4. WATER BALANCE, RESOURCE PLANNING & MANAGEMENT

4.1 WATER BALANCE

4.1.1 Water resources

One of the major issues facing CCT in the future is the task to reduce water demand through the implementation of water demand management initiatives in order to ensure a sustainable supply of water for the future. The limited nature of the available water resources and the shortage of raw water storage capacity have increased the risk of water shortages occurring in the Cape Metropolitan Area prior to the construction of the Berg Water Project, which is scheduled for completion by the end of 2007. Two successive years of well below the long term average rainfall in 2003 and 2004 led to DWAF imposing restrictions on the users of water from the Western Cape Water System in October 2004 (20% reduction in water demand required in 2004/2005). In order to understand the limitations of existing water resources a description of the existing water resources are herewith provided, where after details on future schemes/options will be discussed. For a more detailed description of the available existing water resources, possible future water resources as well as water resource planning issues, refer to the document entitled "Water Resources and Water Resource Planning" GOTO 4.1.

The CCT is aware of the studies that are being conducted on the impact of global warming. The issue of global warming and the possible effect it could have on water consumption is being monitored. The impact of longer term global warming needs to be addressed within the Western Cape Systems Model.

4.1.2 Groundwater

The four groundwater resources in the City of Cape Town (CCT) are summarised in Table 4.1. The volume of groundwater abstracted by consumers residing in the urban peripheral areas that do not have access to bulk water services is unknown.

Table 4.1: Groundwater Resources

Aquifer	No. of Boreholes	Firm Yield (1:50 yr) Mm^3/year	% of Total Requirements
Albion Spring	Not applicable	Approx. 1.64	1.46% of total resources
Atlantis	44	5	

Cape Flats	Not yet developed	18	
Newlands	Not yet developed	10	
Total		**6.64**	

4.1.3 Surface water

Most of the water resources serving the CCT are stored in dams during the wet winter months in order to ensure a continuous water supply during the dry summer months. The CCT utilises water from various dams within the CMA and also from dams outside the CMA. Some of the dams are operated and controlled by the CCT, whilst the other dams are operated and controlled by the Department of Water Affairs and Forestry (DWAF). The CCT currently obtains approximately 70 to 75% of its raw water requirements from DWAF and the remainder from its own sources. Approximately 15% of the raw water requirements are obtained from sources within the CMA. The following dams and rivers are utilised as shown on Table 4.2 below.

Table 4.2: Surface Water Resources

DAMS/RIVERS	OWNED & OPERATED BY	APPROXIMATE % OF TOTAL SUPPLY REQUIREMENTS**	FIRM YIELD* (1:50 YEAR) M m^3	CCT Registered Usage
Major Sources		**%**		**M m^3**
Theewaterskloof Dam/ Kleinplaas Dam	DWAF DWAF	48.3%	219	120
Voëlvlei Dam	DWAF	23.2%	105	70.5
Palmiet River	DWAF	5%	22,5	22.5
Wemmershoek Dam	CMC	11.9%	54	54
Steenbras Upper and Steenbras Lower Dam	CMC	8.8%	40	40
Total		**97.1%**	**440.5**	**307**
Minor Sources			Approx. yields	
Simon's Town: Lewis Gay Dam Kleinplaas	CMC	0,4%	1,85	1.85
Land en Zeezicht Dam (From Lourens River)	CMC	0,1%	0,5	0.5
Table Mountain: Woodhead Hely-Hutchinson De Villiers Dam Victoria Dam Alexandra Dam	CMC	0.88%	4	4
Grand Total		**98.5***	**446.86**	**313.35***

* *Excludes the Atlantis Aquifer and Albion Springs*
** *Approximate % of total supply requirement and firm yield includes Agriculture and other Water Service Authorities.*

On an annual basis the usage from the various sources may vary. The Western Cape Water System (WCWS) is operated so as to minimise spillage by placing a

water demand on the dams that are most likely to spill during the wet winter period.

4.1.4 The Berg Water Project

Implementation and financing of the Berg Water Project (BWP), which comprises a dam on the farm Skuifraam, a supplemental scheme and ancillary works, was approved by National Cabinet on 30 April 2002. The City's increasing demand for water, although significantly tempered by a successful Water Demand Management Policy and Strategy, requires the urgent implementation of Cabinet's decision if the City is not to be compromised with regard to future water supply and exposed to possible more severe water restrictions in the short to medium term.

The Minister of Water Affairs and Forestry has directed the Trans-Caledon Tunnel Authority (TCTA) to finance and implement the BWP in terms of Section 103(2)(b) of the National Water Act. TCTA will own the land and infrastructure until the loans raised by TCTA have been redeemed, whereafter the land and infrastructure will revert back to the Department of Water Affairs and Forestry (DWAF). It is intended that users of the water will fund the BWP which in today's terms will cost between R1,4 billion and R1,5 billion. Other users who are allocated water from the BWP will pay a third party capital charge (for information GOTO 4.2), based on their water allocation and the CCT will receive a credit from DWAF for this amount.

It is important to note that the Department of Water Affairs and Forestry only approved the implementation of the Berg Water Project when they were satisfied that the City had made progress with respect to the implementation of water demand management (WDM). The construction of the Dam was to proceed as a parallel process to the City implementing WDM.

4.1.5 TMG Aquifer Feasibility and Pilot Study

The TMG Aquifer Feasibility Study and Pilot Project was awarded to the TMG Aquifer Alliance (TMGA Alliance) by the Executive Committee of the City of Cape Town on the 23 April 2002. The primary objective of the Study is to determine the viability of the TMG aquifer as a potential future water resource for the City of Cape Town. An incremental and precautionary approach has been adopted in the Study as there is uncertainty regarding the potential environmental impacts of abstracting water from the aquifer.

Due to the nature of the project, the Study was broken up into 4 discreet phases. This flexible approach allows for a significant amount of interaction with the City of Cape Town and enables the CCT to play a key role in the decision making process throughout the Study. Provision has been made in the Project for the CCT to be able to terminate the project at the end of the Preliminary and Exploratory Phases and during the Pilot Phase of the Study should it become evident after reviewing the progress and the feasibility of the various phases that the desired outcomes will not be achieved.

The outcome of the Preliminary Phase was the identification of 26 potential target sites suitable for exploratory drilling to gain a better understanding of the properties of the aquifer. These 26 target sites have been subjected to an

environmental scoping process and now require authorization from the Department of Environmental Affairs and Development Planning (DEA&DP) prior to commencing with exploratory drilling. The Preliminary Phase concluded that, based on a regional desktop assessment of the Table Mountain Group Aquifer, that the TMG Aquifer would most likely be a viable water resource that could significantly augment the City's current water resources in the future.

4.1.6 Desalination

Desalination (or desalting) is generally understood to be the removal of dissolved salts from seawater and in some cases from brackish waters of inland seas, highly mineralised groundwater and municipal wastewaters. Desalination with today's technologies, however, can remove minerals and most biological or organic chemical compounds. A more appropriate term for desalination could be "demineralization" or "purification" of water.

Desalination as a possible water supply (resource) for the City of Cape Town was first investigated as part of the Western Cape Systems Analysis and then investigated at pre-feasibility level as part of the "Integrated Water Resource Planning Study" undertaken by the City of Cape Town from 1999 through to 2001.

Advances in desalination technology over the last decade have meant that the cost of desalination has decreased significantly. It is currently estimated that the cost of water from a desalination plant would be in the order of R5 /m^3.

The decreasing costs of desalination, together with the fact that desalination could provide a more environmentally-acceptable solution, could result in desalination being implemented prior to some of the conventional water resource schemes which have been identified. Given the abovementioned situation and the fact that the City has adopted a "conservative and precautionary" approach to water resource development, the City has taken a decision to further investigate desalination technologies and establish a pilot desalination plant well in advance to large scale desalination being required in order to be in a position to utilise the technology when required.

GOTO 4.13 and GOTO 4.14 for reports on desalination.

4.1.7 Future Water Resource Development

One of the major issues facing the City of Cape Town in the medium- to long term is the limited nature of the available surface and ground water resources. If the City wants to ensure an adequate security of supply to all its water users, it is important that the demand for water is managed in an integrated manner with the need to develop new water augmentation schemes and bulk water supply infrastructure. This will ensure that the risk of having to impose water restrictions is minimized.

The Department of Water Affairs and Forestry is currently in the process of reviewing and updating the Western Cape Systems Analysis. This "Reconciliation" Study (GOTO 4.15GOTO 4.3 IWRP-STUDY.MK.doc) will re-assess all the water resource options available for the City of Cape Town, neighbouring local authorities and the agricultural sector. The Study will utilize information from the City's "Integrated Water Resource Planning Study" and the City's "Review of Long term Urban Water Demand Study", as well as other studies which DWAF has undertaken in the Breede Valley and Lower Berg River Area. Effluent re-use schemes are also becoming an important consideration. The Study will also compare the latest information on desalination to all the other water resource options available to DWAF and the City. The outcome of the Reconciliation Study will be a shortlist of options to be studied at Feasibility level, and associated with each will be a legal requirement to undertake an Environmental Impact Assessment process. The Reconciliation Study will also develop a strategy to guide future water resource development for the City of Cape Town (CCT), surrounding local authorities and agriculture.

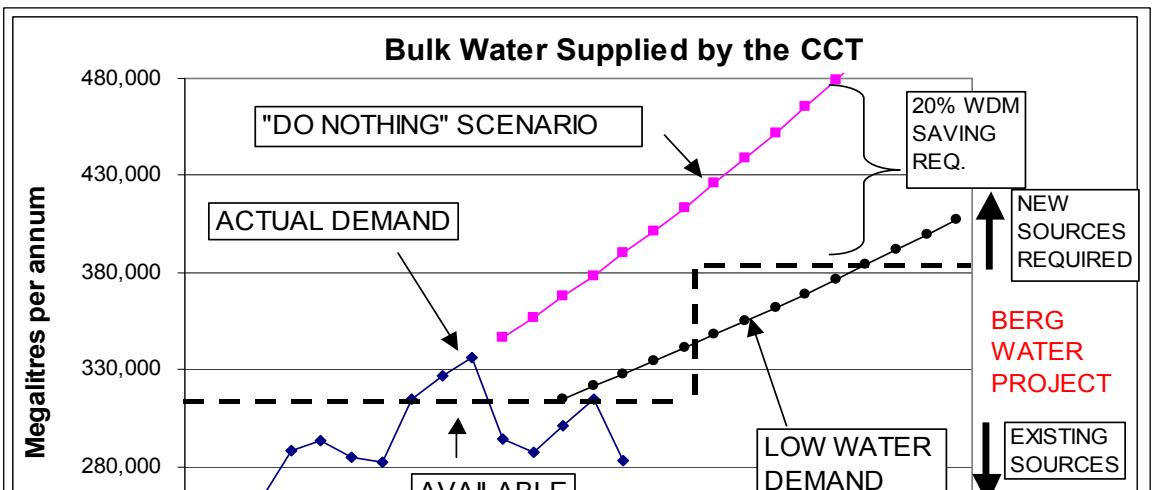
Assuming the City achieved its WDM objective, it is then anticipated that a new water resource, after the Berg Water Project, will only be required in approximately 2013. It is imperative that planning commences at an early stage as the lead time to implement a water resource scheme is approximately 6 to 7 years.

Further water augmentation schemes that could possibly be implemented in the short- to medium term include the Voëlvlei/Augmentation Scheme Phase I, the Table Mountain Group Aquifer, the Cape Flats Aquifer, the Lourens River Diversion Scheme and the Eerste River Diversion Scheme.

Figure 4.1 illustrates diagrammatically when a new water resource is required. From the figure it is clear that there is a higher risk of having to impose water restrictions before the summer of 2007 when water from the Berg Water Project becomes available.

There are a number of factors which could bring forward the timing of new water augmentation schemes e.g. possible climate change, decrease in system yield due to environmental reserve requirements. Given the abovementioned factors, the Mayoral Committee of the City of Cape Town resolved to follow a "precautionary and conservative" approach to water resource planning and implementation in order to ensure that water restrictions are not unnecessarily imposed on the water consumers within the Cape Metropolitan Area.

Figure 4.1: Bulk Water Demand Curves 1

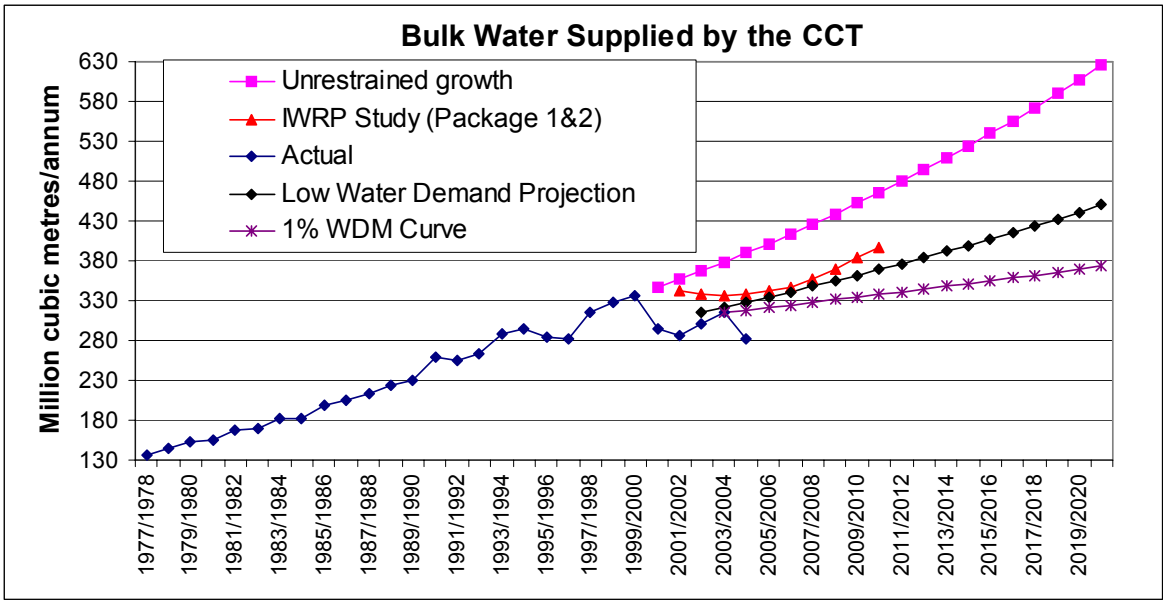


4.1.8 Current and future water demands

In 1998/99 the Department of Water Affairs and Forestry (DWAF) commissioned Ninham Shand together with sub-consultants Palmer Development Group (PDG) and the Institute of Futures Research (IFR) to analyse the past-, present- and future urban demand for water in the Cape Metropolitan Area. In order to better assess and understand current and future demand, this study was updated in 2003/2004 by the City of Cape Town. Based on the potential economic growth and population growth it is estimated that the unconstrained water demand growth in the City will vary between 2,7% and 3,7% per annum.

The historic growth rate of the total bulk water supplied by the CCT between 1973 and 2000 was 3% to 4% per annum. In order to ensure a sustainable supply of water for the future, the CCT initiated an "Integrated Water Resource Planning (IWRP) Study" GOTO 4.3 to best assess how to manage its water demand. The results of the IWRP Study indicated that the CCT has to actively implement Water Demand Management (WDM) measures, whilst simultaneously investigating and implementing additional water augmentation schemes. The implementation of the WDM recommendations contained in the IWRP Study include *inter alia* pressure management, user educational, elimination of automatic flushing urinals, leakage repair, tariffs, metering and credit control. The CCT through its WDM strategy and programme, which has been accepted and adopted by Council, has committed itself to the implementation of the recommendations emanating from the IWRP Study. The objective of the WDM Policy and Strategy is to reduce the projected demand for water by 20% by the year 2010. The CCT through its Water Services Development Plan (WSDP) has also committed itself to ensuring a sustainable supply of water for the future. Figure 4.2 below shows the historic growth in water demand and the low water demand projection for the CCT. The low water demand projection ties in with the 20% reduction in water demand objective stated in the WDM Policy and Strategy.

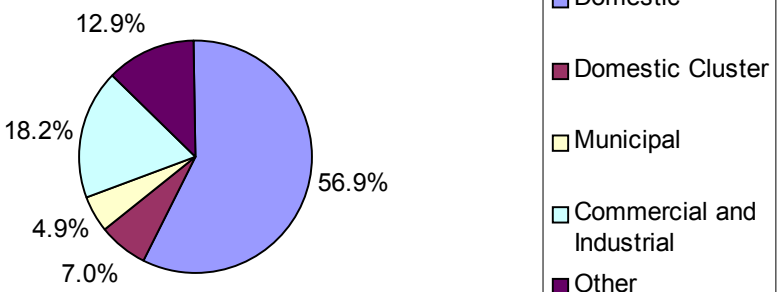
Figure 4.2: Demand growth projections



The total bulk water supplied within the Cape Metropolitan Area for the financial year ending June 2005 was 263 million cubic metres (average 721 Ml/day) This includes Unaccounted-for-Water (UAW) and bulk losses in bulk pipelines. The City also supplies approximately 55 Ml/d to Water Services Authorities and other minor consumers outside its area of jurisdiction, for a total of 776 Ml/d. For a summary of bulk water treated GOTO 4.16

The distribution of water demand is given in Figure 4.3 below. For the spreadsheet of calculations GOTO 4.7.

Figure 4.3 : Distribution of Water Demand



4.1.9 Effluent returned to source

It should be borne in mind that only the Wesfleur Treatment Works at Atlantis returns effluent to the source from which it was extracted (groundwater). All other treatment works have exemptions (in terms of the 1956 Water Act) from this requirement.

For the year ending June 2005, the total wastewater flow generated within the CCT (including for stormwater infiltration) amounted to 206 764 Ml/a, an average of 580 Ml/d. This is less than the 2001/02 figure of 211 565 Ml/a. It is evident that despite the City's growth in population, successes with Water Demand Management have played a part. However, rainfall variations also account for this.

For a table of monthly total flows since 1 July 1997 GOTO 4.5 and for a table of flows from each wastewater treatment plant GOTO 4.6.

The wastewater flow is approximately 79% of the total bulk water demand of 714 Ml/day This is significantly more than the 66% of the total bulk water demand of 803 Ml/d for the previous financial year. It would indicate an significant increase in household grey water and other recycling that took place during the restrictions.

Other statistics concerning wastewater are:

- Approximately 31,0 Ml/d (5,9%) of wastewater is discharged directly via marine outfall sewers
- 53 000 tonnes/annum of dry sludge is estimated to be produced
- Approximately 31 Ml/d (6%) of treated effluent is re-used (refer to Table 4.12)

4.1.10 Non-revenue water and water losses

Unaccounted-for Water (UAW) has historically been calculated on an annual basis by comparing the cumulative treasury-supplied billing data of individual meters to bulk delivery figures.

The last calculation of UAW making use of data as described above was done for the 2001/2002 financial year. Data was used from the legacy Financial computer systems of the 6 erstwhile Local Authorities and bulk consumption as per the CMC Bulk Supplier water book. The result of the calculation for UAW was 18%, which looks favourable in comparison to the figure of 23% calculated by the "Integrated Water Resource Planning Study" for the year before. These figures exclude the smaller bulk losses during treatment and delivery to Reticulation.

Since 2001/2002 the financial system of Council has been migrated to the new unified SAP environment. No more legacy data are kept, and the only source of data is the Utilities information system of SAP (Revenue and Consumption Report).

The data from the Utilities information system was used to calculate the traditional UAW for the 2003/2004 financial year, but due to various uncertainties in the data, the calculated result is not considered reliable. For the interim the previously calculated value of 18% is being used until the data from SAP can be verified.

The total UAW is about 23%. This figure is currently being verified as there appears to be errors. For spreadsheet calculations GOTO 4.7.

The use of percentages to express real losses is increasingly recognised internationally as being potentially misleading when used as a measure of efficiency of managing real losses in comparing distribution systems with different levels of consumption.

It is recommended that the City of Cape Town should follow the recommendations made by the International Water Association Task Force, which have been developing "best practice" approaches to this topic. They have demonstrated that it is appropriate to now improve on the terminology, calculation process and performance indicators traditionally used for calculating water losses in public water supply systems.

However, a transition from traditional familiar terminology and methods is never easy to accomplish, and a commitment is needed from Water Services Management to effect the changes. For example, the terms "Non-Revenue water" and "Water losses" should replace the familiar term "Unaccounted-for-Water".

4.2 INTEGRATED WATER RESOURCE PLANNING

The Integrated Water Resource Planning approach integrates critical planning criteria and activities into one systematic planning process. It involves the concurrent consideration of water supply and water demand management options. It is conducted using an open and participatory approach involving all stakeholders. IWRP also identifies and attempts to quantify the external costs and benefits and inherent uncertainties associated with each alternative.

With the realisation that water demand management was becoming increasingly important in order to ensure future sustainability and affordability, the former Cape Metropolitan Council (CMC) decided to adopt an integrated approach to water demand management and water augmentation. Towards the end of 1999, the CMC initiated an "Integrated Water Resource Planning" (IWRP) Study. GOTO 4.3GOTO IWRP-STUDY.MK.doc

The aim of the Studies was to investigate at pre-feasibility level various water demand management initiatives along with various water supply augmentation schemes. Recommendations were to be made to the City of Cape Town (CCT) on where to focus their resources and attentions with the aim of meeting and managing the water demand within the Cape Metropolitan Area (CMA). The study considered the technical, institutional, socio-economic, environmental and financial aspects of the options using a multi-criteria decision making analysis.

The results of the Studies indicated that a significant saving in water demand could be achieved through the implementation of certain water demand management initiatives. In comparison to the water supply options, certain water demand management initiatives would have a significantly lower implementation cost, could be implemented in a shorter time frame and were generally more environmentally and socially acceptable. The IWRP Study informed the WDM Ten-point Strategic Plan as discussed in the next section of this document.

A full suite of the Reports detailing the various investigations carried out under the IWRP Study are available for scrutiny in the offices of the Bulk Water Department of the City of Cape Town.

4.3 WATER DEMAND MANAGEMENT

4.3.1 Introduction

Water is a scarce resource in South Africa and also in Cape Town. For more than a century there have been periods of water restrictions followed by the development of new schemes to expand the city's water supply, usually through the building of a dam. Until 1995 the focus was primarily on managing the supply of water by developing new schemes to meet the growth in water demand.

Cape Town is a growing city of approximately 3,2 million people and it is expected that over the coming years it will continue to grow and to consume more water. Not only because it will house more people, but also because of a growing economy. Current research, which takes into account demographic shifts, including the impact of HIV/AIDS and in-migration of people to Cape Town, shows that demand is set to grow in the future.

The City of Cape Town recognises that if the population are to make use of its water resources in a sustainable manner, the growth in water demand will have to be carefully managed. Ways will have to be found to reduce demand, primarily by changing the behaviour of consumers of water.

The current drought, which has been proven to be one of the worst in recorded history, has sharpened the focus on water demand management. The possible causes of the drought also point to the need for long-term water demand management and behaviour change. One possibility is that this is a cyclical drought, and follows a pattern. The other possibility is that Cape Town has entered a period of climate change, brought on by global warming. This possibility has long-term implications for water management.

The City of Cape Town's approach to water demand management is based on three broad principles, namely that water is a strategic, precious and scarce resource; that there should be no wastage of water; and that all water used should be measured and accounted for. The principle of measurement is critical to ensure that water is managed effectively as a strategic, precious and scarce resource.

The City's aim, as set out in the Integrated Development Plan (IDP) is to reduce the actual demand for water by 20% from the projected unconstrained demand scenario, by the year 2010.

The finite nature of Cape Town's water supply impacts on all Capetonians and their future generations. As such the City seeks to work in partnership with citizens and stakeholders to develop a long-term strategy to safeguard its water resources. The aim is to work with communities, civil society and the private sector, and to modify consumption patterns so that water is used wisely and more efficiently.

Recognising that there are many ways in which this can be achieved, the City seeks to develop its Water Demand Management Strategy in a participative and inclusive way, building on what has already been achieved. This will build ownership by all communities and produce the best results possible, based on consensus.

4.3.2 Focus areas

In order to ensure public and Council involvement and commitment in reducing water demand, a ten-point strategy aligned to the following five focus areas or objectives is proposed:

- CCT must by 2010 reduce and maintain the non-revenue demand of water to below 25% of the total average demand*;*
- Consumers must not waste water and should endeavour to use water efficiently;
- Ensure effective management and implement Integrated Water Resource Planning in all decisions regarding water resources augmentation, bulk infrastructure development and water efficiency projects;

- Adopt Water Care (WC)/WDM as a key service delivery strategy and give priority to its implementation;
- Reduce the projected potable water demand derived from existing surface runoff water resources by 20% by the year 2010 and by 2020? and conserve Cape Town's Water Supply.

GOTO 4.11 for the Comprehensive WC and DM Strategy and GOTO 4.12 for Strategy Tables

4.3.3 The ten-point strategic plan

1) Reduce *Network and Commercial Losses*

It has been said that one of the biggest challenges facing the civil engineering profession internationally is the rehabilitation of an aging reticulation system in many cities around the world. The problem is that rehabilitation has not been implemented progressively and now many cities are faced with the almost impossible task of having to replace or rehabilitate most of the reticulation system in a very short period of time.

This problem is also true in Cape Town where many parts of the reticulation system are more than 40 years old**.** Although the reticulation system of CCT is not at a critical point at this stage, it needs to initiate a proactive and ongoing programme soon. Failure to do so will result in progressive increase in distribution losses and more frequent pipe bursts.

Some of the initiatives
- Pressure Management
- Identification and repair of leaks on the distribution system
- Adoption of a proactive approach to handling of complaints
- Monitoring, measurement and continuous assessment of water usage and metering devices at commercial properties

2) Reduce low-income household leaks

All households will be encouraged to repair water leaks, effecting savings for the City and its consumers. Building on successful campaigns to repair water leaks in poor households already undertaken, the focus will be on townships where infrastructure is of a poor quality and were under-serviced in the past. Households should be encouraged to re-use grey water (water that has been used for washing and bathing, but can be re-used to water gardens and flush toilets).

Re-using grey water and rainwater means that households can save thousands of litres of clean potable water supplied by the municipality.

Some of the initiatives
- Leak detection and repair programmes
- Encouraging a leak-free household environment
- Measurement, monitoring and continuous assessments

3) *Reduce Council consumption*

The concept 'lead by example' shall be adopted by the City in terms of reducing the current use of water. The Open Space and Nature Conservation Department needs to make use of boreholes and treated effluent, and custodians of all council-owned buildings need to implement measures to achieve water efficiency.

Water-wise plants should over time replace others that consume large quantities of water in public places. The City remains mindful of the role that Cape Town's natural beauty plays in economic development and tourism, and seeks to enhance this still further, but in a water-wise manner.

Some of the initiatives

- To radically reduce the water consumption by the Open Space and Nature Conservation Department
- Installing water saving devices in all council-owned buildings

4) *Ensure equitable tariffs*

Water tariffs charged in the City of Cape Town are amongst the cheapest when compared to the other Metro Councils in South Africa. Water tariffs will be modelled to ensure that they are affordable to the poor, financially sustainable and will encourage efficient water use by consumers.

Some of the initiatives

- Revision of Water tariffs
- Putting incentives in place for water-wise consumers
- Informative Billing Systems

5) *Control water wastage through by-laws and ensure that all new developments are water-wise*

WC/WDM strategies often focus exclusively on increasing the water efficiency of existing consumers, neglecting the large number of new consumers who are getting water service connections every year, due to the current high development growth and backlog of services. It is obviously cheaper and easier to install water-efficient fittings rather than retrofit existing ones.

Some of the initiatives

- Set up of a Forum to assess and reconsider By-Laws
- Enforcement of By-Laws

6) *Promote retrofitting and capacity-building programmes*

Analyses have shown that there is significant water saving opportunities in the retrofitting of plumbing fittings. The added benefit of such measures is

that they may also significantly reduce the hydraulic loading on the wastewater system.

Some of the initiatives

- Implementation of Plumbing Retro-Fit Programme
- Encouraging the use of water-saving devices through the media

7) *Communicate, educate and provide Informative Billing*

The City will embark on ongoing communication and public education campaigns to encourage responsible water consumption. This has short-, medium- and long-term objectives. In the short term a considerable reduction in water consumption is to be effected, while in the medium- to long term a change in behaviour around water consumption is to be achieved. Media campaigns will be based on and reflect the growing public consensus about the need to use our water in a more sustainable way. They will aim to change people's behaviour and their water consumption patterns.

Communication and public education needs to include practical information about how households can save water, how they can recycle water and how they can use it most efficiently. Communication needs to take into account the different needs and practices of different water users.

As all Capetonians, rich and poor, are dependent on water and have a vested interest in conserving this resource; managing water demand needs to be a uniting and not a divisive effort. A central message of the communication is that The City and its people are all in this together and united fronts and partnerships are needed to take this forward.

Some of the initiatives

- Special Events e.g. Water Week
- Initiating Sector Forums such as Large Users and Greening Forums
- Education at Schools
- Informative Billing
- Consumer-Awareness Programme via media and face-to-face

8) *Promote alternative technologies and launch water-saving campaigns*

The City is currently investigating alternate technologies to augment water supply, including inter alia: effluent recycling, boreholes and grey water re-use.

The City is also looking at initiating Rain Harvesting Projects for the purpose of supporting communities to grow their own foods.

Some of the initiatives

- Promotion of the use of Grey Water
- Promotion of local borehole extraction for small users
- Recycling of water

9) Conserve CCT's water supply

The short- to medium-term water demand management strategy is in line with the City's long-term commitment to conserving Cape Town's water supply.

Measures include supporting and working with "*Working for Water" to* clear invasive alien plants in water catchments and in the city as a whole. This is proving to be a cost-effective intervention. The work also creates much-needed employment and empowerment and is partially funded through water tariffs.

Some of the initiatives

- Supporting "Working for Water" Programme
- Clean-up River Campaigns
- Management and monitoring of ground water extraction
- Supporting Catchment Management initiatives

10) Create an enabling environment for long term effective WC/WDM

The City's short- to medium-terms goals are:

- Must by 2007 ensure and maintain ongoing effective management systems and implement Integrated Resource Planning in all decisions regarding water resources augmentation, bulk infrastructure development and water efficiency projects.

- Must adopt WC/WDM as one of the key water service delivery strategies, and must give priority to its implementation and ensure ongoing adequate enabling environment.

Some of the initiatives

- Effective monitoring of zones, ensuring integrity
- Upgrading Telemetry Equipment
- Water Balances and Audits
- Promotion of cooperation partnerships with other government bodies, e.g. DWAF
- Ensuring adequate transparency and public participation

4.4 WATER RESTRICTIONS

4.4.1 Introduction

Water is a scarce resource in the Western Cape, and historically there have been periods of water restrictions followed by the development of a new water augmentation schemes. Table 4.4 below depicts when water restrictions have been imposed on the waters users within the Cape Metropolitan Area (CMA).

Table 4.4: History of Water Restrictions

YEAR/S	RESTRICTIONS IMPOSED
1872	Waterworks Committee reports supply not equal to demand. Temporary suspensions.
1881	Report in press referring to daily suspensions of supply
1902	Summer restrictions imposed
1904 (- 1921)	Restrictions imposed due to insufficient summer supply. Supply frequently interrupted for up to 15 hours per day
1949	Restrictions imposed on garden watering for 2 months preceding completion of Steenbras 840 mm diameter pipeline
1956	Restrictions imposed preceding construction of Wemmershoek Dam
1971 - 1973	Water Restrictions imposed preceding completion of Voëlvlei Dam and a severe drought
1993	Water Restrictions imposed on garden water for 2 months preceding the completion of Faure Water Treatment Plant
2000	Water restrictions imposed for 10 months due to low winter rainfall
2004	Restrictions imposed due to low rainfall in the winters of 2003 and 2004

The table illustrates that the timeous planning, design and construction of bulk water supply and water resource infrastructure is imperative in order to avoid water restrictions being imposed.

There are generally four main factors that could lead to water restrictions, these are:

- periods of low winter rainfall (droughts) inadequate water resource development (resulting in insufficient storage capacity in the mountains)
- the water treatment capacity in the System has been overtaken by the demand for water, and;
- the capacity of the infrastructure such as pipes delivering the water to the consumers is inadequate. This usually leads to more localised restrictions.

Water restrictions can also occur if certain of the available resources become unusable due to pollution.

4.4.2 Determination of water restrictions

Water resources in the Western Cape are normally assessed at the end of the hydrological year, after the normal winter rainfall period (end October) and at the onset of the winter rainfall period (end May). The assessment is done by means of a sophisticated stochastic computer model, jointly set up by the Department of Water Affairs and Forestry and the City of Cape Town. The model assesses the total demand for water in the region i.e. urban and agriculture over a number of years against the expected inflow into the various dams during drought years at

various risks of occurrence. On the basis of the planning model results, informed decisions are made in order to optimise existing resources, on the need for water restrictions and the required severity thereof in order to avoid failure of supply in the short term. Based on this analysis, the levels in the dams are managed through the curtailment of water demand, in order to ensure that the dams will not empty and will recover over time. A progressively severe water restriction may have to be imposed should the drought continue or should less rainfall occur in future years.

The modelling carried out at the end of the winter of 2004 predicted that a 20% curtailment in water demand would have to be imposed on all water users between October 2004 and September 2005 in order to manage the recovery of the dams over the next 2 to 3 years.

The need for water restrictions is determined not only by the level of the water in the dams, but also by factors such as the projected growth in water demand, and the implementation date of future water resource augmentation schemes. Level 1 water restrictions (approximate 10% saving required), are applied earlier rather than later, in order to ensure that the City of Cape Town would have sufficient water to last through a drought cycle (a number of very dry winters). Level 2 water restrictions would require a water saving of approximately 20% and Level 3 water restrictions would require the City to save approximately 30% of its projected demand for water. It is better to introduce Level 1 restrictions at an early stage than reach a situation where it may be necessary to implement Level 2 or even Level 3 water restrictions.

The drought which has occurred from 1 November 2002 through to 31 October 2004 is assessed to be a 1:100-year drought. This implies that there was a 1 in a 100 chance of this event occurring over the 2 year period. The previous worst droughts in history in the Western Cape occurred in the 1930's and the early 1970's. These occurrences were both in excess of 1:200 year droughts.

One must not confuse water restrictions with water demand management. Water restrictions are punitive measures to reduce water demand and should be applied judiciously when circumstances such as droughts necessitate the implementation thereof. Water demand management on the other hand comprises good water demand practices and is the responsibility of all the authorities and water users. Good water demand practices, which will be contained in the proposed City of Cape Town Water By-laws, will also lead to a reduction in water consumption.

4.4.3 Legislative Requirements

The City of Cape Town has drafted Bylaws under Section 21 of the Water Services Act, 108 of 1997, which enables the City to impose water restrictions on all its consumers within its area of jurisdiction. A Bylaw entitled "Municipality of the City of Cape Town: Water Services Bylaw to limit or restrict the use of Water" was promulgated in the Government Gazette

4.5 RE-USE OF TREATED WASTEWATER EFFLUENT

The “Integrated Water Resource Planning Study” determined the potential for effluent re-use at a pre-feasibility level. The City of Cape Town has adopted a Water Demand policy and strategy to reduce the use of potable water. The re-use of Treated Effluent is one of the alternatives pursued by the policy

The CCT has appointed consultants to determine the feasibility of redistributing treated effluent from all its treatment plants. The project investigated the refurbishment and capacity of the treated effluent systems at the waste water treatment works (WWTW). The project has been initiated with the aim of increasing availability of effluent to the present consumers and also encourage others to use it as alternative supply to meet their water needs.

The interest from potential consumers has been overwhelming, to the extent that the City needs to expand the treated effluent infrastructure to serve the demand of the consumers.

The first extension was completed at the Bellville Waste Water Treatment Works and supply network during the 2003/2004 financial year. The extension included additional filtering capacity, disinfection, and connections to council parks, schools and Industrial users. The first phase of the project increased the available treated effluent by 5 Ml/day. All the effluent used from Bellville WWTW replaces potable drinking water use.

A project completed in the 2004/2005 financial year increased the reuse of effluent at the Parow and Kraaifontein WWTW to approximately 3,7 Ml/day. Two mayor Football Clubs close to the Parow WWTW as well as the Durbanville sports fields to be supplied from Kraaifontein WWTW are the new consumers. All these consumers were using potable water.

An existing treated effluent pumping scheme is in operation at the Potsdam WWTW. It serves council parks and is used for dune stabilization at Table View. The pump station has limited capacity and requires upgrading. The Century City private development has installed their own private pump station with sand filters which are governed by a long-term agreement with Council. Their demand is 2,4 Ml/day and is used for water features, canals and irrigation.

The upgrading of the treated effluent supply from Potsdam will be completed in January 2006. The project will increase the effluent use from Potsdam by 17 Ml/day for the first phase of the project, of which 9 Ml/day of will replace fresh water.

Feasibility studies have been completed for systems at all the WWTW. The report has identified potential consumers and quantified their estimated demand from the various plants.

Table 4.5 below gives a picture of current usage as well as potential demand, determined in terms of present economical viability, which will be pursued in order to achieve the objective of water conservation.

Table 4.5: Current and Potential Treated Effluent Supply

EFFLUENT RE-USE		
WWTW	**Present (Ml/day)**	**Potential (Ml/day)**
Athlone	3,0	15,0
Bellville	6,5	19,0
Borcherd's Quarry	2,0	2,0
Cape Flats	4,5	14,0
Gordon's Bay	0,5	2,0
Kraaifontein	1,4	3,0
Macassar	2,1	12,0
Melkbosstrand	2,0	2,0
Mitchell's Plain	0,0	4,0
Parow	1,2	2,0
Potsdam	7,0	24,0
Scottsdene	0,3	3,0
Atlantis Wesfleur	0,3	5,0
Wildevoelvlei	0,0	5,0
Zandvliet	0,0	5,0
TOTAL	**30,8**	**117,0**

Note: These figures exclude unformalised downstream use, where users could be withdrawing a large proportion of the dry weather summer flow.

Based on a 2004/05 summer 6-month average effluent production of 503Ml/day, present re-use equates to 6% while the potential is 23% of the current flow. The potential re-use is a good indicator of what can be achieved even if it takes 10 years to implement.
The planning and construction of future extensions will be determined by available budget and the cost of treated effluent to the consumers. Currently the marginal cost of treated effluent is in excess of 50% that of potable water. A converged tariff model has been developed all user categories across the City of Cape Town GOTO 4.10GOTO Tariffsanitation-20%.xls.

A policy is required for consumers who want to fast track projects and contribute to the capital expense or alternatively, would like to install their own private equipment at the WWTW. The policy should cover the agreement required between Council and the Consumer for the taking over of privately-funded infrastructure in lieu of a special tariff for a number of years.