

Water Conservation and Water Demand Management Conditions for Water Use Authorizations

I remember there were
SAVE WATER warnings
On the outside posters
Radio and TV,
But nobody paid attention

We thought that water
Was to last forever

Now all the rivers, lakes,
Dams and underground water beds
are either dry or contaminated





water & forestry


Department:
Water Affairs and Forestry
REPUBLIC OF SOUTH AFRICA

DOCUMENT APPROVAL

Approval

APPROVED BY:	AUTHORITY:	DATE:	SIGNATURE:
Ms. Deborah Mochotlhi	Chief Director: Water Use	26/09/2007	
Mr. Harrison Pienaar	Acting-Deputy Director General: Policy and Regulation	8/10/07	

This document has been seen and accepted by:

NAME	AUTHORITY:	DATE:	SIGNATURE:
Mr. Cain Chunda	Director: Water Use Efficiency	26 September 2007	

DOCUMENT CONTROL

HISTORY

TITLE	Water Conservation And Water Demand Management Conditions Manual For Water Use Authorisations
Prepared by	Directorate: Water Use Efficiency
Version	4.0
Date	April 02, 2007

REVISIONS

REVISION	DATE	COMMENT
1.0	03/03/06	1 st Draft for review and comments
2.0	01/09/06	2 nd Draft for review and comments
3.0	01/03/07	3 rd Draft for approval and use
4.0	02/04/07	Version 4.0 for approval and use

Published by: Department of Water Affairs and Forestry
Private Bag X 313
PRETORIA
0001
Republic of South Africa

Copyright: (2007) Department of Water Affairs and Forestry
No part of this document may be reproduced in any manner without the full acknowledgement of the source

Disclaimer Although the information contained in this document is presented in good faith and believed to be correct, the Department of Water Affairs and Forestry (DWAF) makes no representations or warranties as to the completeness or accuracy of the information, which is only based on actual information received, and makes no commitment to update or correct information.

Short Title: Water conservation and demand management conditions for water use

Status: Final report version 4.0

Prepared by: Directorate Water Use Efficiency, Sub-directorate Strategy and Oversight

Available from: Department of Water Affairs and Forestry
Directorate Water Use Efficiency
Private Bag X 313
PRETORIA
0001
Republic of South Africa
Tel: (012) 336 8818; Fax: (012) 336 8086
E-mail: qtv@dwaf.gov.za

Table of Definitions and Acronyms

Definitions	
Apparent Losses	Losses in revenue, that results from unbilled consumption, data handling errors, inaccurate or faulty metering, incorrect billing, or theft.
High Water Intensive Industries	Refers to wet massive production industries with significantly important water demand that uses 100 000 m ³ /d or more water from any sources whether is direct abstraction of raw water from DWAF infrastructure scheme such as dams or canals and/or supplied with potable water from either municipal or water utility system. These are multinational industries with global outlook in terms of its operation and listed in corporate markets.
Low Water Intensive Industries	Refers to small medium industries found in almost every Water Services Authorities with cumulative water demand less than 150 m ³ /d and in most cases there is ample scope for improvement in water conservation and demand management such as abattoirs etc.
Medium Water Intensive Industries	Refers to medium industries that uses on average between 50 000 and 100 000 m ³ /d water for industrial purposes. These are industries with huge potential to implement programs such cleaner production and waste minimization.
Non-Revenue Water	The total of apparent and real losses plus the proportion of authorized consumption which is not billed.
Real Losses	Losses through leaks from poorly constructed plants, reservoirs, aging water systems, house connections, accidents, poor maintenance of the infrastructure, unauthorised connections.
Unaccounted-for Water	The difference between the measured volume of water put into the supply and distribution system and the total volume of water measured to authorized consumers whose fixed property address appears on the official list of water services authorities.
Water Conservation	The minimization of loss or waste, the care and protection of water resources and the efficient and effective use of water.
Water Conservation and Water Demand Management Condition(s)	Refers to a condition for inclusion, by a responsible authority, in a general authorization or license as defined in section 29 (1) (b) of the National Water Act, 1998 (Act 36 of 1998) to effect water management by specifying management practices and general requirements for any water use, including water conservation measures.
Water Demand Management	The adaptation and implementation of a strategy and action plans by a water institution or consumer to influence the water demand and usage of water in order to meet any of the following objectives: <ul style="list-style-type: none"> o economic efficiency; o social development; o social equity; o environmental protection; o sustainability of water supply and services; and o political acceptability.
Water Services Institutions	Is a water services authority, a water services provider, a water board and a water services committee.
Water Wastage	Water lost through leaks or water usage that does not result in any direct benefit to a consumer or user and the environment.

Acronyms:	
DWAF	Department of Water Affairs and Forestry
EMS	Environmental Management System
ILI	Infrastructure Leakage Index
KPA	Key Performance Areas
KPI	Key Performance Indicator
MNF	Minimum Night Flow
NRW	Non-Revenue Water
NWA	National Water Act, 1998 (Act 36 of 1998)
NWCWDMs	National Water Conservation and Water Demand Management Strategy
WC	Water Conservation
WC/WDM	Water Conservation and Water Demand Management
WDM	Water Demand Management
WSA	Water Services Authority
WSI	Water Services Institutions
WSP	Water Services Provider

Supporting documents

This water conservation and water demand management conditions for water use sectors document is supported by the following documents:

Department of Water Affairs and Forestry (2004). *National Water Conservation and Water Demand Management Strategy*. Directorate Water Use Efficiency

Department of Water Affairs and Forestry (2004). *Water Conservation and Water Demand Management Strategy for the Water Services Sector*. Directorate Water Use Efficiency

Department of Water Affairs and Forestry (2004). *Water Conservation and Water Demand Management Strategy for the Agriculture Sector*. Directorate Water Use Efficiency

Department of Water Affairs and Forestry (2004). *Water Conservation and Water Demand Management Strategy for the Industry, Mining and Power Generation Sectors*. Directorate Water Use Efficiency

TABLE OF CONTENTS

DOCUMENT APPROVAL	ERROR! BOOKMARK NOT DEFINED.
DOCUMENT CONTROL	3
TABLE OF DEFINITIONS AND ACRONYMS	4
SUPPORTING DOCUMENTS	5
ACKNOWLEDGEMENTS	8
FOREWORD	9
EXECUTIVE SUMMARY	10
1. INTRODUCTION	11
1.1 BACKGROUND	11
1.2 SITUATION ANALYSIS	12
1.3 PURPOSE.....	12
2. APPLICATION	12
3. MUNICIPAL WATER USE	14
3.1 WATER USE LICENSE (\$40)	14
3.1.1 <i>Water Conservation measures and conditions applicable</i>	14
3.2 COMPULSORY WATER USE LICENSE (\$43).....	18
3.2.1 <i>Water Conservation measures and conditions applicable</i>	18
4. AGRICULTURE WATER USE	19
4.1 GENERAL AUTHORISATION	19
4.1.1 <i>Water Conservation measures and conditions applicable</i>	19
4.2 WATER USE LICENSE (\$40)	19
4.2.1 <i>Water Conservation measures and conditions applicable</i>	19

4.3	COMPULSORY WATER USE LICENSE (\$43).....	24
4.3.1	<i>Water Conservation measures and conditions applicable</i>	<i>24</i>
5.	INDUSTRIAL WATER USE.....	25
5.1	WATER USE LICENSE (\$40)	25
5.1.1	<i>Water Conservation measures and conditions applicable</i>	<i>25</i>
5.2	COMPULSORY WATER USE LICENSE (\$43).....	28
5.2.1	<i>Water Conservation measures and conditions applicable</i>	<i>28</i>
6.	MINING WATER USE.....	28
6.1	GENERAL AUTHORISATION	28
6.1.1	<i>Water Conservation measures and conditions applicable</i>	<i>28</i>
6.2	WATER USE LICENSE (\$40)	29
6.2.1	<i>Water Conservation measures and conditions applicable</i>	<i>29</i>
6.3	COMPULSORY WATER USE LICENSE (\$43).....	31
6.3.1	<i>Water Conservation measures and conditions applicable</i>	<i>31</i>
7.	POWER GENERATION WATER USE.....	32
7.1	WATER USE LICENSE (\$40)	32
7.1.1	<i>Water Conservation measures and conditions applicable</i>	<i>32</i>
7.2	COMPULSORY WATER USE LICENSE (\$43).....	34
7.2.1	<i>Water Conservation measures and conditions applicable</i>	<i>34</i>
8.	CRITERIA FOR APPLICATION OF THE WC/WDM CONDITIONS	34
9.	CONCLUSION.....	35
10.	REFERENCES	36

Acknowledgements

The following stakeholders contributed to the compilation of this Water Conservation and Water Demand Management Conditions report and their participation, magnanimity and enthusiasm are sincerely appreciated:

The Project Team:

Messrs CM Chunda, T Masike, C Tsatsi and Ms K Moyo of the Department of Water Affairs and Forestry (DWAF). Messrs J Boroto (Strategic Solutions), M Perez (RUWADE), PM Matji (Matji and Associates (Pty) Ltd) and D Grobler (Blue Science Consulting) and Ms P Moodley (Zitholele Consulting (Pty) Ltd).

External Review Specialist Team:

Agricultural Research Council
CPH Water
South African Sugar Research Institute
Water Resources Planning & Conservation
Water Supply Strategies
International Consulting Specialist

Mr. Felix Reinders
Mr. Andrew Pott
Mr. Pat Brenchley and Dr. Neil Lecler
Dr. Ronnie McKenzie
Mr. George Constantinides
Mr. Hugh Alan

Foreword

More and more, all South Africans realize that water is a scarce commodity and that its continuous availability at our taps should not be taken for granted. Decision makers in the water sector, from the political leadership to the managers on the ground are faced with the dilemma that supply options are almost exhausted while the needs of a thirstier and thirstier society are increasing. Demand for water is not only for industrial development, but also for the upliftment of several layers of society to address the backlogs of our recent past and for the improved living conditions that reflect our nation's growing prosperity.

Water Conservation and Water Demand Management (WC/WDM) is now considered as a necessity. It is the only sustainable response which still offers opportunities for coping with the looming water crisis that our country faces. The opportunities that WC/WDM offers in all sectors are numerous. Most cities experience high levels of night flows, indicating huge losses from our water distribution networks that can be significantly reduced. A culture of wise use of water in our households is far from being adopted. Industrial and mining processes can still be improved to optimize their water use. The agriculture sector, the biggest water user, also offers important opportunities for saving water.

Yet, despite these opportunities, South Africa seems to be ill prepared to adopt WC/WDM on a large scale. There is no other option, however. Considering our growing needs in the face of our limited water resources, our prevailing semi arid climate and the prospects of severe extreme events caused by climate change, strong action is required urgently.

These WC/WDM conditions in the water use authorization processes are therefore a call to all, to respond to this crisis in a responsible manner. Water Licensing and General Authorisation processes do indeed offer the opportunity to request to the water users to adopt WC/WDM practices for their own benefit and that of the country as a whole. They are not, therefore, to be seen as a stick that the Department of Water Affairs and Forestry is waving at all water users but rather as a plea to recognize that we all have a role to play in ensuring that we use our limited water resources in an efficient, sustainable and equitable fashion. They unpack opportunities that are available to all of us and they endeavour to create a framework for the accelerated adoption of these opportunities.

These conditions therefore call for a positive, responsible and enthusiastic response from all. It is for our own good and that of our children.

Deputy-Director General: Policy and Regulation

Executive Summary

Water Use Authorisation processes endeavour to achieve the efficient, sustainable and equitable use of the country's water resources. In this quest, Water Conservation and Water Demand Management offer opportunities that will contribute towards reaching a fair balance between economic efficiency, environmental sustainability and social equity.

The conditions that this document contains attempt to capture such opportunities in order to support Water Use Authorisation processes while contributing to a culture of responsible water use in all water use sectors. These conditions target specifically water use licensing and general authorization processes. It is also recognized that Schedule I water users equally need to be water efficient and an awareness-raising and education drive is therefore advocated for them.

These conditions are presented per sector, from water services, agriculture to industrial, mining and power generation. While there are generic conditions applicable to all, sector specific conditions have been spelt out with the intention to guide their adoption. The document presents first the conditions for water use licensing before those of general authorizations. Given that the latter are only issued in catchment where there is a recognized surplus of supply compared to demand, the applicable conditions reflect this level of relaxation compared to those for water use licensing. No distinction has been made between licensing and compulsory licensing as it is deemed that, despite that compulsory licensing takes place in stressed catchments, the requirement for a license reflects that the relative importance of the water use either in a stressed or non stressed catchment. It should therefore be subjected to similar conditions.

To each condition, a benefit, though seemingly obvious, is stated. The intention is to stress that the conditions have not been formulated in a punitive spirit, but rather in order to promote the sense of a common good. The opportunity is available to each water user to contribute, through responsible water use, to this common good and, in so doing, to his own.

It is unlikely that the water sector will have the capacity to monitor and enforce these conditions in the near future, however, this has not stopped their formulation as it is expected that each water user will act responsibly and with integrity. This does not mean that no control will ever be made to check whether the users are adhering to the WC/WDM conditions of the license.

These conditions have been developed while the Directorate: Water Use Efficiency has also initiated several initiatives to support the development of WC/WDM Regulations. It is expected that, when the regulations are promulgated, they will further confirm the relevance of these conditions and further enforce their widespread adoption. The regulations will have the force of the law as provided for by the National Water Act, 1998 (Act 36 of 1998).

The time has therefore come to embrace wholeheartedly WC/WDM as it is an integral part of the response to our water challenges. At present, WC/WDM is indeed the most sustainable, appropriate and at the same time overdue response.

1. Introduction

1.1 Background

The Constitution, 1996 (Act 108 of 1996) of South Africa in terms of section 27, guarantees everyone the right to have access to sufficient food and water. It also protects the right of people to an environment that is not harmful to their health or well-being. The environment needs to be protected for the benefit of present and future generations, through reasonable legislation and other measures that promote, *inter alia*, water conservation.

The Water Services Act, 1997 (Act 108 of 1997) provides for the right of access to basic water supply and sanitation services, and the National Water Act, 1998 (Act 36 of 1998) sets out the approach adopted to ensure that the country's water resources are protected, used, developed, conserved, managed and controlled in the public interest and in a sustainable manner.

South Africa's water resources are generally scarce and limited. The available natural water resources environment is already heavily exploited. The country faces an enormous challenge to strike a balance between conserving our limited resources and facilitating development that is aimed at eradicating poverty and achieving economic growth. To achieve a balance between ensuring the sustainable provision of access to water and protecting our natural water resources environment, the National Water Act, 1998 regulates all water use.

A person may be entitled to use water if that water complies with one of the following authorizations:

- i. A schedule 1 water use in terms of the NWA;
- ii. A continuation of an existing lawful use as defined in the NWA;
- iii. A water use general authorization; and
- iv. A water use license.

Furthermore, in terms of section 43 of the NWA, 1998 a responsible authority may issue a notice requiring persons to apply for licenses for one or more types of water use contemplated in section 21 of the Act, if it is deemed fit that water use in respect of one or more water resources within a specific geographic area should be licensed:

- (a) to achieve a fair allocation of water from a water resource in accordance with section 45:
 - (i) which is under water stress; or
 - (ii) when it is necessary to review prevailing water use to achieve equity in allocations
- (b) to promote beneficial use of water in the public interest;
- (c) to facilitate efficient management of the water resource; or
- (d) to protect water resource quality.

Section 21(a-k) identify the various water uses, for which a water use license or general authorization may be issued, whilst section 22(2)(d) states that a person who uses water as contemplated in the Act, **may not waste that water**. To prevent the waste of water, the Minister may make **regulations** on the use of water in terms of section 26. Furthermore, the responsible authority may in terms of section 29, attach **conditions** to every general authorization or licence relating to, amongst others-

- (a) water management by-
 - (i) specifying management practices and general requirements for any water use, including water conservation measures;
 - (ii) requiring the monitoring and analysis of and reporting on every water use and imposing a duty to measure and record aspects of water use, specifying measuring and recording devices to be used;

(iii) requiring the preparation and approval of and adherence to, a water management plan.

1.2 Situation Analysis

Water is scarce in South Africa, which is ranked among the top thirty (30) of the world's driest countries. Water is therefore a major limiting factor for virtually all development. The conservation and equitable distribution of water is therefore of paramount importance. Competition for scarce water resources is significant in certain areas and government has a responsibility to ensure an equitable distribution of water between competing sectors of the economy.

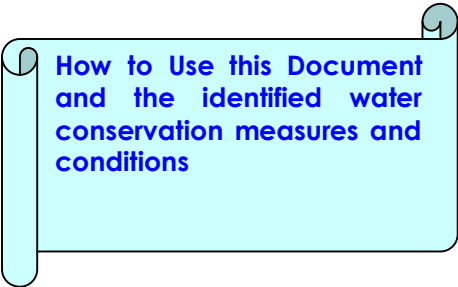
In the domestic water use sector, repressive legislative history has skewed the distribution of available water infrastructure. This is characterized by contrasting high quality fittings and reticulation systems in affluent urban areas and poor quality fittings and distribution infrastructure in poor, historically black townships. This situation results in unacceptable high levels of water losses associated with physical infrastructure leakages in the dominantly black townships with old leaking toilets, taps and distribution systems. This contrasts with better distribution systems, but significant levels of inefficient use of water in the affluent urban areas. As a result of these historical distortions, up to sixty percent (60%) of municipal water supply is lost, wasted and inefficiently used.

The agricultural sector uses the largest share of available water. Recent studies indicate that, up to fifty percent (50%) of water abstracted from dams do not reach the roots of crops. There is therefore, a significant scope to improve irrigation water efficiencies, reduce wastages and physical losses in conveyance and storage facilities. Whilst, generally the situation is reasonably better in the industrial water use sector, there is also a significant scope to improve water use efficiencies through process optimization and other education measures in the industrial sector.

1.3 Purpose

- (a) The primary purpose of this document is to identify and specify practical water conservation measures, management practices and general requirements for any water use identified in section 21 (a-k), for inclusion in water use licences and general authorizations as provided for in section 29 of the Act.
- (b) To provide a guide for the identification and inclusion of the various water conservation measures and conditions on water use licenses and general authorizations for micro and small enterprises, medium and large businesses.
- (c) To provide a criteria for the identification and recommendation for inclusion of water conservation conditions specified for general authorizations, licenses and compulsory licenses in order of priority and importance of the water resource in question (i.e. "stressed versus non-stressed" catchments).

2. Application



How to Use this Document and the identified water conservation measures and conditions

The water conservation and water demand management measures and conditions identified in this document apply to all water uses identified in the Act, in terms of section 21 (a-k). The water conservation conditions apply to all water use sectors identified in the National Water Act and the Water Services Act for domestic water use, irrigation water use and industrial water use alike. To promote sustainable economic growth and environmental conservation of water resources, micro and small

enterprises and water users are to comply with the water conservation measures and conditions identified for general authorizations in their license applications. In a case of compulsory licensing, micro and small enterprises will have to comply with the water conservation measures and conditions identified for water use licenses over a reasonable period of time no longer than five (5) years from the date of issue of the water use license. Medium and large enterprises are to comply with the water conservation measures and conditions identified for water use licenses and compulsory licenses.



Municipal Water Use

- 1) Section 3.1 identifies and list water conservation measures and conditions for municipal water use applicable to water use licenses in terms of S40; and
- 2) Section 3.2 identifies and list water conservation measures and conditions for municipal water use applicable to compulsory licenses in terms of S43.



Agriculture Water Use

- 1) Section 4.1 identifies and list water conservation measures and conditions for agricultural water use applicable to General Authorisations;
- 2) Section 4.2 identifies and list water conservation measures and conditions for agricultural water use applicable to water use licenses in terms of S40; and
- 3) Section 4.3 identifies and list water conservation measures and conditions for agricultural water use applicable to compulsory licensing in terms of S43.



Industrial Water Use

- 1) Section 5.1 identifies and list water conservation measures and conditions for industrial water use applicable to water use licenses in terms of S40; and
- 2) Section 5.2 identifies and list water conservation measures and conditions for industrial water use applicable to compulsory licenses in terms of S43.



Power Generation Water Use

- 1) Section 6.1 identifies and list water conservation measures and conditions for power generation water use applicable to water use licenses in terms of S40; and
- 2) Section 6.2 identifies and list water conservation measures and conditions for power generation water use applicable to compulsory licenses in terms of S43.



Mining Water Use

- 1) Section 7.1 identifies and list water conservation measures and conditions for mining water use applicable to water use licenses in terms of section 40; and
- 2) Section 7.2 identifies and list water conservation measures and conditions for mining water use applicable to compulsory water use licenses in terms of section 43.

3. Municipal Water Use

3.1 Water Use License (S40)

In terms of section 40(1), a person who is required or wishes to obtain a license to use water must apply to the relevant responsible authority for a license. The license for water use is for the water uses identified in section 21 of the Act.

3.1.1 Water Conservation measures and conditions applicable

Rationale and Application Guide for WC/WDM Conditions: Water use licenses are entitlements to use water in terms of the various water uses identified in section 21 addressing both quantity and quality of water for consumptive and non-consumptive uses. Water use licenses authorize the use of significant volumes of water, and thus require specific water conservation conditions and measures to prevent any potential water losses, inefficient use and general water wastages by the user and or the licensee.

In order to prevent, such water losses and wastages, including the inefficient use of water, the following water conservation measures, best management practices and conditions are identified for the various water uses identified in the Act.

3.1.1.1 THE TAKING OF WATER FROM A WATER RESOURCE AND STORAGE OF WATER

[S21 (a) and (b)]

Table 3.1.1.1 Water Conservation Measures, Best Management Practices and Conditions

NO.	CONDITIONS	BENEFIT
1.1	The Licensee shall install and monitor appropriate water measuring devices or meters, to measure and account for the volume of water abstracted, received, lost and/or consumed, as applicable to the technical configuration of infrastructure, including but not limited to: (a) resource abstraction points; (b) bulk distribution networks; (c) reticulation networks; (d) storage facilities; (e) points of use (consumption by and/or sale to third parties); (f) return flows from sewage works; and (g) to all end users.	Enable annual water balance accounting to support water resource planning and demand management initiatives.
1.2	The Licensee shall ensure that all measuring devices and or meters are properly maintained and in good working order, through implementation of the following measures: (a) a programme for meter checking and calibration; (b) meter renewal programme.	Reduce levels of apparent losses and non-revenue demand.
1.3	The Licensee, using the information obtained from 1.1 above, shall prepare and submit to the responsible authority, an annual water balance as described in appendix A, to account for amongst others the following key variables: (a) System input volumes or total annual water purchases; (b) Real and apparent water losses; (c) Authorized consumption (billed and non-billed); (d) Non-revenue and revenue water.	Measure of efficiency in the management system to support future improvements and identification of areas of intervention for optimal operations.
1.4	The Licensee shall, where water is stored off-channel in a dam or reservoir, ensure that all distribution and reticulation systems or pipelines are properly constructed, operated and maintained in good	Minimize water losses through physical infrastructure losses and

	working order to prevent water losses through physical leakages, bursts, and reservoir over-flows.	bursts.
1.5	The Licensee shall establish a formalized system to receive reports on bursts or other visible water losses from the distribution and reticulation infrastructure, both from the public and its own employees. (a) The system shall also provide for the monitoring of repairs, which should be carried out promptly and efficiently. (b) The system shall, at all times, reflect the number of reported defects which are not yet repaired.	Interventions for repairing burst and other defects can be carried out in a timely, coordinated and efficient fashion.
1.6	Water storage facilities such as reservoirs and towers, shall be fitted with automatic shut valves to prevent overflows and spillages when filled with water.	Minimize inefficient and wasteful use of water through overflow spillages.
1.7	The Licensee shall implement water loss management measures including, amongst others: (a) active leakage control; (b) passive leakage control; (c) a programme to detect unauthorized connections; (d) speed and quality of repairs; (e) monthly water balancing; (f) minimum night flow analysis; (g) the use of water regulating devices including automatic shut valves, to prevent storage overflows; (h) pressure management; (i) water efficient devices; and (j) pipeline and asset management including- (i) selection; (ii) installation; (iii) maintenance; (iv) refurbishment; and (v) replacement.	All water demand management opportunities are identified for action.
1.8	In planning upgrades to existing infrastructure, or the construction of new infrastructure, the Licensee shall: (e) investigate, identify and implement all possible WC/WDM interventions before committing to any bulk capital infrastructure programmes; (f) design and build storage facilities in a manner that minimize and reduce evaporation and leakage of raw water from storage; (g) investigate alternative water sources for supply, including but not limited to- (i) large scale rainwater harvesting; (ii) return-flow use; and (iii) ground-water and well-field development.	Better planning for future water needs and savings in water infrastructure.
1.9	The Licensee shall identify all its top ten (10) largest consumers and require from them an annual water management plan, which shall include amongst others, the following: (a) water audit; (b) water balance; (c) benchmarking of use; (d) water use efficiency levels; (e) programme to increase efficiency; (f) future water requirements; and (g) programme to recycle or re-use water.	Greater impact of WC/WDM is achieved by targeting large water consumers.
1.10	The Licensee shall develop and implement a programme to detect unauthorised connections in the distribution and reticulation system, which shall either be metered and authorized or shut down to prevent wasteful and network leakages.	Unauthorized connections minimized with associated water losses, leaks and loss of revenue.
1.11	The Licensee shall take the necessary measures to minimize working pressures within the distribution, supply and reticulation systems, subject to maintaining satisfactory pressures at the points of delivery to	Pressure is managed optimally to reduce wastage.

	<p>consumers. The measures to be taken may include:</p> <ul style="list-style-type: none"> (a) sub-division of the network into pressure zones; (b) the provision of break pressure tanks; (c) agreement with local fire department on minimum pressures; (d) keeping the maximum pressures as low as possible to reduce excessive leakages and prolong the system's life cycles, whilst providing acceptable supply; and (e) the installation of pressure reducing valves. 	
1.12	The Licensee shall carry out minimum night flow (MNF) performance indicator measurements within the reticulation networks, downstream of storage tanks to identify key problem areas regarding water losses and general wastages amongst consumers.	To identify areas requiring intervention for water loss reduction measures.
1.13	<p>The Licensee shall compile and submit annual water audits (in a pre-approved format and the water balance model attached as Appendix A) to the responsible authority, detailing amongst others, the following:</p> <ul style="list-style-type: none"> (f) current infrastructure, its condition, maintenance plans and infrastructure development plans; (g) different types or categories of water use, unit consumptions, benchmark values and historical trends; (h) water abstracted and consumed in each preceding month, and on an annual basis; and (i) losses sub-divided into real and apparent losses, and presented in a format that enables benchmark and historical comparisons to be made. 	Facilitate monitoring and information generation for planning and water resource regulation.
1.14	<p>Using the water balance audit information, the Licensee shall calculate the estimate values of the Infrastructure Leakage Index (ILI) performance indicator for each part of the reticulation network downstream of a storage tank in areas with 2000 or more properties. The ILI levels shall be categorized as follows:</p> <ul style="list-style-type: none"> (a) ILI less than 3.0 representing an acceptable level (b) ILI of 3.0 and less than 5.0 acceptable only if there is a surplus of available water and no rationing is experienced by consumers, and subject also to acceptance by the responsible authority; and (c) ILI greater than 5.0 representing an unacceptable level. 	Interventions for reducing infrastructure leakage are undertaken in a coordinated manner.
1.15	<p>The Licensee shall conduct leakage control programmes according to the ILI as follows:</p> <ul style="list-style-type: none"> (a) If the ILI range is acceptable (i.e. 3.0), then only a passive leakage control programme is required; (b) If the ILI range from 3.0 and less than 5.0, then active leakage control programmes shall be conducted once every year with repairs of all identified leakages; and (c) If the ILI is greater than 5.0, then an active leakage control programme shall be carried out by the Licensee every six months with repairs of all identified leakages. 	A co-ordinated intervention programme to be guided by the leakage control programme.
1.16	<p>The Licensee shall promote WC/WDM among consumers on an ongoing basis by, amongst others:</p> <ul style="list-style-type: none"> (a) establishing water committees, where communities will participate and receive information on water efficient measures and water saving tips; (b) supporting and assisting consumers to replace inefficient plumbing fittings with water efficient devices; (c) establishing and maintaining customer care centers and encouraging communities to report water related problems for attention; (d) informing customers of the expected response times to repairing and fixing reported water leakages and spillages; and (e) educating consumers on the need to conserve water. 	Consumers adopt a WC/WDM culture in their households thus contributing actively to WC/WDM gains.
1.17	The Licensee shall promote rain water harvesting and or reclamation and assist consumers to install reclamation systems and rainwater	More water availed through rainwater harvesting and

	harvesting tanks for household use	reclamation activities.
1.18	The Licensee shall appointment a water inspector and ensure adequate and appropriate training of: (a) meter readers; (b) infrastructure management staff; and (c) all other staff involved in the implementation of WC/WDM measures.	Good quality data is collected for improved management.
1.19	The Licensee shall develop a water conservation and water demand management strategic business plan for inclusion in the WSDP detailing all the WC/WDM measures, best management practices and conditions identified on condition 1.1 to 1.18 above to enable budgeting and council adoption.	WC/WDM actions are evaluated for progress, impact and updated as required.

3.1.1.2 ENGAGING IN A CONTROLLED ACTIVITY, IDENTIFIED AS SUCH IN SECTION 37(1): IRRIGATION OF ANY LAND WITH WASTE OR WATER CONTAINING WASTE GENERATED THROUGH ANY INDUSTRIAL ACTIVITY OR BY A WATERWORK

[S21 (e)]

Table 3.1.1.2 Water Conservation Measures, Best Management Practices and Conditions

NO.	CONDITIONS	BENEFIT
1.1	The Licensee shall investigate the feasibility of, and implement over a period of time the management, treatment and re-use of wastewater at collection points for other uses including but not limited to: (a) lawn irrigation; (b) small-scale gardening; (c) golf-courses, parks, (d) and municipal gardens.	Optimum use of water sources to reduce additional uptake from freshwater resources.
1.2	The Licensee shall investigate opportunities to pre-treat return flows from sewage works and implement dual systems to provide the return flows to users for irrigation purposes as far as practically possible.	Optimum use of water sources and reduction of potable use of water for lawn and sports field irrigation.
1.3	The Licensee shall establish and implement a continual process of raising awareness and educating consumers on the opportunities to re-use and recycle grey water in households and commercial environments to minimize potable water use for: (a) lawn watering; (b) car washing; and (c) Small-scale food gardens.	Optimum use of grey water through public awareness and investment in re-use systems.

3.1.1.3 DISCHARGE OF WASTE OR WATER CONTAINING WASTE INTO A WATER RESOURCE THROUGH A PIPE, CANAL, SEWER OR OTHER CONDUIT; AND DISPOSING IN ANY MANNER OF WATER WHICH CONTAINS WASTE FROM, OR WHICH HAS BEEN HEATED IN, ANY INDUSTRIAL OR POWER GENERATION PROCESS

[S21 (f) and (h)]

Table 3.1.1.3 Water Conservation Measures, Best Management Practices and Conditions

NO.	CONDITIONS	BENEFIT
1.1	The Licensee shall as far as practically possible investigate and implement measures to re-use return flows from sewage works for other uses including controlled activities, and end users dual system supply.	Optimum use of water sources to reduce additional uptake from freshwater resources.

1.2	The Licensee shall meter the outlet from the sewer outflow to quantify the volume of return flows discharged into the water resource for the purposes of the water balance audit.	Optimal accounting for water used.
1.3	The Licensee shall investigate options to re-use and minimize any potential return flows into water resources by optimizing secondary use of water for other purposes including lawn irrigation, sports facilities and pre-treatment for small scale community gardens.	Optimal use of available water to minimize impact on freshwater resources.

3.1.1.4 DISPOSING OF WASTE IN A MANNER WHICH MAY DETRIMENTALLY IMPACT ON A WATER RESOURCE

[S21 (g)]

Table 3.1.1.4 Water Conservation Measures, Best Management Practices and Conditions

NO.	CONDITIONS	BENEFIT
1.1	<p>The Licensee shall take reasonable measures to prevent the pollution of local water resources. These measures shall be guided by the developed protocol for sanitation attached as Appendix B, addressing amongst others, the following:</p> <ul style="list-style-type: none"> (a) positioning of pit latrines, away from water sources/resources to avoid contamination of groundwater; (b) developing appropriate bylaws to control the disposal of chemical and other waste. 	WC/WDM interventions can be carried out efficiently as resources are available.

3.2 Compulsory Water Use License (\$43)

In terms of section 43(1) of the Act, if it is desirable that water use in respect of one or more water resources within a specific geographic area be licensed-

(a) to achieve a fair allocation of water from a water resource in accordance with section 45-

i. which is under water stress; or

ii. when it is necessary to review prevailing water use to achieve equity in allocations;

(b) to promote beneficial use of water in the public interest;

(c) to facilitate efficient management of the water resource; or

(d) to protect water resource quality,

the responsible authority may issue a notice requiring persons to apply for licenses for one or more types of water use contemplated in section 21.

3.2.1 Water Conservation measures and conditions applicable

Rationale and Application Guide for WC/WDM Conditions: Since compulsory licensing is mainly a process aimed at facilitating the same water uses identified in section 21 (a-k), (of which should normally be licensed in terms of section 40 of the Act), *albeit* to fast track reforms and improve efficiency and equity, the same conditions identified for the section 40 water use licence applications for water conservation apply. However, the process to be followed in applying these conditions in individual water use licenses applied for in terms of section 40 and that of compulsory licensing will inevitably differ due to the circumstances under consideration in the two water use authorization processes. Section 8 of this manual; address in detail the proposed criteria to be followed when applying the water conservation and demand management conditions.

4. Agriculture Water Use

4.1 General Authorisation

Refer to sub-section 3.1 for definition and description of a general authorization.

4.1.1 Water Conservation measures and conditions applicable

Rationale and Application Guide for WC/WDM Conditions: General Authorisations are entitlement to use water and may be determined for the various water uses identified in section 21 addressing both quantity and quality of water for consumptive and non-consumptive uses. General Authorisations could entail the use of reasonably significant volumes of water, and thus require specific water conservation conditions and measures to prevent any potential water wastages and losses.

4.1.1.1 THE TAKING OF WATER FROM A WATER RESOURCE AND STORAGE OF WATER

[S21 (a) and (b)]

Table 4.1.1.1 Water Conservation Measures, Best Management Practices and Conditions

NO.	CONDITIONS	BENEFIT
1.1	(a) The GA user shall facilitate the installation, monitoring and maintenance of flow metering devices at farm level and at each point of abstraction including the prevention of vandalism and or theft.	Water use can be recorded and inefficiencies can be highlighted.
1.2	The GA user shall report on an annual basis in a format approved by the responsible authority: (a) details of crops; (b) irrigation system types; (c) water balance including accumulated inflows and outflows from abstraction points; and (d) associated areas irrigated from each water abstraction point.	Water use recorded and compared against benchmark for use and non-beneficial component of water balance from source to farm-gate assessed.

4.2 Water Use License (S40)

In terms of section 40(1), a person who is required or wishes to obtain a license to use water must apply to the relevant responsible authority for a license. The license for water use is for the water uses identified in section 21 of the Act.

4.2.1 Water Conservation measures and conditions applicable

Rationale and Application Guide for WC/WDM Conditions: van der Stoep *et al*, 2005 (WRC Report TT248/05) note that on many schemes, the individual abstractions are not measured, even though the rate of abstractions may be specified. In most of the river systems, no quantitative data on the abstractions are available. The users of the system wherein they pay for their full quota (due to the lack of metering) argues that it is a cost effective management approach, and will not encourage wastage of water by farmers since pumping water unnecessarily will increase their electricity consumption. However, van der Stoep, *et al*, 2005 (WRC report TT248/05) correctly advance the fact that, *this approach does not allow for a mechanism that can be used in times of water shortages, and there is no way of preventing a farmer at the beginning of the distribution system of taking as much as can, or proving that he took more than he should have.*

In order to achieve irrigation efficiency measured as a function of water abstraction, distribution and use from the source (water resource) to root zone as depicted on figures 1 and 2 below, metering of irrigation water is critical and should be enforced through the section 21 (a and b) water use authorizations for general authorizations, licenses (individual applications and compulsory applications).

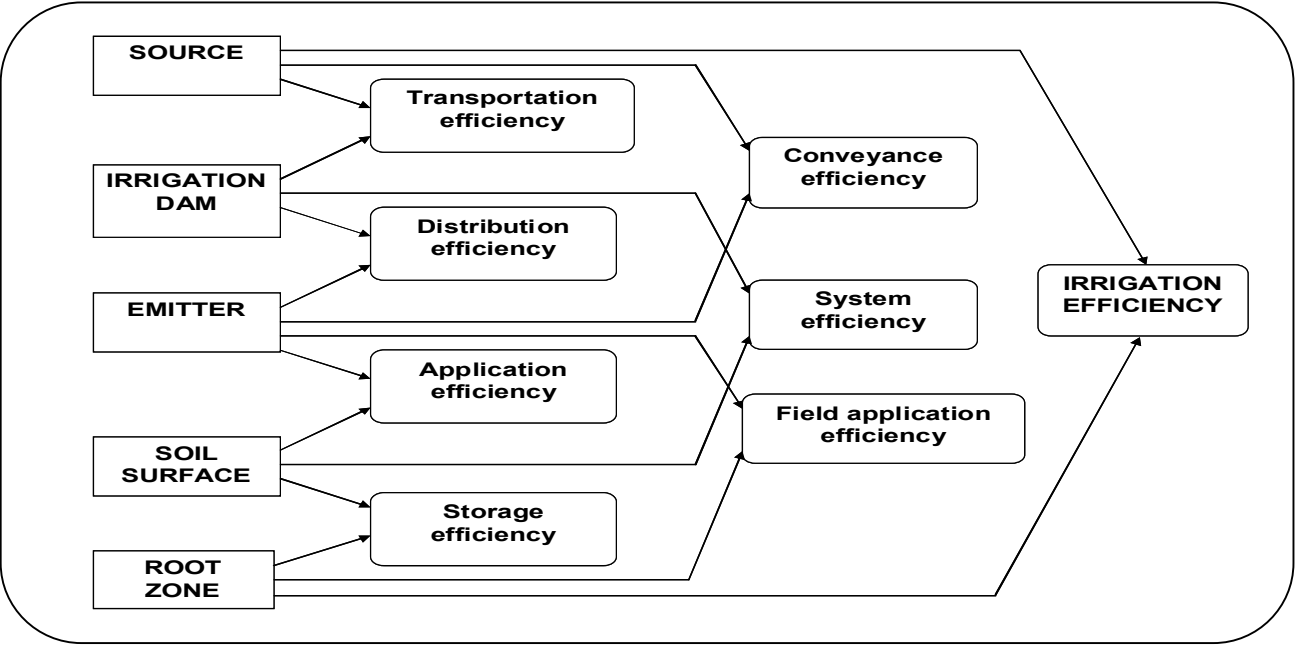


Figure 1: Irrigation Efficiency description

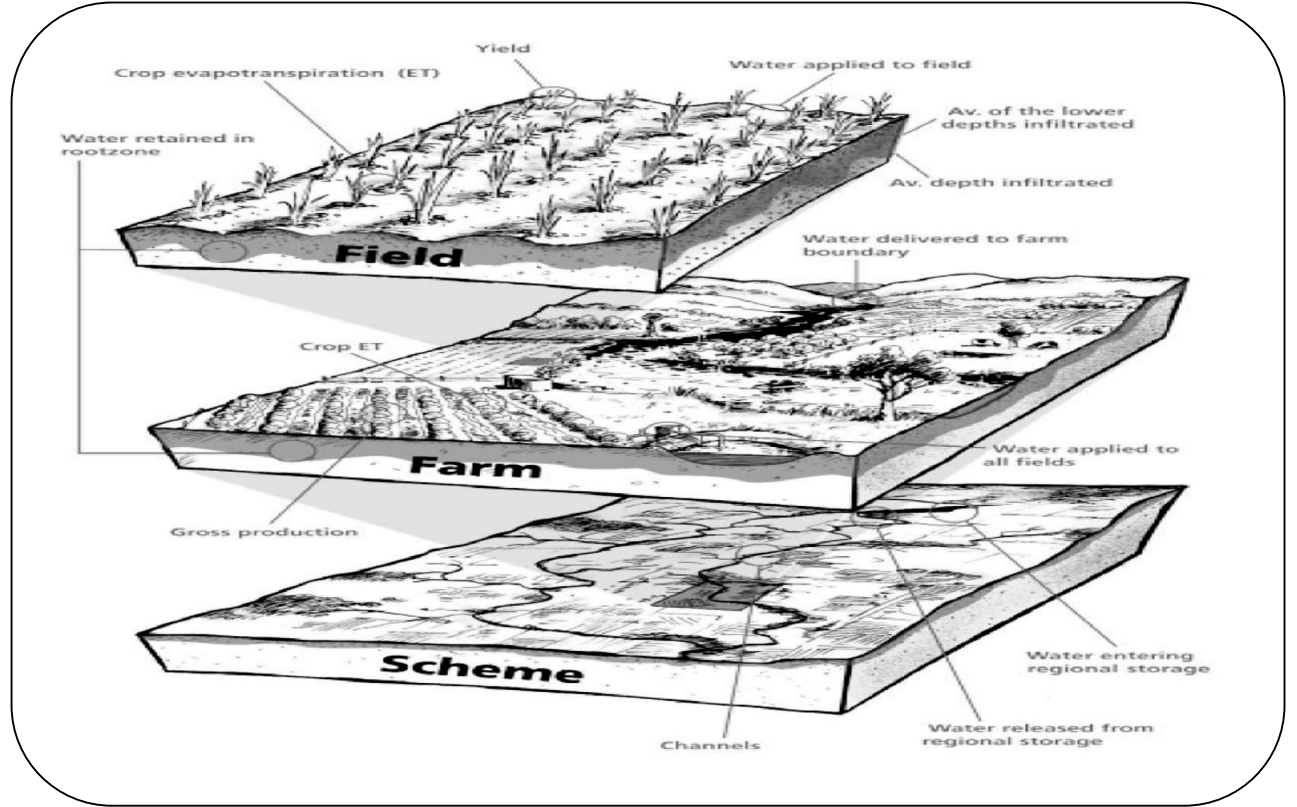


Figure 2: Different levels of irrigation water management

According to van der Stoep, et al, 2005, at most Water User Associations, there are two levels of the water supply system where measurement can be used as a tool to manage the water effectively.

1. Firstly, the main supply and distribution system (the main canal, pipeline or river in the scheme) can be monitored and controlled through measurement at critical points.
2. secondly, the individual abstractions may need to be managed in some way to ensure that fair allocation takes place, (especially in support of Water Allocation Reform and Compulsory Licensing roll-out¹) and measurement can be implemented at farm off-takes to assist in this process.

Figure 3 below depict a schematic representation of measurement as a management tool to assist a responsible authority to manage the available water from DWAF, CMA, and WUA to farm level users. The need for and implementation of water measuring devices in irrigation water use, will be guided by this management tool diagram with respect to the various roles and responsibilities regarding installation, monitoring and maintenance of irrigation water meters at scheme, farm and field level.

¹ Insertion added by Cain Chunda: Directorate Water Use Efficiency-DWAF

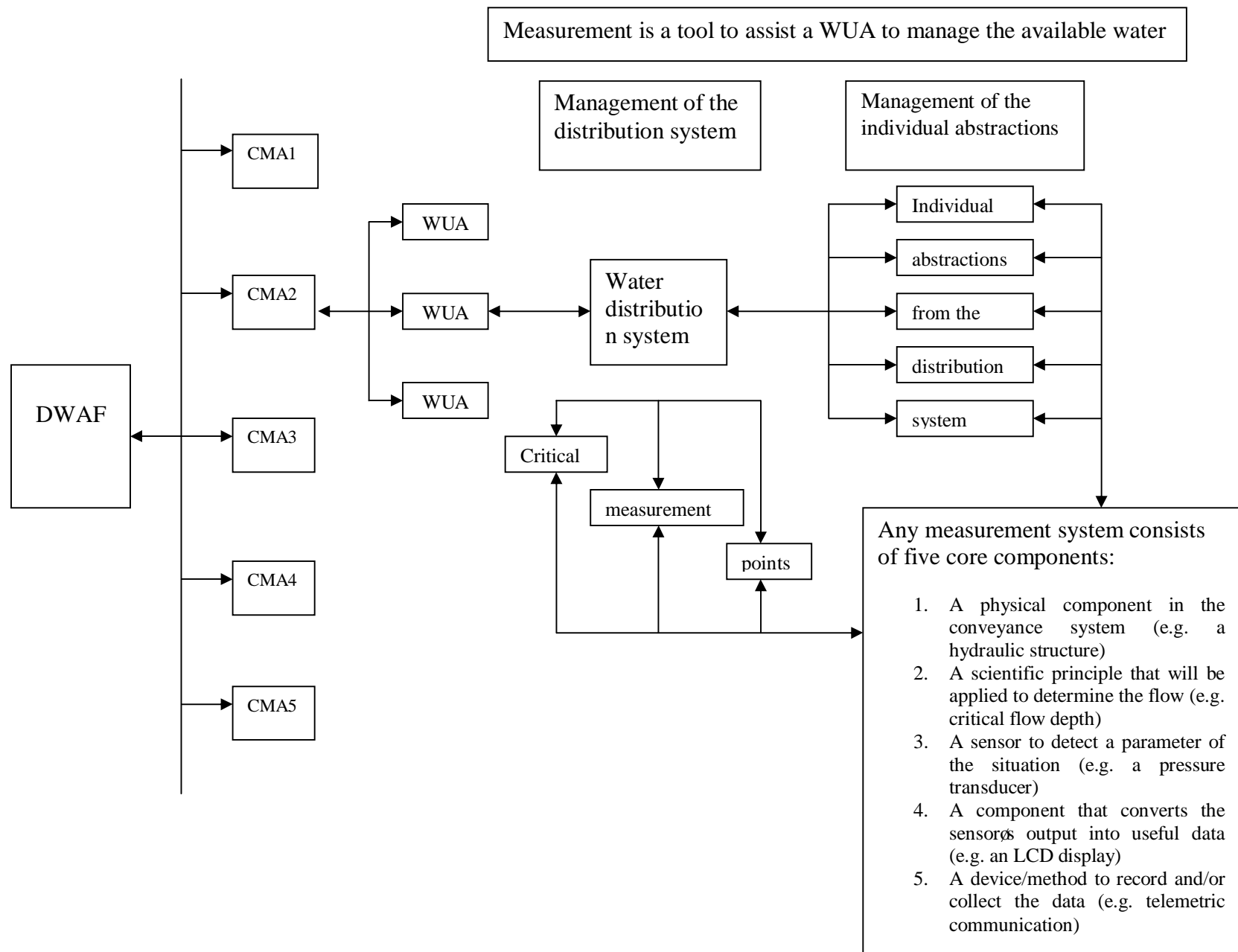


Figure 2.1 Schematic representation of measurement as a management tool

4.2.1.1 THE TAKING OF WATER FROM A WATER RESOURCE AND STORAGE OF WATER

[S21 (a) and (b)]

Table 4.2.1.1 Water Conservation Measures, Best Management Practices and Conditions

NO.	CONDITIONS	BENEFIT
1.1	The Licensee shall facilitate the installation, monitoring and maintenance of flow metering devices at farm level and at each point of abstraction as per the following levels: (b) CMA's shall install measuring devices at catchment level; (c) WUA's shall install measuring devices at scheme level; and (d) Individual farmers shall install, where required, on-farm level metering for various irrigation systems, including the modifications for the installation of the measuring device identified including the prevention of vandalism and or theft.	Water use can be recorded and compared against benchmarks so that problems or inefficiencies can be highlighted.
1.2	The Licensee shall report on an annual basis in a format approved by the responsible authority: (e) details of crops; (f) irrigation system types; (g) water balance including accumulated inflows and outflows from abstraction points; and (h) associated areas irrigated from each water abstraction point.	Water use recorded and compared against benchmark for use and non-beneficial component of water balance from source to farm-gate assessed.
1.3	The licensee shall establish and implement a continual process of raising awareness amongst workers and stakeholders (in case of water user associations) for the need for WC/WDM. Pertinent training topics should include but not be limited to the following: (a) irrigation system and general agricultural business management skills; (b) irrigation scheduling; (c) irrigation system operation and maintenance; (d) evaluation of irrigation system hardware; (e) irrigation system design standards and "Consumer Bill of Rights"; (f) crop production systems; (g) water balance audits; (h) the scarcity of water and the need to preserve it; and (i) local knowledge of the water resource situation and environmental considerations.	All water users, workers and institutions are capacitated in WC/WDM measures resulting in an overall efficient and effective water use by all.
1.4	The Licensee shall monitor using best management practices and scientific methods, including effective water account principles and water balance, the extent and levels of: (a) storage losses from all off-channel storage facilities; (b) conveyance losses from all conveyance systems such as canals and pipelines; (c) on-farm distribution losses; and (d) field losses, which shall be reported to the responsible authority using the annual water audit reports and/or water management plans in case of water user associations.	Accounting for all water use and identifying water loss components for intervention and revitalization of irrigation systems.
1.5	Subject to the outcomes of the water auditing reports on 1.4 above, the Licensee shall develop and submit to the responsible authority, a detailed intervention plan to reduce and prevent excess water losses over and above acceptable standard benchmarks and best practices.	Water conservation and water demand management programmes implemented to prevent water losses and non-beneficial use of water.
1.6	The Licensee shall appoint and make use of suitable qualified irrigation system designers for the design and installation of irrigation	Reduce excessive water losses due to poor irrigation systems

	systems, which shall be registered with the South African Irrigation Institute (SABI) and or the Engineering Council of South Africa (ECSA).	design and installation.
1.7	The Licensee shall develop and implement a programme of irrigation system infrastructure rehabilitation, operation and maintenance to minimize the extent of inefficient and non-beneficial use of water due to excess irrigation system losses.	Reduce excessive water losses and non-beneficial use due to old leaking and wasteful infrastructure.
1.8	As and whenever required by the responsible authority, the Licensee shall facilitate the installation, monitoring and maintenance of apparatus approved by the responsible authority to record daily rainfall associated with each irrigation system, in collaboration with the WUA and or CMA.	Water use can be recorded and compared to benchmarks to reduce inefficient use problems.
1.9	As and when so determined by the responsible authority, the Licensee shall facilitate the installation of observation wells for each irrigation system to monitor the depth of any water table development within 1m of the soil surface, particularly in areas where there is groundwater potential.	Rising water tables can be detected so that appropriate mitigating actions can be initiated to prevent salinity and loss of productive potential.

4.2.1.2 DISCHARGE OF WASTE OR WATER CONTAINING WASTE INTO A WATER RESOURCE THROUGH A PIPE, CANAL, SEWER OR OTHER CONDUIT

[S21 (f)]

Table 4.2.1.2 Water Conservation Measures, Best Management Practices and Conditions

NO.	CONDITIONS	BENEFIT
1.1	The Licensee shall as far as practically possible, within scientific and best practices implement measures to capture and reduce the quantity of contaminated return flows or tail water into the water resources.	Prevent contamination and pollution of water resource quality and minimize excessive use of water for leaching purposes.
1.2	The Licensee shall develop with the assistance of a suitable qualified professional recommended and or approved by SABI (the SA irrigation Institute) a practical programme for leaching excess salts in the soil to prevent excessive and non-beneficial use of water in the field.	Reduce non-beneficial use of water for excess leaching of soil salts.
1.3	The Licensee shall develop and implement a programme for checking and maintaining the irrigation system's nozzles, pumps and other materials that may lead to clogging and wasteful use of water.	Prevent non-beneficial and inefficient use of water in the field.

4.3 Compulsory Water Use License (S43)

Refer to section 3.4 for definition and description of the compulsory licensing process.

4.3.1 Water Conservation measures and conditions applicable

Rationale and Application Guide for WC/WDM Conditions: Since compulsory licensing is mainly a process aimed at facilitating the same water uses identified in section 21 (a-k), (of which should normally be licensed in terms of section 40 of the Act), *albeit* to fast track reforms and improve efficiency and equity, the same conditions identified for the section 40 water use licence applications for water conservation apply. However, the process to be followed in applying these conditions in individual water use licenses applied for in terms of section 40 and that of compulsory licensing will inevitably differ due to the circumstances under consideration in the two water use authorization processes. Section 8 of this manual; address in detail the proposed criteria to be followed when applying the water conservation and demand management conditions.

5. Industrial Water Use

5.1 Water Use License (\$40)

In terms of section 40(1), a person who is required or wishes to obtain a license to use water must apply to the relevant responsible authority for a license. The license for water use is for the water uses identified in section 21 of the Act.

5.1.1 Water Conservation measures and conditions applicable

Rationale and Application Guide for WC/WDM Conditions: Water use licenses are entitlements to use water in terms of the various water uses identified in section 21 addressing both quantity and quality of water for consumptive and non-consumptive uses. Water use licenses authorize the use of significant volumes of water, and thus require specific water conservation conditions and measures to prevent any potential water losses, inefficient use and general water wastages by the user and or the licensee.

In order to prevent, such water losses and wastages, including the inefficient use of water, the following water conservation measures, best management practices and conditions are identified for the various water uses identified in the Act.

5.1.1.1 THE TAKING OF WATER FROM A WATER RESOURCE AND STORAGE OF WATER

[S21 (a) and (b)]

Table 5.1.1.1 Water Conservation Measures, Best Management Practices and Conditions

NO.	CONDITIONS	BENEFIT
1.1	The Licensee shall install and monitor appropriate (as agreed with the responsible authority) water measuring devices, to measure the amount of water abstracted, received and/or consumed, as applicable to the technical configuration of infrastructure, including but not limited to: (a) resource abstraction points; (b) bulk distribution networks; (c) process flow; (d) storage facilities; (e) points of use; and (f) return flows or discharge.	Facilitating accounting for all water consumed by the licensee to support water resource planning and demand management initiatives.
1.2	The Licensee shall ensure that all measuring devices are properly maintained and in good working order, which shall include a programme of checking, calibration and/or renewal of measuring devices so that a reasonable accurate record of water is reflected in the water audit.	Reduce levels of apparent losses and non-revenue demand.
1.3	The Licensee shall, subject to authorization by the responsible authority, consider, investigate and use conjunctively surface and groundwater for production purposes.	Depletion of surface water is avoided.
1.4	The Licensee shall consider the principles of Integrated Resource Planning (IRP) in development of all new infrastructure, with water, waste and energy demand management being central considerations.	Integration with the needs of other sectors results in cost savings through co-ordination.
1.5	The Licensee shall optimize water use and design new infrastructure to ensure optimal layout of buildings and equipment in "short-lines" to support reduced water consumption.	Efficient water consumption through appropriate design of infrastructure.
1.6	The Licensee shall limit the use of water in favour of air and dry	Optimal use of water in cooling

	cooling systems as far as practically possible in the production and generation of products within operations.	systems reducing water consumption.
1.7	The Licensee shall continuously investigate and improve plant efficiency to, as far as practicable, reduce water use by, amongst others: (a) modifying rinse and wash water processes; (b) using high pressure low volume cleaning systems; (c) installing water efficient equipment and devices; (d) optimizing plant layout to reduce spillage; (e) implementing cleaner technologies; (f) using drip collection trays amongst others to prevent minor spills; (g) minimizing the use of evaporative cooling systems, in preference to non-evaporative systems; (h) using counter-current rather than co-current flow; (i) implementing a water management program that promote periodic replacement of cooling water with a quantity of new low salinity intake water to reduce water consumption and create opportunities for re-use and recycling; (j) applying anti-fouling agents to prevent algal growth and mould in the reticulation system to optimize process flow and improve water use efficiency.	Optimal use of water in cooling systems.
1.8	The Licensee shall introduce a local supply distribution system within the operation to reduce water losses by preventing mixing of streams.	Optimization of water use through prevention of mixing systems.
1.9	The Licensee must integrate water conservation and water demand management activities into the Water Management Plan and/or Environmental Management System.	The EMS is WC/WDM compliant and recommends efficient water use.
1.10	The Licensee shall include in the WMP and/or EMS identified in condition 1.9 above, clearly defined targets and benchmarks for WC/WDM to be achieved at all process stages within the plant.	Progress in WC/WDM implementation is measured through targets and benchmarks.
1.11	The Licensee shall report on progress made in the achievement of set benchmarks and targets on an ongoing basis to the responsible authority.	Monitoring and evaluation on the achievement of targets and benchmarks guide the implementation of WC/WDM.
1.12	The Licensee shall make use of institutions (i.e. catchment forum, waste minimization clubs, etc.) at catchment level to share information related to but not limited to: (a) best management practices; (b) benchmarks and targets; (c) technologies/methods for optimizing water use; and (d) water recycling and re-use, amongst others.	A culture of WC/WDM is promoted through sharing of information.
1.13	The Licensee shall develop and include in the annual audit a schedule of cooling system installations, sub-divided into evaporative and non-evaporative systems, and data on their respective use.	Information is available on the use of water efficient cooling systems.
1.14	The Licensee shall include in the annual audit a schedule of processes and systems that use water and data on their respective water uses.	Information is available for monitoring water efficiency of water systems.

5.1.1.2 ENGAGING IN A CONTROLLED ACTIVITY, IDENTIFIED AS SUCH IN SECTION 37(1): IRRIGATION OF ANY LAND WITH WASTE OR WATER CONTAINING WASTE GENERATED THROUGH ANY INDUSTRIAL ACTIVITY OR BY A WATERWORK

[S21 (e)]

Table 5.1.1.2 Water Conservation Measures, Best Management Practices and Conditions

NO.	CONDITIONS	BENEFIT
1.1	The Licensee shall research, identify and implement best	Reduce and minimize impacts on

	management practices for use including the optimization of recycling, re-use and prevention of discharge of process water.	ground water table and prevent decant.
1.2	The licensee shall facilitate pretreatment of water used for irrigation purposes and optimize blending with raw water for pollution remediation.	Limit excess use of raw water for irrigation and optimize water use.

5.1.1.3 DISCHARGE OF WASTE OR WATER CONTAINING WASTE INTO A WATER RESOURCE THROUGH A PIPE, CANAL, SEWER OR OTHER CONDUIT; AND DISPOSING IN ANY MANNER OF WATER WHICH CONTAINS WASTE FROM, OR WHICH HAS BEEN HEATED IN, ANY INDUSTRIAL OR POWER GENERATION PROCESS

[S21 (f) and (h)]

Table 5.1.1.3 Water Conservation Measures, Best Management Practices and Conditions

NO.	CONDITIONS	BENEFIT
1.1	The Licensee must integrate water conservation and water demand management activities into the Water Management Plan and/or Environmental Management System.	The EMS is WC/WDM compliant and recommends efficient water use.
1.2	The Licensee shall make available to the responsible authority either through the water management plan or whenever requested, information that will assess the water use efficiency of its processes, in accordance with available benchmarks for the type of industry.	Transparency in the implementation of WC/WDM measures in the WMP.
1.3	The Licensee shall continuously assess and, as far as possible, adopt new water saving technologies that include, but are not limited to: (a) recycling and use of low quality water for processes where potable quality is not required; (b) minimizing dirty, or polluted run-off from operations by minimizing contaminated areas within the plant; (c) using insulation, shading and natural ventilation to cool offices; (d) using efficient irrigation technologies for watering lawns and gardens; (e) using blended cooling water instead of raw water; and (f) separation of "clean" and "dirty" water.	Water use is minimized through appropriate technology and optimal use of water is achieved.
1.4	Where water seepage can be avoided, the Licensee shall install seepage collection facilities for recycling and treatment.	Seepage water is re-used.
1.5	The Licensee shall control and operate flow rates at the minimum required to reduce water wastage and losses.	Flow rates are optimized and wastage s minimized.
1.6	The Licensee shall monitor the quality of return flows and investigate the feasibility of, and implement over a period of time the management, treatment and re-use of wastewater at collection points for other uses.	The recipient streams are protected against pollution, making water available for downstream users.
1.7	The Licensee shall promote the use of product handling vessels and pipe networks that provide self sterilizing effects.	Use of water is minimized in industrial processes.
1.8	The Licensee shall continuously maintain and keep the pool size on tailings facilities at the minimum possible to reduce evaporative losses.	Optimal sizing of tailings reduces excessive losses and avail water for re-use.
1.9	The licensee shall minimize evaporative losses from cooling systems and storage and/or return flow dams.	Reduce evaporative losses for beneficial use.
1.10	The Licensee shall minimize the use of flow-through systems in preference to recirculation, recycling and re-use systems.	Good practices minimize water use in industrial processes.
1.11	The Licensee shall use the most appropriate effluent treatment system for specific effluent quantity and quality, including the separation of waste water streams where separate treatment is beneficial as well as blending where it fosters beneficial reactions and efficient use of water.	Good practices in the treatment of effluent reduce water use.

1.12	The Licensee shall implement water reclamation strategies based on the fit-for-use criteria for process and operations water.	Use of appropriate processes and operations.
------	---	--

5.2 Compulsory Water Use License (S43)

Refer to section 3.4 for the definition and description of the compulsory licensing process.

5.2.1 Water Conservation measures and conditions applicable

Rationale and Application Guide for WC/WDM Conditions: Since compulsory licensing is mainly a process aimed at facilitating the same water uses identified in section 21 (a-k), (of which should normally be licensed in terms of section 40 of the Act), *albeit* to fast track reforms and improve efficiency and equity, the same conditions identified for the section 40 water use licence applications for water conservation apply. However, the process to be followed in applying these conditions in individual water use licenses applied for in terms of section 40 and that of compulsory licensing will inevitably differ due to the circumstances under consideration in the two water use authorization processes. Section 8 of this manual; address in detail the proposed criteria to be followed when applying the water conservation and demand management conditions.

6. Mining Water Use

6.1 General Authorisation

Refer to section 3.2 for the definition and or description of the general authorization process.

6.1.1 Water Conservation measures and conditions applicable

Rationale and Application Guide for WC/WDM Conditions: General Authorisations are entitlement to use water and may be determined for the various water uses identified in section 21 addressing both quantity and quality of water for consumptive and non-consumptive uses. General Authorisations could entail the use of reasonably significant volumes of water, and thus require specific water conservation conditions and measures to prevent any potential water wastages and losses.

6.1.1.1 THE TAKING OF WATER FROM A WATER RESOURCE AND STORAGE OF WATER

[S21 (a) and (b)]

Table 6.1.1.1 Water Conservation Measures, Best Management Practices and Conditions

NO.	CONDITIONS	BENEFIT
1.1	The GA user shall meter the volume of water abstracted to determine the amount of water abstracted and the amount of water consumed.	Enable water balance accounting for annual water use.
1.2	Where water is stored off-channel in a dam or reservoir, the user shall ensure that all conveyance or distribution canals, pipe-lines are properly constructed, operated and maintained in good working order to prevent water losses through physical leakages, bursts, and reservoir over-flows.	Minimize water losses through physical infrastructure losses and bursts.
1.3	Water storage facilities such as reservoirs and towers, shall be fitted with automatic shut valves to detect and prevent overflows when filled with water.	Minimize inefficient and wasteful use of water through overflow spillages.
1.4	Water meters to measure both the inflow and outflow from the storage reservoir, dam or water tower shall be installed and maintained in good working order.	Enable annual water audit to quantify total volume of GA uses.

6.2 Water Use License (\$40)

In terms of section 40(1), a person who is required or wishes to obtain a license to use water must apply to the relevant responsible authority for a license. The license for water use is for the water uses identified in section 21 of the Act.

6.2.1 Water Conservation measures and conditions applicable

Rationale and Application Guide for WC/WDM Conditions: Water use licenses are entitlements to use water in terms of the various water uses identified in section 21 addressing both quantity and quality of water for consumptive and non-consumptive uses. Water use licenses authorize the use of significant volumes of water, and thus require specific water conservation conditions and measures to prevent any potential water losses, inefficient use and general water wastages by the user and or the licensee.

In order to prevent, such water losses and wastages, including the inefficient use of water, the following water conservation measures, best management practices and conditions are identified for the various water uses identified in the Act.

6.2.1.1 THE TAKING OF WATER FROM A WATER RESOURCE AND STORAGE OF WATER

[S21 (a) and (b)]

Table 6.2.1.1 Water Conservation Measures, Best Management Practices and Conditions

NO.	CONDITIONS	BENEFIT
1.1	The Licensee shall install and monitor appropriate (as agreed with the responsible authority) water measuring devices, to measure the amount of water abstracted, received and/or consumed, as applicable to the technical configuration of infrastructure, including but not limited to: (a) resource abstraction points; (b) bulk distribution networks; (c) process flow; (d) storage facilities; (e) points of use; and (f) return flows or discharge.	Facilitating accounting for all water consumed by the licensee to support water resource planning and demand management initiatives.
1.2	The Licensee shall ensure that all measuring devices are properly maintained and in good working order, which shall include a programme of checking, calibration and/or renewal of measuring devices so that a reasonable accurate record of water is reflected in the water audit.	Reduce levels of apparent losses and non-revenue demand.
1.3	The Licensee shall, subject to authorization by the responsible authority, consider, investigate and use conjunctively surface and groundwater for production purposes.	Depletion of surface water is avoided.
1.4	The Licensee shall consider the principles of Integrated Resource Planning (IRP) in development of all new infrastructure, with water, waste and energy demand management being central considerations.	Integration with the needs of other sectors results in cost savings through co-ordination.
1.5	The Licensee shall optimize water use and design new infrastructure to ensure optimal layout of buildings and equipment to support reduced water consumption.	Efficient water consumption through appropriate design of infrastructure.
1.6	In line with the Integrated Least Cost Planning Principles, the Licensee shall consider in its water planning approaches, the potential use of underground fissure water for mining operations in preference of raw water, which shall then be licensed by the responsible authority.	Optimal use of water for mining purposes.

1.7	The Licensee shall develop and submit to the responsible authority an annual water balance, which shall, amongst, others, provide a detailed accounting of all water sources used, including the taking and use of ground water, either for consumptive or non-consumptive use, of such water.	Optimise use of water and account for all water resource used.
1.8	The Licensee shall make use of institutions (i.e. catchment forum, waste minimization clubs, etc.) at catchment level to share information related to but not limited to: (a) best management practices; (b) benchmarks ad targets; (c) technologies/methods for optimizing water use; and (d) water recycling and re-se, amongst others.	A culture of WC/WDM is promoted through sharing of information.

6.2.1.2 ENGAGING IN A CONTROLLED ACTIVITY, IDENTIFIED AS SUCH IN SECTION 37(1): IRRIGATION OF ANY LAND WITH WASTE OR WATER CONTAINING WASTE GENERATED THROUGH ANY INDUSTRIAL ACTIVITY OR BY A WATERWORK

[S21 (e)]

Table 6.2.1.2 Water Conservation Measures, Best Management Practices and Conditions

NO.	CONDITIONS	BENEFIT
1.1	The Licensee shall research, identify and implement best management practices for use including the optimization of recycling, re-use and prevention of discharge of process water.	Reduce and minimize impacts on ground water table and prevent decant.
1.2	The licensee shall facilitate pretreatment of water used for irrigation purposes and optimize blending with raw water for pollution remediation.	Limit excess use of raw water for irrigation and optimize water use.

6.2.1.3 DISCHARGE OF WASTE OR WATER CONTAINING WASTE INTO A WATER RESOURCE THROUGH A PIPE, CANAL, SEWER OR OTHER CONDUIT; AND DISPOSING IN ANY MANNER OF WATER WHICH CONTAINS WASTE FROM, OR WHICH HAS BEEN HEATED IN, ANY INDUSTRIAL OR POWER GENERATION PROCESS

[S21 (f) and (h)]

Table 6.2.1.3 Water Conservation Measures, Best Management Practices and Conditions

NO.	CONDITIONS	BENEFIT
1.1	Unless, otherwise required by the responsible authority, the Licensee shall strive to minimize discharges into any natural water resource by promoting and implementing re-use of water, including underground and fissure water for other beneficial uses in the public interest within the mining property for amongst others, irrigation and domestic use.	Recipient streams are protected from potential pollution.
1.2	The Licensee shall make use of institutions (i.e. catchment forum, waste minimization clubs, etc.) at catchment level to share information related to but not limited to: (a) best management practices; (b) benchmarks ad targets; (c) technologies/methods for optimizing water use; and (d) water recycling and re-se, amongst others.	A culture of WC/WDM is promoted through sharing of information.

6.2.1.4 DISPOSING OF WASTE IN A MANNER WHICH MAY DETRIMENTALLY IMPACT ON A WATER RESOURCE

[S21 (g)]

Table 6.2.1.4 Water Conservation Measures, Best Management Practices and Conditions

NO.	CONDITIONS	BENEFIT
1.1	The Licensee shall design water storage facilities including evaporation ponds, return flow dams, discard dams and slurry dams or ponds to minimize water losses through seepage and evaporation.	Efficient design of recipient storage facilities minimized water losses.
1.2	The Licensee shall make use of institutions (i.e. catchment forum, waste minimization clubs, etc.) at catchment level to share information related to but not limited to: (a) best management practices; (b) benchmarks and targets; (c) technologies/methods for optimizing water use; and (d) water recycling and re-use, amongst others.	A culture of WC/WDM is promoted through sharing of information.

6.2.1.5 REMOVING, DISCHARGING OR DISPOSING OF WATER FOUND UNDERGROUND IF IT IS NECESSARY FOR THE EFFICIENT CONTINUATION OF AN ACTIVITY OR FOR THE SAFETY OF PEOPLE

[S21 (i)]

Table 6.2.1.5 Water Conservation Measures, Best Management Practices and Conditions

NO.	CONDITIONS	BENEFIT
1.1	The Licensee shall meter the amount of water pumped underground to quantify the volume of dewatering or discharges from underground water resource.	Optimal accounting for water used.
1.2	The Licensee shall incorporate the quantity of water discharged from under ground resource into the total water balance audit of the Licensee's overall water use.	Optimal accounting of water used.
1.3	The Licensee shall investigate options to re-use and minimize any discharges of water found under ground to minimize the raw water abstractions from freshwater systems. Such water may be used for amongst others secondary uses including dust suppression, lawn irrigation, sports facilities and pre-treatment for small scale community gardens.	Optimal use of available water to minimize impact on freshwater resources.

6.3 Compulsory Water Use License (S43)

Refer to section 3.4 on the description of the compulsory licensing process.

6.3.1 Water Conservation measures and conditions applicable

Rationale and Application Guide for WC/WDM Conditions: Since compulsory licensing is mainly a process aimed at facilitating the same water uses identified in section 21 (a-k), (of which should normally be licensed in terms of section 40 of the Act), *albeit* to fast track reforms and improve efficiency and equity, the same conditions identified for the section 40 water use licence applications for water conservation apply. However, the process to be followed in applying these conditions in individual water use licenses applied for in terms of section 40 and that of compulsory licensing will inevitably differ due to the circumstances under consideration in the two water use authorization processes. Section 8 of this manual; address in detail the proposed criteria to be followed when applying the water conservation and demand management conditions.

7. Power Generation Water Use

7.1 Water Use License (\$40)

In terms of section 40(1), a person who is required or wishes to obtain a license to use water must apply to the relevant responsible authority for a license. The license for water use is for the water uses identified in section 21 of the Act.

7.1.1 Water Conservation measures and conditions applicable

Rationale and Application Guide for WC/WDM Conditions: Water use licenses are entitlements to use water in terms of the various water uses identified in section 21 addressing both quantity and quality of water for consumptive and non-consumptive uses. Water use licenses authorize the use of significant volumes of water, and thus require specific water conservation conditions and measures to prevent any potential water losses, inefficient use and general water wastages by the user and or the licensee.

In order to prevent, such water losses and wastages, including the inefficient use of water, the following water conservation measures, best management practices and conditions are identified for the various water uses identified in the Act.

7.1.1.1 THE TAKING OF WATER FROM A WATER RESOURCE AND STORAGE OF WATER

[S21 (a) and (b)]

Table 7.1.1.1 Water Conservation Measures, Best Management Practices and Conditions

NO.	CONDITIONS	BENEFIT
1.1	The Licensee shall install and monitor appropriate (as agreed with the responsible authority) water measuring devices, to measure the amount of water abstracted, received and/or consumed, as applicable to the technical configuration of infrastructure, including but not limited to: (a) resource abstraction points; (g) bulk distribution networks; (h) process flow; (i) storage facilities; (j) points of use; and (k) return flows or discharge.	Facilitating accounting for all water consumed by the licensee to support water resource planning and demand management initiatives.
1.2	The Licensee shall ensure that all measuring devices are properly maintained and in good working order, which shall include a programme of checking, calibration and/or renewal of measuring devices so that a reasonable accurate record of water is reflected in the water audit.	Reduce levels of apparent losses and non-revenue demand.
1.3	The Licensee shall implement a water management program that promotes periodic replacement of cooling water with a quantity of new, low salinity intake water to reduce water consumption and create opportunities for re-use and recycling.	Water use efficiency is attained through replacement of cooling water and recycling.
1.4	The Licensee shall promote the use of counter-current rather than co-current flow operations where it improves water usage.	Water saving through good practice.
1.5	The Licensee shall strive to achieve a water use efficiency benchmark of 1.9litres/kwh energy generated for wet cooled stations.	Improved efficiency achieved.

7.1.1.2 ENGAGING IN A CONTROLLED ACTIVITY, IDENTIFIED AS SUCH IN SECTION 37(1): IRRIGATION OF ANY LAND WITH WASTE OR WATER CONTAINING WASTE GENERATED THROUGH ANY INDUSTRIAL ACTIVITY OR BY A WATERWORK

[S21 (e)]

Table 7.1.1.2 Water Conservation Measures, Best Management Practices and Conditions

NO.	CONDITIONS	BENEFIT
1.1	The Licensee shall research, identify and implement best management practices for use including the optimization of recycling, re-use and prevention of discharge of process water.	Reduce and minimize impacts on ground water table and prevent decant.
1.2	The licensee shall facilitate pretreatment of water used for irrigation purposes and optimize blending with raw water for pollution remediation.	Limit excess use of raw water for irrigation and optimize water use.

7.1.1.3 DISCHARGE OF WASTE OR WATER CONTAINING WASTE INTO A WATER RESOURCE THROUGH A PIPE, CANAL, SEWER OR OTHER CONDUIT; AND DISPOSING IN ANY MANNER OF WATER WHICH CONTAINS WASTE FROM, OR WHICH HAS BEEN HEATED IN, ANY INDUSTRIAL OR POWER GENERATION PROCESS

[S21 (f) and (h)]

Table 7.1.1.3 Water Conservation Measures, Best Management Practices and Conditions

NO.	CONDITIONS	BENEFIT
1.1	The Licensee shall use the most appropriate effluent treatment system for specific effluent quality, including the separation of waste water streams where separate treatment is beneficial as well as blending where it fosters beneficial reactions and efficient se of water.	Optimal effluent treatment techniques in efficient water use.
1.2	The Licensee shall install and monitor appropriate (as agreed with the responsible authority) water measuring devices, to measure the amount of water discharged, as applicable to the technical configuration of infrastructure, including but not limited to: (a) process flow; (c) storage facilities; (d) points of use; and (e) return flows or discharge.	Facilitating accounting for all water consumed by the licensee to support water resource planning and demand management initiatives.

7.1.1.4 DISPOSING OF WASTE IN A MANNER WHICH MAY DETRIMENTALLY IMPACT ON A WATER RESOURCE

[S21 (g)]

Table 7.1.1.4 Water Conservation Measures, Best Management Practices and Conditions

NO.	CONDITIONS	BENEFIT
1.1	The Licensee shall use the most appropriate effluent treatment system for specific effluent quality, including the separation of waste water streams where separate treatment is beneficial as well as blending where it fosters beneficial reactions and efficient se of water.	Optimal effluent treatment techniques in efficient water use.

7.2 Compulsory Water Use License (\$43)

Refer to section 3.4 for the description and definition of the compulsory licensing process.

7.2.1 Water Conservation measures and conditions applicable

Rationale and Application Guide for WC/WDM Conditions: Since compulsory licensing is mainly a process aimed at facilitating the same water uses identified in section 21 (a-k), (of which should normally be licensed in terms of section 40 of the Act), *albeit* to fast track reforms and improve efficiency and equity, the same conditions identified for the section 40 water use license applications for water conservation apply. However, the process to be followed in applying these conditions in individual water use licenses applied for in terms of section 40 and that of compulsory licensing will inevitably differ due to the circumstances under consideration in the two water use authorization processes. Section 8 of this manual; address in detail the proposed criteria to be followed when applying the water conservation and demand management conditions.

8. Criteria for Application of the WC/WDM Conditions

Table 8.1 Water Use Sector Application of WC/WDM Conditions

WATER USE TYPE	SCHEDULE 1	GENERAL AUTHORISATIONS (\$39)	LICENCE (\$40)	COMPULSORY LICENCE (\$43)
HDI water users (including micro & small enterprises, and emerging farmers)	To comply with best management practices identified on Table 3.1.1 in section 3.	To comply with GA WC/WDM conditions for monitoring of water use and annual reporting only.	To comply with at least 50% of all WC/WDM conditions identified in the first five (5) years of issue of water use license.	To comply with all WC/WDM conditions identified within five years of issue of water use license
Low water intensity industrial users²	Not applicable	Not applicable	To comply with a least 50% of all WC/WDM conditions identified within three (3) years of issue of license	To comply with all WC/WDM conditions identified within three (3) years of issue of water use license
Medium water intensity industrial users³	Not applicable	Not applicable	To comply with at least 75% of all WC/WDM conditions identified in the first five years of issue of license	To comply with all WC/WDM conditions applicable within 3 years from the date of issue of water use license
High water intensity industrial users⁴	Not applicable	Not applicable	To comply with all (100%) WC/WDM conditions identified in the first five (5) years of issue of license.	To comply with all WC/WDM conditions applicable within 3 years from the date of issue of water use license

² Refer to definitions table.

³ Refer to definitions table.

Non-HDI and large business including agriculture water use and forestry sector.	Not applicable	Not applicable	To comply with all (100%) WC/WDM conditions identified in the first five years of issue of license.	To comply with all WC/WDM conditions applicable within 3 years from the date of issue of water use license
--	----------------	----------------	---	--

9. Conclusion

The formulation of the WC/WDM conditions to be included in the Water Use Authorization processes has been motivated by the recognized need to ensure that a culture of WC/WDM is instilled at all levels of water use in South Africa. The successful implementation of these conditions depend on the commitment of all stakeholders, from the institutions in charge of water resources management and the provision of water resources to the users themselves, be they significant water users or not. Each drop saved through responsible use is a contribution to the sustainable management of the country's scarce water resources.

The natural resistance to new concepts, given our history of supply side measures to respond to the country's water needs has been overcome by the recognition that we face a crisis calling for appropriate measures. All water authorities, from the political leadership, planners to those in charge of providing water services, now call for a widespread adoption of WC/WDM as a survival strategy. These conditions are a response to this call which will be supported by further initiatives such as the promulgation of WC/WDM regulations that will be formulated in the near future.

WC/WDM is a management instrument in achieving Integrated Water Resources Management through as it ensures that a fair balance is reached between Economic Efficiency, Environmental Sustainability and Social Equity. These three corners are equally competing in our context and each drop saved through WC/WDM will not only contribute to achieving this balance, but will also result in a greater good to society as a whole. The present WC/WDM conditions are therefore a call for an affordable contribution from all water users to hasten the asymptotical achievement of this balance. It is therefore expected that users from all sectors will respond to this call with generosity by embracing these conditions with a sense of a common responsibility and personal commitment to South Africa socio economic development, Delaying the need for future infrastructure which is likely, sooner or later, to result in more imports of water is within our reach.

These WC/WDM conditions offer an opportunity for all to demonstrate that we are responsible citizens, let us grab it. Our children are watching us. Lets make them proud of us, citizens of today, responsible for their tomorrow. Our response will mold their own response to their future challenges.

⁴ Refer to definitions table.

10. References

Department of Water Affairs and Forestry, 2004. National Water Conservation and Water Demand Management Strategy.

Department of Water Affairs and Forestry, 2004. Water Conservation and Water Demand Management Strategy for the Agriculture Sector.

Department of Water Affairs and Forestry, 2004. Water Conservation and Water Demand Management Strategy for the Industry, Mining and Power Generation Sectors.

Department of Water Affairs and Forestry, 2004. Water Conservation and Water Demand Management Strategy for the Water Services Sector.

Hazelton, D. and Buckle, H. 2005. Building Awareness and Overcoming Obstacles to Water Demand Management Guideline, Number 6: Municipal Water Supply Agencies.

Lecler, N.L. 2005. Standards and Guidelines for Improved Efficiency of Irrigation Water Use from dam wall release to root zone application: *Deliverable 3: Interim Report on Interaction with stakeholders to document support for draft terminology and variables or factors*. Unpublished WRC Report for Project No K5/1482/4.

Reinders, F.B. et al. 2005. *Sub-Surface Drip Irrigation: Factors Affecting the Efficiency and Maintenance*. WRC Report No. 1189/1/05.

REPUBLIC OF SOUTH AFRICA, 1996, *Constitution of the Republic of South Africa, Act 108 of 1996*. Government Gazette, Vol. 378, No 17678, 18 December 1996.

REPUBLIC OF SOUTH AFRICA, 1997, *Water Services Act, Act 108 of 1997*. Government Gazette, 1997.

REPUBLIC OF SOUTH AFRICA, 1998, *National Water Act, Act 36 of 1998*. Government Gazette, Vol. 398, No 19182, 26 August 1998.

Reid, P. 2005. Building Awareness and Overcoming Obstacles to Water Demand Management Guideline, Number 4: Subsistence Farming and Dense Settlement Rural Communities.

Stevens, J.B. and Stimie, C. 2005. Building Awareness and Overcoming Obstacles to Water Demand Management Guideline, Number 5: Large-Scale Irrigators.

Van der Stoep, I., Benade, N., Smal, H.S. and Reinders, F.B. 2005. *Guidelines for irrigation Water Measurement in Practice*. WRC Report No. TT 248/05.

APPENDIX A

COMPONENTS OF WATER BALANCE

System Input Volume	Authorised Consumption	Billed Authorised Consumption	Billed Metered Consumption	Potential Revenue Water	Free basic
			Billed Unmetered Consumption		Recovered revenue
	Water Losses	Unbilled Authorised Consumption	Unbilled Metered Consumption	Non Revenue Water	Non- Recovered revenue
			Unbilled Unmetered Consumption		
		Apparent Losses	Unauthorised Consumption		
			Customer Meter Inaccuracies		
		Real Losses	Leakage on Transmission and Distribution Mains		
			Leakage on Overflows at Storage Tanks		
			Leakage on Service Connections up to point of Customer Meter		