Association of Ninham Shand Consulting Services and UWP Consulting to lead the study. Figure 2 provides an overview of the Reconciliation Study process.

Drawing from past studies, the Association has developed an initial list of possible options to consider in the study (see Table 1 and Figure 3). The attached Response Sheet One provides an opportunity for you to suggest additional demand management/ supply options that should be considered in the study.

The initial list of possible options, together with any others proposed by stakeholders, will be evaluated at the Initial Screening Workshop, scheduled for August 2005. The following criteria are likely to be used by the Association to identify options for more detailed study:

- Financial cost,
- Yield (quantity of water supplied to the system on an assured basis or saved by demand management),
- Environmental consequences, and
- Socio-economic impacts.

The list of options selected for more detailed study during the Initial Screening Workshop will be summarised in Newsletter Two and presented to the public at the Second Public Meeting.

Over a six-month period the technical, financial, environmental, and socio-economic aspects of each option will be investigated. A Final Screening Workshop is scheduled for May 2006, during which the results of the detailed study will be used to determine the Reconciliation Strategy. In the Reconciliation Strategy the most favourable augmentation options, as agreed on through this process, will be identified together with the relevant feasibility studies. This aims to improve operation and future planning of the system in order to reconcile supplies with future demands. The results of the Final Screening Workshop will be communicated in Newsletter Three and will be presented to stakeholders at the Third Public Meeting.

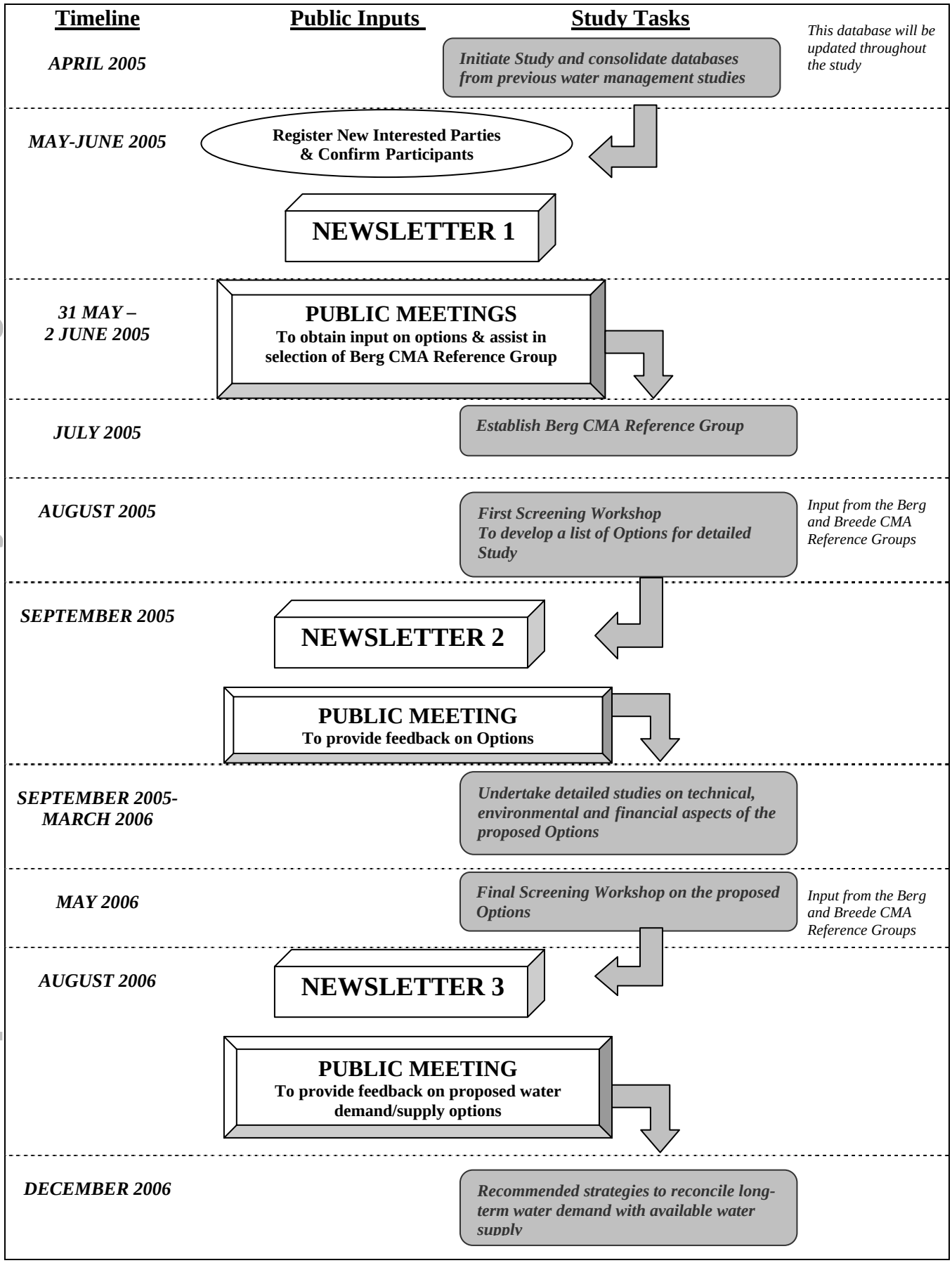

Figure 2: Proposed Reconciliation Study Process

Table 1: An initial list of Water Demand Management and Water Supply Options to be considered in the Western Cape Reconciliation Study. Additional options can be suggested in Response Sheet One.

Numbers refer to map locations in Figure 3.
WS - Wide Spread implementation of options across the system area.
OMA - Outside Map Area

Water Supply Options	
	SURFACE WATER SCHEMES
	Dams:
1	Twenty-Four Rivers
2	Waterval River
3	Lower Wit River
4	Upper Wit River
5	Upper Campanula Scheme
	Diversions:
6	Lourens River
7	Eerste River
8	Olifants River (Keerom)
9	Upper Wit River
10	Upper Molenaars River
11	Michells Pass
12	Voëlvlei Augmentation Phase 1
	Dam Raisings:
13	Misverstand
14	Lower Steenbras
15	Theewaterskloof
16	Voëlvlei Augmentation Phases 2 and 3
	Transfers:
17	Brandvlei to Theewaterskloof Transfer
	GROUND WATER SCHEMES
18	Table Mountain Group Aquifer
19	Cape Flats Aquifer
20	West Coast Aquifers including recharge
21	Newlands Aquifer
	DESALINATION
22	Desalination alone/with co-generation of energy
	OTHER SCHEMES
OMA	Congo River Options
OMA	Tanker /Inflatable bladders
OMA	Orange River (Sea/Surface Pipeline)
OMA	Towing of Icebergs

Water Demand Management Options	
	AGRICULTURAL WATER DEMAND MANAGEMENT
	River Release Management:
23	Riviersonderend
24	Berg River
25	Voëlvlei/Misverstand
	Irrigation Practices:
WS	Canal and Farm Dam Losses
WS	Crop-Deficit Irrigation
WS	Drip/Microjet /Sprinkler irrigation
	TRADING OF EXISTING ALLOCATIONS
26	Eikenhof Dam
27	Lower Berg River
28	Greater Ceres Dam (Koekedouw Scheme)
	REMOVAL OF INVASIVE ALIEN PLANTS
WS	Within catchments
WS	Riparian Zones
	URBAN WATER-DEMAND MANAGEMENT
WS	Leak detection and repair
WS	Pressure management
WS	Use of water-efficient fittings
WS	Metering and plumbing repairs in low income areas
WS	Use of grey water
WS	Use of well points and boreholes
WS	Metering
WS	Tariffs and surcharges / credit control
WS	Water User education
WS	Rainwater tanks
	WATER RE-USE
WS	Exchange reclaimed wastewater for commercial irrigation
WS	Industrial re-use
WS	Reclamation to potable water standards
WS	Urban irrigation
WS	New housing (dual reticulation)
WS	Aquifer recharge

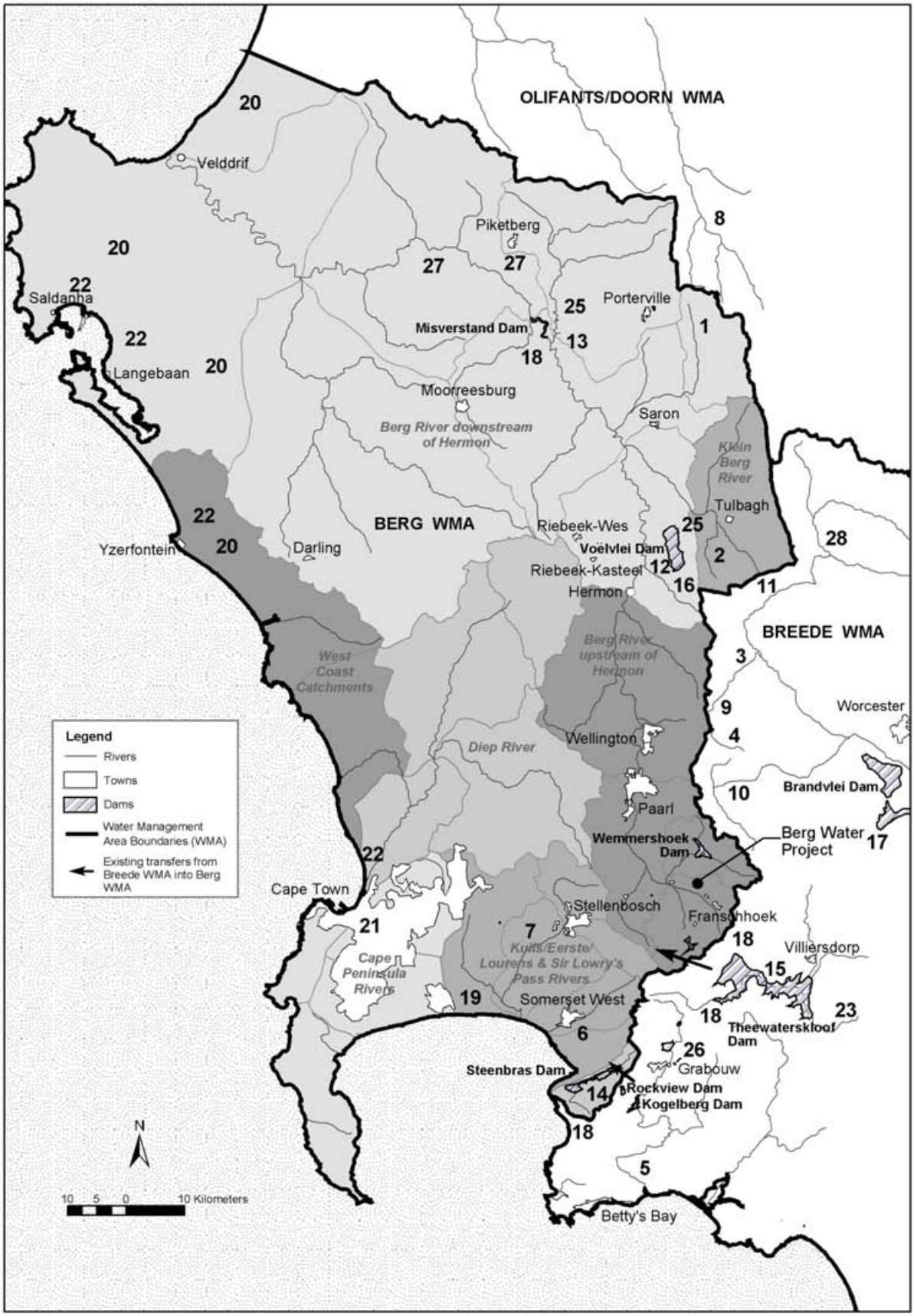

Figure 3: Location of initial Water Demand Management and Water Supply Options to be considered in the Western Cape Reconciliation Study.

THE BERG CATCHMENT MANAGEMENT AGENCY (CMA) PROCESS

The National Water Act provides for the establishment of CMAs as statutory bodies to manage water resources within hydrologically defined catchments, called Water Management Areas.

Initial Functions of a CMA

Each CMA is responsible for managing water resources within a defined Water Management Area. The initial functions are:

- To investigate and advise on the protection, use, development, conservation, management and control of the water resources;
- To develop a catchment management strategy;
- To co-ordinate the activities of water users and water management institutions;
- To promote community participation on the protection, use, development, conservation and control of water resources; and
- To promote co-ordination between the implementation of its catchments management strategy with the implementation of water services development plans by water services authorities (municipalities).

Proposed Process to Establish the Berg CMA

The proposed process for establishing the Berg CMA is described in Figure 4.

Establishment of the Reference Group

The first step in establishing the Berg CMA involves establishing a Reference Group. The process of selecting Reference Group members will be initiated at the first round of Public Meetings, scheduled for Tuesday 31 May, Wednesday 1 June, and Thursday 2 June 2005, as well as on the basis of feedback from Response Sheet One. The Reference Group usually consists of between 50 and 60 individuals who are nominated by organisations or sectoral bodies, such as a Water User Associations. In finalising membership of the Reference Group, the Department of Water Affairs and Forestry must ensure geographical and sectoral representivity and race and gender balance.

Development of the proposal for the establishment of the Berg CMA

The Berg Reference Group will be responsible for drafting a proposal, describing the name, water resource issues, functions, proposed structure, funding and feasibility of the CMA. The proposal will also include information on the required protection, use, development, conservation, management and control of water resources in the Berg Water Management Area. In early 2007, after consultation with stakeholders, the proposal will be submitted to DWAF for evaluation. Public participation, including adequate representation of all stakeholders and their interests, particularly those of marginalised groups, is one of the most important criteria in evaluating the proposal. Further public comment will be invited. After considering all feedback, the Minister of Water Affairs and Forestry will establish the CMA by proclamation in the Government Gazette.

The CMA Governing Board

The Berg Reference Group will also be responsible for nominating representatives from the Water Management Area and the Reference Group to serve on the Advisory Committee. The Advisory Committee is responsible for nominating people to serve on the Governing Board of the CMA. As part of this process, the Advisory Committee must consult with stakeholders, including the relevant organs of state and interest groups, on who should be nominated to the Governing Board. The Minister will be responsible for the final appointment of members to the Governing Board. The Governing Board will govern and provide strategic direction to the CMA.

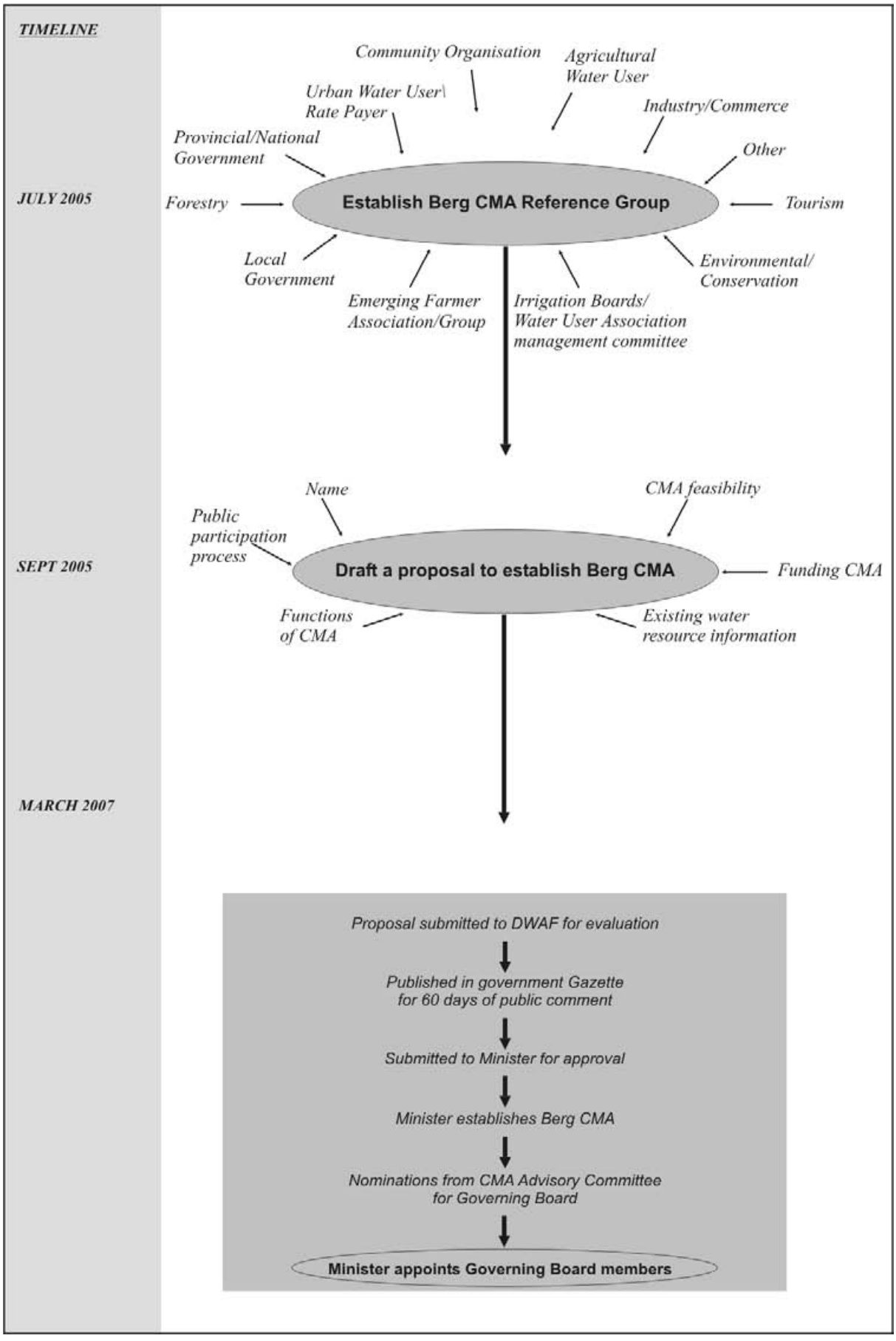

Figure 4: Proposed process to establish the Berg Catchment Management Agency.

OPPORTUNITIES FOR PUBLIC INVOLVEMENT

Stakeholders can elect to become involved in the Reconciliation Study as an Interested or Affected Party, and/or can potentially become involved in the Berg CMA Reference Group.

Reconciliation Study

This level involves providing feedback on the basis of the Newsletters and Public Meetings. Individuals who wish to remain registered with the Reconciliation Study will be invited to attend future Public Meetings and will be sent two further Newsletters with opportunities for feedback on key decisions in the Study.

To remain registered on our database, individuals must please return the attached Response Sheet One.

Berg Reference Group Member

The Berg Reference Group will assist in establishing a CMA for the Berg Water Management Area. The objective of the CMA will be to manage the water resources within the Berg Water Management Area. The process of selecting Reference Group members will be initiated at the first round of public meetings. To be considered for the Reference Group, please return the attached Response Sheet One indicating which sector and geographical area you could represent.

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Western Cape Reconciliation Strategy Study and Berg CMA Process

Newsletter 2 of 4
October 2005

This Newsletter details the progress made in the Western Cape Reconciliation Strategy Study and the initiation of the Berg River Catchment Management Agency (CMA) process. The background to the study and the Berg River CMA process can be found in Newsletter 1 - June 2005 (copies of which can be obtained on request).

INTRODUCTION

The Western Cape Reconciliation Strategy Study will produce a long-term strategy for reconciling water supply with demands from the Western Cape Water Supply System (WCWSS) area. The purpose of this Newsletter 2 is to provide feedback on the outcomes of the Preliminary Screening Workshop, and to report back on the first stages in the process of the Berg River CMA establishment.

THE WESTERN CAPE WATER SUPPLY SYSTEM (WCWSS)

Overview of the WCWSS

The WCWSS provides water to the communities of Greater Cape Town, Stellenbosch, Paarl and Wellington as well as towns on the West Coast and in the Swartland region. Irrigators along the Berg and Eerste rivers and irrigators and urban users in the Riviersonderend catchment (in the Breede WMA) also receive water from the system. The total water use for the WCWSS area is about 510 million m^3/a and the corresponding water supply totals 475 million m^3/a, serving about 3.1 million people. These figures include some abstractions from the Berg River itself.

Overview of the Berg Water Management Area (WMA)

The main economic activities in the Berg WMA are irrigated agriculture --wine, table grape export and deciduous fruit exports-- and tourism. Total water consumption requirement for the WMA is about 745 million m^3/a. Urban water usages comprise 54% of the total consumption, with agriculture consuming 42%. Water supply to the WMA totals 709 million m^3/a on an assured basis, which represents a current shortfall of 36 million m^3 . The Berg Water Project (Berg River Dam and Supplement Scheme) is currently being built to alleviate the current water stress in the WMA.

Overview of the Breede Water Management Area

Economic activities in the Breede WMA are similar to the Berg WMA. The WMA is characterised by irrigated agriculture, wine and table grapes, deciduous fruit exports, and coastal resort towns. The total water use in the WMA including the transfers to the Berg WMA is 1 071 million m^3/a. Current available water supply to the WMA is about 1 090 million m^3/a which means there is a 19 million m^3/a surplus, based at a 98% level of assurance of supply.

The Main Dams

The two main storage dams supplying this system are owned by DWAF: *Theewaterskloof* (in the Breede- Overberg WMA, which also serves irrigators in the Riviersonderend Valley) and *Voëlvlei*. *Wemmershoek*, *Upper Steenbras* and *Lower Steenbras* D*ams* are owned by the City of Cape Town (CCT). The *Berg River Dam, Dam* , which is at present under construction, will initially be owned by the Trans Caledon Tunnel Authority (TCTA) and will later be transferred to the Department of Water Affairs and Forestry (DWAF). **Figure 1** shows the locations of these dams.

The dams are located in a winter rainfall area and are normally filled from May to October when about 90% of the annual runoff occurs and water demands comprise only about 30% of the annual demand. During the dry summer months (November to April) inflows to the dams are small and irrigation demands and garden watering demands in the urban areas are large. Approximately 50% of the dam volume is required for storage during the winter so that the high water demands during the summer can be met. The other 50% of the dams' volume is required to provide long-term carry over storage for periods of droughts.

The Benefits of an Integrated Scheme

The dams are operated in an integrated manner to minimise spillage and maximise storage during winter months. Dam levels are closely monitored, with water demand being shifted onto those dams that are more likely to spill. The effects of droughts are mitigated by implementing water restrictions in all sectors according to agreed levels.

PRELIMINARY SCREENING WORKSHOP

The Preliminary Screening Workshop, held on 4 August 2005, determined the options/schemes that need to be taken into account by the Study Team, and those options that should not be considered further as part of this study.

OBJECTIVES OF THE PRELIMINARY SCREENING PROCESS

The objectives of the Preliminary Screening Workshop were to:

- Identify schemes that require no further evaluation in this study;
- Utilise existing information to 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 warrant further investigations at reconnaissance or pre-feasibility level and which should be considered in the reconciliation process;
- Augment the existing information with specialist inputs from key stakeholders.

Each of the options was considered in isolation during the screening process, however it was stressed that other issues such as those listed below, would be important in formulating the Reconciliation Strategy. These issues are:

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

STARTER DOCUMENT AND ATTENDANCE

A Starter Document was compiled which provided information to workshop participants for discussion purposes. The document content was based on available reports on the options, which for the purposes of the workshop provided information that could be used for strategic-level input. The information was drawn from various sources, based on different assumptions and were of varying detail, age and confidence. Workshop participants were invited to provide further information and to critically review the information provided in the document. Input received through the public participation process being conducted for the Reconciliation Strategy Study, via response sheets, emails, faxes, telephone conversations, letters and through participation in the public meetings, were also included.

The workshop was attended by the DWAF officials, CCT officials, representatives from National, Provincial and Local Government and representatives from the Berg and Breede WMAs (identified through the CMA Reference Groups for these WMAs), environmental NGOs, Study Steering Committee members, and study team and supporting specialists.

OUTCOMES OF THE SCREENING WORKSHOP

The list of potential development options, were screened according to the following criteria:

- potential scheme yields, inclusive of the impact of the Reserve (i.e. the amount of water necessary to maintain the ecological functioning of the river systems and meet basic human needs);
- updated financial cost estimates and unit reference values (URVs);
- socio-economic implications; and
- ecological implications.

A three-point rating system (favourable, moderately favourable or unfavourable) was utilised to rate each option in terms of the criteria. Of the approximately 50 options considered at the Workshop, sixteen were screened out as not requiring further investigation in this study. The options which will be considered further are detailed in **Table 1**. The options that were screened out are listed in **Table 2.** The locations of the options are shown in **Figure 1.**

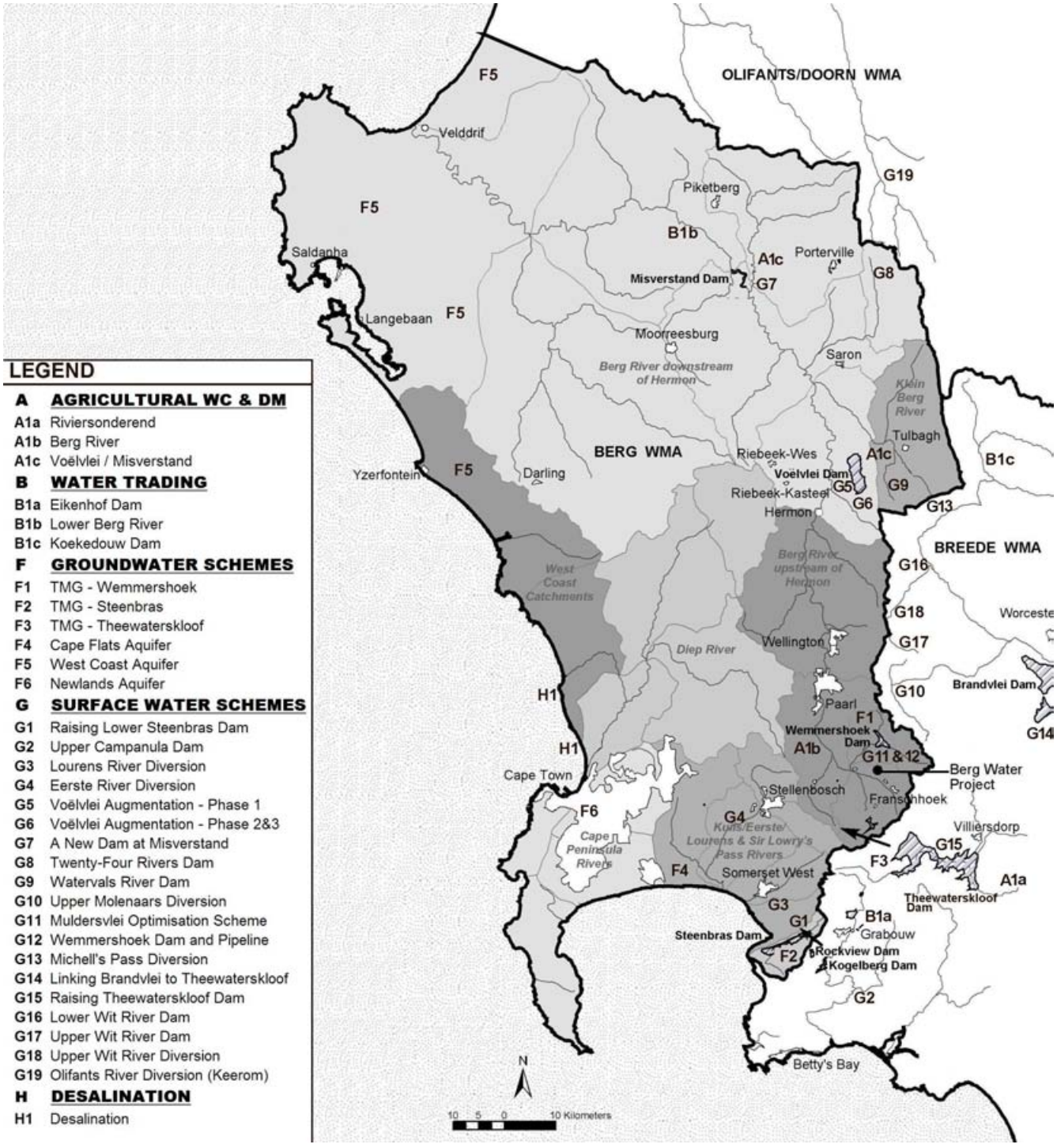


Figure 1: Locality Map Indicating Options for Further Investigation

Table 1: Description of augmentation options that were deemed suitable for further consideration or investigation by the Screening Workshop participants.

OPTION	DESCRIPTION
A: Agricultural Water Conservation and Demand Management	
A1.1 - River Release Management	Releases from dams for uptake by irrigation users could be more efficiently timed and managed. Examples include the releases from Voëlvlei Dam to Misverstand Dam, from Theewaterskloof and Greater Brandvlei dams and from the future Berg River Dam. Freshening releases (notably 22 Mm^3/a from Greater Brandvlei Dam) for salinity management in the middle and lower Breede River could be reduced through the use of interceptor drains to trap highly saline return flows. Decision support systems should be considered to assist water control officers and dam operators.
A1.3 - Irrigation Canal Losses	No significant water conservation and demand management (WC/DM) measures have been applied to conveyance systems, river losses and canals. Concrete lined irrigation canals in the Breede WMA are extensive. Some are as old as 100 years and losses from weakened canals are high. Refurbishment is expensive and may not be affordable by the irrigators. A possible option is for the urban sector to refurbish the canals, in return for a portion of the water traded out of irrigation.
A1.4 - Farm Dam Losses	Over 40% of the total irrigation demand in the Berg WMA is from farmers' own sources. The lining of farm dams could offer water savings of about 6%. However this is likely to be prohibitively expensive for farmers.
A1.7 - Metering	Very limited metering of irrigation usage currently takes place. Metering from source to point of abstraction and then to field application is necessary to properly understand the extent of utilization and losses. This would help to define the potential benefits of WC/DM, to control abstractions and usage by irrigators, and to bill for water actually used.
B: Water Trading	
Theewaterskloof and Upper Berg	During the periods investigated, less than 60% of the allocated water from the system was being used by the Zonderend and Upper Berg River Irrigation Boards. This equated to some 57 Mm^3/a not being utilised by irrigators.
Eikenhof Dam	Approximately 4,5 Mm^3/a is allocated but unutilised from Eikenhof Dam. This volume of water could potentially be integrated into the Western Cape Water Supply System (WCWSS) via the existing Palmiet Pumped Storage Scheme.
Koekedouw Dam	Approximately 3 Mm^3/a is allocated but unutilised from the Ceres-Koekedouw Dam. This volume of water could potentially be integrated into the WCWSS via the potential Michell's Pass Diversion Scheme.
C: Changes in Land Use	
C1 - Removal of Invasive Alien Plants	In the Berg WMA, an area of approximately 137 000 ha of dense invasive alien plant infestation occurs. Most of this is in the Lower Berg catchment. High concentrations occur in the riparian zones and result in a reduction in surface water runoff of some 87 Mm^3/a. Clearing efforts are currently focused on a 30 m strip on either side of the river channel and on light infestations in high mountain areas (reduction in seed spread).
C2 - Removal of Commercial Forestry	Mountain-to-Ocean (25% SAFCOL and 75% Cape Timber Resources) is currently phasing out operations in the Western Cape. In the Berg WMA, 11 900 ha of forestry reduces surface water runoff by about 26 Mm^3/a. In the Upper Breede and Riviersonderend catchments, about 3 600 ha of forestry occurs, reducing surface water runoff by some 8 Mm^3/a. In the Upper Palmiet and Kogelberg catchments some 5 400 ha of forestry exists, with roughly 3 100 ha being phased out. The current reduction of surface water runoff is calculated at 11 Mm^3/a.
D: Re-use of Treated Effluent	
D1 - Treated for Local Irrigation (and Industrial) Use	Entails the treatment of wastewater for the irrigation of public open spaces and sports fields and also for agricultural and industrial purposes. The scheme entails reticulation via a separate treated wastewater distribution network from 13 Wastewater Treatment Works (WWTW). Treatment for

OPTION	DESCRIPTION
	this option assumes further filtration only.
D2 - Treated for Commercial Irrigation (Exchange for Irrigation Allocations)	Entails the exchange of treated domestic effluent with untreated fresh water (currently supplied to farmers). The untreated fresh water would then be treated to potable standards. There is potential to supply the Eerste River irrigators from the Zandvliet and Macassar WWTW during summer. A 45 km pipeline and 0,5 Mm^3 balancing dam near Stellenboschberg Tunnel Outlet would be required.
D3 - Treated for Potable Use	Entails the use of wastewater treated to potable standards for year-round use. Further treatment than conventional would be undertaken with a 1:4 blending ratio (4 parts treated fresh water to one part treated wastewater). Cape Flats, Mitchell's Plain, Zandvliet and Macassar WWTW are proposed with treatment/blending at Faure Water Treatment Works.
D4 - Dual Reticulation Networks	Entails conveyance of treated effluent via a separate network to domestic users for gardening and toilet flushing purposes. This option must be considered conjunctively with other WC/DM initiatives which target the same users (private boreholes, grey water, rain tanks, etc.).
E: Urban Water Conservation and Demand Management	
E2 - Leakage Detection and Repair	This scheme is based on the assumption that unaccounted-for water cannot economically be reduced to below 15% of the average annual daily demand. The target is therefore the difference between the unaccounted-for water and 15% of average annual daily demand. CCT investigations indicate a potential saving of 15,6 Mm^3/a.
E3 - Domestic Leakage Repair (Low Income Households)	Repair of domestic plumbing leaks (toilets, taps, etc.). The target area is lower income households, unable to afford regular maintenance and repair.
E4 - Pressure Management	During periods of low demand (typically at night), reticulation systems experience high pressure. This increases the rate of leakage and pipe bursts. By reducing the pressure during low demand periods, the volume of water wasted through leakage can be reduced.
E5 - Use of Water Efficient Fittings	This option involves the use of water efficient fittings for toilets, showers and hand basin taps/mixers. Opportunity exists amongst commercial, municipal and industrial users, both for new developments and retro-fitting of existing developments.
E6 - Elimination of Automatic Flush Urinals	Entails the replacement of automatic flush urinals with user-activated or waterless urinals. Opportunity within public office buildings, railway stations, schools, private hotels, bars and restaurants. Malfunctioning automatic flush urinals use substantially more water than functioning AFUs.
E7 - Adjustment of Water Tariffs, Metering and Credit Control	This option makes use of adjustment of tariffs, improved metering and more effective credit control. The overall impact is one of awareness of the cost of water with an assumed 30% tariff increase providing potential savings of up to 6%.
E8 - User Education	Focuses on making consumers aware of their responsibility to use water more efficiently. Initiatives include *inter alia* informative billing, media marketing, water user forums and outreach programmes.
E9 - Promotion of Grey Water Use	Interception of water from baths, showers and basins for gardening purposes. Kitchen sinks and washing machines are excluded due to solids content and chemical concentrations in the wastewater.
E11 - Promotion of Private Boreholes and Wellpoints	This is an augmentation option involving the installation of private wellpoints (up to 8m deep) or boreholes (deeper than 8m). Wellpoints have lower yields but are cheaper to install.
F: Groundwater Development Options	
F1 - TMG Aquifer. TSA W7 - Wemmershoek	Pilot phase development of 13 production boreholes and several monitoring boreholes, located 3 km northwest of the Wemmershoek Dam wall. Abstracted water would be piped under gravity to the Wemmershoek Dam.
F2 - TMG Aquifer. TSA H8 - Steenbras	Pilot phase development of 13 production boreholes and several monitoring boreholes, located approximately 3 km south east of the Upper

OPTION	DESCRIPTION
	Steenbras Dam wall. Abstracted water would be piped under gravity to the Upper Steenbras Dam.
F3 - TMG Aquifer. TSA T4 - Theewaterskloof	Pilot phase development of 13 production boreholes and several monitoring boreholes, located approximately 6 km west of Vyeboom. Abstracted water would be piped under gravity to the Theewaterskloof Dam.
F4 - Cape Flats Aquifer	Establishment of production and monitoring boreholes, a lime-dosing facility and a 25 Mℓ buffer reservoir. Boreholes would be sited within public open spaces, parks and school grounds in Mitchell's Plain, sufficiently far away from existing WWTW and solid waste sites.
F5 - West Coast Aquifers	Adamboerskraal Aquifer, adjacent to Berg River estuary. Langebaan Road Aquifer, between Berg River, Langebaan, Darling and Hopefield. Elandsfontein Aquifer, between Berg River, Langebaan, Darling and Hopefield, and Grootwater Aquifer, between Yzerfontein and the Modder River to the south. The Atlantis Aquifer, between Atlantis and Mamre is fully allocated.
F6 - Newlands Aquifer	Potential to install boreholes and abstract additional groundwater up to a safe yield of about 3,5 Mm^3/a.
F7 - Conjunctive Use	The scheme involves injecting surplus surface water into aquifers in winter, for use in summer. Also involves pumping groundwater into surface water storage facilities, to supplement surface water supplies during periods of shortfall. Opportunity exists primarily in the West Coast Aquifers and in the Breede River Valley alluvium.
G: Surface Water Development Options	
G1 - Raising Lower Streenbras Dam	24 m raising of the Lower Steenbras Dam to the same full supply level (FSL) as the Upper Steenbras Dam. The scheme includes existing and potential transfers from the Palmiet River and runoff from within Steenbras Dam's catchment.
G2a - Upper Campanula Dam	Alternative 1 – Construction of a 50 Mm^3 dam on the lower Palmiet River, and a pipeline and canal to the existing Kogelberg Dam. Water transferred to a raised Lower Steenbras Dam via the existing Palmiet Pumped Storage Scheme.
G2b - Upper Campanula Dam	Alternative 2 - As for option G2a above but with a weir 1 km upstream of the Palmiet Estuary. Water transfer from the weir via a tunnel into Upper Campanula Dam, then into a raised Lower Steenbras Dam.
G3 - Lourens River Diversion	The scheme involves the construction of a weir on the Lourens River diverting winter water directly into the Steenbras – Faure pipeline.
G4 - Eerste River Diversion	The scheme involves the construction of 4 m high (35 000 m^3 capacity) weir on the Eerste River, with pumping into a new off-channel balancing dam and on to the Faure WTW. A bypass pipeline would be required from Stellenbosch due to water quality concerns.
G5 - Voëlvlei Augmentation : Phase 1	The scheme requires a 1 m high weir and intake on the Berg River near Spes Bona. Winter water (3 m^3/s) would be pumped over 5 km to the Voëlvlei WTW. Treatment would be for direct delivery to Cape Town or alternatively, pre-treatment for storing water in Voëlvlei Dam. The scheme would optimise spare capacity in the existing WTW and in the pipeline to Cape Town (total 20 million m^3/a). Balance to supply other users reliant on Voëlvlei Dam.
G6 - Voëlvlei Augmentation : Phases 2 and 3	This option takes the Berg River Project into account. Phase 2 involves a 9 m raising of Voëlvlei Dam. Phase 3 involves a 7,5 m high (4 Mm^3 capacity) weir on the Berg River and a rising main to the Voëlvlei Dam, with a diversion capacity of 20 m^3/s. A 1,5 m dia. steel pipeline to Cape Town would also be required.
G7 - A new dam at Misverstand	This option involves the construction of a 27 m high dam (280 Mm^3 capacity) on the Berg River in close proximity to the existing weir. The option could be used to satisfy West Coast demands or be integrated with the Voëlvlei Dam by pumping water to the Twenty-four Rivers canal, which feeds the Voëlvlei Dam.
G8 - Twenty-four Rivers Dam	This scheme involves the construction of a 21 m high rockfill dam at the existing diversion weir site on the Twenty-four Rivers. The potential dam would act as a balancing dam to improve the efficiency of diversions into Voëlvlei Dam.

OPTION	DESCRIPTION
G9 - Watervals River Dam	The dam would be located in the catchment adjacent to Voëlvlei Dam. A 14 m high rockfill dam (12 Mm^3 capacity) would feed water via a tunnel into the Voëlvlei Dam.
G10 - Upper Molenaars Diversion	Involves the construction of a pumping sump in the Molenaars River. Winter flows would be pumped at 5 m^3/s through the Huguenot Tunnel (existing 1,2 m dia. pipe), before being gravity fed to either the Berg River Dam or the Wemmershoek Dam via 26 km of new pipeline.
G11 - Muldersvlei Optimisation Scheme	This is a cost saving initiative by the CCT. The scheme involves a new 500 Mℓ/d WTW at Muldersvlei to treat Berg River Dam and Supplement Scheme water (± 81 Mm^3/a) to potable standards, rather than Theewaterskloof Dam water, which is of a lower quality.
G12 - Wemmershoek Dam and Pipeline	This option would connect the Wemmershoek Dam to the Berg River Dam. Surplus water from Wemmershoek Dam catchment could be transferred to the Berg River Dam, either by flow reversal in the Wemmershoek pipeline or via a new pipeline.
G13 - Michell's Pass Diversion	This option entails the construction of a 10 m high weir on the Dwars River diverting winter water via a 9 km canal into the Klein Berg River, and then to the Voëlvlei Dam. Diversion capacities of 4, 8 and 12 m^3/s have been investigated.
G14 - Brandvlei to Theewaterskloof Transfer	This option entails the augmentation of the Greater Brandvlei Dam by increased Papenkuils abstraction with direct pumping into the Greater Brandvlei Dam. Water would then be transferred by pipeline, canal and tunnel to the Theewaterskloof Dam.
G15 - Raising Theewaterskloof Dam	This option only has a benefit if developed in conjunction with scheme G14. There is little yield benefit from runoff from its own catchment and high evaporation is an issue.
G16 - Lower Wit River Dam	This scheme entails the construction of a 28 m high (24 Mm^3 capacity) rockfill dam at the bottom of Bain's Kloof on the Lower Wit River. Winter water (1,2 m^3/s) would be pumped across the catchment divide, then gravity fed to the Klein Berg River and into the Voëlvlei Dam.
G18 - Upper Wit River Diversion	Entails a diversion weir on the Wit River and a tunnel under Bain's Kloof Pass into the Kromme River catchment. A new dam on the Kromme River (Doolhof Farm) would be constructed. The water would be treated and pumped to Wellington and back to Paarl (reverse use of Paarl-Wellington pipeline). Water could also be reversed into the Wemmershoek-Cape Town pipeline.
H: Desalination	
H1 - Koeberg Site	This option utilises water from the outlet structure at the Koeberg Nuclear Power Station to provide seawater to a reverse osmosis desalination plant. Therefore, no inlet or outlet structures are required. There are cost-saving benefits in using this heated seawater, as well as operating benefits associated with using water of a relatively constant temperature. A 60 Ml/d plant has been assumed.
H2- Melkbos Site	At this site, seawater for the reverse osmosis desalination plant would be drawn directly from the sea, and therefore would require an inlet and outlet works.

The sixteen options which were screened out are documented in **Table 2** below. Please note that many small, low yield options were screened out of the study because, although they have merit, the limited yields are not practical for providing bulk water to the Western Cape Water Supply System.

Table 2: Options that have been screened out as not requiring further investigation during the Reconciliation Strategy Study

Option	Yield (Mm^3/a)	URV (R/m^3)	Socio-Economic	Ecological
A1.2 - Irrigation Practices In the Berg and Breede WMAs most on-farm irrigation technologies are modern and sophisticated, leaving little room for improvement.	Small	High	None	Reduced return flows
Comments: It was agreed that this option was useful for farmers to be more efficient in their irrigation practices, but not for providing additional water to the WCWSS. Modified irrigation practices are also good for on-farm expansions and future development of agriculture.				
A1.5 - Crop Selection Crop type is the major influence on the quantity of water required for irrigation. Planting low-value "thirsty" crops in a water-stressed area should be avoided. The potential water savings from alternative crop types needs to be weighed up against the potential income from that crop type.	Limited in this study area	Can be significant in terms of lost revenue	Reduced revenue to farmers	No adverse impacts
Comments: It was noted that different root stocks and not crop selection plays a role in water demand. Furthermore, the opportunity to change root stocks is dependent on where the agriculture is located (wet or dry region), and by economic trends and demands. It was concluded that there were localised opportunities for changing crops.				
A1.6 - Crop Deficit Irrigation A technique used to induce controlled water stress by periodically irrigating at less than the full irrigation demand of the crop. Successful implementation is reliant on careful monitoring of soil moisture content, pruning and fertilizing.	Not determined	Increased management requirements could have an impact on costs.	Increased operating costs to farmers	No adverse impacts
Comments: It was noted that farmers are currently irrigating on the lean side of the optimum water requirements of many crops, reducing the opportunity to implement crop deficit irrigation. Further water reductions would result in large decreases in productivity. It was also noted that water saved through this reduction method was unlikely to return to the river but would be utilised in crop expansion. Compulsory licensing was considered as a way to achieve a reallocation of water, leaving water conservation/demand management to farmers.				
E10 - Rainwater Tanks This is an augmentation option entailing collection of rainwater from roofs, primarily for toilet flushing. Not feasible for garden watering due to amount of storage required for summer use.	Relatively low yield ($15m^3/a$ per household)	35	No negative socio-economic impacts. Recent reduction in cost of rainwater tanks makes this option more affordable. Implementation is largely driven by the property owner.	No negative environmental impacts

Option	Yield (Mm^3/a)	URV (R/m^3)	Socio-Economic	Ecological
Comments: It was argued that this option had a low yield and was only appropriate for certain income groups, due to its cost. Requires assessment based on latest available cost of rainwater tanks, and should be pursued by private homeowners but is not an appropriate option to provide increased yield for the WCWSS.				
G17 - Upper Wit River Dam Site is 5 km upstream of Bain's Kloof Village and entails a 32 m high rockfill dam with a 650 m crest length. Winter water only would be stored and conveyed to Paarl via a 17,5 km steel pipeline (1,5 m dia.) and a 3 km (200 mm dia.) branch pipeline to Wellington.	12	0,75	Compensation releases of 5 Mm^3/a required to "Gawie se Water" irrigators and others with water allocations. Inundation of existing hiking trail & significant impact on sense of place.	Inundation of 72 ha of pristine fynbos. Displacement of mammals & reptiles. Dam would act as barrier to indigenous fish, eels & may result in introduction of Black Bass
Comments: There was previously significant social and environmental objection and economic concern with regard to this option.				
G19 - Olifants River Diversion A 5 m high weir on upper Olifants River (Keerom site). Tunnel (34 m^3/s capacity) into the Berg WMA and new canal linking to existing Twenty-four Rivers canal, and thence to Voëlvlei Dam. Transfer of 120 Mm^3/a of winter water. A second pipeline to Cape Town required plus raising of Voëlvlei Dam & new Water Treatment Works.	Not determined.	Not determined	Canal construction - impact on existing farmers.	Inundation of Olifants River gorge deemed unacceptable in previous studies, Weir impact on migration of endemic fish to the upper reaches of Olifants River.
Comments: Area already water stressed and this scheme is likely to be met with significant social and ecological objections.				
I - Other Options	These options were not considered to be feasible at this point due to a suite of constraints including *inter alia* technology and cost.			
Water transfers from the Congo River				
Water transfers from the Orange River				
Towing of icebergs				
Cloud seeding				
Dam on Kuils River				
Dredging of existing dams				
Raising of Nuweberg Dam on Palmiet River				

A full description of each option is contained in the Workshop Starter Document, and is available on request. The proceedings of the Screening Workshop and the rating of all the options according to the criteria described above is also available for download from the following website: **http://www.ninhamshand.co.za** (go to “Hot topics” on the top navigation menu).

THE WAY FORWARD AFTER THE SCREENING WORKSHOP

The findings of the Screening Workshop have been summarised in this newsletter and will be presented to the public for comment at the second public workshop, scheduled for 24 November 2005.

The Study Management Committee (SMC), which represents the DWAF, the CCT and other key water resource planning role-players, oversees the Western Cape Reconciliation Strategy Study. After the Preliminary Screening Workshop the SMC determined that the study process needed to be revised in order to ensure better focussed deliverables based on the knowledge gained in the Screening Workshop. The study methodology has therefore been altered in accordance with their recommendations. The revised process is outlined below in **Figure 2**.

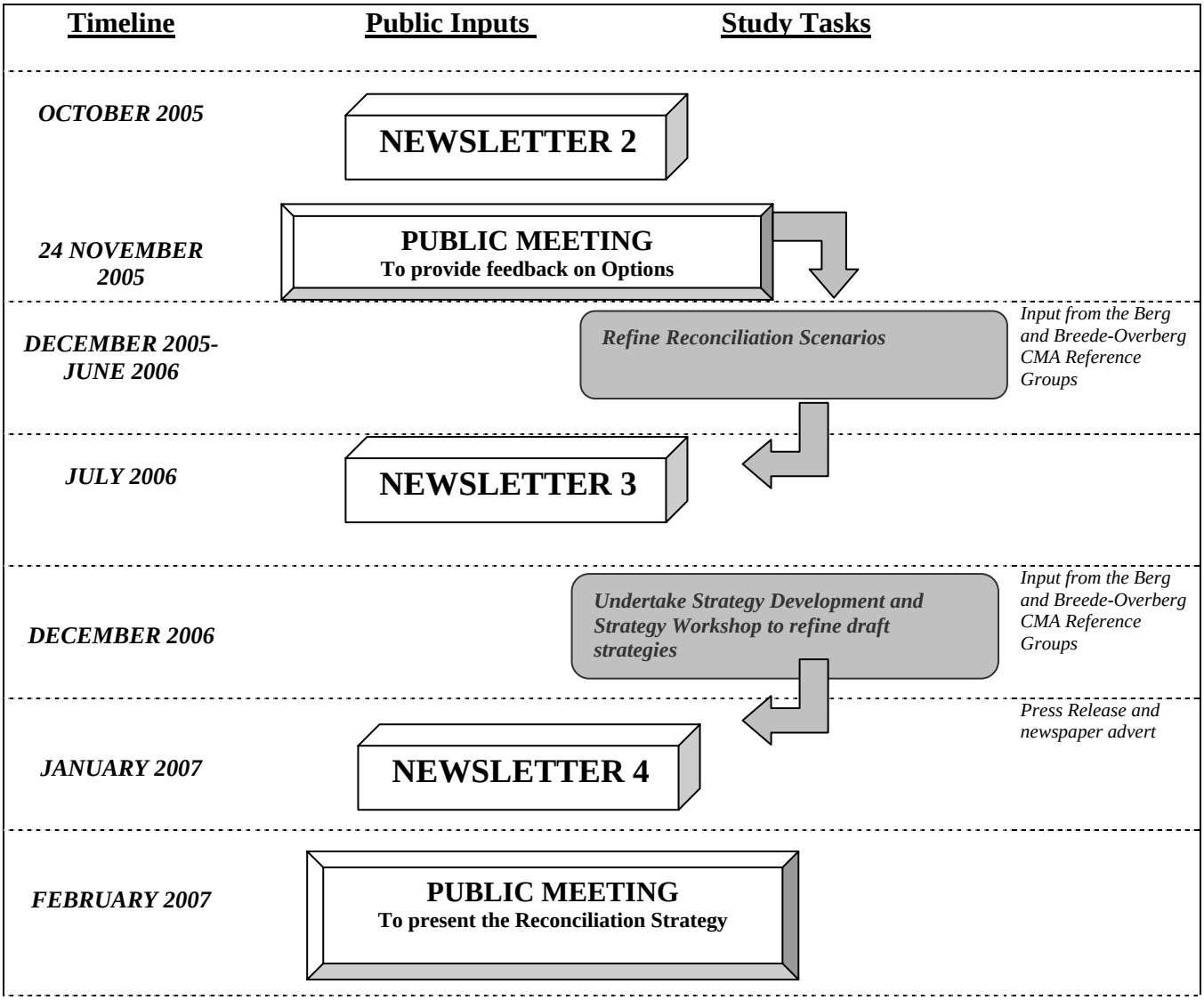


Figure 2: Reconciliation Strategy Study Process

The options identified in the 1st workshop, together with various water demand scenarios will be used to inform a draft Strategy. This draft strategy will be workshoped with water resource planners and the CMA Reference Groups from the Berg and the Breede-Overberg. Newsletter three will outline the strategy to the public for comment. This comment will be taken into account whilst finalizing the Strategy and the last newsletter and public meeting will present and explain the strategy to the public. The adapted process remains committed to public participation through newsletter communication and public meetings.

BERG CATCHMENT MANAGEMENT AGENCY (CMA) PROCESS

As highlighted in Newsletter 1, the National Water Act provides for the establishment of CMAs as statutory bodies to manage water resources within hydrologically defined catchments, called Water Management Areas (WMAs). The first step in establishing the Berg CMA was to establish a Reference Group that will be responsible for drafting a proposal for the establishment of the Berg CMA.

Role of the Reference Group

The role of this Reference Group is to draft a proposal describing the name, water resource issues, functions, proposed structure, funding and feasibility of the Berg CMA. The proposal will also include information on the required protection, use, development, conservation, management and control of water resources in the Berg Water Management Area. In early 2007, after consultation with stakeholders, the proposal will be submitted to the DWAF for evaluation. Public participation, including adequate representation of all stakeholders and their interests, particularly those of marginalised groups, is one of the most important criteria in evaluating the proposal. Further public comment will be invited. After considering all feedback, the Minister of Water Affairs and Forestry will establish the CMA by proclamation in the Government Gazette.

Update on the Process to Establish the Berg Reference Group

The process of establishing a Berg Reference Group was initiated at three public meetings held in Velddrif on 31 May, Bellville on 1 June and Paarl on 2 June 2005. Members of the public were invited to indicate on Response Sheet 1 if they were interested in being involved in the Berg Reference Group. 222 individuals showed interest in the CMA process and were invited to the 1st meeting of the CMA Reference Group, which was held in Stellenbosch on 21 July 2005.

First Meeting of the CMA Reference Group

As explained in Newsletter 1 and at the public meetings, the Reference Group requires balanced representation from the various sectors and geographical areas. This first meeting focused on ensuring that such representation was achieved.

A list of all individuals that were interested in serving on the Reference Group, as well as those who were nominated at the first Public Meetings, was provided to each sector. At the first Reference Group Meeting, the sectors were invited to:

- review the list and identify gaps in representation,
- comment on sectoral issues and capacity building needs, and
- decide amongst themselves on the individuals and organisations that could best represent their sector.

The following sectors and representatives were selected to serve on the Berg Reference Group:

Industry and Commerce Hans Nieumeyer Reetsang Mothibi Siegfried Spännig	**Aquaculture** Etienne Hinrichsen Barbara Gale
Community Organisations Tharcia Mankayi G D Haumann J N Botha	**Urban Water Users** Jonathan Cartwright Gavin Smith Ian Neilson
Provincial and National Government Melanie Weber or Ayanda Mototi (DEA&DP) Andre Roux or Jan Theron (Dept. Agriculture) Niel Muller (Dept. Local Government and Housing) Nigel Rossouw (TCTA) Hennie Du Plessis (Municipal Infrastructure Grant)	**Research and Development, Technology Transfer** Jo Barnes John Lijnes Geordie Ratcliffe Daan Louw Marie Mc Donald
Water User Associations Eduard Malan Andre Du Plessis Adolf Ellman Abraham Van Stanten Billy Bourbon- Leftley	**Tourism and Recreation** Bekithemba Langalibalele Gavin Kanigowski Anthony Reed Graham Avery Henry van der Westhuizen

Forestry Phil Viljoen *Need an additional 2 persons from Small Landowners in Somerset West and Wellington areas.*	**Commercial Agriculture** J D Kirsten Gideon Melck Barry Schreiber Johan Bothma H A Warnich
Emerging Farmers Adam Williams Willy Williams David Searle Augustinus Hendricks Jan De Koker PJ Bruwer Willem Syster Reginald Johnson Antoinette Parker *Women on Farms representative*	**Local Government** Cllr W Mxolose (CCT) Xolile Basholo / Mike Killick (CCT) Hanre Blignaut / Harold Hendricks (Drakenstein) Cllr Deon Swart / Cllr JT Basson (Drakenstein) Pierre Maritz (Saldanha) Cllr Phillip Duiker (Saldanha) *Representatives not confirmed yet for: Stellenbosch, Berg River, West Coast District, Winelands District and Swartland Municipalities*
Organised Labour SAMWU IMATU Sikhula Sonke (Women on Farms Labour Union)	

Minutes of the first meeting are available for download at **www.ninhamshand.co.za** (Look for the WCRSS documents under "Hot Topics'). The second meeting was held on 14 September 2005 and focussed on the existing situation with regard to water resources and the water demand by the various sectors in the Berg WMA. Time was also spent to finalise the representation on the Reference Group. It should be noted that only Reference Group members will be invited to participate in future Reference Group meetings

BERG CMA WAY FORWARD

A preliminary programme has been outlined for the future meetings of the Berg CMA Reference Group. This programme is outlined below:

- Meeting 3 (17 November 2005) Key issues with regard to water resources – as identified by various sectors
- Meeting 4 (February 2006) Existing institutional arrangements in the WMA
- Meeting 5 (April 2006) Proposed functions of the CMA
- Meeting 6 (June 2006) Proposed structure of the CMA
- Meeting 7 (September 2006) Financial viability of the CMA
- Meeting 8 (November 2006) Technical, social and administrative viability of the CMA
- Meeting 9 (2007) Approval of CMA proposal for submission to Minister

You are invited to contact the **CMA Reference Group facilitator Doreen Februarie at tel: 021-903 5911** should you wish to comment on the composition of the Reference Group or to contact the representatives from your sector. Contact details for sector representatives can be obtained from Ms Februarie. Please note that Reference Group members are asked to provide feedback to their sector and to collect information from their sector.

You are encouraged to continue to participate in the process by engaging directly with your sector representative or the CMA facilitator.

CONTACT US

For additional information on the Reconciliation Study contact:

Karen Shippey
Ninham Shand Consulting Services
(021) 481 2481
Email: westerncapewater@shands.co.za

or

Bertrand Van Zyl
Department of Water Affairs and Forestry
(021) 950 7100

Newsletter 3 of 4, November 2006

This Newsletter provides information regarding the progress made in the Western Cape Reconciliation Strategy Study (WCRSS) and the development of the Berg Catchment Management Agency (CMA) Proposal. The background to these projects can be found in Newsletter 1 (June 2005), while Newsletter 2 (October 2005) documents the preliminary screening process and the evolution of the WCRSS into a more comprehensive strategy. Copies of these earlier newsletters can be obtained on request.

INTRODUCTION

The objective of the WCRSS is to ensure balance between the estimated future water requirements and the supply from the Western Cape Water Supply System (WCWSS). Refer to **Figure 1** for an illustration of the System infrastructure and existing contributions to the Western Cape Water Supply System (WCWSS).

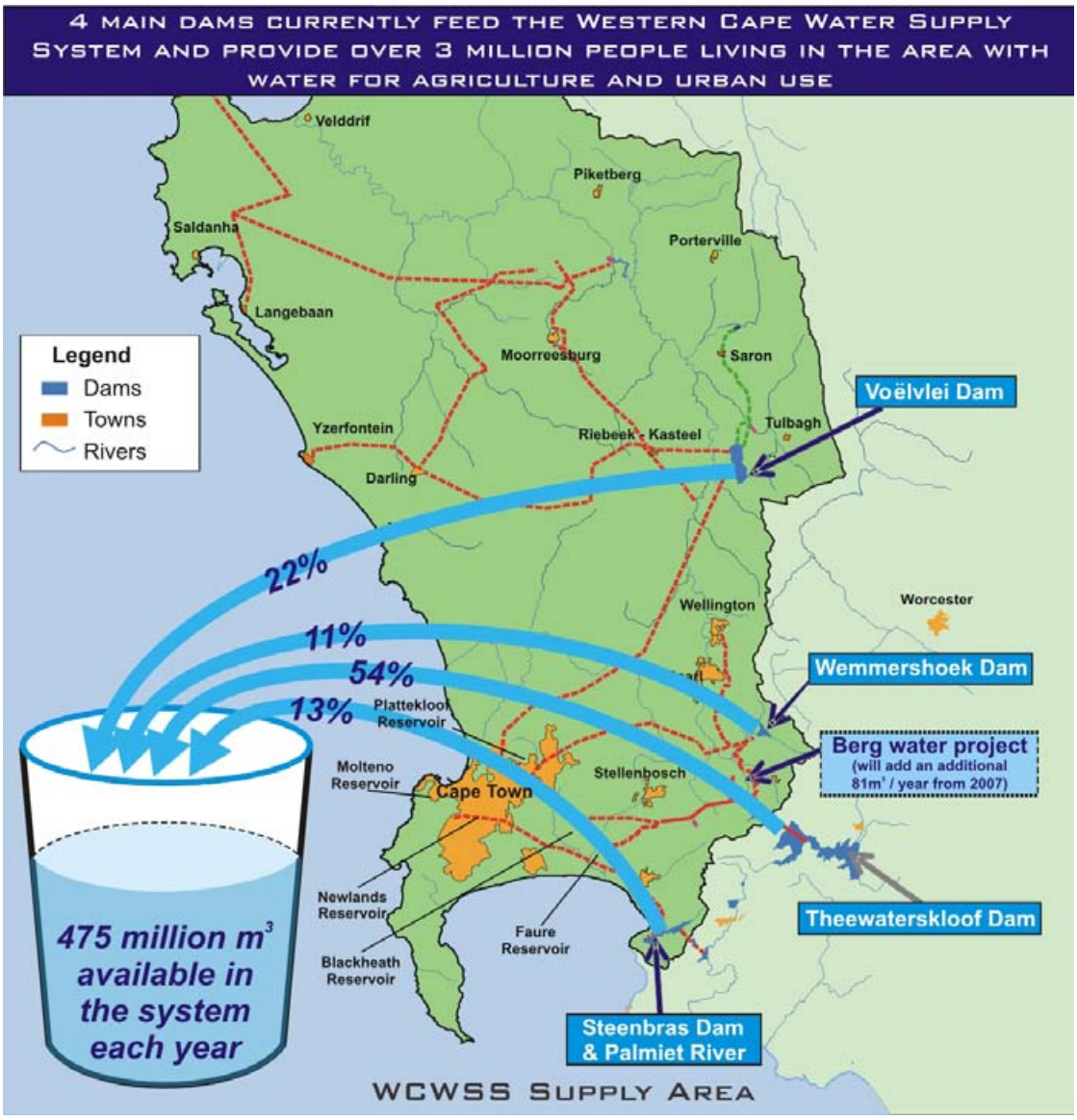


Figure 1: Graphical representation of the water contribution to the WCWSS

The Western Cape Reconciliation Strategy (called the Strategy) is the main outcome of the Study and will ensure regular review of the future water requirement scenarios and interventions to reduce the demand and to supply the future water requirements in Greater Cape Town, Stellenbosch, Paarl, Wellington,

Riviersonderend catchment and towns on the West Coast and Swartland region, within the planning horizon for the next 25 years.

The purpose of this Newsletter 3 is to present a thematic outline of the main outcome of the Strategy. Information regarding methodology adopted, study programme and future public engagement is also provided. The Newsletter also provides an update on the Berg CMA process.

THE WESTERN CAPE RECONCILIATION STRATEGY

A STRATEGIC APPROACH TO INTEGRATED WATER RESOURCE MANAGEMENT

Strategic approaches and/or interventions to balance future water availability with requirements, in the area serviced by the WC Water Supply System, have been investigated and refined during the study. The Western Cape Reconciliation Strategy (called the Strategy) intends to act as a framework for informed decision-making regarding meeting water requirements in the Western Cape now and in the future. The Strategy addresses ongoing management as well as all factors that must be considered in the selection of various interventions required in the short-term (up until 2012), and medium to long-term (up until 2030). The Strategy includes an implementation plan incorporating actions, programmes/timing and assigned responsibilities. Further to this, it provides a supporting toolkit to ensure uniform, relevant and explicit support tools and methodologies. As described in previous newsletters, the Department of Water Affairs and Forestry, City of Cape Town and Department of Agriculture are playing key roles in the development of the Strategy. Representatives of other local authorities and the Reference Groups of the Berg CMA and the Breede-Overberg CMA will also be undertaking a detailed review of the Strategy. Once the full Strategy has been formulated it will be released for broad public comment, likely towards the middle of 2007. The Strategy has ten themes which guide the various elements requiring ongoing attention in order to ensure reconciliation, namely:

- Water requirements
- Water use efficiency
- Water availability and system operation
- Comparison of requirements and availability
- Selection of interventions and decision-making process
- Risk management
- Water resources protection and management
- Stakeholder engagement
- Monitoring and information management
- Implementation and performance monitoring of the strategy

STRATEGY OVERVIEW (*The following section summarises the Strategy's framework)*

The main objective for each theme is provided below. Specific sub-themes have also been identified, under which key issues have been categorised to refine and focus each theme. In the overview of each theme, preliminary recommendations regarding approaches and actions to guide future water resource management for the WCWSS are provided.

THEME	1. WATER REQUIREMENTS
OBJECTIVE	
To address aspects relating to the bulk use of raw water, including estimation of future water use through the development of urban and agricultural water use scenarios, and the management of current and future allocations.	

SUB-THEME	Water requirement scenarios

KEY ISSUES

a. Future urban requirement scenarios

b. Future agricultural requirement scenarios

Summary of the Water Requirement Approach

Water management and resource planning must be centred on specific water requirement scenarios that have been modelled from past water use and influencing factors, such as population growth and economic growth. Clarification on water allocations to the urban and agricultural sector, with the appropriate level of supply assurance will also be addressed. Monitoring, comparison and on going refinement of the methods of projecting future requirements will form part of implementing the Strategy.

THEME	2. WATER USE EFFICIENCY

OBJECTIVE

To address aspects relating to urban and agricultural water use efficiency, including the identification of potential water saving measures, setting targets and objectives, as well as interventions. The potable and non-potable use of treated wastewater is also addressed.

SUB-THEME Urban water use efficiency	SUB-THEME Agricultural water use efficiency	SUB-THEME Water reuse
KEY ISSUES **a.** Defining Water Conservation/Water Demand Management (WC/WDM) targets and objectives **b.** WC/WDM intervention options for water use efficiency	**KEY ISSUES** **a.** Improving efficiency	**KEY ISSUES** **a.** Potable and non-potable use

Summary of the Water Use Efficiency Approach

- Existing WDM strategies and implementation programmes should be reviewed, including the setting of benchmarks and targets. The implementation of the Strategy should be monitored and reported on.
- Ensure that institutions implementing WC/WDM initiatives have the institutional structures, knowledge, capacity as well as political support to undertake studies and interventions to improve water use efficiency. These interventions must be continuously monitored and evaluated.
- Develop Water Management Plans for the agricultural sector. Water Management Plans must incorporate WC/WDM initiatives that allow water inspectors to monitor and maintain infrastructure as well as install and maintain water meters.
- Investigate the promotion of treated effluent use. The study must consider social and health-related issues and develop a comprehensive implementation plan with realistic targets for treated effluent use.

THEME	3. WATER AVAILABILITY AND SYSTEM OPERATION

OBJECTIVE

To address the current annual water availability from the WCWSS as well as the requirement for optimal use of existing water resources and bulk infrastructure, Reserve-related operating rules and operational management.

SUB-THEME Water availability	SUB-THEME Operational management
KEY ISSUES **a.** Quantification of water availability	**KEY ISSUES** **a.** System operation **b.** Operating rules as they pertain to the Reserve **c.** System maintenance

Summary of the Water Availability and System Operation Approach

- The quantity of water available from the major sources of the WCWSS should be regularly reviewed and updated taking into account aspects such as the impact of climate change and the implementation of the Reserve requirements under the National Water Act.
- The WCWSS must be operated so as to ensure that the available water resources are maximised and that the riverine environments are being sustained. The infrastructure must be maintained so as to ensure a reliable supply of water with minimal disruption to supply.

THEME 4. COMPARISON OF REQUIREMENTS AND AVAILABILITY
OBJECTIVE *To address the reconciliation of water requirements and availability in order to identify potential future shortfalls in supply.*
SUB-THEME Identifying the shortfall
KEY ISSUES **a.** Determining the water balance

Summary of the Requirements and Availability Approach

- The actual water usage and future water requirements from both the urban and agricultural sectors will be compared with the quantity of water which is available at the appropriate level of assurance. The Water Resource Planning Model (WRPM) will be used to facilitate this exercise, and will make recommendations regarding timing of new interventions, as well as the probability of having to impose water restrictions.

THEME 5. SELECTION OF INTERVENTIONS AND DECISION-MAKING PROCESS
OBJECTIVE *The identification, evaluation and selection of interventions to reconcile supply with requirements, and the provision of information to support the decision-making process.*
SUB-THEME **Process for prioritisation of interventions**
KEY ISSUES **a.** Identifying interventions for consideration **b.** Studies to support the selection process **c.** Selection process

Summary of the Selection of Interventions and Decision-Making Process Approach

- All possible reconciliation interventions (both supply and demand) will be identified and brought up to the same level of information, so that they can be compared on an equal footing.
- A transparent decision making process, including relevant stakeholder involvement, will be developed to assist in identifying the most appropriate interventions to be studied further and ultimately implemented.

THEME	6. RISK MANAGEMENT
OBJECTIVE *To plan the systematic co-ordination and implementation of risk assessment and risk reduction measures and the establishment and co-ordination of disaster management procedures and activities.*	
SUB-THEME **Risk Reduction**	**SUB-THEME** **Disaster Management**
KEY ISSUES **a.** Risk analysis and assessment **b.** Preparedness: Education and awareness **c.** Preparedness: Development of early warning systems **d.** Preventative action: Infrastructural mitigation **e.** Preventative action: Non-infrastructural mitigation **f.** Reservation of water use entitlements for future use	**KEY ISSUES** **a.** Response **b.** Recovery **c.** Rehabilitation

Summary of the Risk Approach

- In planning, future infrastructural changes and additions to the WCWSS, potential risks and disasters will be identified and managed in order to ensure reconciliation between supply and demand. On a regular basis, these risks will be systematically reviewed and updated.
- The operators of the WCWSS will collaborate and support provincial disaster management authorities in order to ensure that disaster management plans relevant to the WCWSS are developed and managed.

THEME	7. WATER RESOURCE PROTECTION AND MANAGEMENT	
OBJECTIVE *To ensure sustainable use from current and future water sources, reservation and preservation of future water source options, as well as monitoring needs.*		
SUB-THEME Classification	**SUB-THEME Sustainable utilisation**	**SUB-THEME Monitoring**
KEY ISSUES **a.** Determination of management classes and resource quality objectives for water sources **b.** Ecological Reserve requirements	**KEY ISSUES** **a.** Sustainable use of surface water **b.** Sustainable use of aquifers **c.** Impacts of water quality on system sources	**KEY ISSUES** **a.** Resource monitoring **b.** WCWSS operational monitoring

Summary of the Water Resource Protection and Management Approach

- The quantity and quality of the 'Ecological Reserve' for ecosystem functioning is determined using the Classification System. This Classification System will be incorporated into decision-making regarding future water augmentation schemes for the WCWSS.
- The operators of the WCWSS will participate in the development of Catchment Management Strategies and ensure that non-compliance with legislation is brought to the attention of the relevant authorities.
- Studies will be initiated, which will ensure that the Resource Quality Objectives (RQO) are incorporated into the planning and implementation of future interventions.
- Develop, implement and manage monitoring programmes to limit the influence of poor water quality on system yield, RQOs and cost to users.

THEME	8. STAKEHOLDER ENGAGEMENT	
OBJECTIVE *To engage with stakeholders at various tiers of government and with water institutions, raising awareness of water-related issues and building capacity of officials, politicians, stakeholders and the public.*		
SUB-THEME **Co-operative governance**	**SUB-THEME** **Stakeholder awareness raising and capacity building**	**SUB-THEME** **Legally required participation**
KEY ISSUES **a.** Engaging with national government and parastatals **b.** Engaging with provincial authorities **c.** Engaging with regional and local authorities **d.** Engaging with water institutions	**KEY ISSUES** **a.** Engaging with interested parties	**KEY ISSUES** **a.** Legal processes

Summary of the Stakeholder Engagement Approach

- Regularly interact with the relevant national, provincial and local authorities involved in legislation or policies relating to the use of the WCWSS.
- The operators of the WCWSS and implementation of this Strategy must interact with Water User Associations, Catchment Management Agencies, Water Boards and all divisions of DWAF in order to enhance the efficiency and management of the WCWSS.
- Increase awareness and empower civil society to engage with issues relating to water conservation and water resource development.

THEME	9. MONITORING & INFORMATION MANAGEMENT	
OBJECTIVE *To ensure effective data capturing and processing and information and knowledge management to ensure sustainable water resource planning and management.*		
SUB-THEME **Regional monitoring and data management**	**SUB-THEME** **Information & knowledge management**	**SUB-THEME** **Coordination of monitoring activities**
KEY ISSUES **a.** Monitoring Framework & Programme **b.** Data management	**KEY ISSUES** **a.** Information management **b.** Knowledge management	**KEY ISSUES** **a.** Develop co-operative, collaborative relationships between role-players.

Summary of the Monitoring and Information Management Approach

- Develop and implement an integrated regional monitoring framework outlining co-ordinating structures and responsibilities; funding and financial feasibility; data requirements; data processing and gathering standards; and data sharing policies.
- Ensure continuity of planning and operational knowledge of the WCWSS through training and documentation of existing sources of information and knowledge.

- Ensure that appropriate information is accessible to relevant role players.

THEME	10. IMPLEMENTATION AND PERFORMANCE MONITORING
OBJECTIVE	
To address the establishment and financial responsibilities of the committee that will implement the Strategy as well as address the performance and compliance monitoring, and revision processes for the Strategy to be kept relevant and alive.	
SUB-THEME	**Formalisation of the bodies to implement the Strategy**
KEY ISSUES	
a. Establishment of the Strategy Committee	

Summary of the Implementation and Performance Monitoring Approach

- A committee with appropriate stakeholder representation will be established in order to guide the implementation of the Strategy, monitor the effectiveness of the strategy and review/revise the Strategy should it be required.

THE WESTERN CAPE RECONCILIATION STRATEGY STUDY: WAY FORWARD

This Strategy will be workshopped with water resource planners and the CMA Reference Groups from the Berg and the Breede-Overberg. You are invited to comment on the outline provided in this newsletter or you may comment on the entire draft Strategy by a copy off the website (www.shands.co.za. See the hot topics link on the home page). The comments received will be taken into account when developing the Strategy further. Figure 2 details the public process. Newsletter 4 and public meeting are anticipated to take place in early 2007 and will present and explain the completed Strategy to the public.

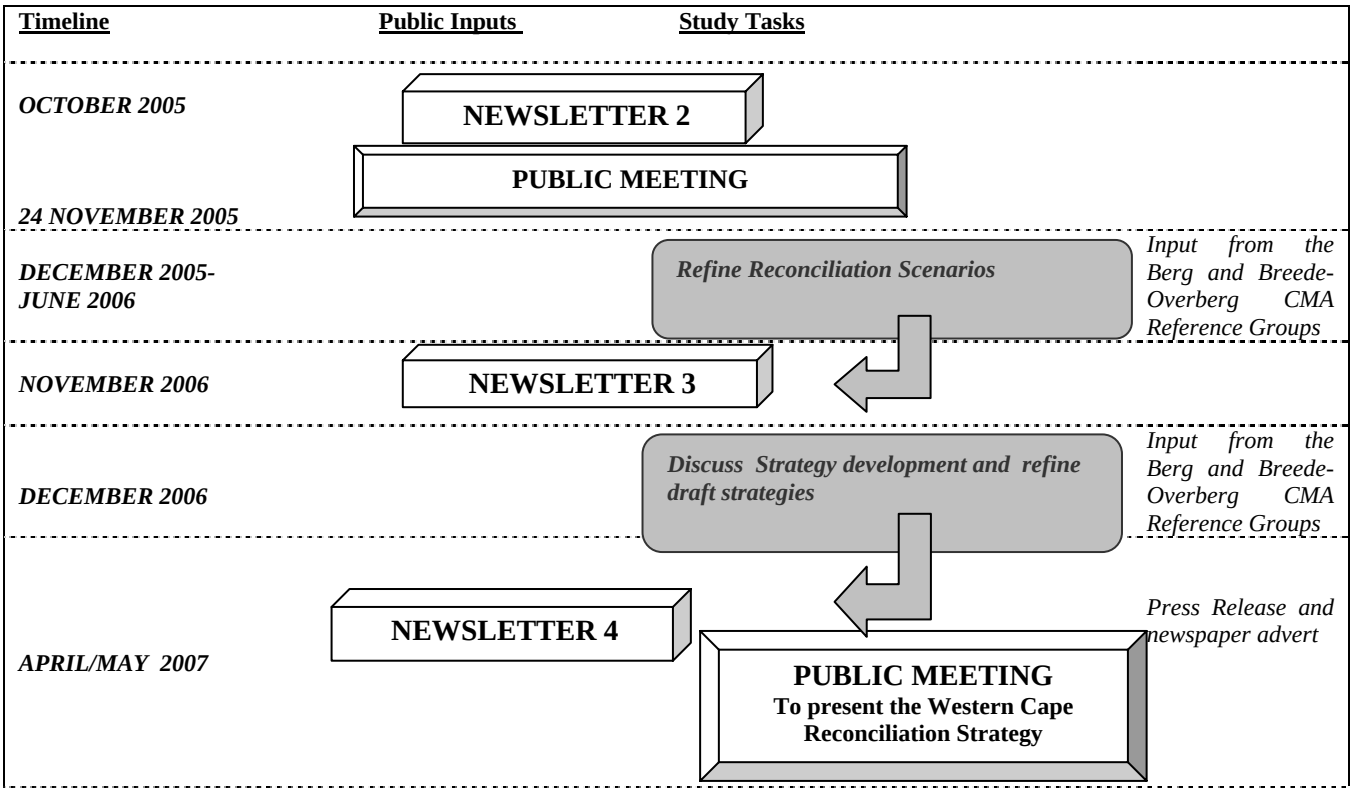


Figure 2: Overview of the Western Cape Reconciliation Strategy Study Process

BERG CATCHMENT MANAGEMENT AGENCY (CMA) PROCESS

The process to establish a CMA for the Berg Water Management Area (WMA) has probably been one of the most inclusive processes that the DWAF has undertaken to date. Every effort has been made to involve as many sectors and organisations as possible. The continuous – and increasingly – active involvement by representatives from a large number of community organisations in the Cape Town area is especially noticeable.

It is important that the collective wisdom and knowledge of everyone in the field of water is harnessed so that everyone can be informed on the variety of water resource issues in South Africa. Public participation must therefore never be viewed as being boring, regulatory or an add-on. It must be the key driver of any process.

As public participation is the basis for stakeholder empowerment, the entire Berg CMA process is designed with this challenge in mind. During each meeting time is set aside for representatives from various sectors to give a short presentation. Not only does this stimulate active involvement in the process and provide for a better understanding of the complexity of integrated water resources management – it also provides the vehicle by which the key water resource issues in the WMA are identified.

PROGRESS TO DATE

The public participation process to establish a CMA for the Berg Water Management Area was launched in May 2005 in association with the Western Cape Reconciliation Study. During this meeting a Reference Group was formed that would take the process further.

Since then, 8 Reference Group meetings have been held. The key water resource issues in the WMA have been identified and group discussions, to determine the functions the proposed CMA should take on to address these issues, were held. The existing capacity in the WMA has also been identified, as this will play a decisive role in the proposed organisational structure of the CMA.

The most recent meeting of the CMA Reference Group (October 2006) focused on developing an appropriate CMA structure in order to fulfil the required functions. It is believed that the CMA will evolve over a period of time, as it takes on more and more responsibilities. However, the capacity in the region will mean that a number of functions could be outsourced or delegated to existing institutions and organisations.

Once the structure has been determined, the financial, technical and social viability will be determined.

PROPOSED FUNCTIONS OF THE CMA

The proposed functions of the Berg CMA are based on the key water resources identified by the stakeholders in the Berg WMA. During the first two years the focus should be placed on the initial CMA functions, which revolve around water resource strategies, institutional co-ordination, co-operative governance, stakeholder communication and corporate governance activities. The DWAF will play an important supporting role during these years – especially with regard to financial and technical assistance.

The CMA could take over the responsibility for invoicing and the recovery of water use charges by means of utilising the central WARMS system, as well as the continuous registration of water users and the updating of a water user registry database.

The responsibility for monitoring and the administration of information systems, as well as auditing of water resources and the management thereof, will most probably be delegated to the CMA during years three to five. This will require the CMA to have obtained the necessary technical water resource management skills, information technology related capabilities and the organisational and financial skills needed for auditing water management institutions.

It is envisaged that the implementation phase, which focuses on taking responsibility for the physical water resource management activities as outlined in Schedule 3 of the National Water Act, will only commence after year five. The CMA will also only become a Responsible Authority during years six to ten when the CMA will have obtained the legal-technical competency, supported by the technical, financial, organisational development and administrative achievements of the other phases, to enable it to manage the authorisation (licensing, etc) and control of water use.

The seven main functional areas identified are:

- Reconciliation of water availability and requirements
- Resource protection and sustainability
- Water use management
- Information and monitoring
- Financial and other corporate management functions
- Co-operative governance
- Stakeholder engagement

COMPONENTS OF A CMA PROPOSAL

The Proposal for the Establishment of the Berg CMA follows the guidelines proposed by the DWAF, but the contents thereof are determined by the Reference Group. The document is therefore compiled by the representatives in the WMA to inform the Minister of Water Affairs and Forestry on the roles and functions that the CMA should take on.

As the process must be fully inclusive of all role-players, stakeholders and beneficiaries, a special chapter in the CMA proposal is designated to provide a detailed summary of all the actions taken to achieve these public participation requirements and goals. The extent of capacity building during the course of the process, especially with regard to those groups that have previously been excluded from such processes, must also be described.

The following chapters will form the main part of the proposal:

Existing Water Resources & Key Water Resource Issues

This chapter will give an assessment of the existing surfacewater and groundwater resources in the WMA and compare the yields from these resources to the existing requirements and future needs in the WMA. The key water resource issues, as identified by the members of the Reference Group by means of presentations and discussions, will also be described.

Role and Functions of the Berg CMA

The key water resources issues identified will form the basis of the functions the Berg CMA will have to take on in order to fulfil its mandate to manage the water resources in its WMA. The Reference Group will prioritise these functions. This information will be structured in such a way that the CMA will be able to adapt this into a catchment management strategy.

Institutional and Organisational Capacity

There are numerous organisations in each WMA that could assist the CMA with the implementation of its functions. Instead of creating a large organisation and duplicating functions, the CMA could delegate some functions to existing accountable organisations. This chapter will describe the organisational capacity in the WMA and the possible functions these organisations could undertake on behalf of the CMA.

CMA Organisational Structure

After taking into account the functions it should fulfil and the institutional capacity in the area, the Reference Group will determine the organisational structure that would best suit the Berg CMA.

CMA Financial implications

This chapter will look at the proposed sources of funding that will enable the CMA to fulfil its functions and ensure that the water resources are managed to the benefit of all.

Viability of the Berg CMA

Once all of the above has been finalised, the Reference Group will assess the social, institutional, organisational, technical and financial viability of the Berg CMA.

PLEASE FORWARD COMMENTS OR REQUESTS FOR ADDITIONAL INFORMATION TO:

For additional information/comments on the WC Reconciliation Strategy Study:

Karen Shippey
Ninham Shand Consulting Services
(021) 481 2481
Email: westerncapewater@shands.co.za

or

Bertrand van Zyl
Department of Water Affairs & Forestry
(021) 950 7213
Email: VzylB@dwaf.gov.za

To access the draft Strategy go to: www.shands.co.za (See the hot topics link on the home page)

For additional information/comments on the Berg CMA Reference Group Process:

Doreen Februarie
Nosipho Consulting
(021) 903-5911
Email: nosiphocc@telkomsa.net

or

Bertrand van Zyl
Department of Water Affairs & Forestry
(021) 950 7213
Email: VzylB@dwaf.gov.za

Western Cape Reconciliation Strategy Study and Berg CMA Process

Newsletter 4 of 4, June 2007

The last newsletter (Newsletter 3) was sent out to interested and affected parties in November 2006. This newsletter is aimed at informing interested and affected parties of the outcome of the Study Selection Process and to inform the public how their comments will be incorporated into future processes.

The Western Cape Reconciliation Strategy Study (WCRSS) was commissioned to ensure a balance between the estimated future water requirement and the supply of the Western Cape Water Supply System (WCWSS). The area served by the WCWSS includes the Greater Cape Town, Stellenbosch, Paarl, Wellington, Riviersonderend catchment and towns on the West Coast and Swartland region. The WCWSS supplies both urban and agricultural water demand.

PURPOSE OF THE RECONCILIATION STRATEGY STUDY

One of the main objectives of the Reconciliation Strategy Study was to provide a defendable, documented process for the selection of interventions to ensure the ongoing reconciliation of the water supply and requirements (demand) until 2030. In addition, the Study also served the following purposes:

- To engage stakeholders and the general public in the management of local water resources,
- To develop toolkits to assist with the future reconciliation of supply and requirement,
- To provide a guide for decision-making towards effective reconciliation of supply and requirement, and
- To recommend preparatory measures, actions and assign responsibilities.

OUTCOME OF THE STUDY

The Reconciliation Strategy consists of ten broad themes, which cover current and future strategic activities and it is supported by five technical reports. For each theme the following aspects were developed:

- The strategic approach to identified issues,
- The required actions with concomitant responsibilities, and
- Time frames for implementation.

Details of the themes were presented in Newsletter 3 (November 2006). Newsletter 1 (June 2005) and Newsletter 2 (October 2005) provided background on the process of developing the strategy. Copies of these earlier newsletters can be obtained on request.

THE STUDY SELECTION PROCESS

The objective of the Study Selection Process is to identify the most favourable scenario to meet the water requirement when this exceeds available supply. The proposed steps in the selection process are:

Step 1: Identify interventions

Step 2: Screen interventions

Step 3: Public review of selected interventions

Step 4: Scenario planning process

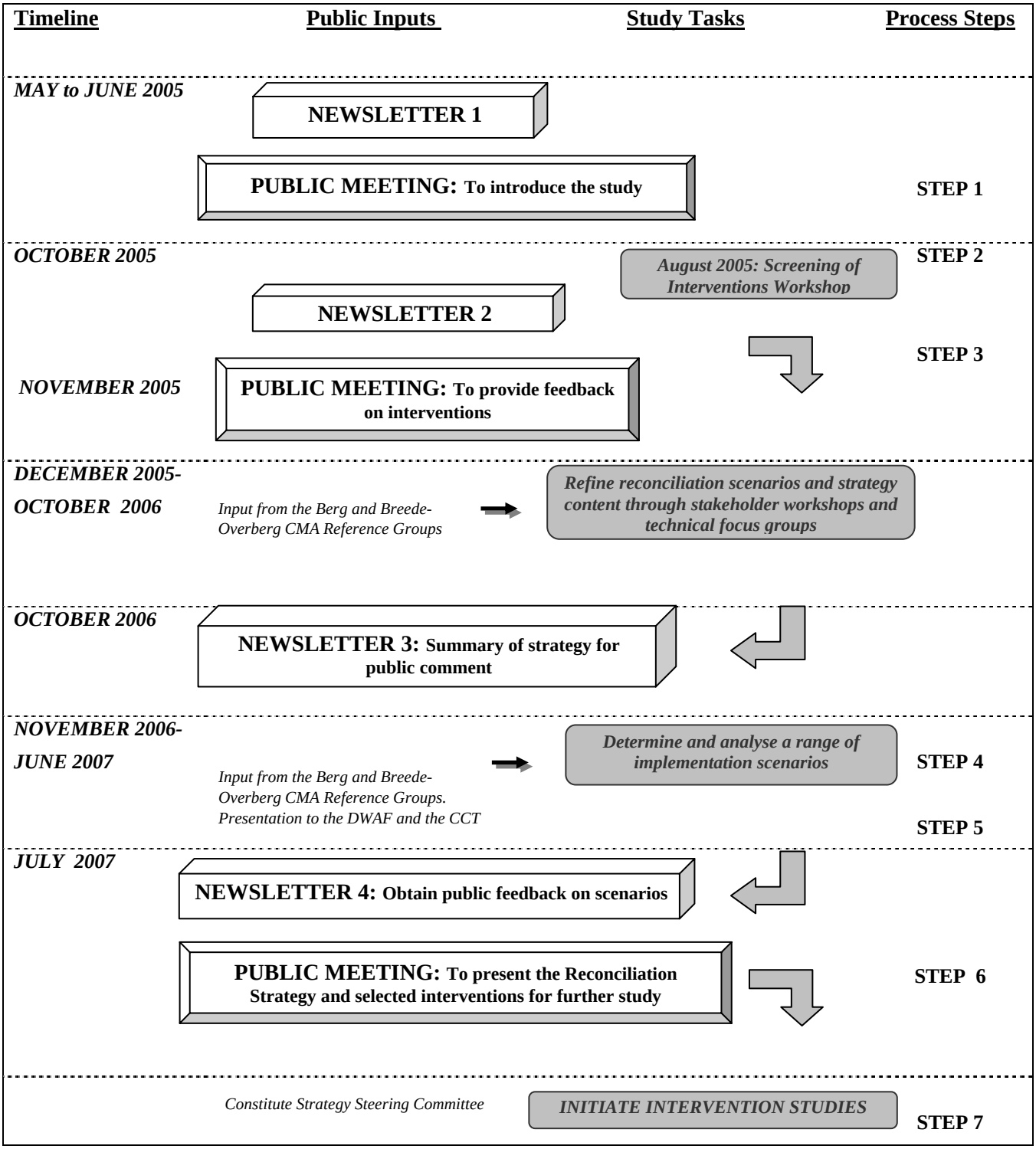
Step 5: Review of selected intervention scenarios by water institutions, authorities and local political representatives

Step 6: Obtain public feedback on scenarios

Step 7: Initiate recommended studies

Western Cape Reconciliation Strategy Study and Berg CMA Process

Figure 1: Overview of the Western Cape Reconciliation Strategy Study Process



OUTCOMES OF THE SELECTION PROCESS

Through a process of stakeholder and public consultation, undertaken since 2005, 60 interventions were initially identified for augmenting the area's water supplies. These include the interventions contained in the City of Cape Town's (CCT) 8-year Water Conservation and Water Demand Management Strategy (WC/WDM), as well as additional WC/WDM interventions, various water re-use interventions (for irrigation and for potable use), surface water and groundwater interventions and desalination.

The Scenario Planning Process involved the evaluation and assessment of alternative groupings and phasing of these interventions so as to determine the most appropriate combination of interventions that should be studied to meet anticipated water requirements up to 2030. Twelve possible scenarios for reconciling the water requirements with the available resources were tested against two water requirement curves. The High Water Requirement (HWR) Curve represented the scenario for high population and economic growth and the Low Water Requirement Curve (LWR) represented low population and economic growth. The time required to implement the schemes, as well as the costs and associated risks were carefully considered. The implementation of the ecological Reserve on existing water resources and the potential impacts of climate change was also considered in the analysis.

INTERVENTIONS RECOMMENDED FOR FURTHER STUDY

Through the Selection Process, the following interventions were recommended for further study and possible development or implementation:

- The City of Cape Town's 8-year Water Conservation and Water Demand Management programme,
- Longer-term Water Conservation and Water Demand Management interventions in addition to the CCT's 8-year programme,
- The development of groundwater aquifers, including the Table Mountain Group Aquifer (TMG),
- Six surface water schemes,
- Effluent treatment to potable standards, and
- Desalination of seawater.

The successful implementation of Water Conservation and Demand Management by the CCT is likely to delay the implementation of additional interventions until 2015.

Further studies on these interventions will provide DWAF, the CCT, and other stakeholders, the maximum amount of flexibility in making informed decisions on which interventions to implement after the Berg Water Project, and beyond.

KEY RECOMMENDATIONS FROM THE STUDY

- The implementation of WC/WDM Strategies and Programmes by all Water Services Authorities emerged as a key aspect to ensuring reconciliation of supply and requirement.
- The TMG aquifer, effluent treatment to potable standards, and desalination emerged as important supply options that require ongoing study and investigation
- To allow adequate consultation and consideration of potential environmental and social impacts, studies on certain supply-side interventions should begin soon. Studies on the following interventions were recommended for commencement in 2007.

Table 1. Summary of Supply-side Interventions recommended for Study and their Starting Dates

Intervention	Study Level	Date to begin Study
TMG Aquifer Feasibility Study	Feasibility Study	Ongoing
Pilot Desalination Plant	Feasibility Study	Ongoing
TMG Regional Monitoring	Monitoring	Ongoing
Voëlvlei Phase 1 (Note 1)	Update Feasibility Study	2007
Michells Pass Diversion	Pre-feasibility/Feasibility (Note 2)	2007

Newlands Aquifer	**Pre-feasibility Study**	**2007**
Cape Flats Aquifer	**Feasibility Study**	**2007**
West Coast Aquifer Recharge (Langebaan)	**Pre-feasibility Study**	**2007**
Upper Wit River Diversion	**Pre-feasibility Study**	**2007**
Raising Steenbras Lower Dam (including pre-feasibility of Upper Campanula Dam)	**Pre-feasibility Study**	**2007**
Lourens River Diversion Scheme	**Update Pre-feasibility Study (as linked to Raising Steenbras Lower Dam)**	**2007**
Upper Molenaars Diversion	**Pre-feasibility Study**	**2007**
Effluent Treatment (policy, effluent treated to potable standards, effluent treated for use byirrigation/industry)	**Pre-feasibility Study**	**2007**
WCWSS treatment of effluent Study (regional scale)	**Pre-feasibility Study**	**2007**

Notes:
1. This would include a pre-feasibility study of the Voëlvlei Phase 2 scheme.
2. Michells Pass Diversion may have to be carried out at Feasibility level in order to make a comparison with Voëlvlei Phase 1

THE STRATEGY STEERING COMMITTEE

A number of organisations currently own, operate and receive water from the WCWSS. The main role-players to date have been the Department of Water Affairs and Forestry (DWAF), the CCT and the Provincial Department of Agriculture. Although these organisations will continue to play a significant role in future decisions, other organisations could make valuable contributions when needed, and should be informed about the development and decisions regarding the WCWSS.

A Strategy Steering Committee with a clearly defined mandate and scope of work will soon be established. The following functions are proposed for the Strategy Steering Committee:

1. To ensure that the Reconciliation Strategy is regularly updated,
2. To monitor and co-ordinate the implementation of the actions identified in the Reconciliation Strategy, and
3. To make recommendations on long-term planning activities required to ensure reconciliation of water requirements and available supply in the WCWSS supply area (i.e. recommending feasibility studies of particular interventions to ensure timely decision-making).

The institutions/agencies proposed to be represented on the Strategy Steering Committee are listed in the following table:

Table 2. The institutions/agencies that are proposed for representation on the Strategy Steering Committee.

WC Provincial Government
• Department of Agriculture: 1 representative
• Department of Local Government and Housing: 1 representative
• CapeNature: 1 representative
• Department of Environmental Affairs and Development Planning (Planning branch and Environmental branch): 2 representatives

Local Authorities
• City of Cape CT (Bulk water, Wastewater, and Water demand management): 3 representatives • West Coast District Municipality: 1 representative • Cape Winelands District Municipality: 1 representative
Department of Water Affairs and Forestry
• Regional Office: (Institutional support, Regulatory support, and Water sector support): 3 representatives • Integrated Water Resource Planning (National Water Resource Planning, Options Analysis, and Water Resource Planning Systems): 3 representatives • Water Use Efficiency: 1 representative • Water Resource Infrastructure Branch: 2 representatives
Catchment Management Agencies (when established)
• Berg CMA : 1 representative • Breede-Overberg CMA: 1 representative
Water User Associations
• Berg WUA: 1 representative • Breede-Overberg WUA: 1 representative

THE FINAL SELECTION PROCESS OF RECONCILIATION INTERVENTIONS

The Final Selection Process will guide the process of determining which interventions are implemented after the Berg Water Project, and thereafter. The selection will include the following components:

- Stakeholder input from the water sector will be sought throughout the process, including comments on the criteria against which the interventions will be evaluated and compared.
- Public participation will constitute a key part of the legal Environmental Impact Assessment processes that are required to implement the interventions.
- Decision-support tools, developed through the Reconciliation Strategy Study, and based on the best available data, will be used to assist in selecting interventions.
- The outcome of important technical decisions and studies will be communicated to the public.
- The Strategy Committee will make recommendation to the Minister of the DWAF on the next supply-side intervention to be implemented.
- The final decision on the next intervention will be made by the Minister.

THE WAY FORWARD FOR THE RECONCILIATION STUDY

Following a presentation to the Berg CMA Reference Group, the Strategy was presented to the DWAF and to the City of Cape Town's Utility Services Portfolio Committee, where the recommendations contained in the report were adopted. The Reconciliation Strategy was subsequently approved by the CCT's Mayoral Committee and by Council (end May 2007). You are now invited to comment on the summary provided in this newsletter or you may comment on the entire Strategy and supporting reports by downloading copies off the website (www.shands.co.za. See the hot topics link on the home page). Any comments received from the public will be taken forward by the Strategy Steering Committee and will be taken into account in the further development and updating of the Strategy. A public meeting will also be held during July 2007 to communicate the results of the study and invite further comment.

BERG CATCHMENT MANAGEMENT AGENCY (CMA) PROCESS

The process of writing a proposal for the establishment of the Berg Catchment Management Agency has been an inter-active and successful process. The draft Proposal, which was discussed at the April meeting held in Franschhoek, was very well received by the Reference Group. The written comments received from stakeholders, underpinned the fact that the document indeed gave a true reflection of the meetings and captured the essence of the discussions. Feedback was given at the Berg CMA Reference Group meeting held on 13 June 2007 in Langebaan, on all comments received to date on the draft proposal. It is the intention to submit the Proposal to DWAF, for approval by the Minister, by the end of June 2007.

KEY WATER RESOURCE ISSUES IDENTIFIED IN THE PROCESS

Apart from the concern about the availability of future water resources for the urban development, especially along the western coastline, the **quality of water** is of most concern to all sectors. For example, the agricultural sector is worried that in the future they will not be able to meet the stringent water quality standards set by the export markets. The health sector is equally concerned about the increasing micro-bacterial load in rivers and the effect this will have on the general health of the people living next to rivers as well as the aquatic life in the river. This same concern is shared by the recreational and tourism sector, as most rivers in the Berg WMA are still regarded as safe to use. Ecologists regarded planned releases from the Berg River Dam, as well as from smaller farms dams, as being of paramount importance for a healthy aquatic environment.

Water quality management was identified as one of the most important functions the Berg CMA should take on – and as a matter of priority.

The **availability of water for emerging farming projects** was identified as another key water resource issue. It was identified that the CMA should take on a much wider governance role in this regard and actively liaise with other government departments who are involved in establishing Historically Disadvantaged Individuals as successful farmers, namely the Departments of Agriculture and Land Affairs. The issue of water for farm workers, and the related responsibilities of land owners, and local authorities are other aspects the CMA will have to urgently address. The responsibility of water user associations (WUAs) as the third tier in the management of water resources, could also assist the CMA in this function.

The **involvement of local authorities** in integrated water resource management was also identified as a key water resource issue. More than half of the water in the Berg WMA is used for domestic (urban) purposes. There is a concern that planning policies, such as the Spatial Development Frameworks (SDFs), do not take enough cognisance of issues such as water availability, limitations to distribution networks and infrastructure, soil properties etc. Much more can also be done with regard to water conservation and demand management, leakage detection and repair, unaccounted for water losses, proper waste water treatment, etc.

STAKEHOLDER ENGAGEMENT

Stakeholder engagement (or public participation) is regarded as the cornerstone of any process and is one of the measures used by the Minister of Water Affairs and Forestry to determine whether the process was truly inclusive and participatory. A research student at the UWC's IWRM Programme, conducted an independent review of the Public Participation Process in the Berg CMA Reference Group, focussing mainly on three issues: representation; participation and power relations.

The outcome of the review showed that:

An independent reviewer gave the process a report card rating of 7½ / 10

- The Berg CMA Reference Group represented relevant sectors well.
- Although there were indications that participation amongst the sectors was not the same and there was still room for improvement, participation was found to improve as the process continued
- Domination of proceedings by certain sectors was found to be unintentional; power relations between the different groups in the Berg CMA Reference Group seemed non-conflicting and the inequity in power distribution decreased through the process.

The consulting team assisting with the process, were congratulated on their important role en ensuring successful stakeholder engagement in addition to facilitating the CMA's establishment proposal.

THE WAY FORWARD FOR THE BERG CMA REFERENCE GROUP

Now that the Proposal has been finalised, the next two meetings of the CMA Reference Group scheduled for this year will focus on the establishment of an Advisory Committee to determine the composition of the Governing Board of the CMA, as well as the roles and functions of the Governing Board. Once the Minister approves the proposal, it will be published in the Government Gazette for comment and will be made available at public libraries and discussed at public meetings.

PLEASE FORWARD COMMENTS OR REQUESTS FOR ADDITIONAL INFORMATION TO:

For additional information/comments on the WC Reconciliation Strategy Study:

Aileen Anderson
Ninham Shand Consulting Services
(021) 481 2481
Email: westerncapewater@shands.co.za

or

Bertrand van Zyl
Department of Water Affairs & Forestry
(021) 950 7213
Email: VzylB@dwaf.gov.za

To access the draft Strategy, go to: www.shands.co.za (see the hot topics link on the home page)

For additional information/comments on the Berg CMA Reference Group Process:

Doreen Februarie
Nosipho Consulting
(021) 903-5911
Email: nosiphocc@telkomsa.net

or

Bertrand van Zyl
Department of Water Affairs & Forestry
(021) 950 7213
Email: VzylB@dwaf.gov.za

Definitions/Explanation	
CCT's WC/WDM strategy and programme	*This is an 8- year programme developed by the CCT which contains several WC/WDM interventions.*
Feasibility Study	*A detailed study including engineering, economic, social, environmental and other relevant aspects. The Study will include a full EIA process. The Study is aimed at enabling a final decision regarding the viability of implementing a specific intervention.*
Intervention	*A supply scheme, operational measure, or WC/WDM option that provides additional yield or reduces the water requirement of the system.*
Pre-Feasibility Study	*A study required to evaluate a number of alternative options (for the implementation of a specific intervention) in more detail, so that sufficient information is made available to make a reliable selection between options.*
Scenario	*A combination of interventions that are selected to meet the water supply requirement of the system.*
Study start date	*The date on which a study should be initiated in order for the intervention to be ready to provide additional water to the system or to reduce the demand.*
Supply-side interventions	*Interventions that provide additional yield to the WCWSS*
Water Conservation and Water Demand Management (WC/WDM)	*The protection and efficient use of water resources. Water Demand Management focuses on achieving the most beneficial and efficient solution to providing water services.*
Yield	*The maximum quantity of water obtainable on a sustainable basis from a dam(s), river or groundwater source in any hydrological year (at a certain level of risk), and under specified conditions of catchment development and system operation.*

APPENDIX B

RAW WATER SUPPLY AGREEMENT

Appendix B: Allocation of Yield of GWS for water pricing purposes

B1. PRINCIPLES: The sharing of the capital cost between users of existing GWS forming part of the Western Cape Water System (i.e. excluding the BWP) will be based on existing lawful use. The yield of GWS will be allocated by DWAF on an annual basis in accordance with existing lawful water use until such time as compulsory licences are issued in terms of the NWA. Sectoral levels of supply assurance will be taken into account in determining the sharing of such costs.

B2. EXISTING LAWFUL WATER USE PER SECTOR

B2.1 Agriculture

The following blanket declaration of existing lawful water use has been made by DWAF in terms of section 33(2) of the National Water Act, 1998: All lawful scheduling in terms 63 (Government Water Scheme scheduling) and/or section 88 (Irrigation Board scheduling) of the previous Water Act, 1956, for which all due water use rates and charges were paid on 30 September 1998, should be treated as existing lawful water uses, until compulsory licences are issued.

All other unexercised water rights on 30 September 1998, which would have been lawful if exercised, do not qualify in terms of this blanket declaration

B2.2 Urban/industrial

Permits issued in accordance with section 56(3) of the Water Act 1956, will qualify for declaration of existing lawful water use in terms of section 33(3) of the NWA, regardless of [13]whether fully exercised or not on 30 September 1998.

B3. APPLICATION OF PRINCIPLES ON MULTIPURPOSE SCHEMES[14]

B3.1 Theewaterskloof (TWK) Dam

(i) Existing lawful water use allocations

- Agricultural sector Urban/Industrial sector

For this sector the sharing of the capital cost of the dam with other sectors for water pricing purposes will be based on the water allocations made from the TWK Dam in terms of the previous Water Act, 1956.

In the case of the City of Cape Town (CCT), a fixed allocation of 90 million m^3/a is applicable.

CCT was also granted an additional temporary allocation by DWAF in 1989 based on that portion of the allocation to Agriculture, which was not being utilised, until such time as agriculture utilized such portion.

[14] "Multipurpose schemes" means a Government Water Scheme which supplies water to more than one user.

A part of the latter is considered as existing lawful water use in terms of the blanket declaration for Agriculture as set out above. However, it also comprises existing lawful water use for CCT, to be utilised on a temporary basis, subject to water availability. This temporary yield allocation must be re-assessed on an annual basis.

- Agricultural sector

  An assessment will be made of the maximum lawful quantity of water required per annum ex storage for each Irrigation Board as well as irrigators pumping from the TWK Dam. This assessment must take account of scheduled areas paid for (see A2.1), the quotas at field edge, water available from run of river (winter and summer) and distribution losses from storage. Compensation releases will form part of this demand. This total quantity will be regarded as the **capped yield allocation** for existing lawful use ex storage for Agriculture. This yield allocation will be subject to curtailments during droughts, depending on the assurance of supply adopted for Agriculture.

  As Agriculture has not developed to the full extent of the declared existing lawful use in terms of the declaration set out above, their current use of the yield of TWK Dam will be less than the **capped yield allocation**. The maximum historical release or abstraction per annum from the dam for each of the various stakeholders since implementation of the National Water Act, 1998, will provide the best available estimate of the required **current yield allocation** for existing lawful use. As the maximum historical releases represent unrestricted supplies during drought periods, it can be assumed that they reflect a relatively high assurance of supply (98% suggested). These maximum releases will be measured at the dam/tunnel outlets and thus include compensation water requirements and distribution losses, where applicable.

(ii) Assurance of supply

In terms of the Pricing Strategy, supplies to sectors from State Dams could be subject to differential assurances of supply in which case the sector demanding a higher assurance will be paying a premium towards capital cost charges for this benefit. In terms of the Pricing Strategy, the capital cost of dams will be shared in proportion to the long-term mean annual volumetric use of allocations, which will depend on the adopted operating rules, annexure H to this agreement, and different water restrictions during droughts. In the case of dams where such supply assurances and operating rules have not yet been negotiated with the stakeholders, long-term annual use figures of 97% and 91% of allocations will be applied to the urban/industrial and agricultural sectors respectively.

For the TWK Dam, the urban/industrial and agricultural sectors will be allocated an equal assurance of supply while the temporary allocation to the CCT is being phased out. The reason for this is that it would be unfair to impose more severe water restrictions on Agriculture while they cannot access their full lawful use allocations during droughts.

(iii) Determination of annual existing lawful water use allocations

The following procedure will be followed by DWAF to determine annual existing lawful water use allocations to water users :

- Determine 1:50 yield (98% assurance) of TWK Dam (including required compensation releases).
- Determine **capped** and **current** annual existing lawful use allocations from the yield of TWK Dam for Agriculture as set out in A3.1 (i).
- The maximum historical release/abstraction from TWK Dam for Agriculture is regarded as the **current yield allocation** at 98% assurance.
- Subtract the total current annual lawful water use allocations for Agriculture and the Urban/Industrial sectors from the 1:50 yield of TWK Dam to give the current irrigation surplus and thus the temporary yield allocation to CCT for pricing purposes. (CCT will therefore get 90 million m^3/a fixed, plus variable temporary allocation).
- Repeat the above by using the **capped yield allocation** for Agriculture to determine the estimated future fixed allocation to CCT.
- Cost sharing and pricing [calculated as per annexure E] will be based on the current yield allocations per sector, weighted at equal assurance of supply. This will be revised annually until the CCT temporary allocation has been phased out, where after the assurance levels prescribed in the Raw Water Pricing Strategy will apply.
- Agriculture will be billed and controlled by the volumes released from TWK Dam, i.e. the quantity released on demand will not exceed the **current yield allocation**.
- Review **current and capped yield allocations** and temporary allocation to CCT on an annual basis, adding another year 's record of actual releases or demands.
- Upon compulsory licensing, the responsible authority shall take into account the City's temporary allocation as an existing lawful water use and the investment already made by the City in respect of such water use, including the development of infrastructure and payment of water resource development costs.

B3.2 Voëlvlei and Misverstand Dams

(i) Existing lawful use allocations

- Agricultural sector

  Apply the same procedure as for TWK Dam to determine the **capped** existing lawful use allocations.

- Urban/Industrial sector
  Section 56(3) allocations i.t.o. the Water Act, 1956 less run-of-river abstractions plus water losses where applicable, will determine the **capped yield allocation** to the urban/industrial sector, from Voëlvlei and Misverstand dams.

(ii) Assurance of supply

Apply the principles laid down in the Pricing Strategy (97% and 91% mean annual use i.r.o. **the capped yield** allocations for Urban/Industrial and Agriculture respectively).

(iii) Annual lawful use allocations

Cost sharing and pricing will be based on **the capped yield allocations** weighted at 97% and 91% as indicated in (ii) above.

B4. ALLOCATION OF YIELD TABLE

Information regarding yield, allocations and demands from Theewaterskloof and Voëlvlei Dams and the adopted 2002/2003 sectoral yield allocation tables are attached in Tables A1 and A2.

The current and capped irrigation surplus must be revised at the end September each year for yield allocations and charge determination for the following (April to March) financial year.

Table B1: Voëlvlei and Theewaterskloof Dams: Yield, allocations and demands

Dam	1:50 Yield (million m^3/a)	Water user	Allocation				Losses (Gains) (million m^3/a)	Yield allocation (million m^3/a)	Maximum historical supply (million m^3/a)	Remarks
			Source	Area (ha)	Quota (m^3/ha/a)	Volume (million m^3/a)				
Voëlvlei		Cape Town	Voëlvlei			70,4	-	70,4		Includes 4 million m^3 allocation to Armscor
		Swartland (WCDC)	Voëlvlei			4,2	-	4,2		
		WCDC	Berg R at Misverstand Dam			17,4	1,2	18,6		20% of allocation from run of river and 25% lost from storage
		Pretoria Portland Cement	Voëlvlei			0,8	-	0,8		
		Piketberg	Voëlvlei & Berg R			0,7	-	0,7		
		Lower Berg River IB	Berg R	3 643,8 (S) 2 302,0 (W)	3 000	10,9	3,6	*18.1	40,8	* Includes 3,57 million m^3 purchased from ICS
Total	**105**			**3 643,8 (S)**		**104,4**	**6,6**	**112,8**	**40,8**	
Theewaterskloof		Zonderend IB	Zonderend R	4 451,6 (S) 1 389,1 (W)	6 000	26,7	4,8	31,5	30,8	15% losses from storage assumed
		Vyeboom IB	TWK Basin	1 852,4	7 100	13,2	-	*13,2	16,3	*Existing lawful use i.r.o. allocations
		Pump from TWK Dam	TWK Basin	Unknown	7 100	1,5	-	*1,5	1,5	*Existing lawful use at Oct 1998
		Upper Berg River IB	Berg R	15 174,0 (S) 1 074,0 (W)	Varies	74,9	(-) *16,3	58,6	48,6	*Draws from run of river in summer. Max supply from dam estimated on basis of 10% of allocation being undeveloped and 25% river losses
		Banhoek IB	TWK Tunnels	450,0	4 000	1,8	-	*1,8	1,9	*Existing lawful use i.r.o. allocation
		Stellenbosch IB	TWK Tunnels	3 010,1	4 000	12,0	-	12,0	9,7	
		Helderberg IB	TWK Tunnels	3 027,9	4 000	12,1	-	12,1	7,8	
		Lower Eerste River IB	Eerste R	514,0	4 000	2,1	*1,0	3,1	2,8	*30% losses assumed
		Overberg Water	Zonderend R			3,0	1,0	4,0		25% river losses assumed
		Cape Town	TWK Tunnels			90,0	-	90,0		Used irrigation surplus extra
		Stellenbosch	TWK Tunnels			3,0	-	3,0		
Total	**241,2**			**28 480,0 (S)**		**240,3**		**230,8**	**119,4**	

Note: Yield of dams and supply from dams include required compensation releases for irrigation
(S) = Summer
(W) = Winter

Table B2 Riviersonderend (RSE)/Berg River system adopted 2002/2003 sectoral allocations for water pricing purposes (million m^3 per annum)

	Domestic/ Industrial	Irrigation	
Berg River (Voëlvlei & Misverstand Dams)		**Current**	**Capped**
Cape Town	70,4		
Swartland	4,2		
WCDC	18,6		
PPC	0,8		
Piketberg	0,7		
LBR IB		18,1	18,1
Totals	94,7	18,1	18,1
RSE / BR (Theewaterskloof Dam)			
Overberg Water	4,0		
Zonderend IB		30,8	31,5
Vyeboom		13,2	13,2
Pump from TWK Dam		1,5	1,5
Totals Riviersonderend Supply Area	4,0	45,5	46,2
Cape Town (Fixed)	90,0		
Stellenbosch	3,0		
Upper Berg IB		48,6	58,6
Banhoek IB		1,8	1,8
Stellenbosch IB		9,7	12,0
Helderberg IB		7,8	12,1
Lower Eerste River		2,8	3,1
Totals Berg-Eerste Supply Area	93,0	70,7	87,6
Grand Totals	97,0	116,2	133,8
1:50 YIELD	241,2		
Irrigation surplus		28,0	10,4
Cape Town (Temporary)	28,0		
Palmiet River (Rockview and Kogelberg Dams)			
Cape Town	22,5		
Totals	22,5		

APPENDIX C

SUGGESTED CRITERIA FOR SCREENING OF INTERVENTIONS

Appendix C: Example of criteria that could be utilised to screen and compare interventions

Criteria Used at the a Screening of Interventions Workshop

For the purpose of comparing scenario sequences of interventions for the WCWSS the following criteria were initially selected and evaluated at a Screening of Interventions Workshop held on 4 August 2005 and attended by a wide range of stakeholders:

- Potential **scheme yields**, after taking account of the releases to meet the ecological Reserves, for groundwater, rivers, wetlands and estuaries including water quality.

- Updated **present value cost** estimates taking into account capital costs and the possible phasing thereof, as well as operation and maintenance costs.

- **Unit reference values** (URVs) (present value costs divided by present value of yields or savings).

- The **negative socio-economic impacts** that were identified included loss of agricultural lands, displacement of persons, loss of jobs, loss of historical buildings, visual impacts on a biosphere etc.

- **Ecological impacts** focussed mainly on the negative impacts on aquatic and terrestrial habitats associated with the various interventions. Barriers on pristine rivers and impacts on biospheres (such as the Kogelberg Biosphere) were also considered to be highly undesirable in some instances and not mitigatable by the ecological Reserve.

Criteria Used by the Study Team to further screen interventions and compare scenarios

A number of additional, mainly scheme specific, criteria are described below. These were identified at the workshop held on 27 February 2006, which was attended by members of the WCWSSRC Steering Committee. Some of these criteria can be quantified by further evaluation but others are scheme specific as indicated below:

- Certain interventions were considered to pose **unacceptable health risks**. For example, upstream urban pollution of the Eerste River could result in viruses being introduced into the potable water supply that cannot be removed by conventional treatment processes (but could possibly be removed by micro-filtration if there is no risk of failure).

- Two of the run of river interventions, namely the Lourens and Eerste River Diversion Schemes, would not be able to provide the yields originally anticipated on account of the **operational problems** at the water works associated with potentially highly variable flows and water quality. On account of similar operational problems and also the low winter demands that preclude the utilisation of sudden large increases in supply, the anticipated yield of Kleinplaas Dam (which is essentially a run of river diversion scheme as the available storage is very small) cannot be realised and therefore the additional yields of run of river supplies from the Lourens and Eerste Rivers could not be realised.

- The **provision of additional storage** (in aquifers or surface reservoirs) would provide carry over yield during periods of drought which may be aggravated by climate change. The provision of additional storage would also facilitate system operation and improve the yields of run of river schemes such as the existing Palmiet Pumped Storage Scheme Transfer Scheme, which cannot be fully utilised on account of insufficient storage in the Upper Steenbras Dam, and possibly also the proposed Lourens River Diversion Scheme.

- The **ability to phase the implementation of interventions** would mean that the capital works only need to be commissioned and the associated costs incurred when the yield or saving is required. Where phasing of interventions is possible (for example for some aquifer schemes, various WCDM interventions and desalination), unit reference values and the associated tariffs could be reduced significantly. On the

other hand phasing is not possible for a scheme where the full capital cost must be expended up front and the full yield can only be exploited after a number of years (such as for a large dam). This phasing criterion should preferably be taken into account when determining the URV of the intervention.

- Increased **diversification of sources of supply,** with less dependence on surface water, was considered to have the potential benefit of bridging periods of drought, particularly if droughts are aggravated by potential future climate change.

- Interventions **that provide large yields** (such as the Berg Water Project) or large savings were considered to have the advantage that they provide sufficient water for a number of years, whereas a number of interventions providing small yields or savings would have to be implemented over the same period taxing the limited administrative resources of the implementing authorities.

- Where two interventions would utilise the same infrastructure such as the proposed Michell's Pass Diversion and Voëlvlei Phase 1 Scheme, only one of these interventions could be implemented unless **costly additional infrastructure** is provided (in this case additional pipeline capacity would be needed from Voëlvlei to Cape Town).

- Certain interventions would only be implemented as **second phase to other schemes**. Some of the first and second phase schemes are:
    - Raising of the Lower Steenbras Dam followed by the Campanula Scheme; and
    - Voëlvlei Phase 1 followed by Voëlvlei Phase 2.

- The **operational and maintenance skills** needed to operate some of the proposed interventions may not be available and may have to be obtained from other departments of the local authority such as the electricity and waste water departments.

- **Diversification** of reticulation infrastructure and storage facilities for greater system flexibility

- Another important criterion that was identified is the **flexibility of operation of the system**. Some of the factors to be taken into account when assessing the flexibility of operation are as follows:
    - The ability to **maximise the yield of the system** by managing withdrawals from reservoirs during the winter months,
    - The **need to undertake maintenance on tunnels and pipelines** which may require that these are taken out of commission for a number of weeks at a time,
    - **Location of existing and planned bulk water supply infrastructure** (eg the location and capacity of the proposed water treatment plant in the Muldersvlei area may make the choice of one resource intervention preferable over another),
    - The **ability to supply water in the event of a disaster** disrupting one of the major sources of supply for an extended period e.g. the disruption of the supply from Theewaterskloof Dam that would occur if the tunnel failed.

APPENDIX D

RISK MANAGEMENT: Risk reduction and disaster management

Appendix D: Additional input on Risk Management

Risk management aims to reduce the system's vulnerability to hazards and to increase the coping capacity of the system as much as possible within existing constraints. Risk management includes managing the infrastructure in the system as well as other infrastructure such as waste water treatment plans but does not include risks associated with managing municipal distribution systems.

The WCWSS comprises the five major dams, shown in **Figure 4.1** and listed in **Table 4.1**, including the infrastructure associated with transferring water from the Palmitet River. Other infrastructure includes the DWAF's associated conveyance infrastructure, including pipelines, pump stations and the Riviersonderend Berg River Tunnel System (RBRTS), as well as CCT's five water treatment works, bulk storage pipelines and storage reservoirs. The dams are operated as an integrated system so as to prevent unnecessary spillage from any one dam, and thereby maximising water resources for the benefit of all users.

The geographic extent and complexity of the system means that the system components are subject to a number of potential risk factors. These relate to particular social, economic, physical and environmental vulnerabilities as well as those occasioned by natural hazards such as floods, droughts and seismic events. Failure in supply arising from social and economic vulnerability could, for example, be a result of ageing infrastructure, poor maintenance, malfunctions, incorrect operation, electricity supply failure, poor (institutional) governance and or co-operation and sabotage. Pollution, natural mineralisation, eutrophication and poor water quality can also present a risk for urban users and irrigators and often arise because of environmental vulnerability to a particular threat. Risk can be increased or decreased, depending on decisions or actions.

The number of dams, and associated infrastructure, and the fact that water can be supplied through gravity from many system sources, means that the system has a number of alternative supply opportunities. This provides some flexibility in the event that any one source, or its associated infrastructure, is temporarily out of commission.

Risk reduction

Risk reduction is the development and application of policies, procedures and capacities to lessen the potential negative impacts of natural, technological, environmental, social and economic hazards. These include structural measures to identify (risk assessment) and limit (risk preparedness) or avoid (risk prevention) the adverse impacts of hazards.

Risk assessment and analysis

Risk assessment and analysis involves identifying potential risks to the WCWSS. For example, the following risks pertain to the present functioning of the WCWSS and primarily to the infrastructure (operation and maintenance) and water quality elements.

- The risk that the RBRTS will collapse and cut off the supply from Theewaterskloof Dam. This could be mitigated to some extent and for a limited period by supplying water from the Upper Steenbras and the future BWP;
- The risk that a dam will be drawn down to such an extent, by incorrect management or faulty infrastructure, that the users that depend mainly on that source cannot be supplied with water. In most cases the system allows water to be abstracted from other sources, except in the case of users downstream of Theewaterskloof Dam, and to a lesser degree users that receive water directly from single resources, e g. the Wemmershoek and Voëlvlei pipelines;
- The risk that failure of the pipeline from Voëlvlei Dam, which has deteriorated with age, will be so significant that the supply cannot be quickly restored. This would deprive users dependent on the pipeline for water, and alternative supply arrangements would have to be made;
- The risk that the system model is not correct, or that abstractions cannot be managed, resulting in all the dams being drawn down to such an extent that the supplies must be cut off on a rolling basis to curtail demands so that the dams do not empty;
- The failure of electricity supplies, precluding pumping from Palmiet, Voëlvlei, or the Firlands pump stations and within the reticulation system;

- Pollution of the Berg River to the extent that the water is not suitable for irrigation of export grapes and fruit;
- The failure of a dam and the consequential downstream damage. This eventuality would be covered by the Dam Safety requirements and disaster management plans;
- Spontaneous algal blooms that temporarily affect purification works;
- The risk of unexpected physical barriers when drawing down dams below previously set drawn-down levels.

Other potential risks would be identified through a risk assessment, including impacts of climate change, fluctuating exchange rates, uncertain long-term energy supplies. Many of the issues associated with these are captured in other strategies.

Preparedness

Based on the outcome of the risk assessment, action plans should be developed to create or enhance the preparedness of the communities and the operators in the event of a disaster. For the most relevant and potentially damaging risks, early warning systems may need to be developed and implemented. Effective early warning systems ensure that mitigating and preparedness measures are initiated timeously and are appropriate to the prevailing threat. This aspect is addressed in Water Availability and System Operation Theme, and the importance of accurate data collection and interpretation is addressed in Monitoring and Information Management Theme.

Preventative action

Preventative action involves the measures required to mitigate the impact of the identified risks through infrastructure measures (e.g. adequate storage in the system) and non-infrastructure measures (e.g. knowledge and information management). Some preventative actions are currently in place. For example, the Dam Safety Office of the DWAF requires the responsible authorities to operate and maintain dams in accordance with specific safety requirements.

Pollution events pose an ongoing risk to water quality. Activities to prevent these risks will be identified in this theme, with cross linkages to other relevant themes. The activities need to be implemented in close association with the responsible authority. The local authorities' health departments monitor the water quality of supplies and the DWAF monitors the quality in rivers.

Disaster management

The CCT and other municipalities, together with the Province and the DWAF, the South African Weather Service and the Departments of Health and Social Welfare, are responsible for dealing with major disasters through the various disaster management centres, whereas minor events are usually dealt with by the relevant authorities or co-operatively. Past experience, such as the response to the Montague Floods, illustrate that there are areas for improvement in how these centres respond to disasters. Relevant lessons learned from these experiences need to be incorporated in the actions emerging from this strategy.

Disaster management includes activities required to strengthen existing provincial actions that relate to the response, recovery and rehabilitation from disasters associated with the WCWSS.

Assumptions underlying recommendations

Sound planning, management, operation and monitoring are essential for minimising risk. This includes the identification of risks during the planning and design phases of new interventions, so that the necessary measures and monitoring needs can be incorporated into the infrastructure, in order to minimise the risk of failure or disruption to the water supply after a failure. Risk reduction must therefore include clear documentation of the actions and procedures necessary to identify and minimise risk, to prevent disruption, and to manage the system following a disaster.

An assumption is made that the DWAF and local authorities, which own and operate the WCWSS, have the necessary resources to plan, operate and manage the various systems to minimise risk and to mitigate the effects of disasters. It is further assumed that disaster management centres are in place and that the necessary resources are available to deal with disasters. It is assumed that the information required for the preparation of a risk assessment plan can be obtained from the various operators of the system.

Risk management reduces the likelihood of disasters by investing in prevention and preparedness rather than response, recovery and rehabilitation. The effectiveness of early warning and mitigation measures are thus increased.

Recommendations

It is recommended that risk identification and management and disaster management should receive high priority when planning any additional infrastructure for the WCWSS. Although this was done previously by the DWAF and CCT individually, it is necessary that the planning be reviewed on a co-operative basis and that non-structural risks and preventative measures as well as a more holistic approaches to those posed by natural hazards are taken into account.

A comprehensive risk assessment of the existing components of the WCWSS, including the state of the infrastructure, its vulnerability to natural disasters, the operating procedures and the potential for human error is recommended. The potential risks should be assessed, mitigatory measures identified and responsibilities assigned. This should lead to the development of a comprehensive operation, maintenance and disaster management plan with clear identification of the potential risks, the actions required and responsibilities.

The detailed identification of the hazards and operating procedures for the BWP, which is currently under construction, is being undertaken and a similar exercise should form part of the risk identification, and development of mitigation procedures, for any new infrastructure.

Scheduled disaster management exercises should be arranged to test preparedness and the effectiveness of the early warning systems should be in place to identify any shortcomings.

Responsibilities

The DWAF's Western Cape RO, co-operatively with the DWAF Directorates of National Water Resource Planning and Options Analysis, and the CCT should take joint responsibility for the planning of all new infrastructure for the WCWSS so as to minimise risk and disruption of supply and for the preparation of the operation, maintenance and disaster management plans. The other authorities that should be involved in the preparation of the plan include Eskom, and the other water service providers and authorities, as well as the Department of Agriculture and water user associations who might be affected by the plan. There should also be close liaison with the various provincial and local disaster management centres.