LEAKAGE REDUCTION PROJECTS UNDERTAKEN BY RAND WATER

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FORWARD

Rand Water's core business, for the past 100 years, has been to purify raw water and to supply bulk potable water to its customers, the municipalities throughout Gauteng and surrounding areas that form the industrial heartland of South Africa. It is estimated that more than 10 million people consume water supplied by Rand Water daily with an average supply in excess of 3 000 Ml/day.

In 1994/95, during a very severe drought, a levy was placed by Rand Water on the water tariff of municipalities that exceeded predetermined water demand quotas and these funds were placed in a separate "drought fund".

In 1996, Rand Water proceeded to establish a new division specifically to assist the municipalities with a variety of expertise. The aim of this division, the Community Support Services Division, was directed outward to interventions in communities including awareness on water matters, education in effective and efficient water use, marketing of products as well as implementing and promoting Water Demand Management.

In order to promote and demonstrate the benefits of Water Demand Management, Rand Water initiated and supported numerous pilot projects with the aim of establishing "best practice" examples in certain aspects of Water Demand Management. A variety of these projects were targeted at leakage reduction in the municipal reticulation networks as well as retrofitting of existing inefficient water endpoint fittings, including old ductile cast iron toilet cisterns, with modern units inside homes on properties. All of the projects involved a high level of community involvement which was considered essential to the success of the projects.

This publication serves to document the efforts in this regard – efforts costing in the region of US$6 million that were undertaken with funds from the "drought fund". The majority of these projects were a resounding success with consumption reduction averaging 25%. This manual documents all of the efforts, the successes as well as the less successful projects. In the process, the manual provides details which will help water suppliers in implementing such projects and anticipating potential pitfalls.

Rand Water would like to take this opportunity to thank the United Nations Centre for Human Settlements (Habitat), the relevant Local Authorities, the communities and other partners for their contributions in these worthwhile projects. These interventions have highlighted the value and importance of partnerships in capacity building and sharing of expertise.

It is hoped that this document will be of use to water suppliers throughout Africa who may be considering the implementation of various Water Demand Management measures. It is also hoped that it will be widely read and disseminated in order to encourage growth in Water Demand Management initiatives – specifically the management of leakage.

Maggie Letsoalo
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Executive Summary

Rand Water has undertaken numerous Water Demand Management (WDM) pilot projects to address the problems of water wastage and leakage in the Rand Water supply area. From the analyses of the various leakage reduction projects the following observations and conclusions were made, as shown in **Table 1.**

Table 1: Summary of key observations and conclusions

Project Name	Budget	Objectives	Results/ Findings	Estimated Payback Period [1]
Tlhabane Water Loss Management Project	R 1,1 million ($ 180 000)	To reduce and manage water losses through various WDM interventions, discussed in the report.	The total minimum night flow was reduced by 11.2 m^3/hr through the repair of approximately 11 mains leaks. This represents an annual saving of 100 000 m^3. The repair of internal household leaks was outside the scope of the project.	+6 years
Johannesburg CBD Retrofit Project	R 750 000 ($ 100 000)	To investigate a variety of leak detection methods and select the most suitable for use in CBD areas.	The best approach for undertaking a leak detection exercise is to use a combination of techniques. Some methods like sounding, GPR, Step Testing, Aqualogs etc. are better suited for an initial sweep while methods like LNC and ground microphones can be used to pin-point specific leaks.	N/a
Boksburg Schools Water Loss Project	R 960 000 ($ 60 000)	To retrofit ablution facilities at 48 schools in Boksburg.	Meter readings before and after the project were available for 28 out of the 48 schools. The combined monthly water consumption for the 28 schools was reduced by 7 737 kl. This can be extrapolated to a total saving of approximately 12 000 kl (7 737 X 1.5) for the 48 schools.	± 4 years
Kagiso Schools Retrofit Project	R 625 000 ($ 90 000)	To retrofit ablution facilities at 27 schools in Kagiso in Krugersdorp.	Meter readings before and after the project were available for 15 out of the 27 schools. The combined monthly water consumption for these 15 schools was reduced by 3 000 kl. This can be extrapolated to a total saving of approximately 4 500 kl (3 000 X 1.5) for the 27 schools.	± 6 years

Project Name	Budget	Objectives	Results/ Findings	Estimated Payback Period [1]
All-Africa Games Village Water Efficiency Project	R 570 000 ($ 90 000)	Implementation of water efficient devices in new houses built for the All-Africa Games Village	It was not possible to identify savings due to various external factors, discussed in the report.	N/a
Johannesburg Inner City Retrofit Project	R 1.3 million ($ 240 000)	To reduce water losses through the upgrading of plumbing in 946 flats.	The average water consumption per flat was reduced from 920 l/day to 750 l/day, equating to a saving of 170 l/flat/day and a total saving of 60 000 kl/year.	±11 years
Kagiso Retrofit Project	R 1.5 million ($ 345 000)	To reduce leakage through retrofitting toilet cisterns in 6 000 houses.	The average consumption was reduced by 280 000 kl/month over the period 1996 to 2000. It was not possible to quantify the savings attributable directly to the project due to a number of other WDM measures that were undertaken simultaneously.	N/a
Odi Retrofit Project	R 4.4 million ($ 800 000)	To reduce water wastage through retrofitting and installation of dual flush toilets in 16 244 houses.	The average monthly household consumption was reduced by 2.9 kl, equating to a total saving of 47 000 kl/month.	± 4 years
Sebokeng Retrofit Project	R 2.1 million ($ 380 000)	To reduce water losses through retrofitting and replacement of inefficient toilet parts in 3 500 houses.	The average monthly household consumption was reduced from 23.4 kl to 14.8 kl, equating to a household saving of 8.6 kl per month and a total saving of 30 000 kl/month.	± 3 years
Soweto Retrofit Project	R 4. 6 million ($ 1 million)	To reduce leakage through retrofitting at 13 235 privately owned houses.	The monthly bulk consumption of Soweto was reduced by 500 000 kl, over the period 1996 to 1997. It was not possible to quantify the savings attributable directly to the project due to a number of other factors, which may have influenced the consumption.	N/a

Project Name	Budget	Objectives	Results/ Findings	Estimated Payback Period [1]
Tembisa Fast Retrofit Project	R 3.7 million ($ 800 000)	To reduce leakage through retrofitting at 14 500 properties.	The average monthly unaccounted-for-water was reduced from 575 000 kl to 290 000 kl. However, a year after completion of the project the monthly unaccounted-for-water increased again to 370 000 kl. Further follow up investigating are required to assess the true sustainable savings for the project.	N/a
Tembisa West Retrofit Project	R 2.5 million ($ 450 000)	To reduce leakage through retrofitting at 5 000 properties.	The average monthly consumption was reduced by 96 000 kl. The local council also indicated that it repaired numerous mains leaks during the same period and, therefore, some of the savings are not attributable directly to the project. Based on the assumption that 50 % of the savings can be attributed to the project, the saving is estimated to be in the order of 48 000 kl/month.	+ 3 years
Thokoza Retrofit Project	R 670 000 ($ 160 000)	To reduce leakage through retrofitting at 2580 properties.	The average monthly consumption was reduced by 53 000 kl. It was not possible to quantify the savings attributable directly to the project due to a number of other WDM measures that were undertaken simultaneously.	N/a
Slovoville Pressure Management Case Study	R 57 000 ($ 6 600)	To quantify the benefits of leakage reduction by installing a time-modulated pressure controller on an existing PRV.	The daily demand for the zone was reduced by 591 kl, equating to a projected saving of 18 000 kl/month.	± 2 months

Note: [1] The estimated payback period was based on the Rand Water selling price in the first year of each project. (R 1.1 / m^3 in 1996, R 1.3 / m^3 in 1997, R 1.7 / m^3 in 1998, R 1.8 / m^3 in 1999, R 2.0 / m^3 in 2000, R2.1 / m^3 in 2001)

Table of Contents

1 INTRODUCTION

1.1 SCOPE OF REPORT

Section 1 of this report provides an overview of the Importance of Water Demand Management in South Africa and highlights the significance of improving water use efficiency with regards to the Vaal River System. The importance of Rand Water in the Vaal River System is explained and the historical and projected future demands for Rand Water's area of supply are discussed. The section concludes with an explanation of how various Pilot Projects are being investigated to determine the possible savings that can be achieved through selected WDM measures as well as to find best practice methods for undertaking such projects. This leads onto the remainder of the report, which investigates the specific leakage reduction projects undertaken by Rand Water and presents detailed information on each project.

1.2 GENERAL

Most parts of South Africa experience relatively low rainfall, which together with very high evaporation rates result in low unit runoff for the country as a whole. South Africa is rated as one of the twenty most water stressed countries in the world and receives an average rainfall of less than 500 mm per annum (well below the world average of 860 mm per annum). Not only is the rainfall low but it is also unevenly distributed throughout the country with most of the rainfall concentrated along the narrow region on the southern and eastern coastline. Figures published by DWAF (1986, Fig 3.3.3) indicate that the combined natural runoff from all of South Africa's rivers is in the order of 53 500 million m^3/a, representing an average depth (unit runoff) over the whole country of approximately 42 mm/a. This is very low compared to most countries and to the world average of 330 mm/a as can be seen in **Table** 1-1 which provides some comparative figures from around the world (Gleick, 1993 and DWAF, 1986).