CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

WATER AND SANITATION

WATER DEMAND MANAGEMENT AND STRATEGY

Review: 2015/16

Update and additions to existing long-term water conservation and water demand management strategy

Update and additions to initial long-term water conservation and water demand management strategy

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CHANGE LIST					
Sheet	Reason for change	Ver.	Filename	Reviewer	Release Date
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DOCUMENT OVERVIEW AND PURPOSE

Please not that this document is to be seen as an update of the previous water conservation and water demand management (WCWDM) Strategy (2007) this does not supersede or replace the existing strategy.

This Summary Report should not be read in isolation of the full report of 2007 (Mayco approved WC/WDM Strategy) in order to contextualise the source or foundation of this update. Furthermore the report should also be read in conjunction with the report, commissioned by CCT, developed by Vela VKE which assesses the achievements (linked to the strategy) made within the period of 2007-2010.

Four year years has transpired since the implementation of the strategy in June 2007. The City of Cape Town has reviewed the strategy to re-align and focus future initiatives up to 2020/21.

The primary purpose of this document is to:

- Redefine the targets and align these targets with the SDBIP indicators
- Review the initial strategy and further project the anticipated savings for the next 10 years.
- Promote the need for the implementation of WC/WDM initiatives and further re-iterate why WC/WDM initiatives are considered the first and foremost measures needed to reduce and sustain water demand
- Assess the achievements of the WCWDM strategy initiatives on water demand profile of the City
- Ensure integration of all initiatives that foster water saving and water conservation
- Provide a guideline and methodology on the implementation mix of the various initiatives
- Review the strategy objectives and goals

LIST OF ACRONYMNS

AADD	Annual Average Daily Demand
AMR	Automated Meter Reading
CCT	Cape Town City Council
DMA	District Metered Areas
DWA	Department of Water Affairs
HWR	High Water Requirement
ILI	Infrastructure Leakage Index
IRP	Integrated Resource Planning
IWRP	Integrated Water Resource Planning
IWRM	Integrated Water Resource Management
KPIs	Key performance indicators
LWR	Low Water Requirement
LOS	Level of Service
NRW	Non-Revenue Water
NWA	National Water Act
NWRS	National Water Resource Strategy
O & M	Operation and Maintenance
PPP	Private Public Partnerships
MIS	Management Information System
SALGA	South African Local Government Association
SWOT	Strengths Weaknesses Opportunities and Threats
ToR	Terms of Reference
UaW	Unaccounted for water
UWD	Unconstrained Water Demand
WC	Water Conservation
WDM	Water Demand Management
WSA	Water Services authorities
WSDP	Water Services Development Plans
WSI	Water Services institutions
WWTW	Waste Water Treatment Works

LIST OF UNITS

l/s	Litres per second
m^3/s	Cubic metres per second
Mm^3/a	Million cubic metres per annum
Ml/day	Megalitres per day
Kl/month	Kilolitres per month

LIST OF DEFINITIONS

Apparent Losses	Also known as commercial losses - Include unauthorised consumption and meter inaccuracies
Inefficient use of water	Water used for a specific purpose over and above the accepted and available best practices and benchmarks, or water used for a purpose where very little benefit is derived from it.
Integrated Water Resource Planning	A way of analysing the change in demand and operation of water institutions that evaluates a variety of supply-side and demand-side management measures to determine the optimal way of providing Water Services.
Real Losses	Also known as physical losses – include leakage on transmission and distribution lines; leakage and overflows at storage tanks; and leakage at service connections.
Reticulation management	Any function relating to the management, maintenance and operation of any system of structures, pipes, valves, pumps, meters or other associated equipment, including all mains, connection pipes and water installations that are used or intended to be used in connection with the supply of water.
Retrofitting	The modification, adaptation, or replacement of an existing device, fitting or appliance.
Supply-side management	Any measure or initiative that will increase the capacity of a water resource or water supply system to supply water.
Unbilled authorised consumption	Water used for backwashing of filters, flushing of pipes, washing streets, firefighting, public taps and fountains, parks, etc.
Unaccounted for water	Part of the Non-Revenue Water (NRW) that remains after deducting unbilled authorised consumption. UFW or UAW includes Real and Apparent losses.
Water Institutions	Water institutions include both Water Management Institutions and Water Services Institutions as defined in the National Water Act and the Water Services Act respectively.
Water Wastage	Water lost through leaks or water usage, which does not result in any direct benefit to a consumer or user.
Water Conservation	The minimisation of loss or waste, care and protection of Water Resources and the efficient and effective use of water.
Water Demand Management	The adaptation and implementation of a strategy by a water institution or consumer to influence the water demand and usage of water in order to meet any of the following objectives: economic efficiency, social development, social equity, environmental protection, sustainability of water supply and services, and political acceptability.

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1. INTRODUCTION

The availability of adequate Water Resources and the related 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 up-liftment 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 to 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.

This strategy forms the overarching strategy for water demand management. Sub strategies and plans, derived out of this strategy and now forms the basis for tracking, are as follows:

- Treated Effluent Reuse Strategy (2013 Master Plan)
- Water Conservation Strategy (2014)
- Long-Term Water Research and New Technology Strategy (2012/13)
- Meter Replacement programme
- Bulk Water Demand Management programme
- Infrastructure Asset Management Plan: Pipe replacement programme (2011/12)

1.1. NEED FOR WC/WDM

DWA has recognised WDM initiatives as the first and foremost measures to reduce and sustain water demand.

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 and the Reconciliation strategy 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 business: WC/WDM can contribute significantly to ensuring the financial viability of water service business in the CCT in the following ways:

- Reducing the direct distribution, operating and treatment costs by reducing non-revenue demand
- Reducing the operating cost of revenue demand (not significant)
- Increasing income from consumers through affordable tariffs
- Reducing the bad debt costs by reducing wastage and inefficient consumption by non- paying consumers. Postponing the need for new capital infrastructure
- Energy costs reduction due to reduced demand; More water connections can be made for revenue generation

2. LEGISLATIVE REQUIREMENTS

This WC/WDM strategy supports the key principles embodied and complies with the relevant provisions of both the National Water and Water Services Acts. The following is a list of all the relevant national legislations and policies regarding WC/WDM.

2.1. NATIONAL WATER ACT

The National Water Act adopts water conservation as a key concept. Conservation appears more than twenty times throughout the Act. The following are the most significant clauses regarding WC/WDM in the National Water Act.

Clause 8 makes water conservation one of the requirements of a catchment management strategy.

"(1) A catchment management agency contemplated in Chapter 7 must, by notice in the Gazette, establish a catchment management strategy for the protection, use, development, conservation, management and control of Water Resources within its water management area."

Clause 29 makes water conservation one of the conditions associated with authorisation of licences.

"(1) A responsible authority may attach conditions to every general authorisation or licence -

(a) relating to the protection of

- the water resource in question;
- the stream flow regime; and
- - other existing and potential water users;

(b) relating to water management by -

..specifying management practices and general requirements for any water use, including water conservation measures;"

Clause 56 specifies that the cost of water conservation can be included in the pricing strategy.

"(1) The Minister may, with the concurrence of the Ministry of Finance, from time to time by notice in the Gazette, establish a pricing strategy for charges for any water use within the framework of existing relevant government policy.

(2) The pricing strategy may contain a strategy for setting water use charges -

(a) for funding water resource management, including the related costs of - .....

(iv) water resource protection, including the discharge of waste and the protection of the Reserve; and

(v) water conservation;"

Schedule 3 Clause 6 specifies that the catchment management agency may require users to undertake water conservation measures.

"(1) If a catchment management agency on reasonable grounds believes that a water shortage exists or is about to occur within an area it may, despite anything to the contrary in any authorisation, by notice in the Gazette or by written notice to each of the water users in the area who are likely to be affected -

(i) Limit or prohibit the use of water;

(ii) Require any person to release stored water under that person's control;

(iii) Prohibit the use of any waterworks'; and

(iv) Require specified water conservation measures to be taken."

2.2. WATER SERVICES ACT

The following clauses in the Water Service Act relate directly to WC/WDM:

Clause 2 (j) states that one of the main objectives of the Act is:

"the promotion of effective water resource management and conservation"

Clause 4 (2) requires that one of the conditions set by the Water Services provider

(c) "Must provide for-

(vi) measures to promote water conservation and water demand management"

Clause 11 specifies the duty of water service authorities to provide access to Water Services.

(1) "Every Water Services authority has a duty to all consumers or potential consumers in its area of jurisdiction to progressively ensure efficient, affordable, economical and sustainable access to Water Services."

It specifies that this duty is subject to:

(2) (e) "the duty to conserve Water Resources"

Clause 13 specifies the contents of a draft Water Services development plan. Clause (j) specifies the following:

(j) "of existing and proposed water conservation, recycling and environmental protection measures"

2.3. WATER SERVICES ACT REGULATIONS

The following clauses in the Regulations under the Water Service Act relate directly to WC/WDM:

Clause 10 (1) " A Water Services authority must include a Water Services audit in its annual report on the implementation of its Water Services development plan required in terms of section 18 (1) of the Act."

Clause 11 (1) Within two years of the promulgation of these regulations, a Water Services institution must every month- "Determine the quantity of unaccounted for water ……"

Clause 12 " A Water Services institution must repair any major, visible or reported leak in its Water Services system within 48 hours of becoming aware thereof."

Clause 13 " A Water Services institution must within two years …fit a suitable water volume measuring device or volume controlling device to all user connections provided with water supply services that are existing at the time of commencement of these regulations"

Clause 15 "A Water Services institution must design and maintain every water reticulation system installed after promulgation of these regulations to operate below a maximum pressure of 900 kpa."

3. CORE BUSINESS OF THE DEPARTMENT

The core business of the Water and Sanitation Department is to equitably and efficiently provide access to Water and Sanitation Services to all citizens of the City in a sustainable, safe, reliable, environmentally friendly and financially viable way observing the dictates of sound good governance principles.

4. VISION AND MISSION FOR WATER AND SANITATION

The vision of Water and Sanitation Services in Cape Town is: complemented by the CCT's IDP:

IDP Strategic Focus Area's are as follows:

- The Opportunity City
- The Safe City
- The Caring City
- The Inclusive City
- The Well run City

VISION STATEMENT

To be a beacon in Africa for the provision of Water and Sanitation services

MISSION STATEMENT

We pledge to achieve our vision through creating a centre of excellence in water and sanitation provision through:

- Employee and Leadership Development
- Infrastructure Stability
- Water Resource Adequacy
- Product Quality
- Community Sustainability
- Consumer Satisfaction
- Operational Optimisation
- Stakeholder Management and Support
- Financial Viability
- Operational Resilience

We operate within a value system aligned to Batho Pele principles:

- **Integrity**: We maintain the highest level of ethics and fairness in our interaction with each other, our customers and other stakeholders.
- **Respect**: We respect all our employees, customers and stakeholders. We have the highest regard for the dignity of all people.
- **Customer Focus**: We meet customers' needs by providing excellent service, optimal product performance and efficient support system.
- **Trust**: Our business model is based on trust and integrity as perceived by our stakeholders and customers.
- **Transparency**: We operate safely, openly, honestly and with care for the environment and the community.
- **Professionalism**: We encourage innovation, teamwork and openness among our employees and reward performance excellence.

4.1. BUSINESS FOCUS AREAS

The Water and Sanitation department has adopted the framework for effective water and wastewater utility management developed by the American Water Works Association (AWWA) as a balanced scorecard for its business management. The framework covers all aspects of the Water and Sanitation business necessary to position the department to achieving and contributing effectively and efficiently to the achievement of the City vision. The following are the ten attributes that have been adopted:

a) **Product Quality:** looks at the ability of the department to meet the potable water quality standards licence conditions, the Department of Water Affairs' general wastewater effluent standards, environmental management requirements and ecological needs.

b) **Customer Satisfaction:** looks at the ability of the department to provide basic services to all residents in the City; sanitation and water in informal settlements at a City set targeted improved level of service, provision of affordable service, meeting Service Charter standards, level of service and standard of service. The department seeks to provide services to backyarders on a direct basis in agreement with the landowners such as the Directorate of Human Settlements and private household owners.

c) **Employee and Leadership Development:** the department has a challenge to develop and retain its employees and ensure high levels of motivation among employees. This challenge demands that the department must ensure adequate staffing levels, skills retention, succession planning and individual development of employees so that their progression into management or a specialist function is supported adequately.

d) **Operational Optimisation:** this attribute forces the department to review its business processes to ensure timely on-going cost-effective, reliable and sustainable service provision in all its operations. The department is challenged to minimise resource utilisation, losses and take advantage of technological advancement to better its efficiency levels in providing water and sanitation services.

e) **Financial Viability:** the focus is for the department to improve its collection ratios and ensure that the tariffs, charges or any levies are total cost-recovering in nature. In addition there is a need to reduce high debt levels and improve the willingness to pay by its consumers. The investment into infrastructure must also be well-timed, synchronized with mutual projects and appropriate funding explored to ensure a good return on investment. The cost of capital must be minimised and the challenge is how to achieve this given the consolidated nature of the investment decisions in the City. The department must also ensure effective utilisation and timely maintenance of its assets to sustain revenue growth levels that is in sympathy to the consumer base growth.

f) **Infrastructure Stability:** this business attribute requires the department to understand when to create and dispose of an asset, the condition of its assets, lifecycle costs, the associated costs to be incurred in unlocking asset value, to sustain the business. The department must ensure timely maintenance, repair, rehabilitation, replacement and upgrading of existing infrastructure. The lifecycle costs of the assets must be well understood and asset management plans developed. The department is currently developing asset management plans to be integrated into the SAP system modules and this process is a huge challenge that requires time and resources to complete.

g) **Operational Resilience:** this business focus area requires the department to ensure adequate risk management for its water and wastewater

business. To this end the department has developed the draft Wastewater Risk Abatement Plan and the draft Water Safety Plan and the Department of Water Affairs' requirements of these plans are increasingly becoming stringent. The establishment of operational tolerance levels that ensures adequate management of the legal, regulatory, financial, environmental, safety, and national disaster risks are still to be finalised. Servitude encroachment is a risk to the department that affects the operational resilience of its service provision value chain.

h) **Community Sustainability:** this focus area ensures infrastructure investment led job creation for communities in the City of Cape Town. This will assist in improving the disposable income of households and enhance their ability to pay for water and sanitation services. The department must ensure that its operations, services output and by-products such as sludge and wastewater effluent do not harm the environment and compromise community health. Infrastructure Management and Operations must be managed to ensure efficient utilisation of water resources, energy and promote economic vitality with minimum impact on the environment. Efforts should therefore be made to ensure investments are green and climate change impact is managed.

i) **Water Resource and Demand Management:** as it is, this business attribute focuses on the ability of the department to ensure security of water supply. The department has a challenge to ensure that by 2017 a new source of water supply to the City will have been developed either directly by the department or through Department of Water Affairs. The department has to keep pace with future customer needs for basic services and economic expansion through long term resource planning, long term demand analysis and conservation of the existing resources.

j) **Stakeholder Management:** this attribute requires the department to identify the representatives of various stakeholders and ensure adequate engagement in

issues that affect them. Satisfying differing views between interest groups, throughout the City of Cape Town, is a challenge for the department in its quest to provide the targeted improved level of service. The department must also ensure adequate engagement with the Department of Water Affairs, the Provincial Government and other directorates in the City for the purpose of optimising investments into improvement programs and risk management.

4.2. CRITICAL CHALLENGES

Out of the business focus areas described above, the Water and Sanitation Department has identified the following as areas of required focus as they could constitute as risks to the business, they are clustered into four categories:

(a) Financial viability:

- Collection ratio and willingness to pay for services;
- Metering and billing;
- Ensuring full cost recovery and acceptability of the tariffs by the consumers;
- Reduction in unaccounted for water;
- High financial requirements;
- High cost of doing business, and
- High debt due to non-payment.

(b) Customer satisfaction:

- Meeting Service Charter standards;
- Improved Provision in accordance with the City's own set desired target levels of basic services to Informal Settlements and Backyarders;
- Availability of services for infrastructure expansion;
- Appropriate service standards and level of service;
- Providing a targeted improved level of service, and
- Provision of affordable service.

(c) Water Resource and Demand Management:

- Achieve water demand targets through intensified WDM strategy;
- Development of additional water sources;

- Treated effluent re-use and its acceptance, and
- Provision of adequate infrastructure to meet City development/growth needs.

(d) Employee development (internal):
- Establish effective institutional arrangement;
- Sufficient staff resourcing, skills retention and development, and
- Increasing productivity, efficiency and effectiveness in the operations of the business.

(e) Operational Optimisation:
- ISO 9000 certification;
- ISO 17025 laboratory certification, and
- Processes re-engineering and right-sizing of the department.

(f) Product quality:
- Meeting the licence conditions for Wastewater Treatment Works, and
- Meeting the amended SANS 241 standards.

(g) Operational Resilience:
- Water Safety Plan development;
- Wastewater Risk Abatement Plan;
- Servitude enhancement;
- Developing and managing the Risk Register, and
- Asset Management.

The strategies to overcome these challenges are dealt with under the appropriate section of the plan that follows.

4.3. WATER AND SANITATION OVERALL STRATEGIC OBJECTIVES

In order to implement the business plan, goals and strategic objectives have been set as follows, with a medium-term objective target date close to or at the 2016/17 horizon - the term of the 2014/15 business and IDP plan.

Business Focus Area	Strategic Goal	Strategic Objective	Objective Target Date
Customer Satisfaction	To provide the Department's core service	To sustainably provide basic sanitation services to all residents in the city	ONGOING
	To provide the Department's core service	To sustainably provide basic water to all residents in the city	ONGOING
	To satisfy the users of the service as much as possible	To achieve 2.9, customer satisfaction levels in all our services	2016/17
Quality, Operational Optimisation	To implement an accredited Quality Management System for the Department	To implement and maintain ISO 9001 for all our services within budgetary constraints	2017/18
Quality, Environment	To achieve the best possible effluent discharge quality	To achieve 85% waste water effluent quality to National Standard	2016/17
	To reduce sewage overflows from spillages, blockages and infrastructure failure as much as possible	To minimise river systems pollution by reducing sewage overflows	2016/17
Water Resource and Demand Management	To reduce water losses as far as possible	To reduce Non-Revenue Water to 19% in the next five years	2016/17
	To ensure security of Water Supply for the City into the future, as the lifeblood for sustaining the community and enabling City Economic growth	To improve security of supply: Peak week demand - percentage of potable water production capacity. Target 90%	2016/17
	To increase effluent re-use rather than potable water, thereby reducing total potable water demand	To increase effluent re-used to 5% of potable water used	2016/17
Infrastructure Stability	To operate and maintain the infrastructure for the service sustainably	To develop Asset Management Plans for the Department	2014/15
Operational Optimisation	To consolidate all office accommodation to be less dispersed and in the best location, for closer contact with other parts of the organisation and with the customer	To improve operational efficiencies by consolidating office accommodation	2017/18
	To automate, monitor and control infrastructure as efficiently as possible	To roll out automation, remote monitoring and control systems on treatment works, pump stations and other infrastructure	2017/18
Financial Sustainability	To ensure income covers expenditure	To improve revenue collection to 89%	2016/17
Employee Development	To train all staff to discharge their functions to high standard of excellence	To develop and enhance Process Controllers through the Training Centre	2016/17

5. STATUS QUO SITUATION OF THE DEPARTMENT (SWOT ANALYSIS)

It is necessary to carry out a situation analysis that identifies the constraints and opportunities in implementing WC/WDM. This is necessary in order to ensure that the strategy developed can be implemented successfully.

STRENGTHS

- High levels of technical staff
- Integrated metering and billing system
- Previous successful WC/WDM programmes
- Alignment of WC/WDM programmes and activities
- Efficiency campaigns (i.e. water savings campaigns)
- Budget allocation
- Political buy-in
- Water Bylaw
- Adopting Integrated Resource Planning
- Council Approved 10 year WC /WDM Strategy linked to IDP
- Tariff Structure
- Impact of previous forced adaptation to water scarcity
- Improve Service Delivery (Water Supply)

WEAKNESSES

- Current organisational structures hinders holistic water management by entrenching fragmented policy, planning and budgeting approaches
- Short-term financial planning
- Combined authority and provider
- Lack of knowledge of consumer needs and water usage patterns

Consumers lack understanding of the need to implement water conservation

- Lack of control measures to assess impact of water conservation programmes
- High levels of leakage within the smaller zones and within low income households
- High price of domestic water use to subsidise non-payment and reduced revenue (through reduced water usage): Cost recovery percentages (for water supply, sewage and wastewater treatment) not satisfactory

SWOT

OPPORTUNITIES

Possibility of securing external funding from a range of institutions and donors

Establishment of PPP's geared around elimination of water wastage

Delayed infrastructure investment and energy savings leading to reduced water costs

Increased efficiency in the use and allocation of water whilst promoting social equity

No Drop Audit – ensure WDM is implemented, data is handled effectively and efficiently, ensures good governance

Research opportunities (MOU) between UCT and CCT including internal research unit

Water resource alternatives: Springs project, rain water harvesting and TE for irrigation

Awareness of communities to conserve water

Water Conservation Strategy

Meter replacement programme

Infrastructure Condition Assessment

Asset Management Plan

Integrated Master Plan for Water and Sanitation Infrastructure

Alignment of WCWDM programmes to electricity (reduced energy)

The existence of infrastructures actually unused for water storage

An increasing awareness of the relationship between economy and water availability

THREATS

Impact of debtors collection ratio on Capital and Operating budgets

Aging infrastructure

Low level of knowledge and awareness of the need and benefits of water conservation amongst the public

Community acceptance/behaviour change

Willingness of consumers to pay for water used

Climate Change

The high cost of the reclamation technologies implemented for wastewater reclamation and reuse

5.1. OFFENSIVE STRATEGIES (SO): INCLUDE STRENGTHS TO EXPLOIT OPPORTUNITIES

- Use the existing Water and Sanitation Master Plan to determine future water demand requirements
- Utilise the council approved WC/WDM Strategy as motivation to obtain increased budget of a long term period (10year)
- Integrated Planning, Strategy and Information Management Unit has developed a system to collect, store and analyse data which has resulted in successful outcome within the No Drop Audit
- Realise the successful implementation of WC/WDM initiatives to motivate for additional budget through analysing financial gains made on water saved as a result of initiatives which can further strengthen council by-in and participation
- Control and manage water usage through conservation programmes and Water Bylaw enforcement and continue to advise on alternate water resource options

5.2. REACTIVE STRATEGIES (SW): THESE STRATEGIES AIM TO OVERCOME THE WEAKNESSES BY TAKING ADVANTAGE OF OPPORTUNITIES

- Utilise research opportunities, through the development of MOU's, to investigate impact of successful implementation of WDM and WC interventions and to assess and analyse water consumption patterns along with strategic interventions as set out by the sub-strategies such as the Water Conservation Strategy and Research Strategy
- Monopolise on the requirements/ criteria as set out within the "No Drop" with respect to using it as a tool to motivate for funding to meet and exceed criteria.
- Realise the aim of the Integrated Planning, Strategy and Information Management Unit to ensure an integrated and aligned planning system
- Through the implementation of the advanced water loss programme and development of water balances, through the IP,S and IM unit, areas with highest losses (leaks on distribution mains and household level) will be identified and various programmes, retrofit and leak repair and leak detection and repair, will be implemented within those areas and focused attention given to households registered as indigent and council owned buildings
- Upgrade infrastructure highlighted through the asset condition assessment tender

5.3. DEFENSIVE STRATEGIES (ST) USE STRENGTHS TO AVOID THREATS

- Realise the advantage of the political buy-in and use it as a platform to enter into communities to encourage them to become water efficient through water efficiency campaigns
- Improve collection ratio through WDM installations and appropriate education to consumers to obtain consumers' willingness to pay
- Ensure that the WC/WDM programmes are aligned with the intention of extending asset life and prioritised in order to ensure efficient and optimal replacement of aged infrastructure (reaching its useful life)

5.4. ADAPTIVE STRATEGIES (WT): REDUCE THE WEAKNESSES AND AVOID THE THREATS

- Identify and extend the use of treated effluent across the City and thereby ensuring additional revenue is obtained
- Ensure that community surveys are conducted to obtain an idea of consumer water usage within households and analyse the consumption data to assess water usage patterns before and after demand management and conservation interventions
- Implement measures to ensure that the zones are prioritised in terms of level of losses and a unique WDM/WC plan can be developed in order to address the needs identified within that zone
- Implement measures to ensure and secure consumers' willingness to pay
- Ensure the existing staff are afforded opportunities to become more experienced within their positions/ or area of focus, by allowing networking opportunities and sharing of experiences through seminars, workshops or conferences.

5.5. SUMMARY

Bearing in mind some of the threats, example impact of water demand management on revenue collection and communities awareness, the opportunities attached with having a Water Conservation Strategy and meter replacement programme (which includes AMR), will allow advanced community engagement to improve water management and revenue collection which can be combined with strengths such as the use of integrated metering and billing system. Furthermore there is a need to act on opportunities to obtain additional revenue through (alternative sources) TE users.

Also, the current water management can also be strengthened through acting on opportunities such as the development of water management alternatives to increase water availability (i.e. rain water harvesting, Springs Project and TE reuse), the willingness of international donors to fund local projects and perform research, and the awareness of some communities to conserve water.

5.5.1. Outcomes

- Increase the reuse of wastewater, especially in the field of agriculture and parks/ sports fields.
- Enhance the cost recovery associated with the use made by each consumer.
- Define priorities for investment in infrastructure.
- Involve and engage users and general public in matters related to water management

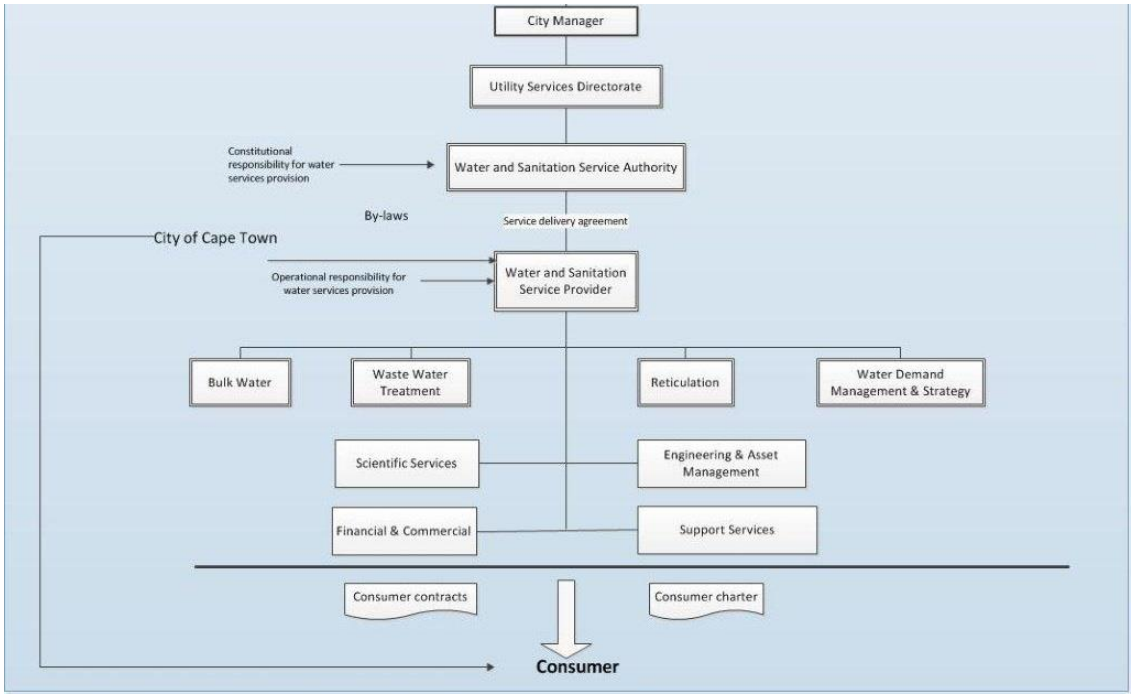
5.5.2. Challenges

- Determining Actual Savings – No formal control measure exists to quantify impact of certain initiatives.
- When people know they are using a water conservation device they tend to use the device longer. This increased use may have a detrimental effect on the expected savings (Campbell et al., 2004).
- Obtaining significant research to validate some of the assumptions made.
- No understanding of the problem by role-players
- Lack of capacity (insufficiently trained staff)
- Inadequate funding and capacity to replace and maintain infrastructure
- Lack of management commitment (prioritisation)
- Weak enabling environment and performance incentives (community liaison)
- Quality of Final Effluent from the Wastewater Treatment Plants
- Inferior plumbing infrastructure
- Behavioural and mind-sets change of water users
- Lack of willingness/ability to pay for services
- Lack of understanding of the roles and responsibility of the end user with respect to leaks and payment for services
- Regulation of the By-Law
- Operational after hours support (lack of resources)
- Public Private Partnerships to supplement existing budget

6. INSTITUTIONAL ARRANGEMENTS

The new City of Cape Town and the Water and Sanitation Services entity was formed with the amalgamation of the Cape Metropolitan Council and the 6 metropolitan local councils in December 2000.

Table 1: Water and Sanitation Institutional Arrangements

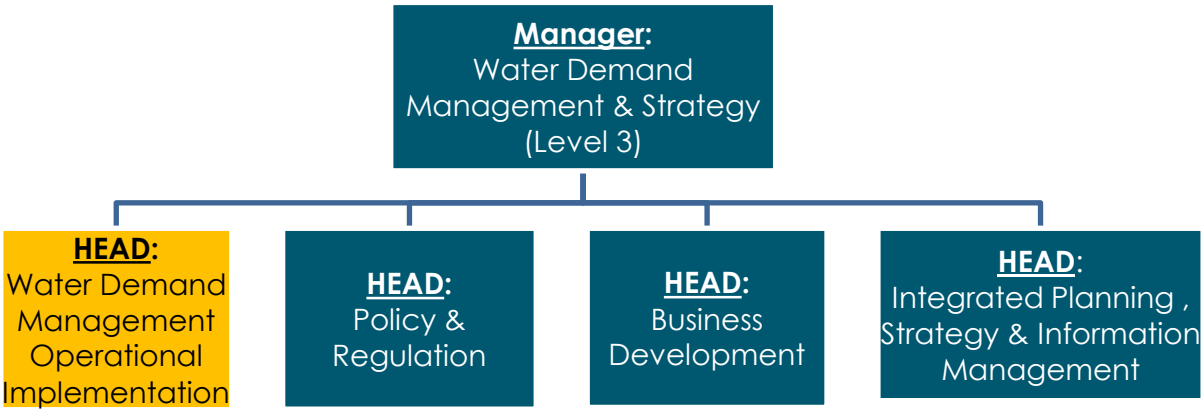


Water Demand Management and Strategy Branch is one of five service provider branches to the 3 core branches, namely Bulk Water, Wastewater and Reticulation Branches.

The primary function of the Water Demand Management and Strategy Branch is to drive service delivery and business improvement. Some of the key deliverables include the following:

- Ensure security of water supply
- Information and conservation strategies
- Strategic Planning and Business Plans aligned with City's IDP
- Integrate Master Planning of infrastructure
- Performance measurement and Benchmarking
- ISO certification
- Development and Regulation of By-Laws
- Researching and piloting innovative and new technologies

Table 2: Organisational Structure of Water Demand Management and Strategy



6.1. CORE FUNCTION: WATER DEMAND MANAGEMENT AND RESEARCH UNIT

- Consumer demand analysis
- Update of WDM strategy
- Develop programmes and project to implement the strategy
- Reduce water losses and water demand
- Create DMA and conduct water balance
- Implementing leak
- Reduce Alternative water sources (investigate/ research and implement)
- New technologies (test and implement)
- Evaluating the impacts of WDM projects
- Behavioural change (water conservation programmes)
- Implementation of Treated Effluent
- Research, test and propose improved materials for infrastructure

6.2. CORE FUNCTION: WATER CONSERVATION UNIT

- Implement and develop water conservation strategy
- Develop and implement projects and programmes
- Identify tools and resources for rolling out WC programmes
- Develop water conservation measures, policy and guidelines
- Develop and update WC website
- Community and stakeholder engagement in terms of WC practices
- Quality monitoring on education conducted by external service providers
- Evaluate and measure the impact of WC programmes and projects
- Benchmarking WC programmes with other similar programmes in the water sector

7. STRATEGY REVIEW AND UPDATE

7.1. WATER DEMAND MANAGEMENT PROCESS

Table 3: Phases undertaken during the development of the WC/WDM Strategy

Phases	Description
Collect and verify data	• Bulk meter readings within distribution system • Wastewater flows • Rainfall figures • Information from previous leakage studies • System daily flow patterns • Information gaps identified
Undertake Water System Audit	• A thorough accounting of all water into and out of a water • supply scheme • A water balance calculation • A meter testing and calibration program
Undertake Water Supply End Use Analysis	• Customer profiles including usage and revenue • Demand frequency distribution (e.g. consumption ranges verses • number of connections) • Customer usage patterns • Comparisons with results from similar schemes
Review water Costs	• Determine short-run and long-run marginal costs
Identify appropriate Demand Management Options	
Undertake Economic Analysis of Options	• Preliminary review to identify most appropriate strategies • Economic analysis of demand and supply side options • An effective tool is the integrated least-cost planning approach.
Develop Demand Management Strategies and Action Plans	-
Implement Strategies	-
Evaluate Effectiveness of Strategies	-

Table 2 represents the processes undertaken in order to develop the initial WC/WDM Strategy of 2007. This strategy is a ten year council approved strategy. Period of approval is 2006/07 to 2016/17. A decision to review the strategy has been undertaken in 2010 in order to revise budget requirements and proposes water saving estimates.

7.2. BACKGROUND: WHY UPDATE THE STRATEGY?

The CCT has committed itself to the implementation of the WC/WDM strategy and targets saving approximately 90 million m^3 /annum (target as per the WCWDM Strategy, based on certain assumptions which were then interrogated as part of the assessment 2010) by 2016/17. After 5 years of implementation the City of Cape Town has made an undertaken to assess the strategy objectives and its impact (WCWDM Strategy, 2007). CCT however chose to assess the strategy within the 3rd year of implementation in order to keep ahead of any factors which may impact the success of the implementation of the strategy. Vela VKE has done an extensive study which involved assessing the savings over the past three years (2007 -2010).

It is of vital importance that the impact of the strategy on water demand and conservation must be measured and it must be established whether its original goals are being achieved. The WC/WDM strategy is a critical component in the future planning of the Western Cape Water Supply System and CCT understands the importance of monitoring the success of the Strategy and reporting to the Department of Water Affairs.

The revised WC/WDM Strategy (2013) identified and stated 5 goals that the strategy will endeavour to achieve over the ensuing ten years (up until 2022/23). These five goals consist of both quantitative and qualitative techniques which both have a direct and indirect impact on the water demand.

As per the WCWDM 2012/13 Review, Table 4 represents the revised strategic goals:

Table 4: Amended Strategic Goals

Goal	Target	
A	**Water Losses (unaccounted for water) < 15% by 2015/16**	**Quantitative**
	• Apparent Losses (Unbilled Unauthorised Consumption)	
	• Real Losses	
D	**NRW < 20%**	**Quantitative**
	• Unbilled Authorised Consumption	
	• Apparent Losses (Unbilled Unauthorised Consumption)	
	• Real Losses	
E	**Demand Growth < 2 %**	**Quantitative**
B	**On-going effective management systems and implementation of IWRP**	**Qualitative**
C	**Mobilise resources according to the Water Conservation and Water Demand Management Strategy.**	**Qualitative**

Five goals have been identified, Goals A and D each having sub-goals and represent the overall policy.

Goals, A, D and E relate to the implementation objectives that will result in the direct reduction of water demand.

The enabling action plan consists of two goals. Goal B relates mainly to ensuring adequate information and Goal C relates mainly to ensuring adequate resources and capacity to implement WC/WDM initiatives.

The purpose of the review is to:

Verify estimated impact of WCWDM, as indicated within the previous strategic review (WCWDM 2012/13 Review) against actual impact of WC/WDM.

- The base figures used needed to be validated against various research papers in order to develop an increased confidence in the assumption made.
- To evaluate the effectiveness of the strategy
- To review and set new goals relating to potential savings based on projects to be implemented

7.3. SITUATION ASSESSMENT

- **Base Data**

Various assumptions/estimates made needed to be reconfirmed with international norms and best practices. Some of the assumptions could not be validated and in the new updated strategy, these assumptions were brought forward until references could be obtained.

The base dated was updated using the latest audited statistics available – 2013/14.

- **Water losses and Non-Revenue Water**

Using water and billing figures, the Water Losses (or unaccounted-for water (UAW)) and Non-Revenue Water (NRW) for the overall supply system from Bulk Water Treated to end consumer billing is 13.5% and 20.7% respectively (2012/13) for the 2013/14 financial year the Water Loss and NRW % were 14.7% and 21.8% respectively. Reasons for the increase are explained further in the presentation.

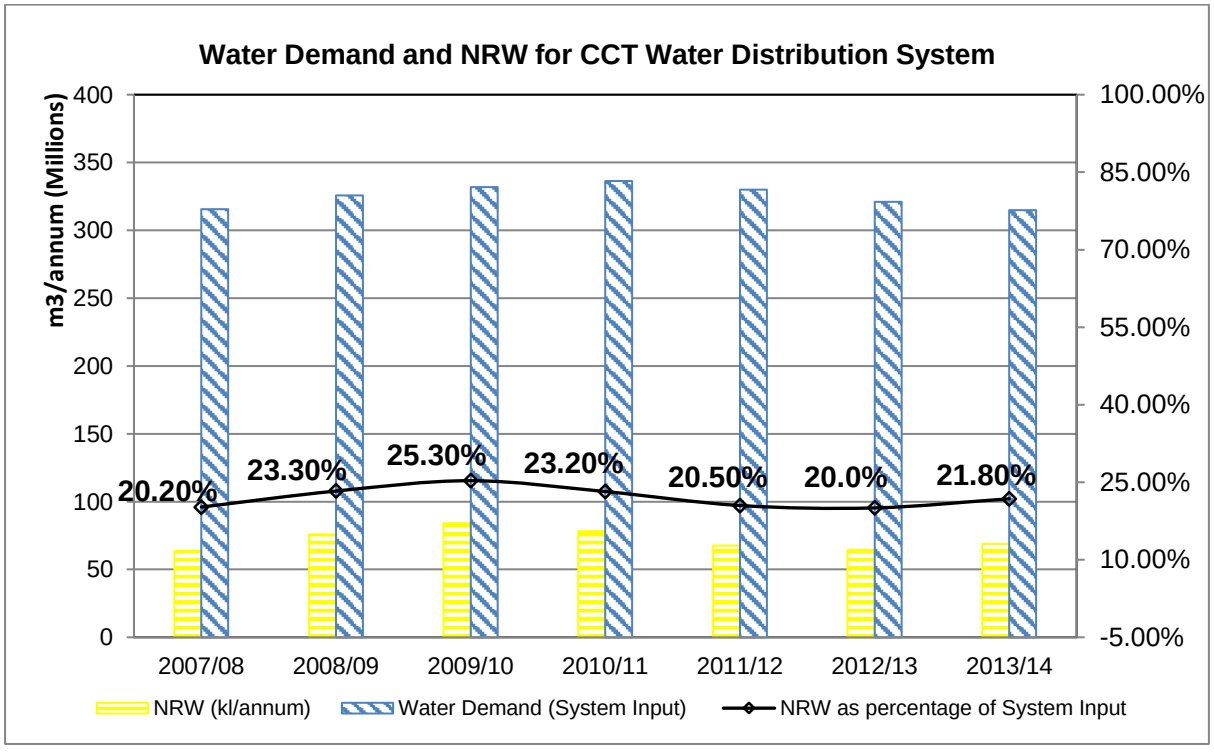


Figure 1: Water Supply and Non-Revenue Water for the City of Cape Town

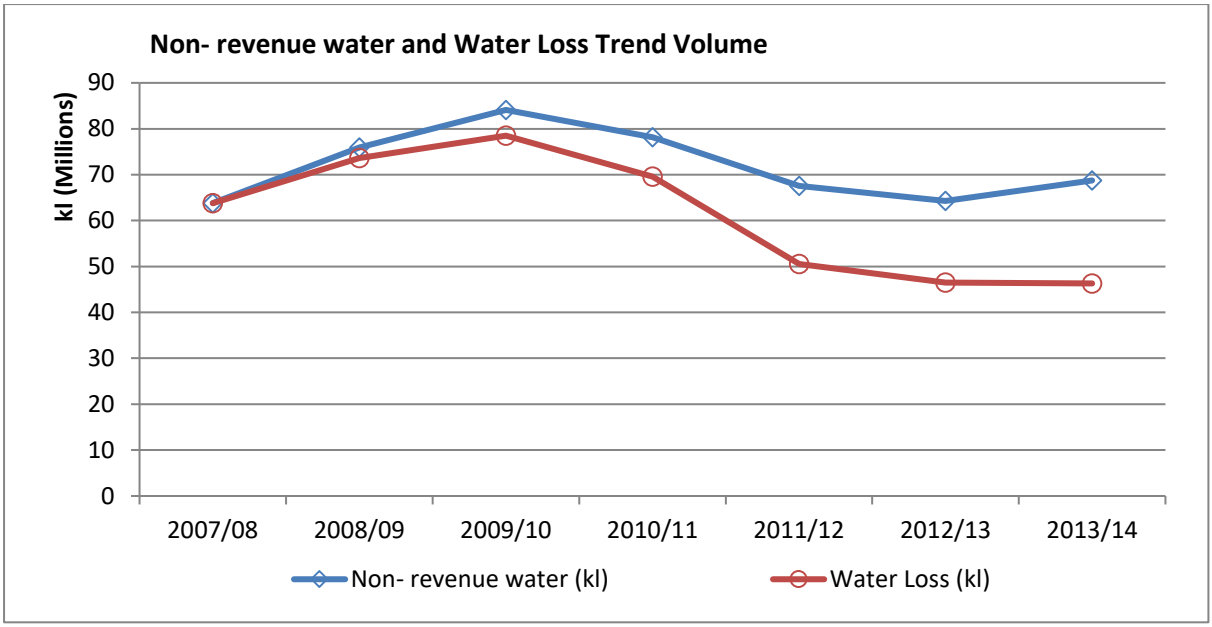


Figure 2: Non-Revenue Water Volume Trend

Table 5: City of Cape Town Non-Revenue Water Status for 2013/14 Financial Year (IWA Format)

	(B) Authorised 268 467 785 85.3%	(D) Billed 246 017 052	(H) metered 246 017 052	External Customers	32 573 237	(Q) Revenue Water 246 017 052 78.2%
				Internal Customers	213 443 815	
			(I) Unmetered		0	
(A) System Input 314 773 795 100%		(E) Unbilled 22 450 733	(J) Metered 13 630 733	Informal Settlements	11 283 893	(R) NRW 68 756 744 21.8%
				Formal Metered Unbilled	2 346 840	
			(K) Unmetered 8 820 000	Formal Unmetered	8 820 000	
	(C) Losses (UAW) 46 306 011 14.7%	(F) Apparent Losses 21 734 923	(L) Unauthorised	2 685 121		
			(M) Meter Inaccuracies	19 049 802		
		(G) Real Losses 24 571 088	(N) Mains	13 743 334		
			(O) Storage	665 100		
			(P) Connections	10 162 654		

Volume measured in kℓ

Note: The calculation of the IWA water balance was performed using the best available information at present and in some cases estimation based on input from officials within Water and Sanitation Department. Therefore the accuracy of the IWA water balance can still be improved.

Table 6: Historic Non-Revenue Water Trend

	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Total System Input (kl)	315 555 297	325 691 626	331 895 445	336 271 703	330 040 938	320 921 722	314 773 795
Non- revenue water (kl)	63 809 479	75 901 218	84 107 521	78 159 401	67 541 133	64 297 222	68 756 743
Non – revenue water (%)	20.20%	23.30%	25.30%	23.20%	20.50%	20.0%	21.8%
Non – Revenue water (R)	R 151 228 465	R 196 584 155	R 217 838 479	R 222 754 293	R 203 974 222	R207 037 055	R 235 148 063
Number of metered connections	Not available	Not available	Not available	617 323	623 191	627 589	634 071
Water Loss (kl)	63 809 479	73 595 268	78 496 376	69 549 908	50 543 518	46 474 019	46 306 011
Water loss (%)	20.20%	22.60%	23.70%	20.70%	15.30%	14.5%	14.7%
Water loss (R)	R 151 228 465	R 190 611 744	R 203 305 614	R 198 217 238	R 152 641 424	R 149 646 345	R 158 366 557

Note: Expressing NRW as a percentage of the system input is not encouraged as it can be misleading as percentage figures are strongly influenced by the consumption.

One of the objectives of the strategy was to have a system in place which assesses the overall water balance. This has been successfully fulfilled.

From Figure 1, previous trends, before 2010/11, showed steady increase in the overall NRW. Possible reasons for improved NRW value:

The City of Cape Town has been undertaking the following key interventions:

Bulk Water System:

- Bulk Water Meter Audits/ Meter Replacement/ Meter verification

Reticulation System:

- Extensive implementation of Pressure Management
- Treated Effluent Reuse (increased users)
- Dysfunctional consumer meters replaced
- Water meters re-fixed/ relocated
- Training of Caretakers of schools (fix leaks)
- Integrated leaks repair programs
- WDM devices (improved revenue collection)

- Increased repair of leaks on water connections

Additionally, downward trend in burst water mains (Refer to Figure 2) as a result of:

- Increased water mains relays/replacement
- Pressure management (as mentioned above)
- Improved management of network operations

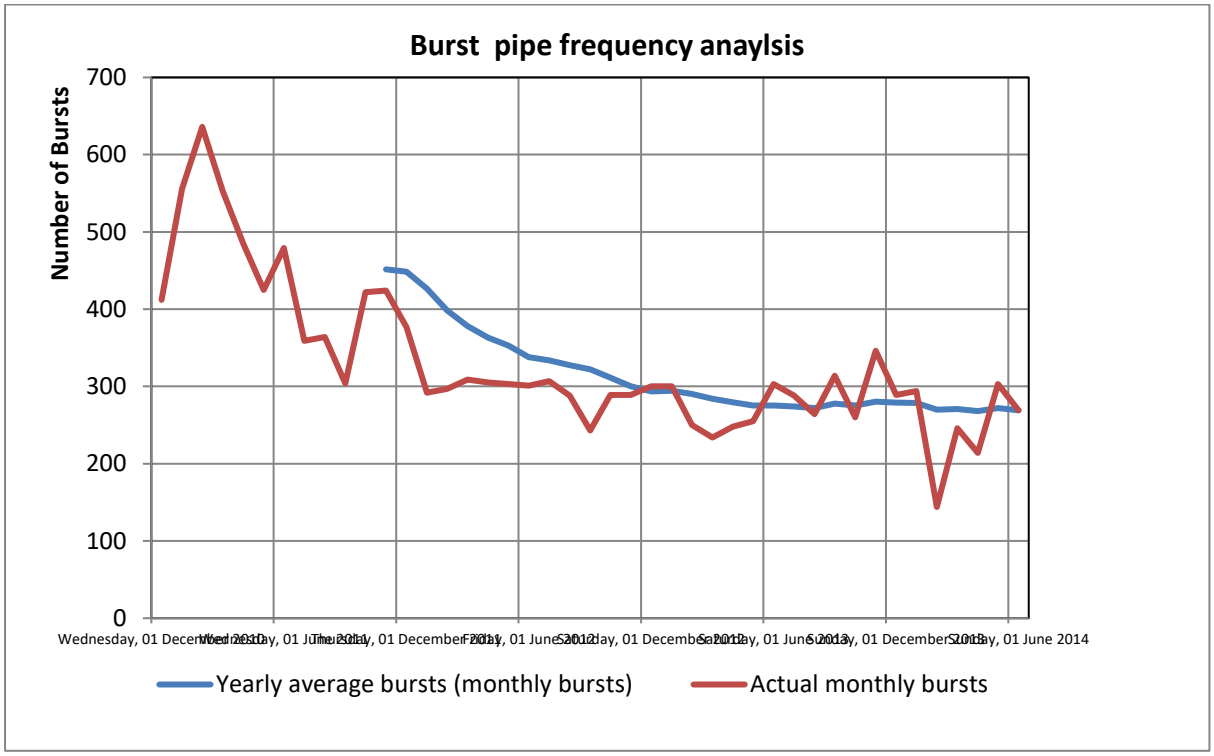


Figure 3: Burst Frequency Analysis (month on month)

8. OVERVIEW OF INTERVENTION IMPLEMENTED TO DATE (SINCE 2010/11)

8.1. QUANTITATIVE INTERVENTIONS

	Prior 2010/11	2010/11	2011/12	2012/13	2013/14	**Cumulative**
Pressure Management (million m³/annum)		**0.18**	**2.91**	**0.64**	**2.23**	
Crossroads		0.18				**0.18**
Plumstead/ Retreat			0.96			**0.96**
Marina Da Gama			0.33			**0.33**
Grassy Park			1.07			**1.07**
Bishop Lavis			0.55			**0.55**
Thornton				0.53		**0.53**
Kalkfontein				0.11		**0.11**
Melkbos					0.88	**0.88**
Brakloof					0.31	**0.31**
Dennehoek					0.15	**0.15**
Mountainside					0.65	**0.65**
Lynns View					0.18	**0.18**
Pelikan Park					0.07	**0.07**
Treated Effluent						
No Users		99.0	21.0	13	22	**155**
Potable Water Offset (conservative estimate) (million m3/annum)		7.08	5.2	5.68	5.52	**23.48**
Retrofit and leak repair						
Retrofit and leak repair	No. Households					
Samora Machel	1700	0.20				**0.20**
Fisantekraal	1233		0.15			**0.15**
Ravensmead	1423		0.15			**0.15**
Education and Awareness						
Pipe Replacement						
Pipe Replacement (best estimate) million m3/ annum		0.11	0.90	1.16	0.03	**2.18**
Leak Detection and Repair						
Highbury					0.031	**0.031**
Highbury Park					0.008	**0.008**
Wesbank					0.037	**0.037**
Other						
No. Meters Replaced/ re-fixed/relocated		20 574	8 272	5 450	5 656	
No. Water Management Devices Installed		-	17 556	7 468	17 989	
No. Repairs on connections		22 579	27 203	28 933	36 968	

It must be noted that the actual savings are only shown for those WC/WDM initiatives of which could be measured, and that the additional immeasurable savings may also have been achieved.

8.2. QUALITATIVE

Period: 2010/11- 2012/13

- ± 100 Caretakers of schools were trained
- 60 **Schools** were visited and **leaks repaired**
- **Awareness and Education with** approximately **2 688** workshops

a) Intervention Name: City Wide Analysis Statistics

Impact: EPWP and Education and Awareness

Number of EPWP field workers deployed		1 019
Total number of survey questionnaires completed for City		86 802
Average number of completed surveys per four divided sections		21 700
Quantity of material distributed during survey	Schedule 1 (Of Water Bylaw)	12 552
	By-law Poster	8 874
	Saving Tips	15 069
	Leaks Card	13 748

b) Intervention Name: Umrhabulo Triangle

Education and Awareness leak detection projects		
Total number of households		18 266
	Total Ervin	
	Ward 95	7 263
	Ward 96	5 049
	Ward 97	5 954

c) Intervention Name: Borehole Registration

Total Located 315

d) Intervention Name: The School Extensions

- Education and awareness relating to Water consumption
- Umrhabulo Triangle Project schools visited and surrounding schools

- Develop and distribute additional literature to schools,
- creative use of art, theatre and music to install water conservation benefits of water saving for the future"

No. Schools visited: **18** No. learners impacted: **5 292**

e) Intervention Name: PRV installation at the schools

No. installed: **451** No. Library visits: **67**

f) Intervention Name: Car Wash Initiative

No. Car washes : **92**

g) Intervention Name: "Student Resident Awareness Workshop"

Institution: CPUT Duration: 3 hrs. No. Students: 200

h) Intervention Name: NAC Water Saving Campaign. The "Saving Water Makes Cents" campaign

No. Churches: 103

Quantity of material distributed during survey: 12 645

No. Water pledges signed: 8000

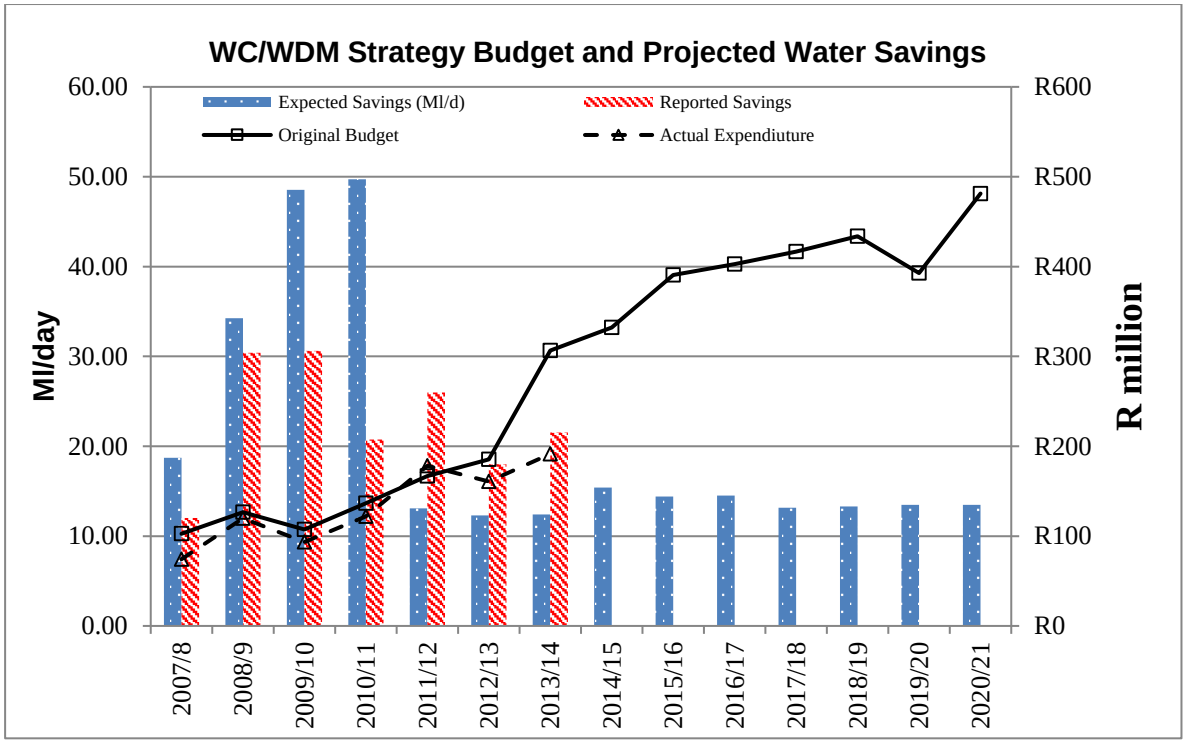


Figure 4: Progress from revision of WCWDM strategy (2007/08-2016/17)

Figure 4 represents the projected re-instated budget figures and water savings to date. It shows the anticipated year on year savings contained in the WCWDM Strategy, as well as the year-on-year actual saving achieved.

Should WDM receive a reduced budget it will result in a reduction in the potential future savings that could have been achieved. The latter being due to the lack of finance required to introduce more stringent projects.

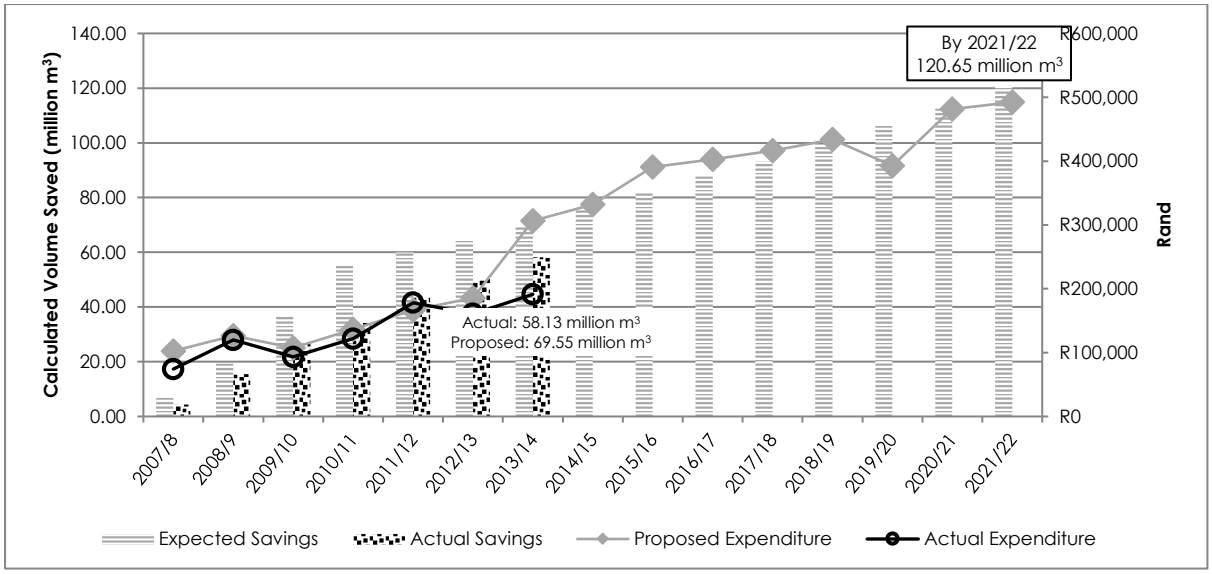


Figure 5: Cumulative Calculated Volume Saved vs. Proposed Volume

The cumulative savings achieved since strategy implementation (2007) until 2013/14 is calculated to be in the region of 58.13 million m³ per annum. This value only includes calculated savings of implemented, quantitative, interventions where possible and does not include the savings achieved through various behaviour change programmes and retrofitting as there were no proper control measures set out in place in order to assess the impact of those initiatives. The savings calculated were calculated taking a very conservative approach.

ANALYSIS ON WATER WASTAGE AND DEMAND

9. ANALYSIS ON WDM/WC

This section analyses the current water demand and determines the opportunity for water reductions due to WC/WDM. The potential economic benefits of WC/WDM are also calculated. Most of the calculations are based on assumptions and these will need to be verified with more accurate data obtained from an appropriate Management Information System and field research.

9.1. CURRENT DEMAND

The total water demand for the metropolitan area amounts to approximately 879.2 Ml/day (2012/13) and 862 Ml/day for 2013/14.

9.2. WATER USE ANALYSIS

The following demand analysis is based on the **2013/14 consumption figures**. Figure 6 below depicts the water demands for the various sectors. Residential demand accounts for 48.7% of the overall demand. The overall water demand has decreased from 879.2Ml/day (2012/13) to 862.3Ml/day (2013/14).

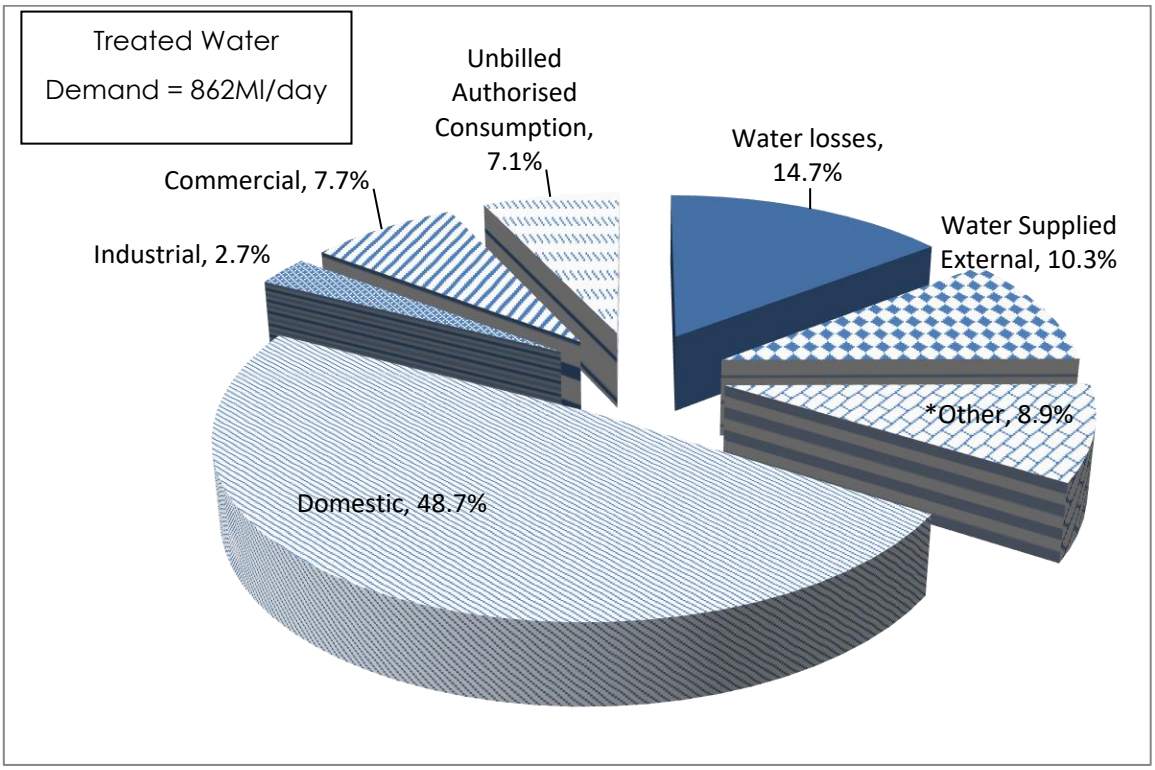


Figure 6: Sectoral Water Demand for 2013/14 financial year

*Other: Departmental Water+ Municipal Standpipes+ Government Water+Miscellaneous Water+ Water for Schools+Municipal Water+Standpipes

Figure 6 provides an overview of the sectoral water usage. Residential consumption contributing the highest.

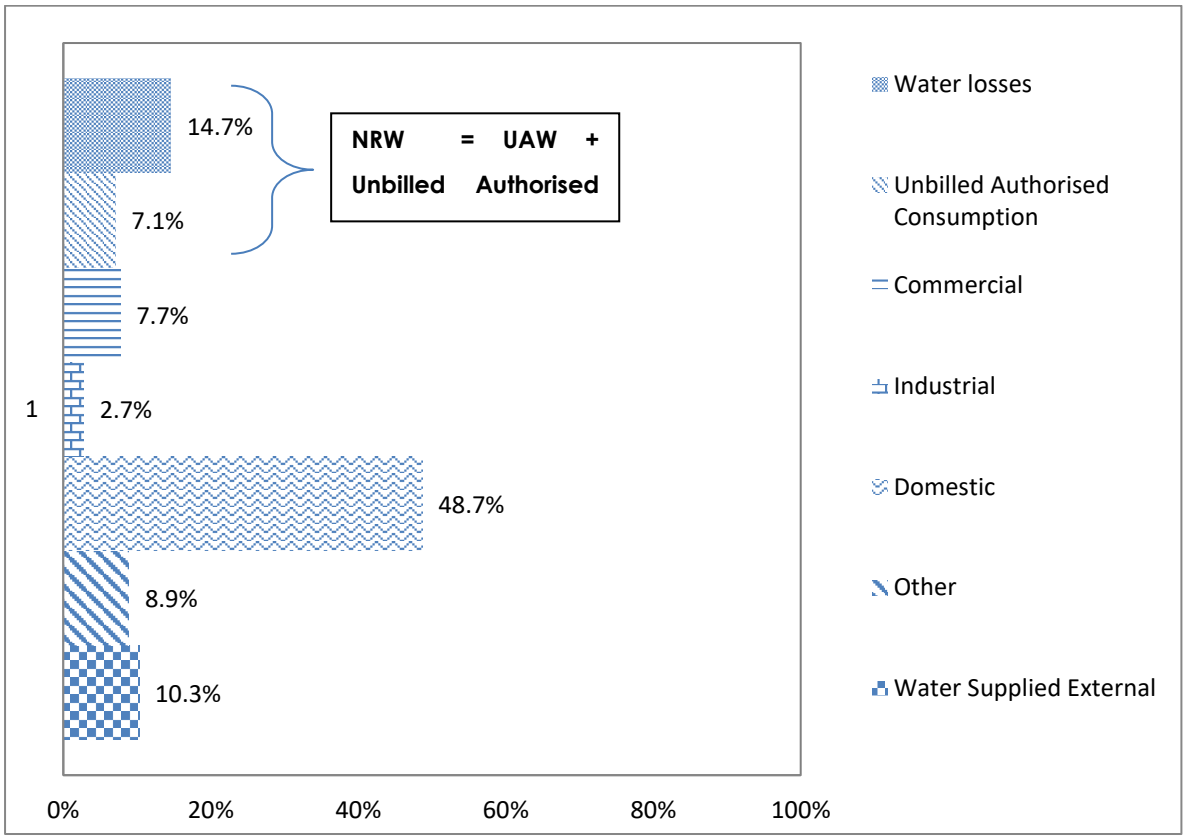


Figure 7: Bar representation of Sectoral Water Usage for 2013/14

From Figure 7 one can get a better understanding of the composition of NRW as opposed to UAW. Other is defined as the sum of the water supplied externally and miscellaneous water. The latter being the water supplied/used that could not be characterised according to the other sector categories (Water and Sanitation, Billing). Further detailed visual breakdown of non-revenue water will be found in corresponding Figures 8, 9 and 10.

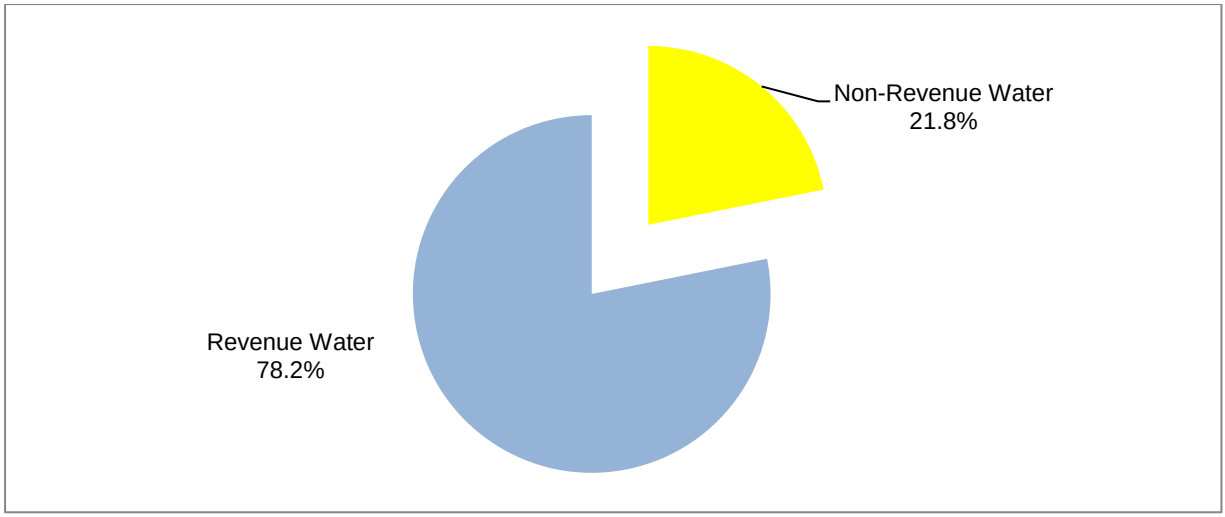


Figure 8: Revenue Water vs. Non-Revenue Water 13/14

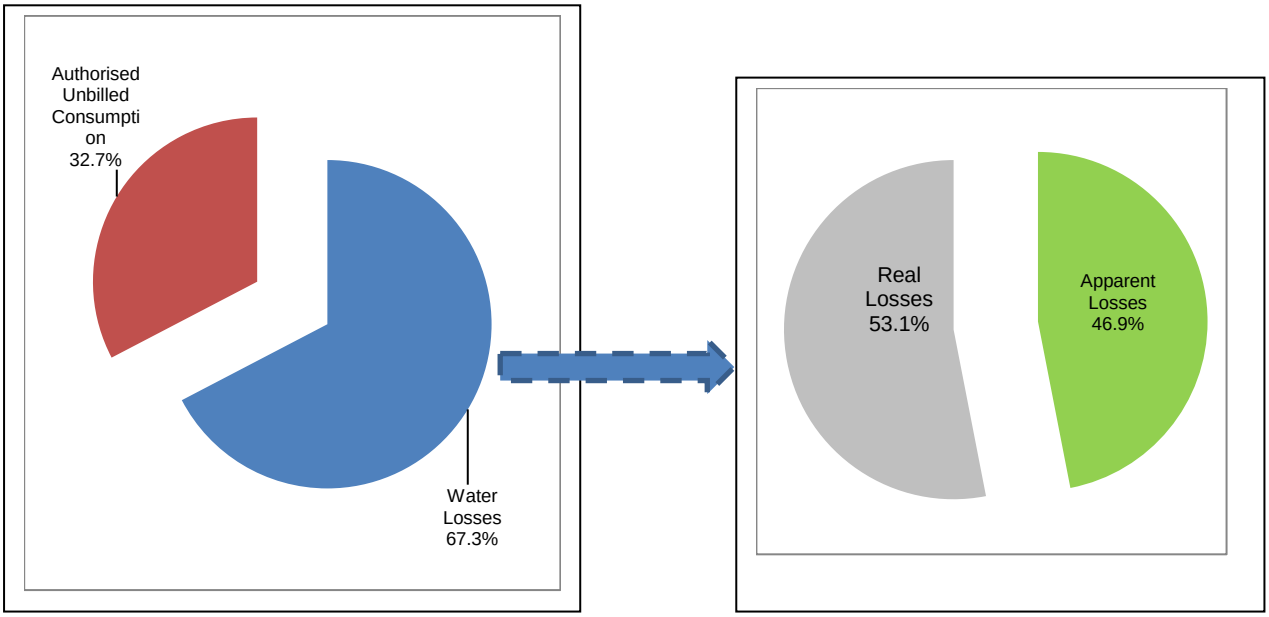


Figure 9: Non-Revenue Water Primary breakdown 13/14 (based on best estimate)

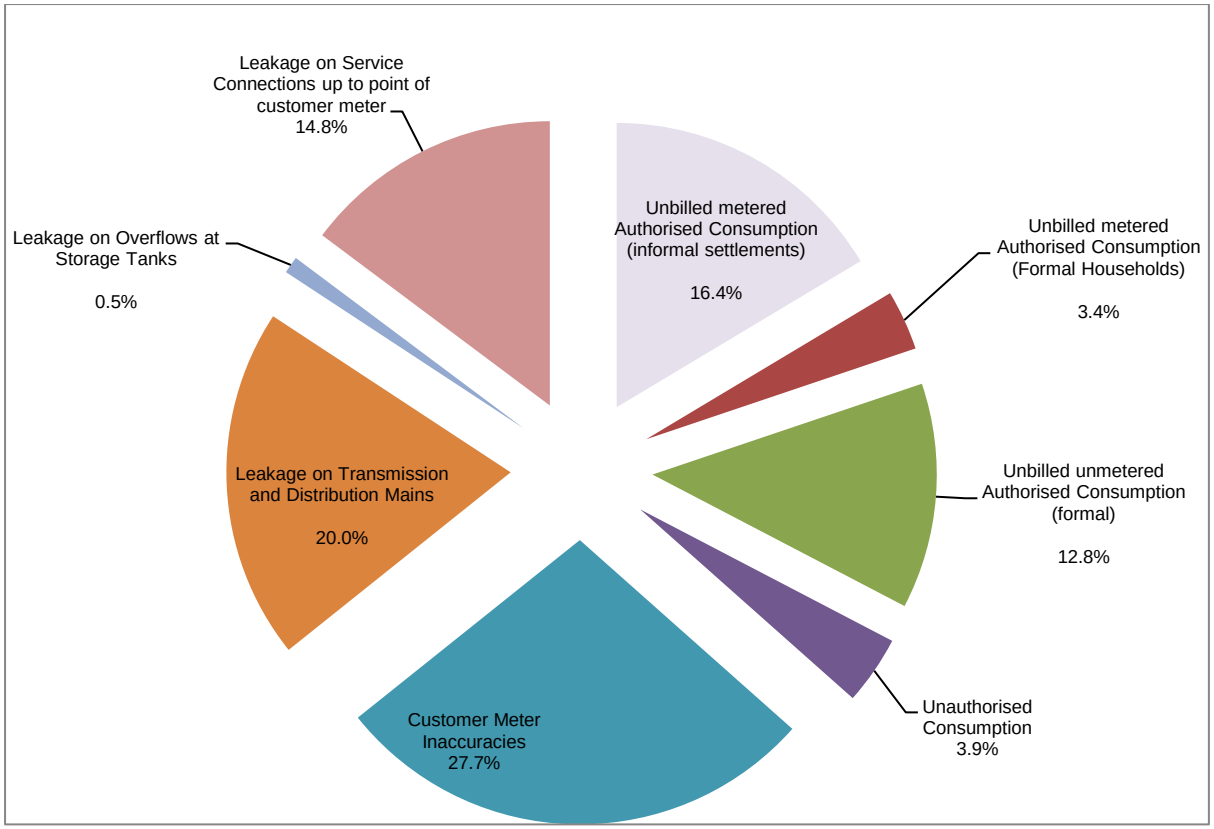


Figure 10: Non-Revenue Water Secondary breakdown 13/14 (based on best estimate)

From Figures 10 it can be seen that the highest losses are attributed to meter inaccuracies (keep in mind that some of the figures are based on best estimates). Age of meters play determines the accuracy of the readings obtained from the meters. Some meters can under reading, ranging from 2% up to 10%. The third highest contributor to the non-revenue water value is unbilled metered consumption (informal settlements) at around 16%.

9.3. WATER WASTAGE

The total unaccounted for water (water losses) is estimated at **14.7% or 126.9 Ml/day** (as at 2013/14). This includes bulk losses, reticulation losses and apparent losses (excludes unbilled authorised consumption). This figure has decreased from the previous value of 127.32 Ml/day (2012/13).

Statistics on Water Losses (or UaW) do not necessarily reflect the major impact of water wasted and is mainly determined by consumer behaviour. A good indicator is minimum night flow (MNF). MNF is made up of reticulation losses and consumer wastage.

In a residential area where there is no industrial water usage it can be assumed that most of the Minimum Night Flow recorded from data logging is water wastage made up of the following:

- Leaks in the reticulation systems
- Leaks within the consumers' properties (i.e. plumbing leaks)
- Indiscriminate wastage of water (i.e. people leaving taps open)
- Automatic flushing urinals (i.e. urinals in schools and public buildings)

The City of Cape Town is in the process of creating smaller district metered areas in order to enable a more effective assessment of the MNF. There are over 240 pressure zones which criss-cross residential areas, thereby making it difficult to accurately quantify the overall MNF for the entire City. These 240 plus pressure zones are being analysed to create smaller zones.

9.4. INEFFICIENT USE OF WATER

In addition to water wastage, it is estimated that a significant proportion of water is used inefficiently. Inefficient water use is the amount of water that can be saved by implementing water efficient technology and practices and by altering the consumption behaviour towards industry benchmarks and best available practices. The opportunity of reducing inefficient water usage is related to the fact that most of the water is used for the service that is derived from it and not for the water itself. For example, when a toilet is used the objective is to clean the pan and contribute to the transport of sewage to the wastewater plants. If through new technologies, the water required to flush a toilet is reduced to 3 litres (i.e.6/3 l dual flush toilet) the objective is not altered but water consumption is reduced significantly.

The following sections outline the estimated water use inefficiencies per sector:

- Residential

The per capita consumption per day for domestic water use in CCT is calculated for the entire City of Cape Town and is illustrated in Table 6 below and calculated using the Equation 1:

$$Consumption\ (\ell\ per\ capita\ per\ day) = \frac{(BAC - Industrial\ Consumption) + AUC}{Total\ Population}$$ …… Equation 1

Where:

- BAC = Billed Authorised Consumption
- AUC = Authorised Unbilled Consumption

Table 7: Historic Citywide Average Per Capita Consumption for Domestic Water Users

Sub sector	%	2009 June	2010 June	2011 June	2012 June	2013 June	2014 June
Indoor use	75%	161	163	162	155	149	135
Outdoor use	18%	39	39	39	37	36	32
Leaks	7%	15	15	15	14	14	13
Total	**100 %**	**215**	**218**	**217**	**207**	**198**	**180**

The above household per capita consumption is based on best available data. As per trend in average household consumption, per capita, it is noticed that there is a definite decrease (although not excessive) in the consumption per capita.

9.5. END-USE WATER CONSUMPTION

The average domestic water consumption is estimated at 206 l/day/person. Factors which impact the figure are the household count within informal settlements. Recent survey revealed that the number of informal households were 143 823.

Improved household water use efficiency impacts on the overall water treated volume as it is directly related to how people use their water. The efficiency of household water use can be improved significantly through the following key measures:

- Retro-fitting of plumbing fittings
- Consumer behaviour change
- Pressure management
- Usage of water efficient appliances

It is estimated that up to 35 % of the existing household demand in CCT can be reduced through various WC/WDM measures (Jacobs and Haarhoff, 2007).

Figure 11 represents the historic trend and breakdown of household usage. The breakdown was based on typical household appliances and usage estimates.

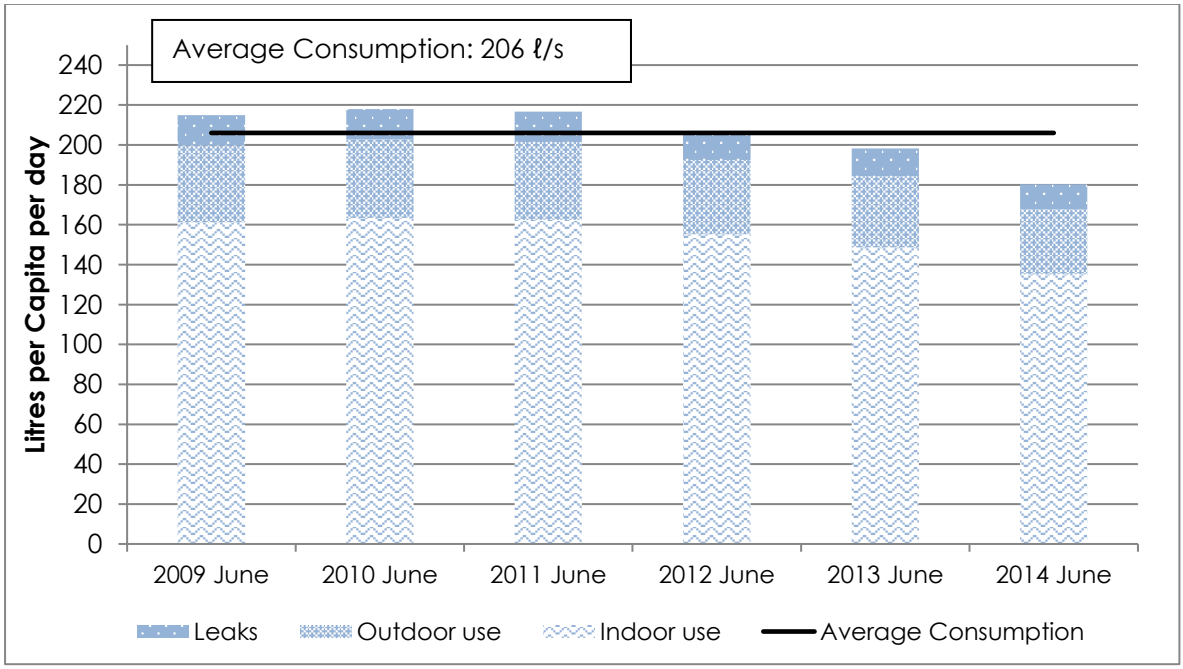


Figure 11: Per capita consumption - end use analysis

In general, inefficient use of water for gardening could be as high as 40% (Jacobs et al., 2007). A conservative figure of 20% is used however because water usage for gardening continuously varies according to rainfall and weather conditions. The efficiency of water used for gardening / outside water use can be improved significantly by (schedule 1 of Water Bylaw of CCT):

- Irrigation scheduling (no watering between 10H00 and 16H00)
- Mulching
- Planting local indigenous plants
- Use of grey water
- Replacing grassed areas with alternative ground covers
- Pool covers

There is little inefficient water usage by low-income households were the level of service often consists of a communal standpipe or a yard tap or no services at all.

To impose water restrictions or WDM initiatives within the informal area would not be wise as they are already restricted to a very small quantity of water. Further reasoning is as follows

- 25 HH per stand pipe (CCT internal targeted level of service),
- standpipe is a distance away. So most of the time they will collect only the bear necessity in order sustain them for the course of the night and day.

To impose water restrictions would be to cause great discord as can be seen they barely have enough to meet the minimum conditions for health and hygiene. This is just an example of a possible estimate of the quantity of water used for basic living activities. The water requirement for the informal hh could still very well be well below the 32l/c/d.

A critical step in towards determining how water can be better managed, in terms of water demand and supply and wastewater management) is to understand how water is used (Retamel, et al., 2010)

Knowledge of the water savings achieved per end-use could be used as an indication of which end-uses might have a relatively larger impact on water demand than others. According to Jacobs et al (2007, pp. 511), end-uses identified as being significant in their contribution to water demand often contribute most to the saving of water. These include the garden, toilet, bath, shower, washing machine and leaks.

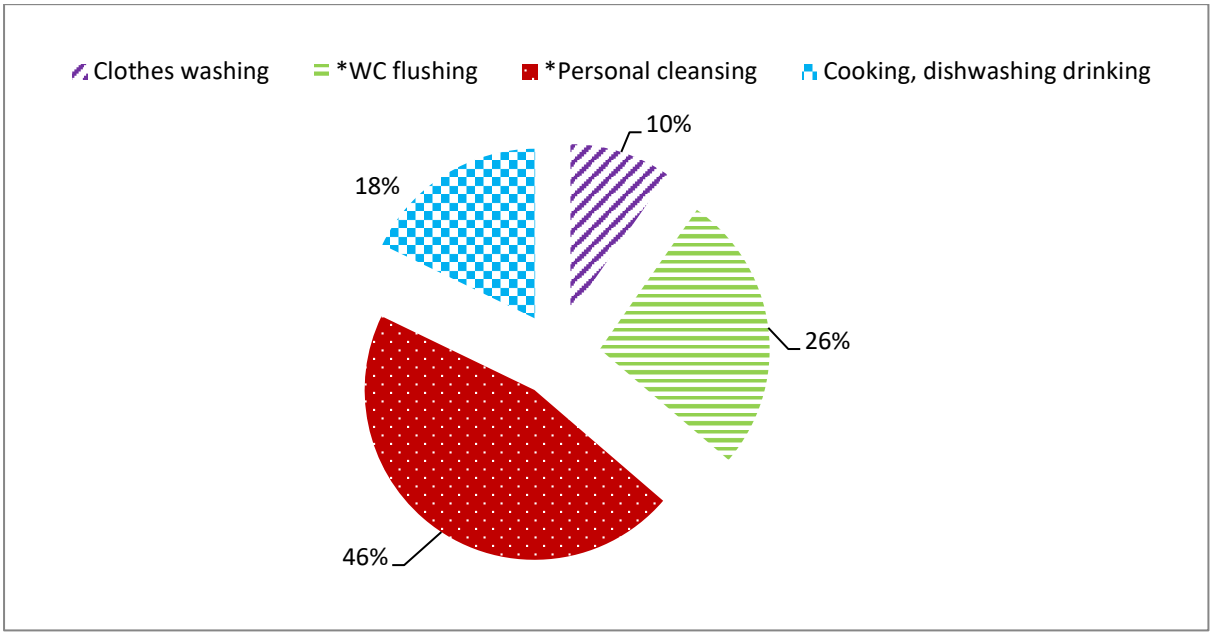


Figure 12: Estimated Average End use consumption

Figure 12 reflects the estimated average of end uses of consumers within the City of Cape Town. Currently the research unit, of the water demand management and strategy branch is in the process of conducting household surveys, across different income groups, in order to establish how they use their water within their household. Study is expected to be complete by 2015.

10. WATER DEMAND MANAGEMENT TARGETS

10.1. SUMMARY OF TARGETS SET FOR DEMAND MANAGEMENT

	Description	2010/11 (Baseline)	2012/13	2013/14	Target 2016/17
GOAL A	**Water Losses**	**19.8%**	**14.5%**	**14.7%**	**>15%**
	Apparent Losses (Unbilled Unauthorised Consumption)	*7%*	6.9%	6.9%	*4%*
	• Unauthorised Consumption	1.0%	0.9%	0.9%	1%
	• Customer Meter Inaccuracies	6.0%	4.8%	6.1%	3%-4%
	Real Losses	*12.8%*	*7.6%*	*7.8%*	*8%*
	• Leakage on Transmission and Distribution Mains	12.71%	4.31	4.4%	*6%
	• Leakage on Overflows at Storage Tanks	0.05%	0.15	0.2%	-
	• Leakage on Service Connections up to point of customer meter	Negligible	3.14	3.2%	*2%
GOAL D	**NRW**	**23.4%**	**20%**	******21.8%**	****19%**
	• Unbilled Authorised Consumption	3.6%	5.5%	7.1%	4%
	• Apparent Losses (Unbilled Unauthorised Consumption)	*7%*	6.9%	6.9%	3- 4%
	• Real Losses	12.8%	7.6%	7.8%	8%

*Revised targets **NRW Target aligned to Strategic Objectives - Table 1 ***Targets developed with 2010/11 baseline **** Increase in NRW attributed to increase in UAC

Table 8: Interventions to be implemented in order to manage water losses

Unbilled Authorised Consumption	
• *Unbilled Metered*	
o Formal HH o Informal Settlements	- Meter Audits of household - SAP clean up - Treasury fix up. (e.g. Register new households to correct owner, title deeds to correct owners, Khayelitsha/ Umrhabulo triangle situation)
• *Unbilled unmetered*	
o Formal HH	- New meter installation (WMD installation with retrofit and leak repair projects) - New meter Installation by Reticulation. (new housing projects, develop and sign SLA) - Monitoring and pro-active maintenance - Meter Audits of household - SAP clean up - Education and Awareness. (water conservation strategy, encourage people to report missing meter, buried or damaged meters)
Apparent Losses	
• *Unauthorised Consumption (Illegal Connections)*	- Water Audits
• *Customer Meter Inaccuracies/ data errors*	- Meter replacement program - Meter Audits and data clean-up - Meter age analysis - AMR
Real Losses	
• *Leakage on transmission and distribution mains*	- Pressure Management - Leak Detection - Pipe Replacement - Repair/response time
• *Leakage on overflows at storage tanks*	- Water Audits - Pro-active maintenance of infrastructure (tanks)
• *Leakage on service connections up to point of customer meter*	- Leak Detection - Repair and maintenance of connection

Table 8 represents the interventions which are implemented to assist in obtaining our desired targets for both Non-revenue water and Water Losses.

To calculate the percentage non-revenue water (NRW), NRW (numerator) is divided by total water treated or System Input Volume (denominator). The smaller the System Input Volume (SIV) the "higher" the percentage of NRW. Generally the smaller SIV is attributed to behaviour change (due to water conservation interventions) or significantly wetter weather patterns.

10.2. INFRASTRUCTURE LEAKAGE INDEX

The Infrastructural Leakage Index (ILI) is the ratio of actual real losses to the expected unavoidable technical losses of a well maintained system.

$$ILI = CARL/UARL \quad \text{…Equation 2}$$

Where:

CARL = Current Annual Real Losses

UARL = Unavoidable Annual Real Losses

$$UARL = (18 \times Lm + 0.80 \times Nc + 25 \times Lp) \times P \quad \text{…Equation 3}$$

Where:

Lm = Length of mains (km)

Nc = No. of Connections

Lp = Length of unmetered unground pipe from street edge to customer meters (km)

P = Average Operating Pressure at Average Zone Point (m)

Well-managed systems in very good condition can achieve ILI values close to 1.0. However, achieving this ideal is uneconomic in many countries and a higher ratio may then be deemed acceptable. Internationally, ILI ratios typically range between 2 and 10.

The infrastructure leakage index (ILI) provides municipalities with a snap shot of the operational efficiency and soundness of the water distribution network.

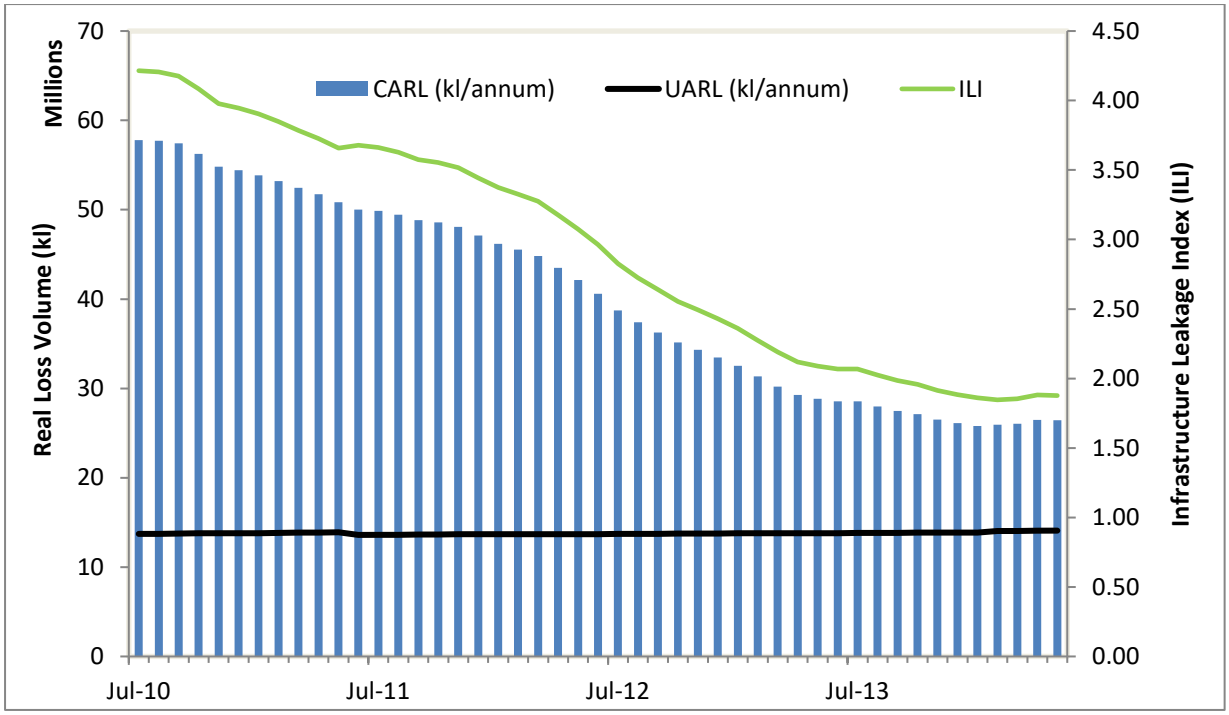


Figure 13: Historic Trend of CCT ILI

Figure 13 displays the historic trend of the month to month ILI value for the CCT, including the level of losses within the system. There is a definite decline in the level of losses within the system. The losses calculated above include both Reticulation and Bulk water Losses. The Unavoidable Annual Real Losses (UARL) is approximately 13 million m^3 per annum. The CCT's ILI is approximately 1.88.

Worldwide international indexes have been compared (Farley & Trow, 2003). The supply system which holds similar characteristics to the CCT, ranked 8 out of 27 countries, referenced as sample 9 holds the following characteristics:

Table 9: CCT ILI compared to similar system internationally

Description	Average Pressure (m)	Density of connections (conn/km)	Average length of pipe from street	International ILI	Real losses (l/conn/d)	Consumption (l/conn/day)	Real losses % of system input.
REF 9	60	50	0	1.66	114	1 199	9.5
City of Cape Town	55	58	0	1.88	124	1 398	8

*Analyses includes both bulk and Reticulation system losses

Accordingly, targets can only be set with systems of similar conditions (Farley & Trow, 2003). Table 9 refers to the basis on which CCT has initially started setting its target. CCT has exceeded the target hence the revised target as set in section 10.1.

10.3. REVENUE COLLECTION

The strategic objective is to improve Financial Stability through ensuring that income received covers expenditure. The revenue collection target is 89% by 2016/17.

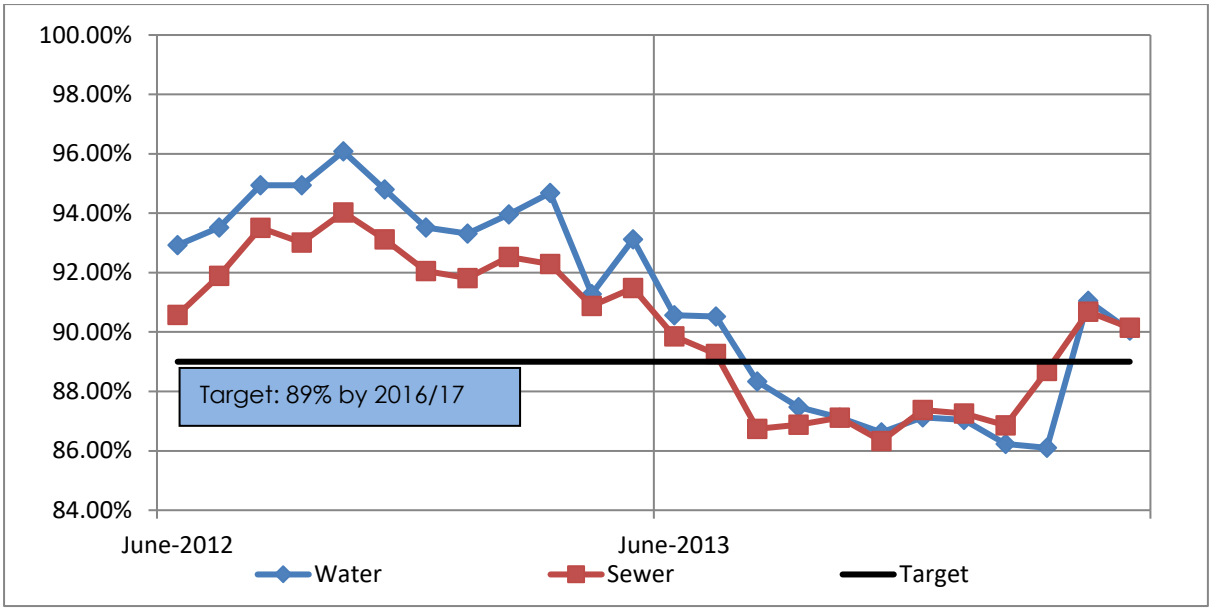


Figure 14: Collection Ratio for 11 months for both water and sanitation (12/13 financial year)

Figure 14 reflects the collection ratio aver the past 24 months. The average collection ratio is approximately 93% for 2012/13 and 2013/14 it is 88.14%. The collection ratio is boarding around the 89% target.

Table 10: Interventions required to improve revenue collection and overall revenue return

Billed Authorised Consumption	- Meter Audits of household - SAP clean up - Treasury fix up - Education programmes on the need to pay for water
Unbilled Authorised Consumption	
• *Unbilled Metered*	
o Formal HH o Informal Settlements	- Meter Audits of household - SAP clean up - Treasury fix up. (e.g. Register new households to correct owner, title deeds to correct owners, Khayelitsha/ Umrhabulo triangle situation)
• *Unbilled unmetered*	
o Formal HH	- New meter installation (WMD installation with retrofit and leak repair projects) - New meter Installation by Reticulation. (new housing projects, develop and sign SLA) - Monitoring and pro-active maintenance - Meter Audits of household - SAP clean up

	- Education and Awareness. (water conservation strategy, encourage people to report missing meter, buried or damaged meters)

Table 11: Alternate Revenue Sources

Source	Target
Treated Effluent Re-use	To increase treated effluent reuse to 5% of potable water used by 2016/17

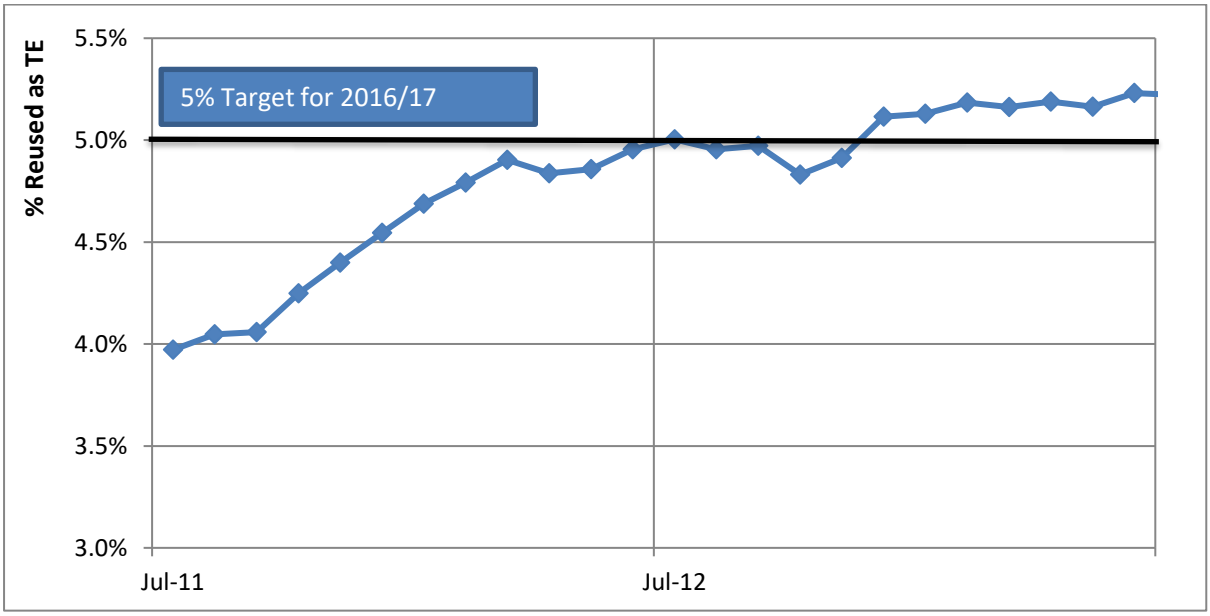


Figure 15: Percentage Potable Water Used as Treated Effluent

There are more than 99 treated effluent users within the City of Cape Town. Recently a tariff for treated effluent re-use has been finalised. The challenge with offsetting potable with treated effluent is that it is based on seasonal fluctuation.

11. DEMAND PROJECTIONS

11.1. HIGH AND LOW WATER REQUIREMENTS

The CCT has determined two future water requirement curves, namely a HWR Curve with a growth of 3.38 % per annum and a LWR Curve and a high water demand future demand requirement with a growth of 2% per annum (DWA uses 3.09% and 1.45% respectively).

11.1.1. Determining High Water Requirement

The following motivation is given regarding the determination of the high water requirement curve:

a. Due to HIV/AIDS and other factors, the average population growth rate is 2.98%.
b. The current economic growth rate is estimated at 4.06 % (2011).
c. Normally the water demand growth is a combination of the current population and economic growth rate which would imply that the water demand growth rate should be about 3.52 % p.a. provided the average population growth rate is maintained.
d. Considering that domestic water demand is significantly more than the industrial and commercial water demand, we can conclude that the demand growth will be more closely related to the population growth rate rather than the economic growth rate.

11.1.2. Starting points of High Water Requirements

The strategy was initially revised within 2013/14 financial year. The starting point of the HWR developed specifically for CCT is at the demand during 2012/13.

11.1.3. Determining the Low Water Requirement

The low requirement curve was calculated at 2% and was determined based on reducing the maximum demand growth by factors such as economic growth rate, population growth rate, growth in demand of new consumers and impact of HIV/Aids.

11.2. PROJECTED UNRESTRICTED

Based on an average 3% water demand growth, from Figure 16, within the CCT, baseline 2011, and an allocation of 399 million m^3 per annum, the next augmentation scheme would have been required by 2016 had no WCWDM initiatives been further implemented. Bearing in mind that the latter assumes that system yield remains constant (which is not the case). Using a baseline of 2013, and an average growth rate of 2.98%, it is anticipated that the next augmentation scheme be implemented by 2020.

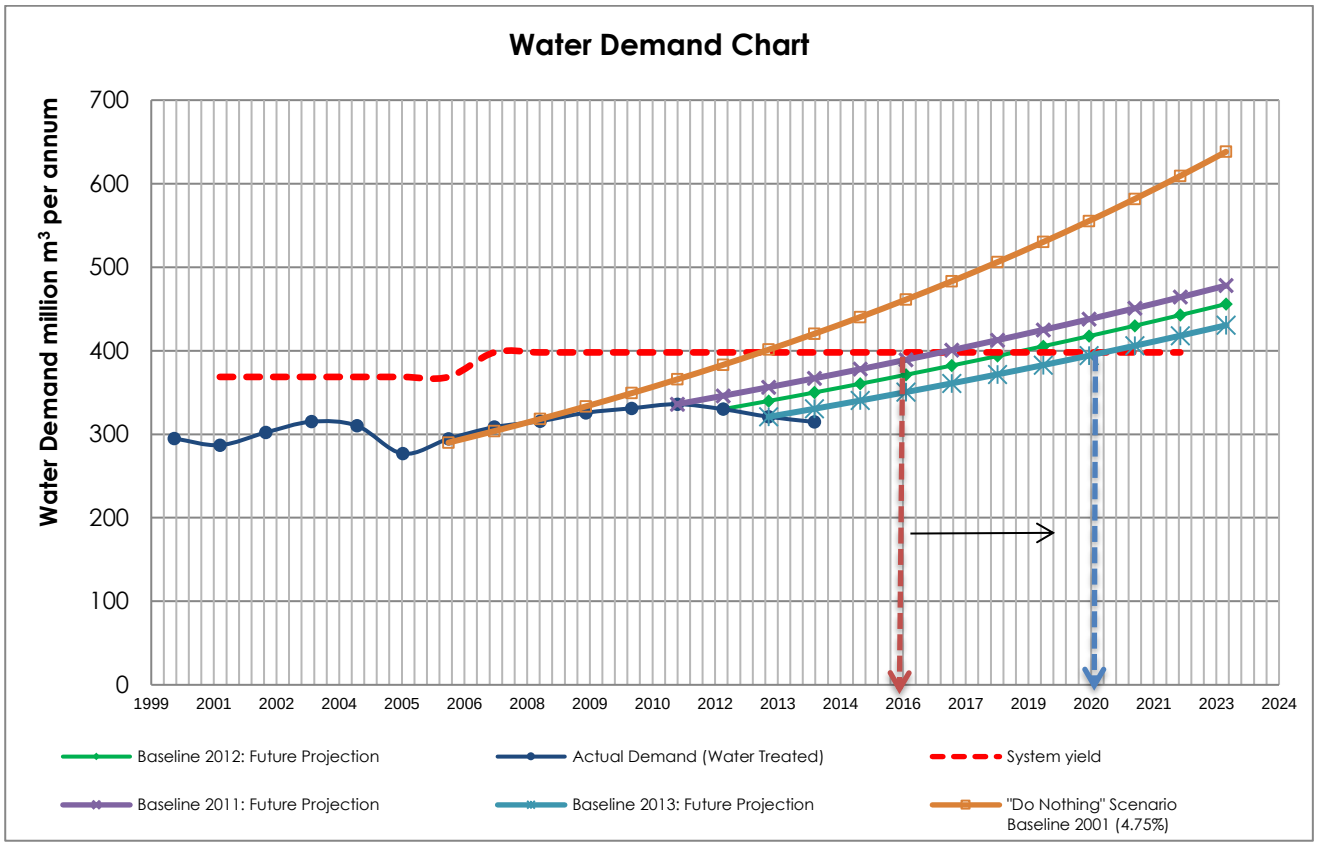


Figure 16: Water Demand Trend (water treated) Chart and Projections

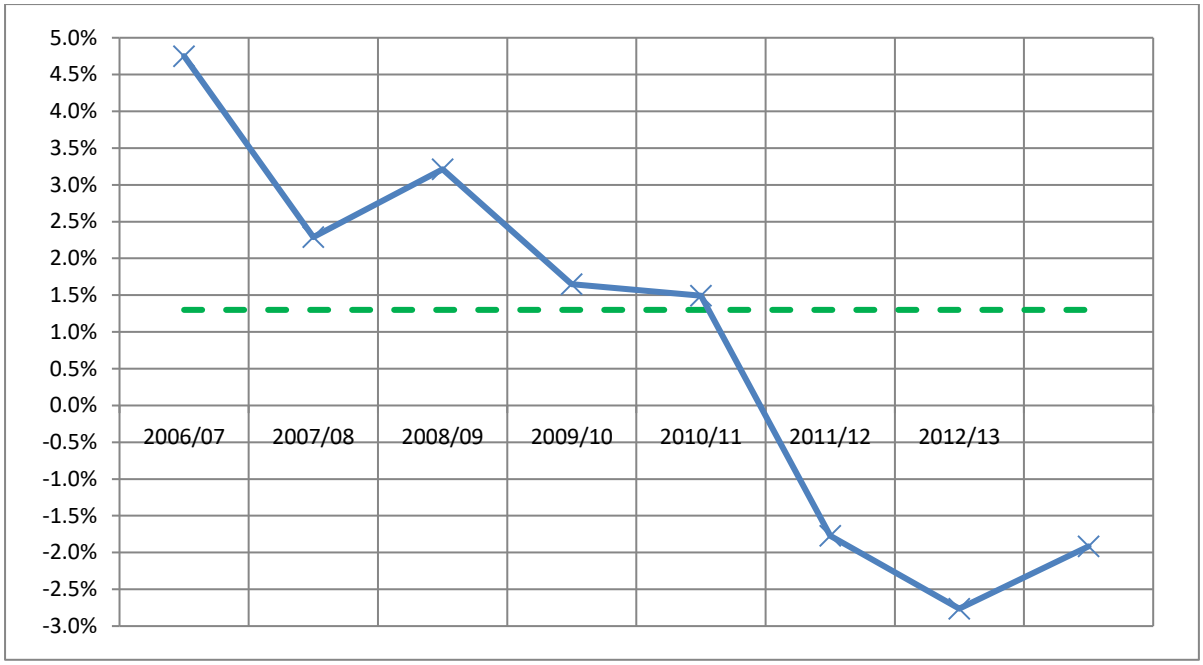


Figure 17: Annual Percentage change in demand

Figure 17 represents the annual percentage change in demand. The demand is declining. Average demand percentage growth is 1.30%.

From Figure 17, it can be seen that water demand trends are tending toward the low water requirement curve (LWR = 1.45%) as opposed to the HWR of 3.09% (LWR AND HWR curves as set out in the Water Reconciliation Study).

Impact of WCWDM Initiatives on the LWR and HWR

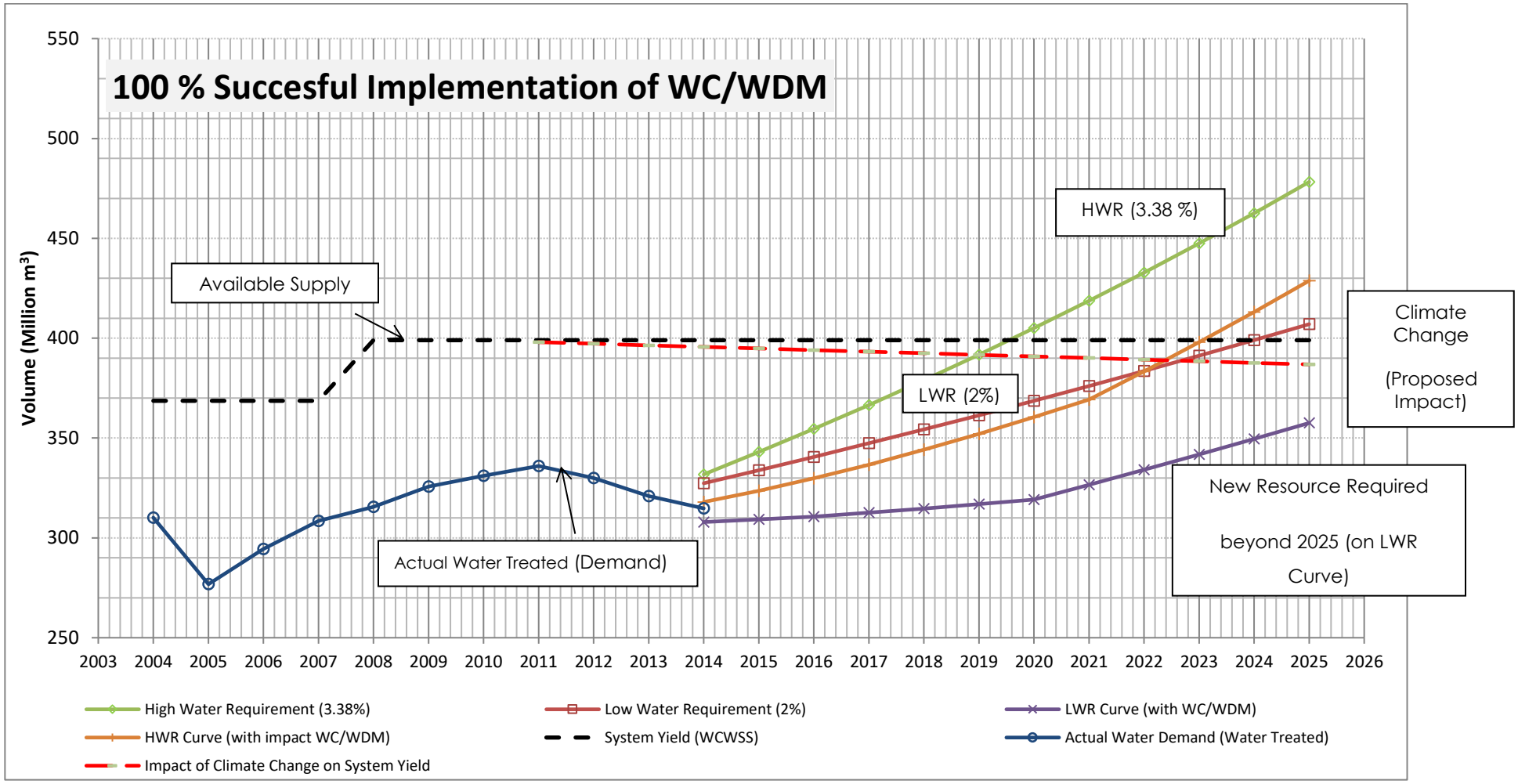


Figure 18: Impact of WCWDM on LWR and HWR curve includes impact of climate change on system yield (100% success)

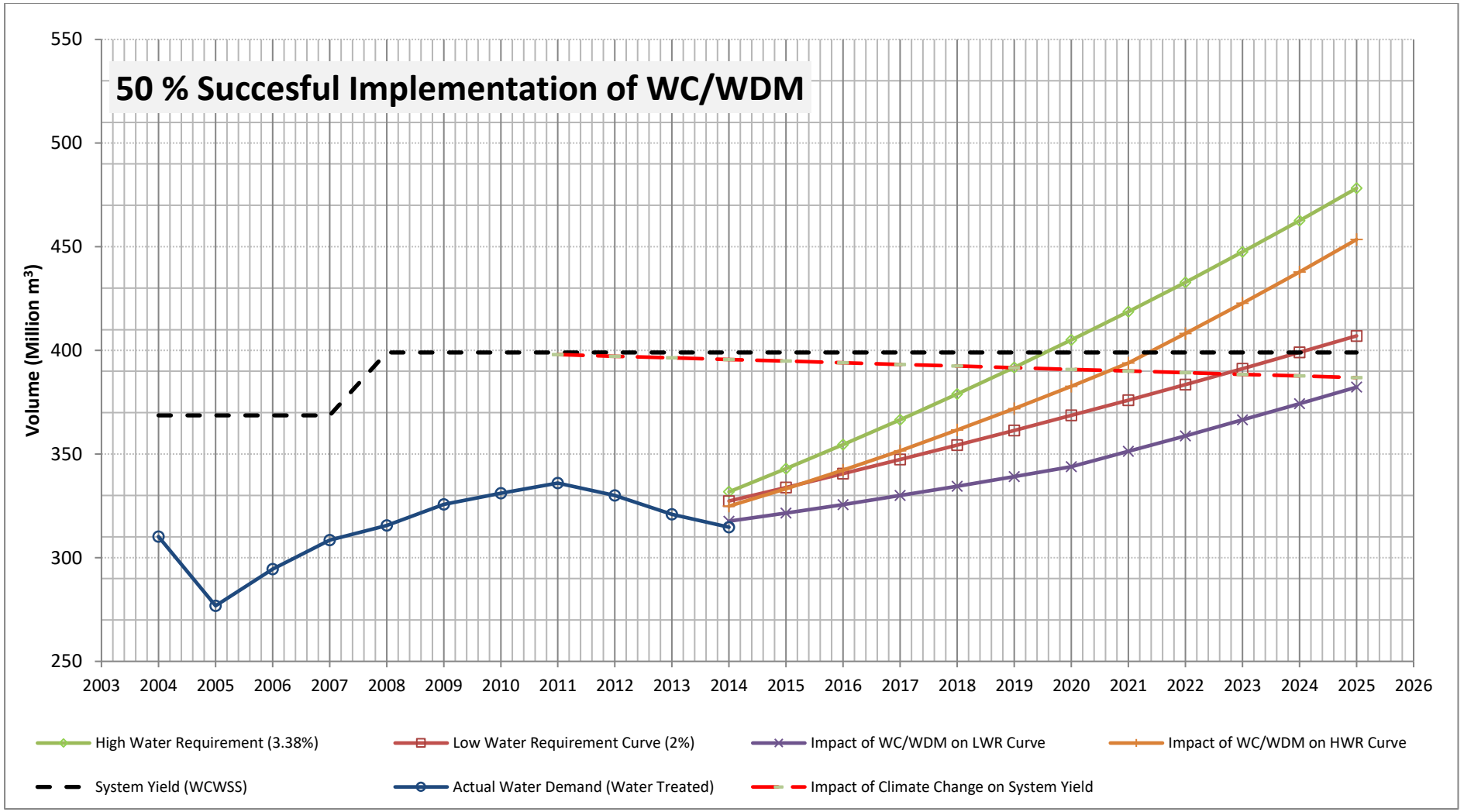


Figure 19: Impact of WCWDM on LWR and HWR curve includes impact of climate change on system yield (50% success)

11.3. ANALYSIS OF DEMAND CURVES

Each graph, Figure 18 and 19, assess' the impact of WC/WDM, as depicted in the cumulative savings found in Table 14, through different scenarios.

Table 12: Impact of WC/WDM on Water Demand (Baseline 2012/13)

Scenario	HWR (3.38%)	LWR (2%)
No WC/WDM	2020	2024
100% Success of WC/WDM	2023	Beyond 2025
50% Success of WC/WDM	2021	Beyond 2025

Note: These figures are for internal use only and does not in any way replace the projections as made or found within the Water Resource Reconciliation Strategy.

It is assumed that climate change will impact water demand in such a manner that it will reduce the system yield by 5% over the next 25 years (Recon Study, November 2011). However, researchers have indicated that climate change does not impact on the system yield at a steady decline but rather it has a fluctuating or erratic trend. In order to implement the best possible impact of climate change on the system yield, detailed modelling will be required.

Table 13: Impact of Climate Change on Water Demand (Baseline 2012/13)

Scenario	HWR (3.38%)	LWR (2%)
No WC/WDM	2019	2023
100% Success of WC/WDM	2022	Beyond 2025
50% Success of WC/WDM	2021	2025

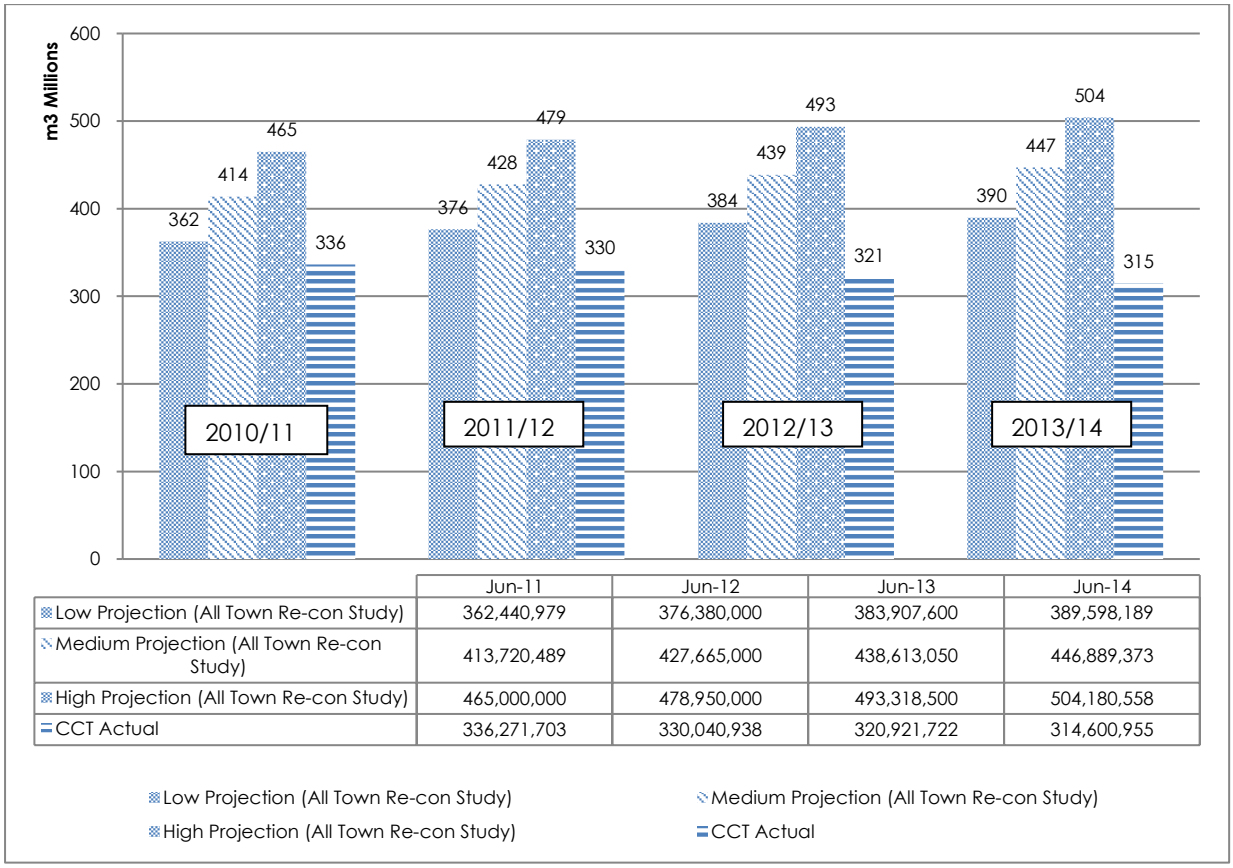
11.4. ALL TOWN RECONCILIATION TARGETS

These projections are based on the CCT historical demand. Reference is made to the water demand projections incorporated into the official agreements with DWS (DWA) in 2003.

Table 14: All Towns Reconciliation Targets (m^3 million)

		LWD (2%)	Medium (average of HWD and LWD)	HWD (3%)
*2015	2014/15	395	455	515
**2016	2015/16	407	473	539
2017	2016/17	416	485	555
2018	2017/18	424	498	572
2019	2018/19	432	511	589
2020	2019/20	441	524	607
2021	2020/21	450	537	625
2022	2021/22	459	551	644

*Based on previous DWA (DWS) reporting spreadsheet **Based on forward projections in keeping with original low and high water requirement curves of 2% and 3% respectively



	Jun-11	Jun-12	Jun-13	Jun-14
Low Projection (All Town Re-con Study)	362,440,979	376,380,000	383,907,600	389,598,189
Medium Projection (All Town Re-con Study)	413,720,489	427,665,000	438,613,050	446,889,373
High Projection (All Town Re-con Study)	465,000,000	478,950,000	493,318,500	504,180,558
CCT Actual	336,271,703	330,040,938	320,921,722	314,600,955

Figure 20: Actual Demand compared to All Towns Reconciliation Targets

Based on Figure 20, it is evident that the CCT is on a progress task on reducing water demand below the water demand reconciliation strategy targets.

12. FINANCE

12.1. BENEFITS OF WC/WDM STRATEGY INITIATIVES

12.1.1. Benefits to WSA

- Postponement of capital infrastructure for water supply
- WC/WDM reduces the uncertainty of demand forecasts

12.1.2. Benefits to the community and individuals

- Ensure sustainable, efficient and effective service delivery, particulary in low-income areas (WDM devices)
- Creating jobs in plumbing and other semi-skilled jobs within the community

12.2. SUSTAINABILITY AND ECONOMIC BENEFIT

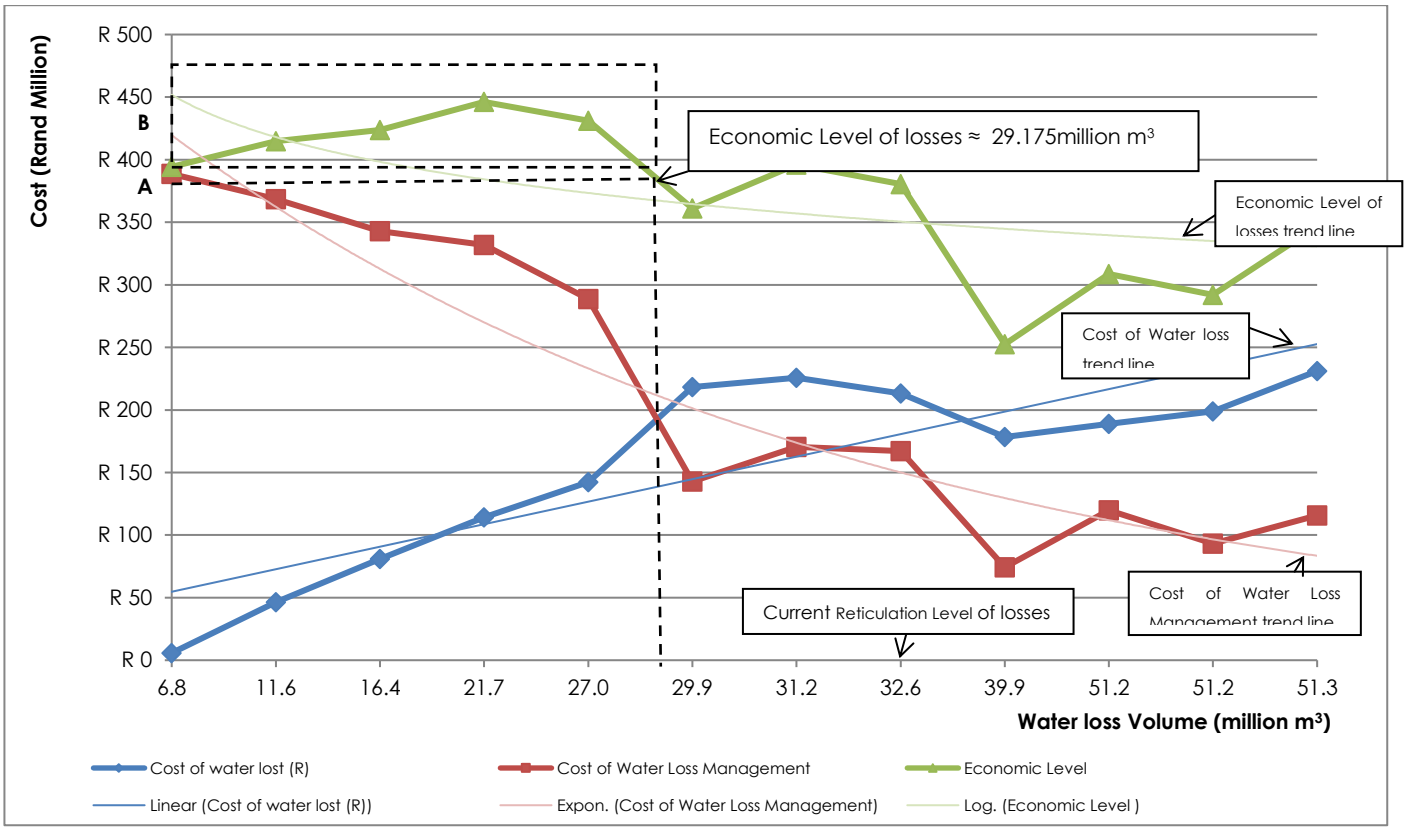


Figure 21: Highlights Economic Level of Water Losses (Cost of Water Lost vs. Cost of Water Losses Management)

The **cost of water lost** (within reticulation system only) is the value of water lost through both physical losses and commercial losses. The volume of physical losses was multiplied by the variable operational costs (which includes manpower, chemical and electricity costs). The volume of commercial losses was multiplied by the average customer tariff. Each cost varies for each financial year.

The **cost of Water Loss management** (within the reticulation system only) is the cost of reducing water losses, which includes cost of all water loss management interventions (both operating and capital projects). As water losses decreases the cost of cost of water loss management increases.

Figure 19 represents actual Water loss financial costs and financial losses (dates back since 2007/08).

The total cost was determined by adding both the cost of water lost and cost of Water Loss management. In Figure 19, the intersection of the two component lines overlaps with the minimum total cost (cost A), which is the economic level of Water Losses.

This graph indicates that reducing Water Losses lower than the economic level of Water Losses will cost more than the potential savings (Cost B – on the trend line). Currently the CCT's losses (Reticulation System only) are valued at approximately 32 617 574 kℓ per annum (2013/14 financial year). According to Figure 19 the Economic Level of Losses for the CCT is calculated at approximately 29 175 000 kℓ. The CCT will need to reduce their losses by an additional 3 442 574 kℓ. This is a relatively small value (1% of total Reticulation System Input Volume). The City is aware that this value is subject to the following:

- Source data being improved (through metering and DMA creation (zone balances)
- Estimations within the NRW Table (relating to calculating losses) revised (although it is subject to the above point improving)

Physical losses (real loss) reduction should be directly related to reducing the variable operational costs. Commercial loss detection and resolution will result in an increase in revenue (improved readings translating into better sales). The latter statement and Figure 19 provides confirmation of the need to restructure NRW management priorities.

It is important to note that the economic level of water losses constantly changes with shifts in the water tariffs, cost of electricity and chemicals, and equipment supply costs. It is important that the economic level of water losses are determined on yearly basis and the water loss target adjusted accordingly in order to ensure the efficient use of resources.

Table 15: Programmes to reduce NRW (10 year project: Since 2011/12)

Programme to be implemented (water losses)	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22
Pressure Management	2.27	0.84	1.57	2.61	2.00	1.86	1.86	1.86	1.86	1.86	2.10
Pipe Replacement (115km per year)	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	2.42
Treated Effluent	0.11	1.27	0.57	0.62	0.87	1.05	0.55	0.61	0.67	0.67	0.73
Water Meter Replacement	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.16
Retrofit and leak repair	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Leak Detection	-	-	0.55	0.76	0.64	0.60	0.64	1.57	1.57	1.57	1.57
Total reduction in Water losses (yr. on yr.) - 1	4.77	4.50	5.08	6.38	5.90	5.90	5.44	6.43	6.49	6.49	8.07
cumulative (million m3/annum)	4.77	9.27	14.35	20.73	26.63	32.54	37.98	44.41	50.89	57.38	65.45
Additional programme to be implemented which impact on NRW - 2	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**2020/21**	**2021/22**
Water Management Device (Improve NRW)	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
Total NRW reduction (1 + 2)	5.16	4.89	5.47	6.77	6.29	6.29	5.83	6.82	6.88	6.88	8.46
cumulative (million m3/annum)	5.16	10.05	15.52	22.29	28.58	34.88	40.71	47.53	54.40	61.28	69.74

*represents 100% successful implementation of WC/WDM interventions

Table 14 represents the revised projected potential savings (water demand offset) as a result of implementing various WDM programmes. The revised table includes potential savings as a result of leak detection and repair intervention.

Table 16: Tracking Schedule

Programme to be implemented (water losses)	2011/12 Proposed	2011/12 Actual Savings million m3/annum	Variance	2012/13 Proposed	2012/13 Actual Savings million m3/annum	Variance	2013/14 Proposed	2013/14 Actual Savings million m3/annum	Variance
Pressure Management	2.27	2.91	0.64	0.84	0.64	-0.20	1.57	2.23	0.66
Pipe Replacement (115km per year)	1.29	0.79	-0.50	1.29	0.25	-1.04	1.29	0.03	-1.26
Treated Effluent	0.11	5.49	5.38	1.27	5.68	4.41	0.57	5.52	4.95
Water Meter Replacement	1.01	0.00	-1.01	1.01	0.00	-1.01	1.01	0.00	-1.01
Retrofit and leak repair	0.09	0.30	0.21	0.09	0.00	-0.09	0.09	0.00	-0.09
Leak Detection	-	-	-	-	-	-	0.55	0.08	-0.47
Total reduction in Water losses (yr. on yr.) - 1	**4.77**	**9.49**	**4.72**	**4.5**	**6.57**	**2.07**	**5.08**	**7.85**	**2.77**
cumulative (million m3/annum)	**4.77**	**9.49**	**-**	**9.27**	**16.06**	**-**	**14.35**	**23.91**	**-**

It was anticipated that 14.35 million m^3 of water would be saved as at end of 2013/14 (based on Table 16), however, it was determined that the implemented programmes have resulted in an actual cumulative saving of 23.91million m^3 (from 2011/12 till 2013/14). The latter has resulted despite the fact that some of the interventions proposed for that year were not implemented yet.

12.3. CAPITAL AND OPERATING BUDGET

12.3.1. Historic Expenditure

Table 17: Historic Expenditure

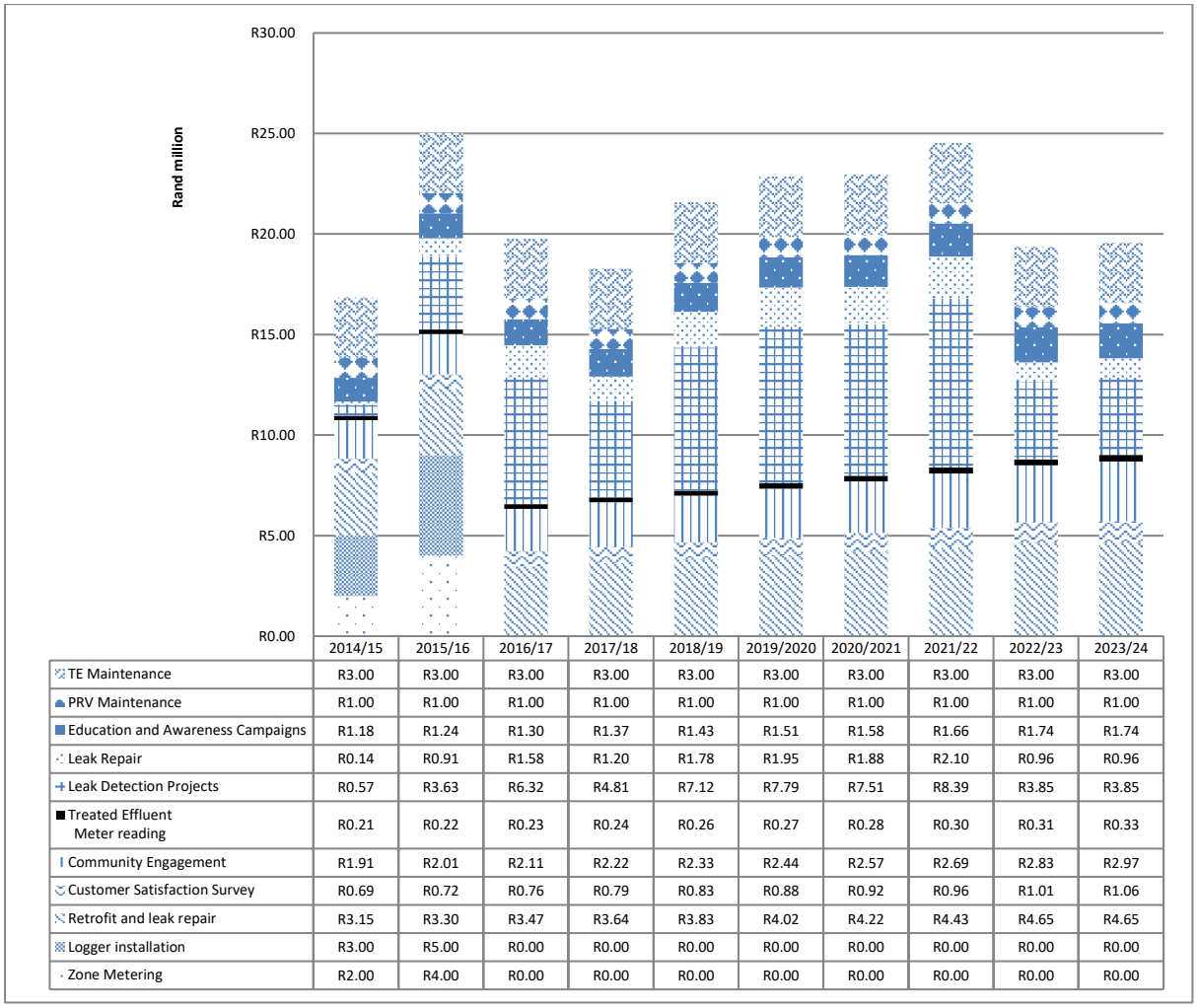
Capital Budget **Initiative**	**Approved 2011/12 (Million)**	**Actual Expenditure**	**Approved 2012/13 (Million)**	**Actual Expenditure**	**Proposed 2013/14 (Million)**	**Approved 2013/14 (Million)**	**Actual Expenditure**
Pressure Management	R 14.35	R 66.87	R 16.00	R 15.81	R 20.00	R 20.00	R 19.22
Pipe Replacement	R 83.80	R 66.87	R 83.80	R 96.61	R 96.99	R 78.62	R 51.47
Treated Effluent	R 6.19	R 7.94	R 18.00	R 18.00	R 39.15	R 27.90	R 24.14
Zone Metering	R 2.00	R 0.00	R 2.40	R 0.00	R 3.00	R 2.00	R 1.66
Logger installation	R 1.50	R 0.35	R 1.50	R 0.00	R 1.50	R 3.00	R 2.97
Water meter replacement	R 50.00	R 12.29	R 50.00	R 16.85	R 90.00	R 91.00	R 85.99
Meters (New Connections)	-	-	-	-	-	-	-
Capex	**R 157.84**	**R 154.31**	**R 171.70**	**R 147.27**	**R 250.64**	**R 222.52**	**R 185.45**
Operating Budget **Initiative**	**Proposed 2011/12 (Million)**	**Actual Expenditure**	**Proposed 2012/13 (Million)**	**Actual Expenditure**	**Proposed 2013/14 (Million)**	**Approved 2013/14 (Million)**	**Actual Expenditure**
Retrofit and leak repair	R 6.00	R 31.77	R 9.20	R 3.50	R 9.40	R 2.63	R 2.63
Community Engagement	R 6.50	R 8.04	R 6.50	R 9.25	R 6.00	R 2.17	R 1.77
Leak Detection Projects	R 0.00	R 0.00	R 0.00	R 0.00	R 3.00	R 0.00	R 0.00
Education and Awareness Campaigns	R 1.50	R 0.00	R 1.50	R 0.00	R 2.00	R 0.00	R 0.00
Research/Feasibility Study	R 1.50	R 0.20	R 1.50	R 0.17	R 1.50	R 1.20	R 1.20
Treated Effluent (meter reading)	R 0.00	R 0.00	R 0.00	R 0.27	R 0.20	R 0.18	R 0.18
PRV Maintenance	R 2.50	R 0.00	R 2.50	R 0.00	R 2.50	R 0.00	R 0.00
Opex	**R 18.00**	**R 40.01**	**R 21.20**	**R 13.19**	**R 24.60**	**R 6.18**	**R 5.78**

12.3.2. Revised long term budget (2014/15 till 2021/22)

Table 18: Revised Long Term Year Budget

Initiative	Proposed 2013/14 (Million)	Proposed 2014/15 (Million)	Proposed 2015/16 (Million)	Proposed 2016/17 (Million)	Proposed 2017/18 (Million)	Proposed 2018/19 (Million)	Proposed 2019/2020 (Million)	Proposed 2020/2021 (Million)	Proposed 2021/22 (Million)	TOTAL
Pressure Management	R 20.00	R 20.00	R 20.00	R 20.00	R 20.00	R 23.43	R 20.00	R 35.80	R 20.00	
Pipe Replacement	R 96.99	R 66.75	R 70.00	R 49.00	R 49.00	R 52.00	R 0.00	R 77.31	R 87.75	
Treated Effluent	R 39.15	R 40.50	R 55.80	R 57.00	R 45.10	R 42.10	R 41.20	R 35.60	R 49.50	
Zone Metering	R 3.00	R 2.00	R 4.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00	
Logger installation	R 1.50	R 3.00	R 5.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00	
Water meter replacement	R 90.00	R 163.12	R 199.00	R 235.00	R 262.00	R 285.00	R 300.00	R 300.00	R 300.00	
Water Meters (new connections	-	R 16.00	R 17.00	R 18.00	R 18.00	R 6.00	R 5.00	R 6.00	R 6.00	
Capex	**R 250.64**	**R 311.37**	**R 370.80**	**R 379.00**	**R 394.10**	**R 408.53**	**R 366.20**	**R 454.71**	**R 463.25**	**R 3 398.60**
Initiative	**Proposed 2013/14 (Million)**	**Proposed 2014/15 (Million)**	**Proposed 2015/16 (Million)**	**Proposed 2016/17 (Million)**	**Proposed 2017/18 (Million)**	**Proposed 2018/19 (Million)**	**Proposed 2019/2020 (Million)**	**Proposed 2020/2021 (Million)**	**Proposed 2021/22 (Million)**	**TOTAL**
Retrofit and leak repair	R 3.00	R 3.15	R 3.30	R 3.47	R 3.64	R 3.83	R 4.02	R 4.22	R 4.43	
Customer Satisfaction Survey	R 0.65	R 0.69	R 0.72	R 0.76	R 0.79	R 0.83	R 0.88	R 0.92	R 0.96	
Community Engagement	R 1.82	R 1.91	R 2.01	R 2.11	R 2.22	R 2.33	R 2.44	R 2.57	R 2.69	
Treated Effluent Meter reading	R 0.20	R 0.21	R 0.22	R 0.23	R 0.24	R 0.26	R 0.27	R 0.28	R 0.30	
Leak Detection Projects	R 3.00	R 0.57	R 3.63	R 6.32	R 4.81	R 7.12	R 7.79	R 7.51	R 8.39	
Leak Repair	R 0.75	R 0.14	R 0.91	R 1.58	R 1.20	R 1.78	R 1.95	R 1.88	R 2.10	
Feasibility Studies/Research	R 1.50	R 9.00	R 3.80	R 4.00	R 4.10	R 3.60	R 3.70	R 3.60	R 4.50	
Education and Awareness Campaigns	R 1.12	R 1.18	R 1.24	R 1.30	R 1.37	R 1.43	R 1.51	R 1.58	R 1.66	
PRV Maintenance	R 2.50	R 1.00	R 1.00	R 1.00	R 1.00	R 1.00	R 1.00	R 1.00	R 1.00	
TE Maintenance	R 3.50	R 3.00	R 3.00	R 3.00	R 3.00	R 3.00	R 3.00	R 3.00	R 3.00	
Opex	**R 18.05**	**R 20.84**	**R 19.83**	**R 23.77**	**R 22.38**	**R 25.17**	**R 26.55**	**R 26.56**	**R 29.03**	**R 212.17**

Table 18 represents the revised capital budget for the City of Cape Town and is further projected for the next few years. The previous budget (2011/12 till 2020/21) was revised. The revised capital budget is has increased by approximately R1 203.37 million (for the mentioned period only). The previous operating budget (2011/12 till 2020/21) was also revised. The revised operating budget has decreased. This is due to the greater capital investment that is required to replace and install new meters (relates to the need to address the concerns raised in section 12.2).



	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
TE Maintenance	R3.00	R3.00	R3.00	R3.00	R3.00	R3.00	R3.00	R3.00	R3.00	R3.00
PRV Maintenance	R1.00	R1.00	R1.00	R1.00	R1.00	R1.00	R1.00	R1.00	R1.00	R1.00
Education and Awareness Campaigns	R1.18	R1.24	R1.30	R1.37	R1.43	R1.51	R1.58	R1.66	R1.74	R1.74
Leak Repair	R0.14	R0.91	R1.58	R1.20	R1.78	R1.95	R1.88	R2.10	R0.96	R0.96
Leak Detection Projects	R0.57	R3.63	R6.32	R4.81	R7.12	R7.79	R7.51	R8.39	R3.85	R3.85
Treated Effluent Meter reading	R0.21	R0.22	R0.23	R0.24	R0.26	R0.27	R0.28	R0.30	R0.31	R0.33
Community Engagement	R1.91	R2.01	R2.11	R2.22	R2.33	R2.44	R2.57	R2.69	R2.83	R2.97
Customer Satisfaction Survey	R0.69	R0.72	R0.76	R0.79	R0.83	R0.88	R0.92	R0.96	R1.01	R1.06
Retrofit and leak repair	R3.15	R3.30	R3.47	R3.64	R3.83	R4.02	R4.22	R4.43	R4.65	R4.65
Logger installation	R3.00	R5.00	R0.00	R0.00	R0.00	R0.00	R0.00	R0.00	R0.00	R0.00
Zone Metering	R2.00	R4.00	R0.00	R0.00	R0.00	R0.00	R0.00	R0.00	R0.00	R0.00

Figure 22: Interventions required to sustain savings

From Figure 22 one can see that there is a lot of investment in leak detection initiatives to assist in sustaining the savings and locating areas where improvements can be made. The second highest investment is more focused on registered indigent households. It is the retrofit and leak repair initiative.

13. CONCLUSION

NRW has increased from 20% to 21.8%. This increase has been greatly influenced by the increase in the unbilled authorised consumption volume (newly built formal households not yet on the treasury system).

Commercial loss detection and resolution will result in an increase in revenue (improved readings translating into better sales). Data feeding the NRW Table needs to be improved. City of Cape Town needs to focus its resources towards meter replacement and new meter installation and prioritise on this intervention.

City of Cape Town needs to improve their revenue collection.

Physical losses (real loss) reduction should be directly related to reducing the variable operational costs. This is evident through reduced burst events per 100km.

A system needs to be set-up which will assist in overall monitoring of the system losses and one which will accurately calculate and monitor all losses within the system.

A control measure needs to be set-up in order to better assess the savings achieved especially concerning the more qualitative initiatives which include education and awareness.

More complex models need to be developed overtime in order to better understand the effect and impact of climate change on the availability of our water resource.

The CCT must take on an active role in monitoring and maintaining all the areas where the different WC/WDM programmes have been implemented.

Calculations are to be carried out recording the benefits achieved during the implementation of various WC/WDM programmes and these figures are to be utilized in the calculations to determine the economic cost of intervention/programme.

Many comments have been made concerning the energy savings that will be achieved through WC/WDM but no attempt has been made to assess the energy savings within CCT based on the water savings. It would be important, in future to consider a study that will assess the impact of WC/WDM on energy reduction.

14. STRATEGIC PROGRAMME GOING FORWARD

14.1. PROPOSED RECOMMENDATIONS

The table below represents the revised proposed priority for implementation of various demand management initiatives.

Priority	Intervention
1	DMA Creation and Analysis
2	Meter Replacement Programme Meter Audits
3	Pressure Management
4	Leak Detection and Repair
5	Pipe Replacement

District metered areas (DMA's) needs to be implemented within each of the water zones within the City of Cape Town. By developing these DMA's one can determine the level of NRW within that zone and further prioritise areas for different demand management interventions (especially with respect to meter audits and meter replacement programmes) and improve on the estimates found within Overall Water Balance for the CCT. Furthermore:

- Ensure all properties are metered and that consumers are being billed;
- Reduce the number of meter estimations
- Install meters to all other discharge points especially informal areas;
- Replace all meter installations that do not comply with installation standards;
- Replace all meters that have exceeded their replacement criteria (volume passed or old age);
- Attend to all other meter / billing discrepancies (Stopped meters, meters with no registered consumer, meter tampering, illegal connections), so as to minimize the apparent losses and reduce the NRW;

- Through water audits detect and report all illegal connections that are discovered and ensure that procedures are put in place to achieve successful prosecution

Where applicable, remote controlled pressure management needs to be implemented within zones which have pockets of household with low supply pressure. Remote controlled pressure management will aid in the equitable distribution of water to consumers (improving service delivery) and further delay the need the need for infrastructure replacement.

Leak detection and repair programmes (on reticulation mains) are fundamental in assisting with the reduction of real losses. Minimize the real losses as much as possible through consecutive leak detection and repair exercises. The pressure across an entire supply area needs to be managed in order to ensure that leakage levels are in fact reduced through leakage replacement. IWLP is only applied to indigent households.

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