4. WATER CONSERVATION / DEMAND MANAGEMENT

Water conservation and demand management is related to the wise use of water, such that the inefficiencies within the bulk and reticulation system that result in water losses are minimised and controlled, and that the wastage of treated water either within the network or by the consumer is reduced. Through education and appropriate tariff structures the ZDM may reduce the water services demand and provide effective water conservation.

4.1 Water resource management interventions

ZDM has liaised closed with the DWAF Resource Department in the province when the water master planning exercise was done. Water resources that were known to be under stress were avoided and rather more sustainable resources were targeted for long-term future water supply. Chapter 3 of this report provides an overview of which resources are under stress.

ZDM also participates in DWAF and other initiatives aimed at protecting the water resources in the district, e.g. the Working for Water Programme. ZDM is also an active member of the local Catchment Management Agencies and the various Water Users Associations that have been established in the district.

In addition to the above ZDM is also in the process of embarking on an extensive Unaccounted for Water programme (UAW), aimed at understanding the usage of water in the district and to provide guidance to future demand management and waterloss interventions. An UAW strategy has been drafted and is included below. The UAW programme will be implemented in parallel with the roll-out of a district telemetry system, which will provide most of the electronic equipment for measurement purposes. The information gathered from the UAW programme will be fed into the ZDM WSP reporting system and used to develop a water balance for individual schemes and eventually an accurate water balance for the district.

The above information will furthermore be used to progressively focus the O&M resources where most needed and thereby applying resources more efficiently. Specific interventions will be launched in the individual schemes to address water losses through:

- Pressure management
- Leak repair programmes
- Meter repair & replacement programmes
- Internal plumbing leaks
- Consumer end-use demand management initiatives

NEED FOR AN UAW PROGRAMME

The municipality has identified the need to embark on an Unaccounted for Water (UAW) programme for the district not only to save water but also to benefit from the many added advantages that can be linked to such a programme. A few such advantages are listed below:

- Reduced water consumption and water wastage;
- Improved quality of service provided with more consumers receiving water consistently (the need for example to close reservoirs at night will be substantially reduced or even completely eliminated);
- Improved coverage with billing and improved income stream for the municipality;
- Reduced costs to provide water services (less chemicals used, less maintenance required, etc);
- More efficient use of limited financial and human resources by focusing resources where most needed;
- Increased lifespan of infrastructure assets and postponing huge capital investments required to upgrade infrastructure in order to meet excessive growth in consumer consumption.

PRINCIPLES

Before embarking on any new initiative it is best to first clarify the principles that must guide the programme and thereby set the framework within which to operate, as follows:

- The approach should be holistic and should deal with the complete solution from design issues, through to operational challenges and included metering and billing shortcomings. All role-players within the organisation must be brought on board and ownership of the programme established in-house.
- Remedial actions identified through the programme must involve the relevant staff of the municipality and thereby work towards permanent change for the long term. The programme should influence daily operations in such a manner that it becomes a “way of life” within the organisation and lead to ongoing sustainability.
- Remedial actions that are decided upon have to be reviewed or at least judged economically by comparing the investment required versus the anticipated “win” that will be achieved. The 80/20 principle should apply whereby the effort is firstly focused where the major challenges occur. Schemes need to be prioritised for intervention and one possible method could be to prioritise schemes in terms of their estimated contribution to the total estimated UAW in the district (see Table 1 below).
- Pressure Management activities should aim at achieving static pressures in the reticulation networks of urban areas of between 2,5 – 6 bar and in rural areas of between 1- 6 bar. Proper network modelling should however dictate the final solution for each individual scheme.
- Measurement devices installed through this programme must be compatible with the telemetry and SCADA systems that will be installed by ZDM through parallel processes.
- All field information must be captured electronically on the existing central database called MANZI (Infrastructure Management System) and thereby linked to the GIS.
- The IWA method is recommended to be used to categorize water usage and to compile a water balance for each scheme, as shown in the figure below:

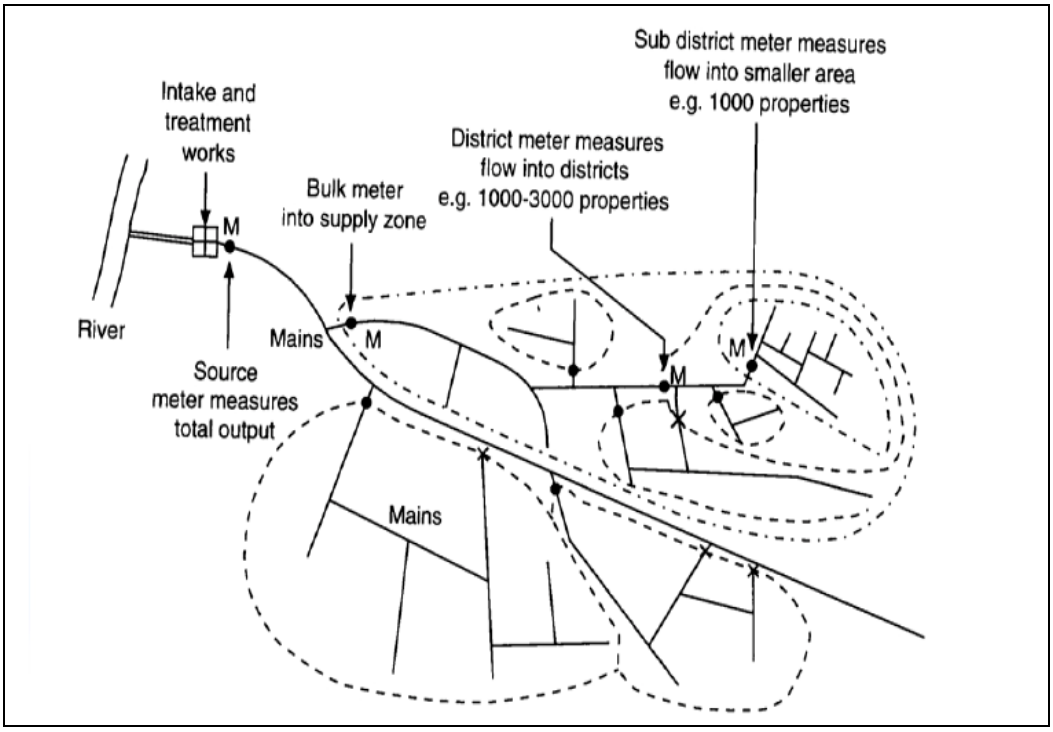
Figure 4.1: IWA Method of categorizing water use

<table>
<tr><td rowspan="8">System Input Volume</td><td rowspan="4">Authorized Consumption</td><td rowspan="2">Billed Authorized Consumption</td><td>Billed Metered Consumption</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Unmetered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption</td><td>Unbilled Metered Consumption</td><td rowspan="6">Non Revenue Water</td></tr>
<tr><td>Unbilled Unmetered Consumption</td></tr>
<tr><td rowspan="4">Water Losses</td><td rowspan="2">Apparent Losses</td><td>Unauthorized Consumption</td></tr>
<tr><td>Customer Meter Inaccuracies and Data Handling Errors</td></tr>
<tr><td rowspan="3">Real Losses</td><td>Leakage on Transmission and Distribution Mains</td></tr>
<tr><td>Leakage and Overflows at Storage Tanks</td></tr>
<tr><td>Leakage on Service Connections up to point of Customer Meter</td></tr>
</table>

METHODOLOGY

The methodology to be used with the implementation of the UAW programme is summarised below:

- Understanding the functioning of the scheme from source to end user with the scheme information available;
- Managing scheme operations to achieve as closely as possible a situation where all consumers can receive water all day round and reservoirs do not have to be closed down at night (this allows for more accurate measurement);
- Identify water demand zones for each scheme and metering and logging points (temporary and permanent) and initiate implementation of the measurement devices as well as measures required to make zones discreet (see illustration below).



- The accurate recording and regular review of flow profiles and water supply volumes into each discrete zone, i.e. the metering infrastructure and data logging systems, including the compilation of system water balances.
- The accurate recording and regular review of consumer demand and the sustained implementation of specific tasks (e.g. leak detection surveys, step testing, pressure management reviews, prompt burst repairs, etc.) and sustained overall maintenance of all system components.
- The roll out of a meter testing and meter replacement programme.
    - Consumer metering and billing
    - Identify unmetered consumers and systematically install meters at all consumer connections.
    - Accurate and consistent billing of consumers as per the tariff policy.
    - Deal with non-payment in accordance with the ZDM by-laws and debt collection policy.

PRIORITY SCHEMES

It is difficult to determine accurately the extent of UAW in the district at this point in time and the pilot investigations that were discussed earlier indicated variances in UAW of between 41% and 68% between different schemes.

Table 4.1 (a) below lists the schemes in the district and the known System Input Volumes (SIV) as per the ZDM WSP report of March 2011. Although the state of UAW in each individual scheme is unknown it could be safely assumed, based upon the previously mentioned pilot investigations, that at least a 40% UAW scenario prevails throughout. When 40% UAW is applied and the UAW contribution from each scheme is calculated as a percentage of the total UAW for the district, the schemes can be prioritised as follows:

Table 4.1 (a): List of schemes with total monthly production and estimated UAW

Plant Name	Production (Ml/month)	Estimated UAW	% of Total district UAW
Vryheid Klipfontein Vryheid Bloemveld	373.0	71%	20.1%
Coronation	39.1	47%	2.1%
Hlobane	12.2	59%	0.7%
Paulpietersburg – eDumbe	82.5	63%	4.5%
Louwsburg	12.3	11%	0.7%
Mpungamhlope	39.5	78%	2.1%
eMakhosini	8.5	43%	0.5%
Babanango	13.6	53%	0.7%
Mandlakazi	29.5	94%	1.6%
Enyokeni Royal Palace	0.9	65%	0.1%
Kombuzi	1.9	0%	0%
Nongoma	156.4	78%	8.4%
Ophuzane	13.1	57%	0.7%
Tholakela	8.5	38%	0.5%
Mangosuthu	32.3	10%	1.7%
eMondlo	39.0	12%	2.1%
Msibi	10.1	23%	0.5%
Nkonsentsha	1.2	50%	0.1%
Belgrade	23.8	67%	1.3%
Khiphunyawo	12.0	66%	0.6%
Khambi Village	8.6	80%	0.5%
Mountain View	2.5	98%	0.1%
Osingisingini	1.7	50%	0.1%
Ceza	3.4	50%	0.1%
Sidinsi	6.0	11%	0.3%
Ulundi – Nkonjeni	623.0	79%	33.6%
Pongola Town/ Simdlangentsha East	228.8	59%	12.4%
Spekboom	30.3	44%	1.6%
Khangela Royal Palace	0.3	29%	0.1%
Mvuzini	15.3	54%	0.8%
Nkonjeni Hospital	4.6	47%	0.2%
Itshelejuba Hospital	5.1	53%	0.3%
Thulasizwe Hospital	2.6	9%	0.1%
Masokaneni	0.0	0%	0.0%
Purim	10.4	22%	0.6%
	1 852	**43%**	**100%**

4.2 Water demand management interventions

ZDM has already identified the development of a Water Demand Strategy, in conjunction with the UAW programme, as very high priority for the district. Excessive water usage in many areas are putting the bulk infrastructure under immense pressure and upgrading of this will soon become necessary unless this could be postponed through effective demand management interventions. The roll-out of new infrastructure to communities without services is of highest priority and leaves the ZDM with very little available capital for upgrading of existing services. Promoting more efficient usage of water therefore can have a significant impact in relieving this pressure and requires relatively low capital input.

The water demand strategy will focus on a number of ways to ensure the reduction of water demand by consumers, for example:

- Influencing the behaviour of consumers
    - School and public educational and awareness programmes aimed at promoting effective usage of water (brochures, advertising, newsletters, demonstrations, exhibits, informative billing, etc)
    - Water services tariff that promotes efficient water usage
    - Any other “win-win” initiatives that could influence consumers positively
- Specific targeted projects like;
    - Repair plumbing leaks inside properties
    - Installation of water flow control devices, etc.

ZDM by-laws have also been promulgated in 2008 and this will assist the municipality to effectively regulate water usage in the district.