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**LONG-TERM WATER CONSERVATION AND
WATER DEMAND MANAGEMENT STRATEGY
SUMMARY DOCUMENT**

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**WATER & SANITATION
WATER DEMAND MANAGEMENT**



LONG-TERM WATER CONSERVATION AND WATER DEMAND MANAGEMENT STRATEGY SUMMARY DOCUMENT

**DIRECTOR WATER SERVICES:
SIPHO MOSAI**

**MANAGER WATER DEMAND & STRATEGY:
ZOLILE BASHOLO**

**HEAD WATER DEMAND MANAGEMENT:
JULIAN DANIELS**

**CONSULTANT:
GEORGIOS CONSTANTINIDES**

Report prepared by:
Conward Consulting c.c.
PO Box 911
Bedfordview; 2008
Tel: (011) 450 2670
Email: gcon@mweb.co.za

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1 Introduction

The availability of Water Resources and adequate bulk water and wastewater infrastructure to meet the growing water demand in the City of Cape Town (CCT) is a limiting constraint to the social upliftment and economic prosperity of the city. As early as 1995, City of Cape Town committed itself to a 10% saving on the historical demand growth of 4 % per annum. An Integrated Water Resource Planning (IWRP) study carried out in 2001 also indicated that various Water Demand Management and Water Conservation (WC/WDM) initiatives are the most feasible water augmentation options to meet the growing water demand for the city.

In 2001 CCT developed a WC/WDM policy and strategy based on the outcome of the IWRP study. A number of WC/WDM projects were implemented and some of the projects such as the Khayelitsha Pressure management project were very successful and received wide recognition. The implementation of the strategy was however not sustainable and due to numerous institutional challenges the initial commitment and resources to WC/WDM were significantly reduced during 2003, 2004 and again during 2006. This revised WC/WDM strategy seeks to overcome these challenges, build on experience gained and adapt the city's approach in light of current socio-political, environmental and urban management imperatives.

The **purpose of the WC/WDM strategy** is to ensure the long-term balance between available Water Resources and water demand, to postpone the need for expensive capital infrastructure projects for as long as it is economically viable and to minimise water wastage.

The main report documents and motivates the implementation of the new comprehensive and sustainable strategy and consists of the following four sections:

- **Section A:** Gives a background to the strategy and describes the current water situation in the City of Cape Town and the current status regarding WC/WDM
- **Section B:** Describes both the generic and specific concepts and theory that the strategy is based on.
- **Section C:** Evaluates the economic, social and environmental benefits of WC/WDM and establishes the motivation for the scope of the strategy. A demand analysis is also carried out and analysed in order to determine the opportunities of WDM.
- **Section D:** Describes the framework of action to be implemented. The framework of action is divided into three components: Goals, Implementation objectives and action plan and Enabling objectives and action plan.

This executive summary gives a general overview of some of the elements of the strategy, describes some of the key findings and lists the most important recommendations. Interested stakeholders however are encouraged to read the full WC/WDM strategy document.

2 Need for WC/WDM

The need of a WC/WDM at CCT is not limited to the immediate water resource shortages and includes the following:

- a) Reconciling supply and future demand. The IWRP study of 2001 as well as the Reconciliation study of 2006, had clearly indicated that WC/WDM measures are the most feasible options for reconciling supply and future demand.
- b) Water resource and environmental protection. Through WC/WDM, the environment can be protected by limiting the water abstracted from rivers and also reducing the pollution discharged through the wastewater system and reducing the pollution from contaminating the water supply.
- c) Financial viability of the Water Services. WC/WDM can contribute significantly to ensuring the financial viability of water service delivery in CCT in the following ways:
 - Reducing the direct operating costs by reducing Non-Revenue Water (NRW)
 - Reducing the operating cost of revenue demand (not significant)
 - Increasing income from consumers through more equitable tariffs
 - Increasing income by capacitating non-paying consumers to pay for water (reducing consumption to affordable levels)
 - Postponing capital infrastructure requirements

The estimated net financial benefit of implementing WC/WDM over the next 10 years is estimated at approximately **R 1694 million**.

- d) Assist in alleviating the current problems of the wastewater system. The wastewater treatment in CCT is currently under severe stress due to lack of capacity. There are a number of treatment plants where hydraulic loading is the key constraint and WC/WDM can play a significant role in alleviating problems and reducing costs.

3 Consequences of not implementing WC/WDM

The consequences of not implementing the entire WC/WDM strategy can be significant and will depend on the extent of implementation. Some of the important consequences are as follows:

- 1) Risk of the total water demand exceeding available supply, which will require the city to impose long-term severe water restriction that can effect economic development for the region.
- 2) Premature development of the next water augmentation scheme at significant cost.
- 3) Threaten the aim of achieving sustainable and affordable service delivery to low-income areas.

- 4) The existing loss of income to Council will continue to increase. Current levels of loss of income could be as high as R 205 million per annum (20% of total demand at an average selling price of R3.50 /kl).
- 5) The existing direct cost of distribution losses will continue to increase. Current financial losses due to distribution losses are estimated as R 15 million per annum. (Assuming 10% of total demand and R0.50 / kl)

4 Opportunity of reducing wastage and increasing efficiency

From the demand analysis and from the various discussions with various key role players it is estimated that the implementation of WC/WDM can achieve the following savings:

1. Reduction of water wastage by **111 MI/day**
2. Reduction of inefficient water usage by **147 MI/day**
3. A further reduction of approximately **65 MI/day** due to effluent treatment recycling and other alternative Water Resources.
4. Reduction in the normal natural growth rate due to new consumers by **25 %**. For example, if the normal growth rate required by new consumers and economic development is 3.09% p.a. it can be reduced to 2.32% p.a.

The combined opportunity for reducing the total demand (based on 2004 figures) through WC/WDM is estimated as 323 MI/day. This can reduce the 2004 demand from **797 MI/day to 474 MI/day**. The following table illustrates where the various opportunities exist within each sector.

Table 1: Opportunities in reducing demand – MI/day

Domestic(household)				Domestic(outside use)			
Efficient Usage	Ineffici. Usage	Leaks	Total	Efficient Usage	Ineffici. Usage	Leaks	Total
55%	38%	7%	100%	73%	20%	7%	100%
189.7	132.4	24.2	346.3	84.3	23.1	8.1	115.4
Industrial				Commercial / business			
Efficient Usage	Ineffici. Usage	Leaks	Total (MI/day)	Efficient Usage	Ineffici. Usage	Leaks ¹	Total
85%	10%	5%	100%	65%	25%	10%	100%
32.3	3.8	1.9	38.0	62.7	24.1	9.6	96.4
Municipal				other consumers			
Efficient Usage	Ineffici. Usage	Leaks ²	Total (MI/day)	Efficient Usage	Ineffici. Usage	Plumbi.L Leaks ²	Total (MI/day)
65%	25%	10%	100%	65%	25%	10%	100%
22.4	8.6	3.4	34.5	47.3	18.2	7.3	72.8
UAW + bulk losses				Summary - Total			
Leaks bursts	Backgr. Leaks	Commercial	Total	Efficient Usage	Ineffici. Usage	Leaks	Total
30.00%	20%	50.00%	100%	55.08%	26.40%	18.53%	100%
55.8	37.2	93.0	185.9	438.7	210.2	148	796.5

The activities and the target savings that can be achieved are illustrated in the table below.

Table 2: Activities that will achieve the savings envisaged.

	Inefficiency component	Max Saving	% savings target	Target Savings (Ml/day)	Activity to achieve saving	Primary necessity
1	Reduction of NRW (leaks only)	93.0	60%	55.8	· Comprehensive reticulation management programme	• Financial sustainability of Council
2	Inefficient water consumption in low income areas	52.2	75%	39.2	· Comprehensive management programme in low income areas	• Financial sustainability of Council • Affordability for consumer
3	Inefficient water consumption of business / industry	77.0	80%	61.6	· Behavior change · Retro-fitting · Leak repair	• Water resource consideration
4	Inefficient water consumption of domestic, affluent consumers	135.6	75%	101.7	· Behavior change · Retro-fitting · Leak repair / flow limiter · Effective tariff	• Water resource considerations
5	Treated effluent and alternative water resources	72.0	91%	65.5	· Effluent recycling plants · Well and bore holes · rain harvesting · Unconventional resources	• Water resource considerations
	Total	429.8		323.8		

5 The role of WC/WDM on water resources

In order to determine the possible impact of WC/WDM, the High Water Requirement (HWR) and the Lower Water Requirement (LWR) future projections developed by the reconciliation study are adopted, but with the assumption that the LWR does not already incorporate WC/WDM

To emphasise the role of WC/WDM Figure 1 illustrates the existing demand and the water availability, (EWE, including Berg river scheme) with the assumption of not implementing any further WC/WDM. There are three curves illustrated each starting at a different point on the existing curve and all adopting the HWR growth rate. The figure indicates that if we assume that the impact of the water restrictions is sustained and existing water consumers do not return to their previous habits, then a new water augmentation is required during 2013 (light blue curve). If however we assume that existing consumer return to their previous habits prior to 1999, then the next water augmentation scheme would have been required by 2002. (red curve)

The reconciliation study made the assumption that the total demand will soon recover to the level before the restrictions and has therefore adopted a future projection with the HWR starting on the actual 2004 demand. The position adopted in the WC/WDM strategy however is different and assumes that most of the savings achieved by the water restrictions and the WC/WDM projects to date can be maintained. This implies that in order to calculate the impact of the long-term strategy that both the HWR and LWR will be projected from the current 2006 demand levels. The maximum potential savings on the demand will then be superimposed in order to determine a new future projection with WC/WDM. It should be noted that the potential savings from WC/WDM calculated based on the 2004 base figures are reduced in order to allow for the savings achieved to date.

Figure 1: Impact of past restrictions and WC/WDM

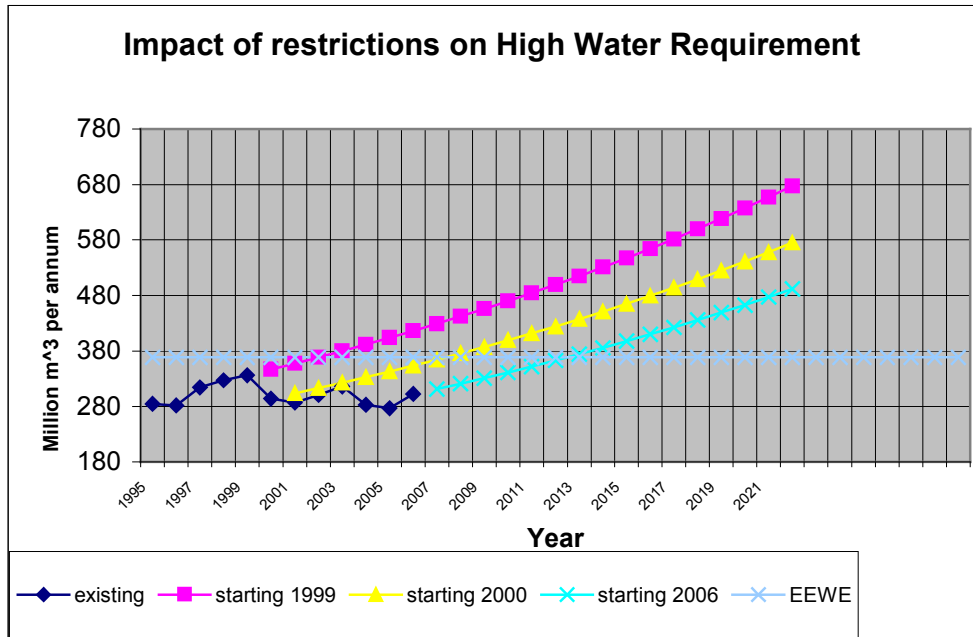


Figure 2 illustrates the proposed impact of the W/WDM strategy assuming a HWR. The diagram illustrates that with the proposed WC/WDM strategy the next water augmentation can be postponed **until 2026**.

Figure 2: Impact of proposed WC/WDM on HWR

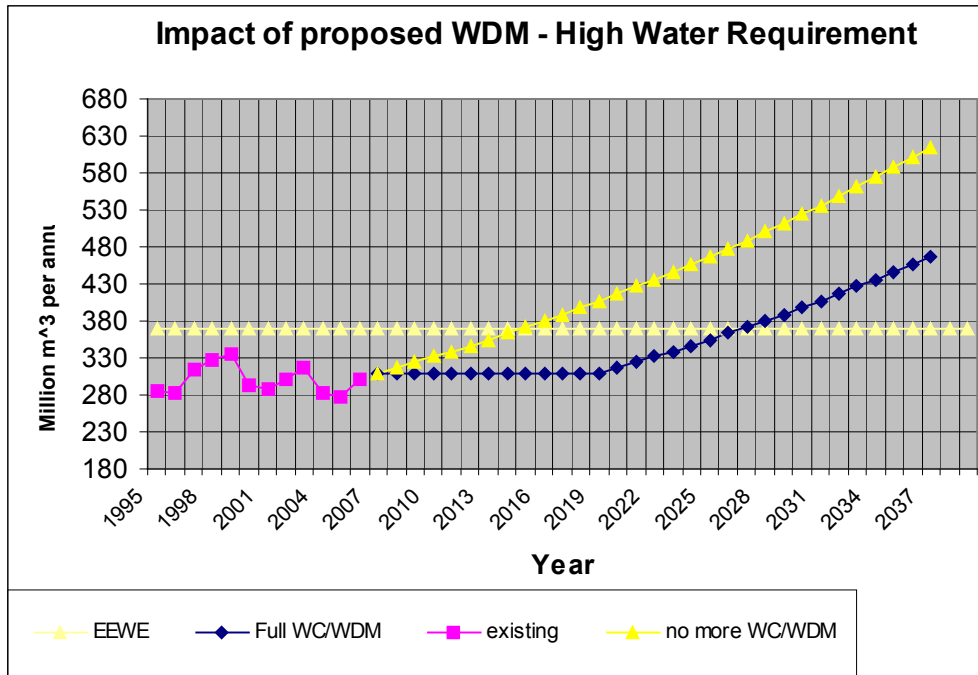
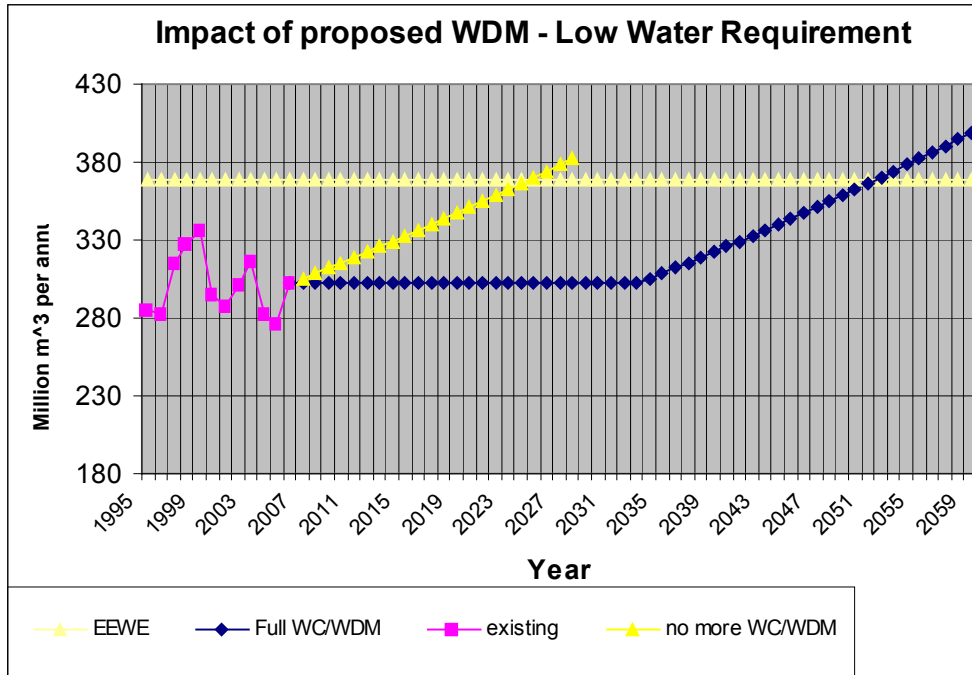


Figure 3 illustrates the proposed impact of the W/WDM strategy assuming a LWR. The diagram illustrates that with the proposed WC/WDM strategy the next water augmentation can be postponed **until 2051**.

Figure 3: Impact of proposed WC/WDM on LWR



The table below illustrates all the possible variations on the possible effect of WC/WDM on the need for a new water augmentations scheme.

Table 3: Impact of WC/WDM on need for new water resources

Impact of WC/WDM	Year new supply augmentation will be needed	
	Low Water Requirement	High Water Requirement
No WC/WDM	2016	2008
Sustaining efficiency from restrictions	2020	2013
10 yr WC/WDM progr.	2051	2026

The results indicate quite a significant potential for WC/WDM in postponing new water resource augmentation. The calculations however are based on a number of assumptions that need to be verified. A number of decision makers are also sceptical on the potential role of a sustained WC/WDM programme because it is a new function in water resource planning. Wide scale retro fitting of plumbing fittings to residential homes has for example never been carried out in South Africa and a number of the proposed WC/WDM activities require a new paradigm and extensive commitment by the Council. In order to overcome these constraints and also to verify the number of assumptions made in the calculations, it is proposed that CCT makes the following undertaking:-

Proposed Undertaking: CCT will commit over the next three years to implementing and monitoring a comprehensive WC/WDM strategy. Within this time no decision should be taken regarding further water augmentation schemes in order to verify the full potential of WC/WDM. After five years, the full impact and potential of WC/WDM must be clearly demonstrated by CCT and re-evaluated. All assumptions made in the current analysis on the role of WC/WDM will be tested and adequately researched.

6 Framework of action

Based on the fundamental principles of WC/WDM as well as the policy adopted in the previous WC/WDM strategy by CCT, five goals have been identified and represent the overall WC/WDM policy.

Goals, A,B and E relate to the implementation objectives that will result in the direct reduction of water demand. Fourteen implementation objectives have been developed under the various goals. These objectives are illustrated in the table below.

Goal A: CCT must by 2010 reduce and maintain the Non-Revenue water to below 15% of the total average demand and within accepted international benchmarks.

Goal B: Water wastage by consumers should be reduced and maintained to below 2% of the total demand by 2012 and most consumers should achieve acceptable water efficiency benchmarks by 2016.

Goal E: Reduce the projected potable water demand to an average growth rate of no more than 1% pa. for the next 10 years and conserve Cape Town's Water Resources.

Table 4: Implementation /Water Demand reduction objectives

Policy	Objective number	Description
Goal A	A1	Reduce and maintain low levels of water losses through the reticulation system
	A2	Reduce and maintain low levels of non-revenue demand by consumers
	A3	Adopt and implement proactive O & M measures
	A4	Reduce and maintain low levels of billing and metering losses
Goal B	B1	Promote the efficient use of water to consumers and customers
	B2	Regulate and enforce the prevention of wastage of water
	B3	Ensure the efficient use of water in new connections and developments
	B4	Introduce more equitable tariffs and informative billing
	B5	Assist and capacitate consumers to be water efficient, including the introduction of leak repair and retrofitting projects
	B6	Reduce and maintain low levels of inefficient water use by Council
Goal E	E1	Maximise the use of treated effluent
	E2	Promote alternative Water Resources and technologies
	E3	Conservation of existing Water Resources
	E4	Ensure the quality of treated effluent is of suitable standards

The enabling action plan consists of two goals and seven objectives as illustrated in the table below. Goal C relates mainly to ensuring adequate information and Goal D relates mainly to ensuring adequate resources and capacity to implement WC/WDM.

Goal C: CCT must by 2009 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.

Goal D: CCT must adopt WC/WDM as one of the key water service delivery strategies, and must give priority to its implementation and ensure an ongoing adequate enabling environment.

Table 5: Enabling WC/WDM objectives

Policy	Objective number	Description
Goal C	C1	Establish appropriate district management areas and monitor the Non-Revenue Water
	C2	Ensure adequate information and policies to support decision-making
	C3	Ensure all decisions are supported in terms of Integrated Resource Planning (IRP).
	C4	Monitor the impact of WC/WDM measures and KPI
Goal D	D1	Ensure adequate financial resources
	D2	Ensure adequate human resources and processes
	D3	Ensure adequate transparency, stakeholder buy-in and commitment

7 Budget

The proposed budget allocation for WC/WDM over the next ten years, starting during the 2007/08 financial year, is illustrated in Table 6 follows. More detail on how the budgets are allocated for each of the more important programmes and projects is illustrated in Table 7.

Table 6: Budget for WC/WDM

Year	Operating	Capital	Total x 1000
2007/08	R 19,581	R 27,167	R 46,748
2008/09	R 40,417	R 56,078	R 96,495
2009/10	R 57,125	R 79,260	R 136,385
2010/11	R 54,692	R 75,884	R 130,576
2011/12	R 52,616	R 73,004	R 125,620
2012/13	R 26,872	R 37,284	R 64,155
2013/14	R 18,771	R 26,045	R 44,816
2014/15	R 16,138	R 22,391	R 38,530
2015/16	R 24,685	R 34,250	R 58,935
2016/17	R 24,727	R 34,308	R 59,035
Total	R 335,624	R 465,670	R 759,195

Table 7: Costs of main projects

Objective number	Programme	Budget x R 1000										Total				
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10					
Objective A1	A1.1	4200	3000	2900	2900	2900	2900	2900	2900	2900	2900	2900	2900	2900	2900	13300
	A1.2	1400	1400	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	10800
Objective A2	A2.1															
		2000	15700	30620	30676	30879	21142	7485	1485	1485	1485	1485	1485	1485	1485	142958
	A2.2	1293	2300	2630	3010	3446	3948	3446	3010	2630	2300	2300	2300	2300	2300	28012
Objective A3	A2.3	1920	2220	3640	3640	3640	3640	3640	3640	3640	3640	3640	3640	3640	3640	33260
	A3.2	300	700	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	10200
Objective A4	A4.2	1000	4200	4050	4000	4000	4050	4000	4000	4000	4000	4000	4000	4000	4000	37300
		1410	2010	2410	7350	2710	2710	2710	2710	2710	2710	2710	2710	2710	2710	29440
Objective B1	B1.1	0	2040	2040	1790	1790	1590	1590	1590	1590	1590	1590	1590	1590	1590	15610
	B1.2	1150	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	21850
Objective B2	B1.3	745	845	895	945	995	1045	1095	1145	1145	1145	1145	1145	1145	1145	10000
	B1.4	0	500	2600	1500	0	0	0	0	0	0	0	0	0	0	4600
Objective B5	B1.7	80	305	5	150	5	150	5	150	5	150	5	150	5	150	570
	B2.2	0	500	2300	5000	5000	5050	5000	5000	5000	5000	5000	5000	5000	5000	37850
Objective E1	B5.1	0	520	1070	1070	870	870	870	870	870	870	870	870	870	870	7880
	B5.4	23490	34000	50200	47000	51000	0	0	0	0	0	0	0	0	0	205690
Objective E2	E1.1	0	950	950	950	950	950	950	950	950	950	950	950	950	950	8550
	E3.1	1600	1500	1500	0	0	0	0	0	0	0	0	0	0	0	4600
Objective C1	C1.1	500	10000	10000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	27500
	C2.1	0	0	200	6400	6530	6730	2030	2030	2030	2030	2030	2030	2030	2030	27980
Objective C2	C2.2	41088	84990	122460	121831	117315	57230	38321	31935	31555	31225	31225	31225	31225	31225	677950
	Total															

8 Progress to date

The following is brief summary of the progress on the WC/WDM initiatives undertaken during 2005/2006 and 2006/2007.

- a) Treated effluent distribution systems: R18M project in Blaauwberg Area to serve industry and farms, as well as an innovative pilot dual network system in the new residential development of De Grendel. The estimated additional treated effluent supplied between 2005 and 2007 is an annual average of **14.55 MI/day**.
- b) Sustainable domestic leak repairs focusing on more than 12 000 indigent homes, including skills transfer to communities: R2,7M project value with estimated reduction in consumption of **3 MI/day**.
- c) Reduction of Non Revenue Water by approximately **34 MI/day**. It is not clear however, what the reduction of real losses versus commercial losses is.
- d) Pressure reduction schemes that have greatly reduced night-flows and leakage at Mfuleni and Guguletu: R1,2M project value with estimated reduction in water supplied of **2.5 MI/day** (reduction is a combination of reticulation losses and consumer demand)
- e) Retrofit of water efficient showerheads issued and installed by Eskom. The estimated reduction in water supplied is **1.3 MI/day**.
- f) Communication, awareness and educational drives: R1,8M

The overall combined impact of the WC/WDM initiatives and water restrictions is to reduce the total demand by approximately **50 MI/day** based on the 2004 base demand.

9 Conclusions

Both the IWRP study undertaken by CCT during 2001 and the recent reconciliation study undertaken by DWAF have clearly identified WC/WDM as the most feasible solution to reconcile the future water demand. The following extract from the reconciliation study emphasises the need for WC/WDM:

“ The long lead time required to implement a supply-side intervention precludes its selection as the first intervention to be implemented prior to 2013. It is therefore imperative that additional WC/WDM interventions (beyond the CCT’s long-term strategy) be studied and implemented as the first phase of the development path. If the CCT is unsuccessful in implementing its WC/WDM strategy and programme, and assuming that the

HWR Curve is followed, then the supply will exceed requirement in 2011 and the City will face an increased possibility of having to impose water restrictions on its consumers.”

To avoid water shortages and ensure sustainable and affordable Water Services CCT has no choice but to implement a very comprehensive WC/WDM strategy.

The current method of forecasting future demand by DWAF and CCT is considered very inaccurate and can result in a wide range of demand forecasts. Such a wide range of forecasts is having a significant impact on the need for the next augmentation and the financial consequences are enormous. The difference in the need for a new Water Resource augmentation (assuming WC/WDM is implemented) is 14 years depending on whether the High Water Requirement or Low Water Requirement will be achieved. Internationally there are more accurate models based on “end-use” demand analysis that can provide a greater level of confidence in demand forecasting.

10 Key recommendations

The following are some of the key recommendations of the WC/WDM strategy:

- 1) CCT must commit to implementing WC/WDM as the preferred Water Resource augmentation option. This commitment should be reviewed after an initial period of five years.
- 2) WC/WDM should be submitted for consideration to become a Mayoral Flagship project.
- 3) Attention should be given to address all of the proposed WC/WDM related programmes and projects described in the strategy.
- 4) An approximate budget of R 759 million should to be allocated to WC/WDM over the next ten years. Most of the budget required can be allocated from savings achieved from WC/WDM or from extra revenue generated from the water restrictions tariff or the sale of treated effluent.
- 5) The 2007/2008 budget and the rolling 3- year budget allocated to WC/WDM activities as part of the Water Services budget, should be revised in accordance with the budgets identified in this strategy.

- 6) WC/WDM activities should be intensified over the next two years in accordance with the strategy, in order to ensure that the total water demand does not suddenly increase to the levels prior to the introduction of the water restrictions.
- 7) All revenue from the sale of treated effluent should be ring-fenced and allocated towards the WC/WDM budget requirements.
- 8) The Water Restriction levy should be renamed the Water Conservation levy and all revenue collected from this should be allocated towards the costs of the WC/WDM strategy.
- 9) Finance and Water Services should agree on a method to estimate the financial impact of the various WC/WDM initiatives. The net savings should then be allocated towards the budget requirements of the WC/WDM strategy.
- 10) The strategy should be regularly reviewed to incorporate the latest available information and to re-prioritise the implementation of various programmes.
- 11) A new forecasting model based on “end-use” demand analysis should be developed in conjunction with an appropriate Management Information System and research.
- 12) Attention should be given to the human resource requirements to enable the successful implementation of the WC/WDM strategy.
- 13) The effluent treatment strategy should be accelerated and implemented fully over the next five years in order to assist in generating adequate income to subsidise other WC/WDM related activities.