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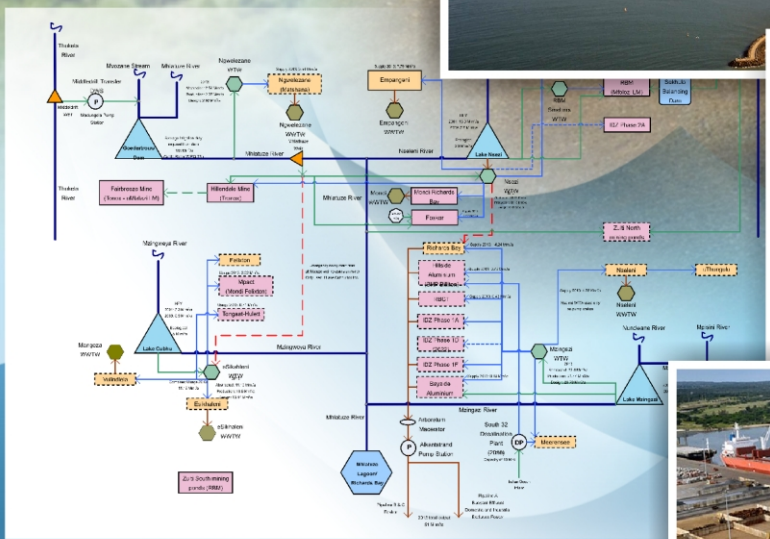
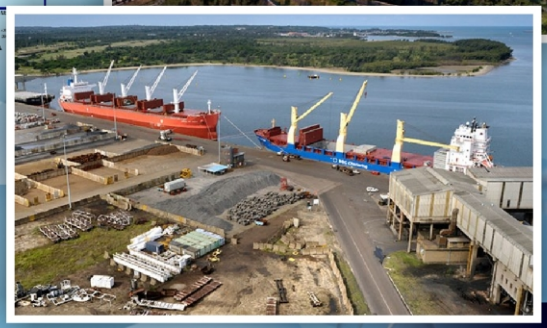
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

DIRECTORATE: NATIONAL WATER RESOURCE PLANNING

The Implementation and Maintenance of the Water Reconciliation Strategy for Richards Bay and Surrounding Towns

Water Conservation and Water Demand Management Report





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August 2019

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P WMA 04/ W100/00/9218/4

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

IMPLEMENTATION AND MAINTENANCE OF THE WATER RECONCILIATION STRATEGY FOR RICHARDS BAY AND SURROUNDING TOWNS

WATER CONSERVATION WATER DEMAND MANAGEMENT PLAN

AUGUST 2019

COMPILED FOR:	COMPILED BY:
Department of Water and Sanitation	**BJ/iX/WRP Joint Venture**
Contact person: K Mandaza	Contact person: N Zondo
Private Bag X313,	Block 5, Green Park Estate,
Pretoria 0001	27 George Storrar Drive,
South Africa	Pretoria
Telephone: +27(0) 12 336 7670	Telephone: +27(0) 12 346 3496
Email: MandazaK@dws.gov.za	Email: nsikaz@wrp.co.za

IMPLEMENTATION AND MAINTENANCE OF THE WATER RECONCILIATION STRATEGY FOR RICHARDS BAY AND SURROUNDING TOWNS

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Report Name	Report Number	DWS Report Number
Inception	1	P WMA 04/W100/00/9118
Economic Growth and Demographic Analysis for the Richards Bay Reconciliation Strategy	2	P WMA 04/W100/00/9218
Water Requirements and Return Flows Report	3	P WMA 04/W100/00/9318
Water Conservation / Water Demand Management	**4**	**P WMA 04/W100/00/9218/4**
Water Resources	5	
Infrastructure and Cost Assessment	6	
Updated Reconciliation Strategy	7	
Executive Summary: Updated Reconciliation Strategy	8	

Title:	**Water Conservation Water Demand Management Plan**
Authors:	**Nsika Zondo, Willem Wegelin**
Project Name:	**Implementation and Maintenance of the Water Reconciliation Strategy for Richards Bay and Surrounding Towns**
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Approved for the Consultants by:

.....

L Louw

Study Leader

DEPARTMENT OF WATER AND SANITATION

Directorate National Water Resource Planning

Approved for the Department of Water and Sanitation by:

.....

K Mandaza

Production Engineer: National Water Resource Planning (East)

.....

P Mlilo

Director: National Water Resource Planning

EXECUTIVE SUMMARY

Introduction

The Department of Water and Sanitation (DWS) commissioned a study on the Implementation and Maintenance of the Water Reconciliation Strategy for Richards Bay and Surrounding Towns Study, referred to as this Study hereafter, to inform the planning and implementation of water resource management interventions necessary to reconcile future water requirements and water use patterns up to a period of thirty years. For the Strategy to remain relevant in order to properly fulfil its purpose into the future it has to be dynamic. Hence the water balance has to be continuously monitored and the developed Strategy has to be regularly updated and maintained. This would ensure that planned intervention options to be implemented will also consider any changes that may have potential impacts on the projected water balance.

Overview of Study Area

The study area includes the Mhlathuze River catchment. The main focus of this Study was the Richards Bay Water Supply Scheme RBWSS. The RBWSS supplies water to the City of uMhlathuze Local Municipality (CoMLM), which comprises the towns of Richards Bay, Empangeni, Ngwelezane Nseleni and Esikhaweni, as well as a number of rural villages. The City of uMhlathuze LM is the third largest municipality in KwaZulu-Natal located on the north-east cost of the province and forms part of the King Cetshwayo District Municpality (KCDM). The RBWSS also supplies large well-developed industries, commercial areas and business centers within the study area. The supply area is within the Mhlathuze River Catchment, which is the major water resource. Water is, however, also sourced from various natural lakes within the catchment such as Lake Nhlabane, Lake Mzingazi and Lake Cubhu. The Mhlathuze River Catchment receives inter-catchment transfers from the Umfolozi River and Thukela River Catchments and, as a result, these catchments are also part of the study area.

Additional smaller towns not incorporated in the Strategy, namely, Eshowe, Mtunzini, Melmoth, Amatikulu and Gingindlovu, have been included in this Study. They were addressed at a desktop level.

Background and Approach

The Water Conservation and Water Demand Management (WCWDM) assessment task, was undertaken in the stepped approach:

Status quo assessment: Review the status quo of the municipalities concerning their institutional, financial, legal, social and technical pillars. The assessments were undertaken to gain a complete understanding of the existing municipal water business, their operations and current key challenges.

Assessment Overview of Individual Demand Centres: To allow for the concise assessment of the water situation, the individual demand centres the CoM LM and KCDM were assessed and visited to gather information and to gain a better understanding of the status quo. The WCWDM key performance indicators (KPI's) were assessed for each demand centre.

Strategy: Based on the results of the assessments a WCWDM strategyy was developed, which was broken down into institutional, financial, social and technical strategy components.

Business Plan A business plan (targets and budgets) was developed for the CoM LM and the assumptions on which the business plan is based are documented.

Water Loss and NRW Reduction Targets

City of uMhlathuze Targets and Budget

The realistic and optimistic targets for CoM are summarised in **Table 1.** The realistic target aims to reduce the system input volume, non revenue water and water loss by 10%. The optimistic target aims to reduce the input volume, non revenue water and water loss by 20%.

Table 1: Realistic and optimistic targets

Indicator	Current Value	Realistic Target value 10% Reduction	Optimistic Target Value 20% Reduction
System Input volume (million m^3/a)	39,15	34,87	31,84
System Input volume (Mℓ / day)	107,19	95,48	87,16
Billed Authorised Consumption (million m^3/a)	30,00	28,88	27,93
Unbilled Authorised Consumption (million m^3/a)	1,95	1,78	1,23
Water Losses (million m^3/a)	7,20	4,22	2,67
Non-revenue Water (million m^3/a)	9,15	6,00	3,91
% Non-revenue water	43%	30%	25%
% Water Losses	24%	17%	12%
Input Volume (litres / capita / day)	277	246	225
Input Volume (m^3 / household / month)	35	31	29
Authorised Consumption (litres / capita / day)	226	217	206
Authorised Consumption (m^3 / household / month)	29	28	26

If the above targets could be achieved, the future realistic water balance for the municipality is presented in **Figure 1.**

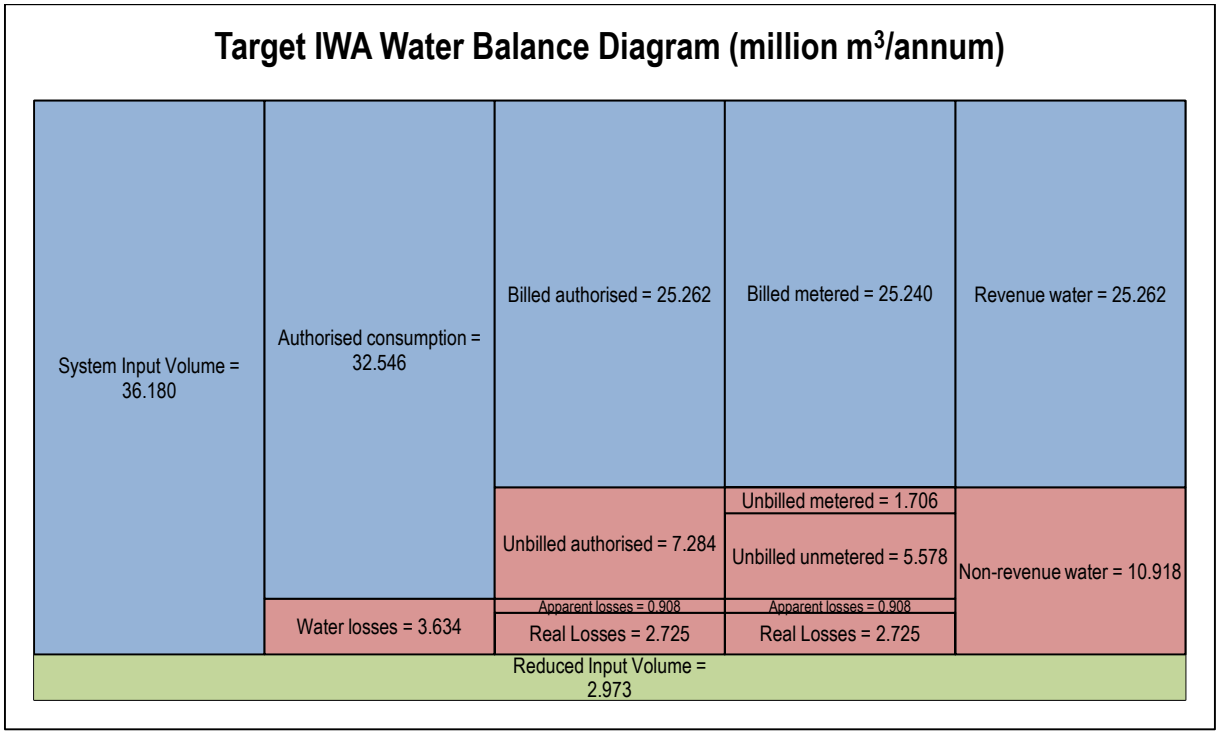

Figure 1: Target realistic water balance

The recommendations for WCWDM measures are based on the findings of the various analyses undertaken. The assessments include recommendations on interventions, estimated costs, and priorities for the period of five years and a summary of the budget requirements is presented in **Table 2**.

Table 2: WCWDM Budget summary

Interventions	Type	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Institutional	Capex	100 000	300 000		0	0	400 000
	Opex	375 000	375 000	375 000	375 000	375 000	1 875 000
	Sub Total	**475 000**	**675 000**	**375 000**	**375 000**	**375 000**	**2 275 000**
Financial	Capex	200 000	200 000	0	0	0	400 000
	Opex	19 139 840	19 139 840	19 139 840	19 139 840	19 139 840	95 699 200
	Sub Total	**19 339 840**	**19 339 840**	**19 139 840**	**19 139 840**	**19 139 840**	**96 099 200**
Social	Capex	3369 952	3 369 952	2 219 952	2 219 952	2 219 952	13 399 760
	Opex	5 859 880	5 859 880	5 859 880	5 859 880	5 859 880	5 859 880
	Sub Total	**9 229 832**	**9 229 832**	**8 079 832**	**8 079 832**	**8 079 832**	**42 600 160**
Technical	Capex	19 321 360	23 757 200	17 202 200	16 524 700	16 524 700	93 330 160
	Opex	17 527 445	17 527 445	17 527 445	17 527 445	17 527 445	87 637 275
	Sub Total	**36 848 816**	**41 284 655**	**34 729 655**	**34 052 155**	**34 052 155**	**180 967 435**
Total		**65 893 487**	**70 529 327**	**62 324 327**	**61 646 827**	**61 646 827**	**322 040 795**

The budget shows that approximately R 60 million per annum is required over the next five years to address WCWDM. **Table 3** shows that if the municipality can achieve the realistic saving scenario, the payback period would be approximately 3.8 years. This is based on the assumption that the municipality improve its water tariff structure to promote WCWDM and increase revenue.

Table 3: Cost benefit ratio

Item	Unit	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Reduced Input Volume							
Volume	m^3/annum	522 000	1 044 000	1 566 000	2 088 000	2 610 000	7 830 000
Amount	R / annum	2 610 000	5 220 000	7 830 000	10 440 000	13 050 000	39 150 000
Increase revenue water							
Volume	m^3/annum	435 400	780 800	1 306 200	1 741 600	2 177 000	6 531 000
Amount	R / annum	3 047 800	6 095 600	9 143 400	12 191 200	15 239 000	45 717 000
Total							
Volume	m^3/annum	957 400	1 914 800	2 872 200	3 829 600	4 787 000	14 131 000
Amount	R / annum	5 657 800	11 315 600	16 973 400	22 631 200	28 289 000	84 867 000
						Payback period - years	**3.8**

Unit Reference Values

Unit reference values for demand centres are summarised in **Table 4** the unit reference values have been discounted over 20 years at 6%; 8% and 10%.

Table 4: Unit Reference Values

Demand Centre	Scenario	6%	8%	10%
Richards Bay	Realistic	R 17.57	R 18.02	R 18.50
	Optimistic	R 15.06	R 15.45	R 15.85
Esikhaweni	Realistic	R 28.44	R 29.18	R 29.97
	Optimistic	R 19.63	R 20.14-	R 20.69
Ngwelezane	Realistic	R 16.81	R 17.26	R 17.73
	Optimistic	R 15.99	R 16.41-	R 16.86
Empangeni	Realistic	R 9.03	R 9.28	R 9.54
	Optimistic	R 11.53	R 11.85-	R 12.18
Nseleni	Realistic	R 13.10	R 13.45	R 13.81
	Optimistic	R 9.24	R 9.48	R 9.74
Total	**Realistic**	**R 15.98**	**R 16.38**	**R 16.80**
	Optimistic	**R 13.58**	**R 13.91**	**R 14.27**

Conclusion and Recommendations

Based on the findings of the municipal water sector, it is clear that there is significant scope for WCWDM in the study area. WCWDM will result in both a reduction of NRW and the total system input volume. A serious concern however, is the pervasive limitation in institutional capacity and technical skills to embark on WCWDM programmes in the municipality.

Water conservation water demand management (WCWDM) interventions should focus on the following interventions:

- Reduce the high water losses and inefficiencies with set targets and timelines;
- CoMLM and KCDM should improve service delivery, as this will minimise informal and unauthorised connections in some areas;
- Develop and implement an operation and maintenance plan, if an existing plan is not in place;
- Install bulk meters to measure supply from the zones and districts;
- Maintain satisfactory operating pressures and install control valves in areas experiencing high pressures to ensure that operating pressures do not exceed the DWS regulation of 9 bar;
- Properly investigate the status of the service level for drinking water and sanitation in order to assess the situation and formulate recommendations for future improvements of servicing the entire area;
- Investigate the situation of water supply infrastructure on the base of new data in order to assess properly which investments in the refurbishment of the system are required;
- Provide training technical staff and for meter readers and perform monthly audits to eliminate estimates and other inaccuracies; and
- Embark on community awareness programmes that promote the value of water wise gardening.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

BJ	Black Jills Engineers Pty Ltd. (BJE)
CoMLM	City of uMhlathuze Local Municipality
DM	District Municipality
DWS	Department of Water and Sanitation
IDP	Integrated Development Plan
IDZ	Industrial Development Zone
iX	iX Engineers Pty Ltd.
KCDM	King Cetshwayo District Municipality
LOS	Level of Service
MIIF	Municipal Infrastructure Investment Framework
MW	Mhlathuze Water
NRW	Non-Revenue Water
PRV	Pressure Reducing Valve
RBCT	Richards Bay Coal Terminal
RBM	Richards Bay Minerals
RDP	Reconstruction and Development Programme
WRC	Water Research Commisio
WRP	WRP Consulting Engineers Pty Ltd.
WSA	Water Service Authority
WSP	Water Service Provider
WSS	Water Supply Scheme
WTW	Water Treatment Works
WCWDM	Water Conservation and Water Demand Management

LIST OF UNITS AND SYMBOLS

l/c/d	Litres per Capita per Day
Mℓ/d	Mega Litres per Day
m^3/a	Cubic Metres per Annum
million m^3/a	Million Cubic Metre per Annum
m^3/household/month	Cubic Meters per Houshold per Month
m^3/s	Cubic Metres per Second
%	Percentage

GLOSSARY OF ITEMS

Unavoidable Annual Real Losses (UARL)	This represents the minimum level of real losses for a specific system that can be achieved under the most efficient operating conditions. It is an indication of the level of leakage that can theoretically be achieved if the system is operated very efficiently and all practical measures are taken to minimise leakage.
Non Revenue Water	This is the difference between the volume of water supplied into the system and the billed authorised consumption.
Annual Real Losses (ARL)	The difference between the system input volume and the authorised consumption (the water which can be accounted for).
Apparent Losses (AL)	The apparent losses include all unauthorised consumption (theft or illegal use) as well as all technical and administrative inaccuracies associated with customer metering and billing.
Minimun Night Flow (MNF)	The Minimum Night Flow (MNF) is the lowest flow entering a water supply area during a 24-hour period and usually occurs sometime between midnight and 04:00 when the consumption in the network is at its lowest (because most people are asleep then).
Infrastructure Leakage Index (ILI)	The infrastructure leakage index (ILI) is a performance indicator used to measure the extent of leakage in a particular system. It is normally used for systems with over 5 000 connections but can be used for smaller systems if they are known to be homogeneous (systems down to 1 000 connections can often be considered).
Passive Leakage Control (PLC)	Passive leakage control addresses leakage and pipe burst reported by the public.
Yield	The average annual volume that can be drawn from a supply source or supply option to meet a specific demand at a specified service level
(IWA) Water Balance	An International Water Association system that compares the volume of water entering system with the volume of water registered by the consumer meters. The purpose is to improve efficiency, management, cost recovery, etc. The quality of the water balance/audit is reliant on the consumer database and monitoring results.
Billed Consumption	The volume of authorised consumption which is billed and paid for
Free Basic Water	The volume of authorised consumption which is billed at a zero rate and

(FBW)	represents free basic water.
Network Sectorisation	The SABS 0306 : 1999 Code of Practice for the Management of Potable Water in Distribution Systems recommends management zones not exceeding 2 000 properties, depending on the reticulation system.
Fixed Outlet Pressure Control	Fixed outlet pressure control involves the use of a device, normally a pressure reducing valve (PRV) which is used to control the maximum pressure entering a zone. This is possibly the simplest and most straight forward form of pressure management as it involves the use of a PRV with no additional equipment.

1 INTRODUCTION

1.1 Background to this Study

The Department of Water and Sanitation (DWS) completed the *Water Reconciliation Strategy for Richards Bay and Surrounding Towns in 2015 (DWS, 2015).* For the Strategy to remain relevant, it has to be dynamic, the water balance continuously monitored and the developed Strategy has to be regularly updated and maintained. This would ensure that planned intervention options are planned and implemented on time and changes that may affect the projected water balance are identified.

To ensure the Strategy remains relevant, the Department of Water and Sanitation (DWS) commissioned a study on the *Implementation and Maintenance of the Water Reconciliation Strategy for Richards Bay and Surrounding Towns Study*, referred to as this Study hereafter. The Study is to inform the planning and implementation of water resource management interventions necessary to reconcile future water requirements and water use patterns up to a period of thirty years.

1.2 Objectives of this Study

The overall objective of this Study is to systematically update and improve the Strategy to remain technically sound, economically feasible, as well as socially acceptable and sustainable. In addition, smaller towns in the neighbouring catchments were included, at a desktop level of detail, to cover selected smaller towns also affected by the Strategy.

1.3 Study Area

The study area includes the Mhlathuze River catchment as illustrated in Error! Reference source not found.. The focus of this Study was the Richards Bay Water Supply Scheme RBWSS. The RBWSS supplies water to the City of uMhlathuze Local Municipality (CoMLM), which comprises the towns of Richards Bay, Empangeni, Ngwelezane and Esikhaweni, as well as a number of rural villages. CoMLM forms part of the King Cetshwayo District Municipality (KCDM) on the north-east coast of KwaZulu-Natal. The RBWSS also supplies large well-developed industries, commercial areas and business centres within the study area and is the third largest economic area in the province after eThekwini and Msunduzi Municipalities. Water is also sourced from various natural lakes within the catchment such as Lake Nhlabane, Lake Msingazi and Lake Cubhu.

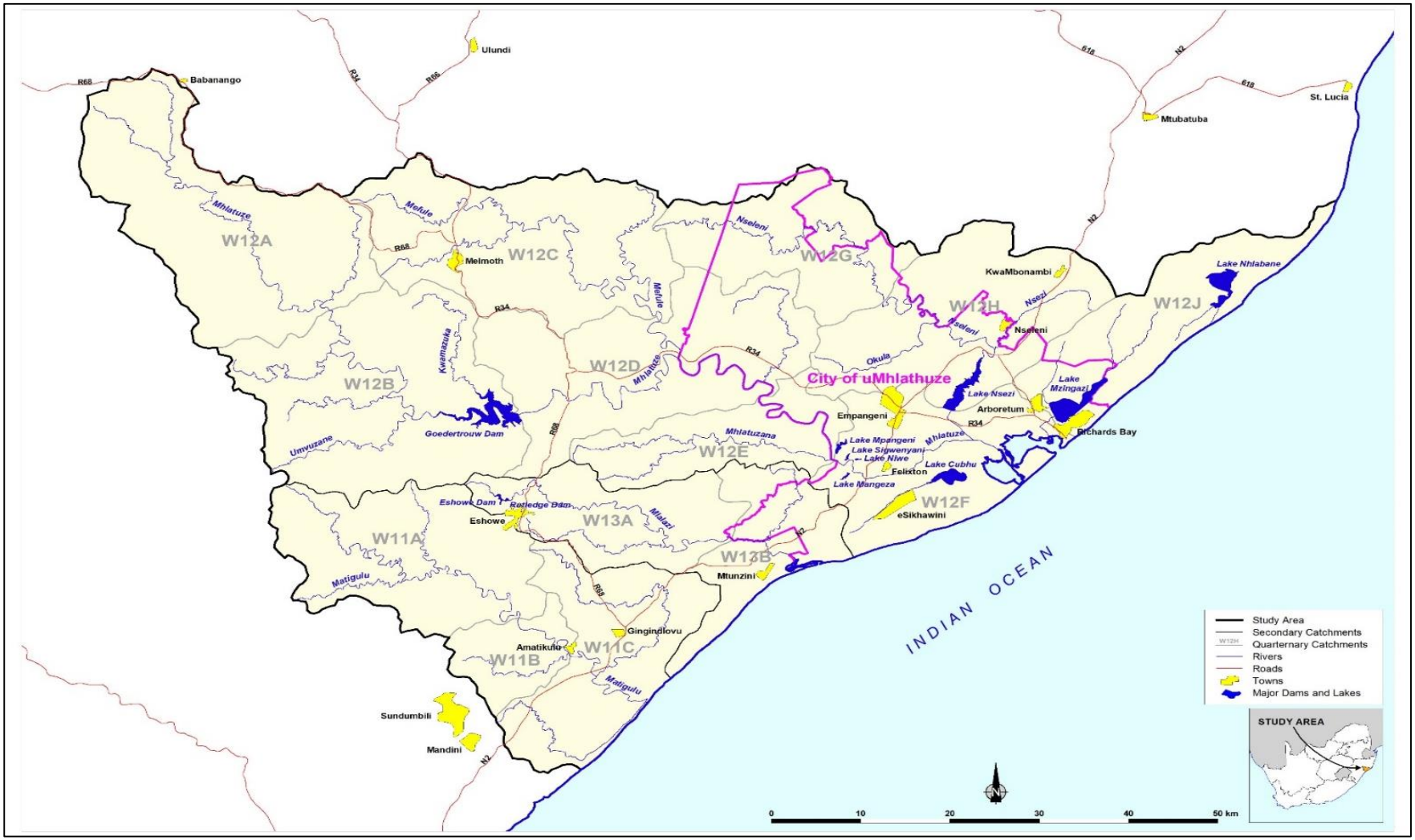

Figure 1-1: Mhlathuze River catchment

The Mhlathuze River Catchment receives inter-catchment transfers from the Umfolozi River and Thukela River Catchments and, as a result, these catchments are also part of the study area.

1.4 Purpose and structure of this report

The purpose of this report is to:

1. Review the status quo of water conservation and water demand management (WCWDM) in the towns of Richards Bay, Empangeni, Ngwelezane, Esikhaweni and Nseleni.
2. Compare/reflect the sytem performance (WCWDM implementation) current status versus phase 1 of the study.

The assessment of surrounding towns was conducted at a desktop level. The assessment includes a review of the institutional, financial, legal, social and technical pillars of WCWDM. The assessments were undertaken to gain a complete understanding of the existing municipal water business, their operations and current key challenges. This report includes a brief review of the existing condition of the infrastructure, the operation of the system, levels of cost recovery and management practices and finaly summarises the water situation in the CoMLM area and highlight the recommendations and required actions to ensure sufficient and sustainable water supply to all towns within the municipal area.

Section 1: Provides the background to the project and states the objectives and required outcomes of the study.

Section 2: Gives an overview of the study area.

Section 3: Describes the water situation in all demand centres that fall under CoM jurisdiction.

Section 4: Describes the overview of the demand centres and provide the status quo analysis as well as required actions by the different role players to ensure sustainable water supply to all demand centres within CoMLM and KCDM.

Section 5: Provides risk factors that can negatively impact implementation of WCWDM initiatives.

Section 6: Business plan.

Section 7: Describe implementation plan for WCWDM recommendations.

2 SYSTEM OVERVIEW

2.1 Overview of Reconciliation Strategy

The Water Reconciliation Strategy for Richards Bay and Surrounding Towns (DWS, 2015) recommended the following interventions to reconcile the water supply and demand.

- Urban WCWDM, comprising a range of measures and the continuation of existing initiatives;
- Bulk industrial WCWDM, comprising the continuation of existing initiatives essentially aimed at the significant industrial water users, but also at other industrial water users;
- Raising of Goedertrouw Dam by 2.8m, following confirmation by feasibility evaluation;
- In addition, there were opportunities for the evaluation and potential implementation of the following development options:
- A dam on the Nseleni River;
- Use of treated effluent from the Arboretum macerator site;
- Seawater desalination;
- Implement a policy for rainwater harvesting to augment municipal supplies for outdoor and indoor non-potable domestic uses;
- Determine groundwater contributions to lake yields at an acceptable confidence, and revise the operating rules of abstraction to ensure a sustainable supply from the three coastal lakes of the water supply system, namely Lakes Mzingazi, Cubhu and Nhlabane;
- Support the removal of invasive alien plants, especially in the catchments above dams in the water supply system;
- Investigate the reduction of illegal/commercial afforestation in the immediate vicinity of the coastal lakes and implement practical measures to curb illegal afforestation;
- Encourage the responsible development of groundwater for local use.
- The potential for WCWDM is based on the Water Requirements Report for the Water Reconciliation Strategy for Richards Bay and Surrounding Towns (DWS, 2014) which is summarised as follows:
- A preliminary assessment of the level of water use efficiency and the level of non-revenue water (NRW) in the uMhlathuze WSS, indicated that the total system losses were high. It was estimated that the total system losses in the WSS is approximately 31% of the treated water production. This translates to approximately 5.3 million m3/a (14.7 Ml/d).

The City of uMhlathuze Municipality has implemented some WCWDM in Richards Bay. Some municipal personnel were dedicated to water loss management, although it had not been formally institutionalised. The current measures included measuring of NRW as well as

passive leakage detection based on responding to consumers reporting any leaks. Some of the supply zones also have pressure reducing valves (PRVs) which have fixed outlets with constant head on the downstream of the valves.

Their 5-year Strategic Management Plan for the implementation of WCWDM was in place and identified that a target of about 19% NRW is the minimum practical achievable goal, as it would become prohibitively expensive to better that target.

The Esikhaweni Water Supply System Report (2013) identified the inadequacies in the metering, billing and revenue collection system, and that rectification of these problems, would benefit both the Municipality and its customers. These opportunities included:

- Implementing metered zones and bulk meter monitoring to support water balance determinations;
- Undertaking a review of consumer meters in place and billing processes;
- Calibration of new consumer water meters;
- Ensuring correct sizing of water meters to be installed;
- Undertaking routine meter readings as part of a monitoring program;
- Implementing active leakage control and expediting repairs;
- Structuring by-laws to promote use of water efficient fittings in new developments;
- Building public awareness on the importance of efficient water use;
- Ensuring adequate budget and resources to support all of the above.

2.2 Demographics

The CoM LM consists of the main urban demand centres of Richards Bay, Esikhaweni, Empangeni, Ngwelezane and Nseleni. Richards Bay and Empangeni are the most significant economic centres within the CoMLM and in the KCDM. Richards Bay, which is a coastal, harbour and industrial town, attracts people from surrounding towns, rural settlements and from beyond the area. Empangeni is mainly a commercial town and service centre to the settlements of Esikhaweni, eShowe, Nkandla, Buchanana and other surrounding rural settlements. As a result, Empangeni attracts many people due to the range of higher order services available in the town. The highest settlement densities are within the formal urban areas. The distribution and characteristics of the population in the areas play a significant role in the ability of the municipality area to deliver basic municipal services. The demographics for each demand centre within the City of uMhlathuze municipal area are shown below in **Table 2-1**.

Table 2-1:Demographics profile for CoMLM

ID	Municipality	Demand Centre	Adopted Population (2016)	Adopted Households (2016)	Population per household
KZN282	CoMLM	Richards Bay	57 672	12 804	4.5
		Esikhaweni	164 563	40 311	4.1
		Felixton	1 099	442	2.5
		Empangeni	60 526	7 308	3.3
		Ngwelezane	61 245	16 603	3.7
		Nseleni	42 500	12 230	3.5
Sub-total			**387 605**	**93 063**	**3.8**

Source: DWS Implementation and Maintenance of the Water Reconciliation Strategy for Richards Bay and Surrounding Towns: Economic Growth and Demographic Analysis Report 2018

2.3 Level of Service

CoMLM is classified as a non-delegated and category B1 municipality. Non-delegated municipalities report directly to National Treasury whereas Category B1 municipalities are those local municipalities with the largest budgets in terms of the Municipal Infrastructure Investment Framework (MIIF). The level of service is 92% at or above RDP water infrastructure, however, the reliability of the schemes is only 78% as summarised in **Table 2-2**. Due to the number of different data sources, conflicting values were often obtained for the same system. In cases where this happened, the project team used one source and most recent to select the value which they thought was the most appropriate data for the specific topic.

Table 2-2: Summary of the Level of Service for the CoMLM

Total Households	Access to Water Infrastructure Households	Total At and Above RDP Water Infrastructure Households	Reliable Water Households
110 495	103 809	102 065	85 651
100%	94%	92%	78%

Source: DWS NWSKS April 2016

The service levels depicted clearly indicate the significant potential for proper metering and billing within the municipality. The water supply system appears largely formal which means that the necessary technical structures should be present to effect sound cost recovery in the municipal area.

2.4 Indigent Register

The municipality is characterised by a large number of indigent consumer base and the indigent register is updated annually. According to the municipality some of the registered

indigents households are metered where possible, and receive 6kℓ/month of free basic water thereafter pay for the usage. It should be noted that indigent consumers from the rural villages are not paying for services and it is impossible for the municipality to implement cost recovery in the rural areas as there is no formal infrastructure.

2.5 Institutional Overview

CoMLM is the WSA and WSP for its demand centres and Mhlathuze Water (MW) currently has contracts with the CoMLM to manage and supply bulk water to Richards Bay, Empangeni and Esikhaweni, Ngwelezane and Nseleni urban demand centres as well as the industrial users such as Mondi, Richard Bay Minerals (RBM), Foskor and Tronox. KCDM is the Water Services Authority (WSA) for the surrounding towns, playing an integral role in supporting all the municipalities under its jurisdiction.

The relationship, between CoMLM, KCDM and MW is positive. Within the CoM municipality departments the relationship between the technical departments and the other departments with specific reference to the department of finance is positive with a reasonable flow of information between departments. The CoM acknowledged the existence of commercial and political support for a variety of water related issues, WCWDM training is sorely needed in order to improve the understanding of the Councillors of the water business and the municipal reforms that are required in this regard to turn the WSA around.

2.6 Historical Water use and Allocation

Table 2-3: Historical Water Use and Allocation Summary

Demand Centre	Usage		Allocation	
	Annual (Mm^3/a)	Daily (Ml/d)	Annual (Mm3/a)	Daily (Ml/d)
Richards Bay	14.24	39.02	9.13	25.00
Nseleni	4.28	11.71	0.00	0.00
Empangeni	9.34	25.58	13.51	37.00
Esikhaweni	11.16	30.58	11.32	31.00
Ngwelezane	2.54	6.95	2.92	8.00
Total	**40**	**109.58**	**36.87**	**101.00**

Source: DWS Water Reconciliation Strategy for Richards Bay and Surounding Towns (2015)

Large Industrial Water Users

The industrial sector is well-developed industries, commercial areas and business centres within the study area. The commercial, institutional and light industrial water users are

included in the municipal water use. Water for large industrial users is sourced from various natural lakes within the catchment such as Lake Nhlabane, Lake Msingazi and Lake Cubhu The larger industrial and institutional water users are summarised in **Table 2-4**.

Table 2-4: Large Industrial water users

Consumer Name	Water Use (2018)	
	Ml/d	million m^3/a
Mondi	100	36.5
Foskor	17.01	6.21
Bayside Aluminium (Isizinda)	0.9	0.34
Tongaat Hulett Sugar Mill	15.73	5.74
Mpact	6.79	2.48
Total	**140.43**	**51.27**

Source: DWS Water Reconciliation Strategy for Richards Bay and Surounding Towns (2018)

2.7 Water Balance

The generation of a standard water balance forms the cornerstone to implementing WCWDM activities within a water supply system. Having a clearly defined and auditable water balance will enable the municipality to;

- Determine the volume of Non-Revenue Water (NRW) as a volume and as percentage of the total input to the system;
- Determine the average consumption per capita per day;
- Determine the Apparent losses for the water supply system;
- Determine the real losses in the system in litres per connection per day;
- Determine the Infrastructure Leakage Index (ILI) for the water supply system;
- Benchmark itself against other municipalities in South Africa and abroad;
- Identify gaps in the handling and capturing of information and data relating to the purchase, distribution and sale of water within the municipality;

The International Water Association (IWA) was utilised to prepare the water balance.

A typical IWA water balance is indicated in **Figure 2-1** , the water balance indicates how the total system input volume is systematically analysed and separated into revenue and non-revenue water.

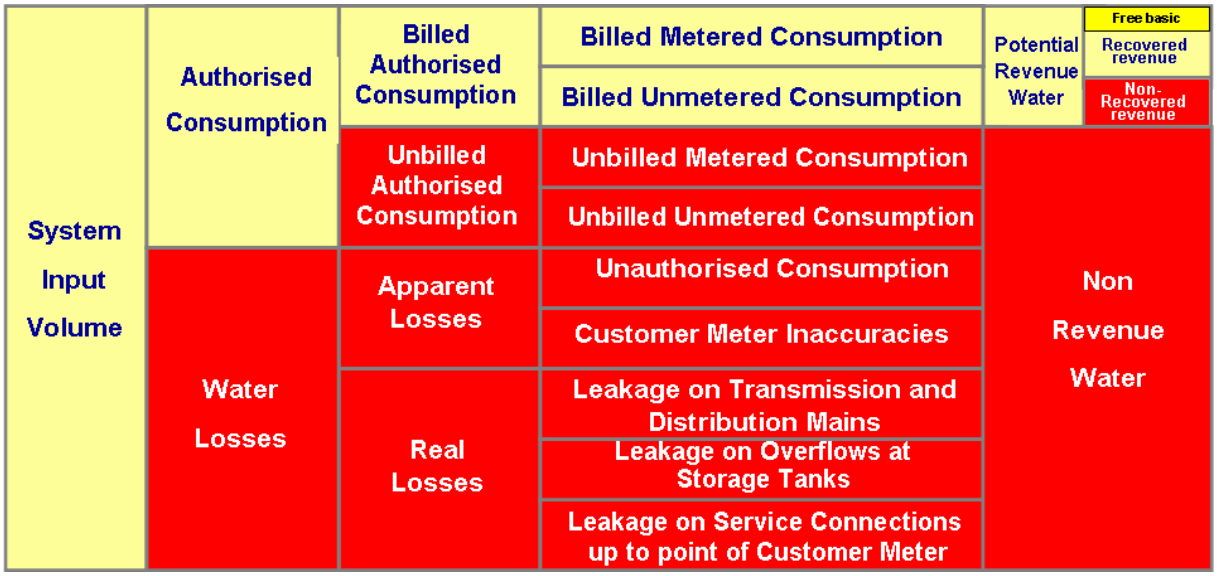

Figure 2-1: IWA Water Balance Template

2.8 CoMLM Historical Water Balance and KPIs

The historical water balance results indicate NRW of between 26.7% in 2012 and 43% in 2017/18. NRW has been consistently increasing in the past 5 years. The current study will revisit the targets set for the CoM LM and determine the new targets and timeline for the municipality.

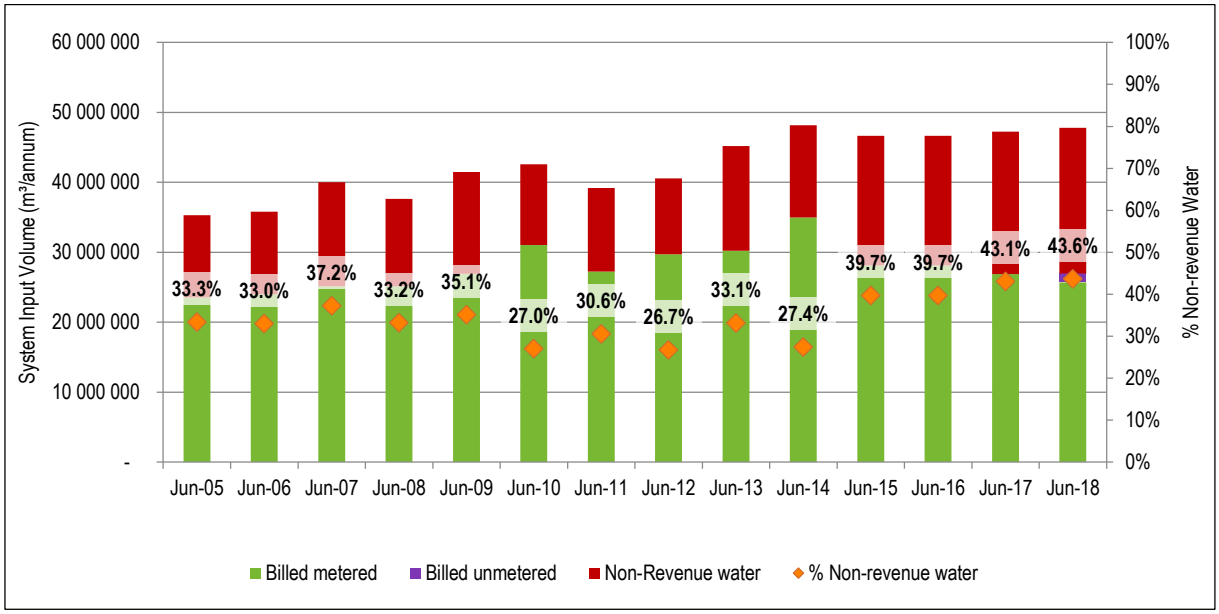

Figure 2-2:CoMLM Historical Water Balance and KPIs

2.9 Current water use, losses and KPIs

Water balance figures were sourced from CoM LM, MW and KCDM respectively,.additional information was sourced obtained from the *Benchmarking of Water Loss, Water Use Efficiency and Non-Revenue Water in South African Municipalities (2004/05 to 2015/16) (DWS, May 2017)* to get an indication of the water use and losses. DWS All Town reports, Blue Drop Report (2012) as well as previous reconciliation strategies. The collected information was utilised to prepare the IWA water balance for the individual demand centres and the consolidated water balance for the municipality indicated in **Figure 2-1.**

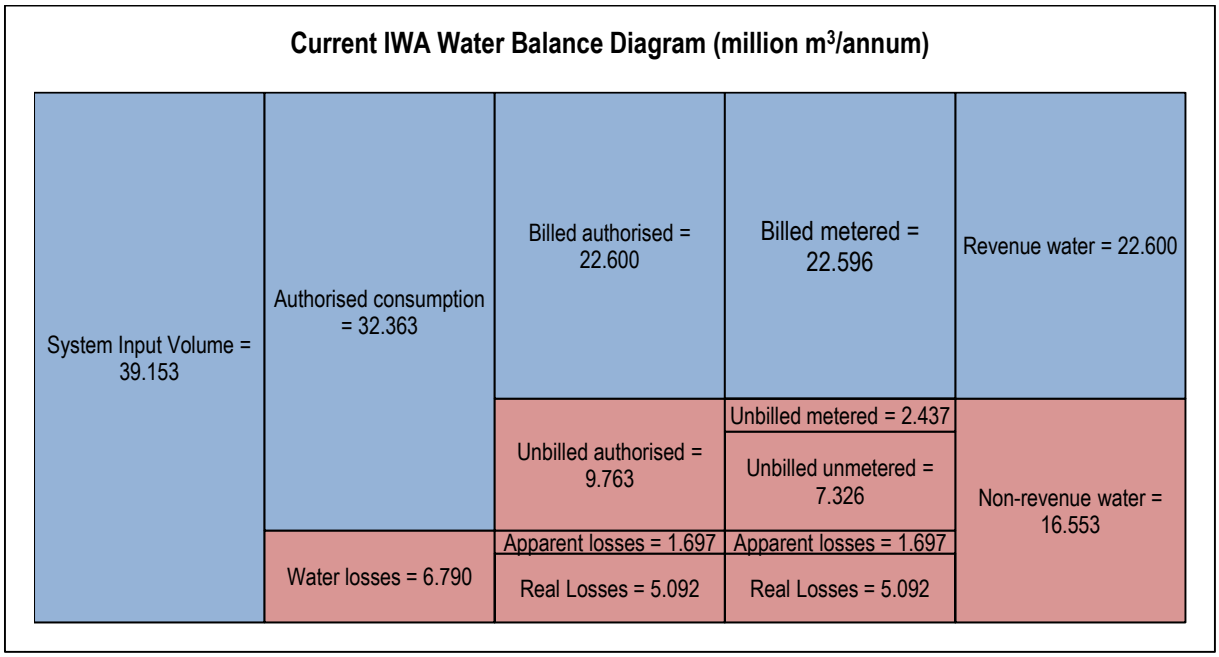

Figure 2-3: CoMLM Current Water Balance

The estimated 2016/17 water balance for the study area indicates NRW and water loss to be the order of 43% and 25% respectively. The high water loss and NRW figures are supported by the high unit consumption of 277 ℓ/c/d for the study area.

Table 2-5: Current Key Performance Indicators

Demand Centre	Population	System Input (million m³/a)	% Water Losses	% Non-revenue water	litres / capita / day
Richards Bay	57 672	14	10%	30%	672
Empangeni	60 526	7	19%	39%	336
Esikhaweni	164 563	10	35%	54%	172
Ngwelezane	61 245	3	30%	55%	124
Nseleni	42 500	4.47	43%	56%	288
Total	**387 605**	**39.15**	**24%**	**43%**	**277**

The NRW figure of 43% and average consumption of 277 ℓ/c/d are above the national averages of 41.0% NRW and 233 ℓ/c/d (DWS 2017). The initial indications are that there is scope for reducing the average consumption in some demand centres and considerable scope for reducing the NRW through improved metering and billing processes. Some demand centres such as Ngwelezane, Nseleni and Esikhaweni are having areas charactirised with informal water infrastructure, with limited or no payment of services there may be limited scope for more reduction of SIV due to the level of service. The more formal demand centres such as Richards Bay and Empangeni are showing high average consumption and this may be contributed by the presense of industries. The high percentage in water losses are mainly in the rural and informal areas where there are limited metering and cost recovery.

Table 2-6: Key Perfomance Indicators Comparison (2015 and 2018)

Demand Centres	Recon 2015				Current Recon			
	SIV (Mm^3/ a)	l / c /d	%NRW	%Water Loss	SIV (Mm3/ a)	l / c /d	%NRW	%Water Loss
Richards Bay	14	749	31%	20%	14	672	30%	10%
eMpangeni	9	422	42%	25%	7	336	39%	19%
eSikhaweni	11	186	56%	40%	10	172	54%	35%
Ngwelezane	3	114	55%	30%	3	124	55%	30%
Nseleni	4.28	276	56%	43%	4.47	288	55%	43%
Total	**41.56**	**298**	**44%**	**30%**	**39.15**	**277**	**43%**	**24%**

Source: DWS, Continuation of Richards Bay Reconciliation Strategy – 2015 and 2018

Table 2-6 shows key performance indicators comparison between the 2015 Reconciliation strategy and the current recon which indicates that some demand centres are showing a reduction in unit consumption such as Richards Bay from 749 l/c/d to 672 l/c/d and Enpangeni with 422 l/c/d down to 336 l/c/d. Futhermore areas such as Nseleni and Ngwelezane are showing slight increase and this may be related to the improvement to the level of service. The results indicates that the municipality is moving in the right direction in terms of NRW management and keeping the restriction conditions in place for longer periods however, significant scope still exists for further reduction taking into account the drought conditions experienced by Kwazulu Natal region.

The current average litres per capita per day consumption of 277 for the CoM LM is highly influenced by Richards Bay and Empangeni demand centres that shows consumption of 672 l/c/d and 336 l/c/d respectively which is far above the national average of 233 l/c/d. The other demand centres show very reasonable l/c/d consumptions, which are in line with the level of service and climatic conditions. Initial indications from the 2015 Recon are that there is limited scope for reducing the average consumption but considerable scope for reducing

the NRW through improved metering, billing processes in some areas. The average consumption for Richards Bay and Empangeni can be significantly improved through more effective water use control, which may include monthly top consumer monitoring, meter audits and meter replacement programmes as well as concerted efforts in the area of community awareness and education. Due to the limited economic activities in some demand centres and the high levels of indigent populations residing within the CoM municipality area, the billed metered consumption can be increased to a limited extent in certain areas in order to reduce the non-revenue water (NRW).

3 STATUS QUO ASSESSMENT

Having reviewed the varying existing information sources for each demand centre, meetings were set-up with the CoM LM and KCDM to discuss the WCWDM strategy development methodology as well as to discuss the findings extracted from the existing data sources. The main objective of these meetings was to establish.

- Status quo on the implementation of the WCWDM strategy;
- Discussion of water balance and management information;
- Results from the various interventions;
- Problems and possible solutions for implementing a WCDM programme; and
- Prioritising of key projects and development of a realistic implementation programme.

A workshop was held with the CoM LM and KCDM respectively to review the work done following the previous reconciliation strategies and to identify the key elements, which could unlock more effective implementation of WCWDM. The following sections summarise the status quo of water resources in the municipality and its demand centres, observations from the site visits undertaken and the pertinent challenges and aspects discussed during the workshops. Water Demand Centres are faced with myriad challenges, one of the most significant being reduction of non-revenue water and that of revenue recovery. The challenges are cross cutting and reflect the state of water services in the municipality as a whole.

The workshop questionnaire was aimed at gathering detailed information from the municipalities under investigation pertaining to the adequacy of institutional aspects of the organisation to support demand management, the availability of materials, vehicles and other support structures to aid in the implementation of WCWDM, the efficacy of the metering and billing systems, levels of political support, customer relations and support services, asset management as well as the nature, level and frequency of the technical interventions undertaken to ensure proper management of the water systems and NRW reduction Water.

3.1 City of uMhlathuze LM Status Quo Assessment

The municipality comprises mostly formal towns and townships such as parts of Esikhaweni, Ngwelezane and Nseleni with formal infrastructure for the larger areas, which enables proper metering, billing and cost recovery. The WCWDM status quo assessment for the CoMLM is summarised in**Table 3-1**.

Table 3-1: Status Quo Assessment for CoMLM

Institutional and legal assessment	Financial assessment
• The municipality has an approved organogram in place, and all key positions are filled. • There are no formalised WCWDM dedicated team in place for all demand centres. • The municipality previously had an issue with technical skills gap within the water services department, however this has been addressed through skills and capacity building. • There is training and capacity building taking place within the municipality to capacitate the stuff with SETA accredited training for process controllers. • There is good working relations and transparency between the technical and other department such as finance and planning departments. • The relationship between the municipality and politicians is good and there is support given to some extent, especially, at an upper level however it becomes a challenge on the ground. • The municipality has a water service charter but stills needs to be updated. • The municipality is the Water Service Authority (WSA) and has Bylaws in place which have been recently updated but these can be made better to address WCWDM.	• There is an open channel communication between the finance department, technical department and the community however there is still room for improvement. • The existing metering, billing and cost recovery in the municipality is approximately 55 - 60% and the source of revenue is mostly in the formal areas such as Richards Bay and Empangeni. • The primary sources of funding for the municipality is through revenue collection, grants and equitable shares. • The municipality has adopted a rising block tariff structure which is mainly for droughts. • The water tariff structure does not supports WCWDM.
Social assessment	**Technical assessment**
• Richards Bay is considered to be one of the most significant social economic centres within the CoMLM and dominating with small to large industrial centres and is also a tourism attraction centre. • There is a positive relationship between the	• There is limited macro management information to facilitate a proper assessment of the water losses and potential savings that can be achieved for most demand centre. • System Input Volume (SIV) is measured

municipality and the majority of the communities in the larger parts of municipality more especially in formal areas. • The relationship is strained in the rural areas mainly due to limited water supply in some areas as well as unwilling to pay for services by consumers in some villages. • Cost recovery and services are maintained at an acceptable standard. • Community awareness and education does take place but only on an ad-hoc basis, in cases of droughts and during national water weeks. • Consumers in general have not adequately internalised water conservation practices. • Consumers report leakages and submit water related queries through customer care centres which are proactive.	with bulk meters from the reservoir outlets and monitored with a telemetry system. • The supply system to zones and districts are metered in the formal areas. • All non-domestic consumers are metered and most of the domestic consumers are also metered with the same type of meters. • There is limited preventative maintenance that is being undertaken. Maintentance is done reactively. • The is high water losses and inefficiencies within the surrounding towns managed by KCDM which need to be addressed.
General observations	
There are WCWDM activities taking place and there is limited management information available to perform a proper assessment of the water losses and potential savings. The current metering, billing and cost recovery systems are adequate. The engineering department has filled most vacancies low capacity and technical skills	

3.2 Access to Portable Water

Most formal areas within the study area have access to 24-hour potable water supply, however; there are some informal areas where consumers experience scheduled intermittent water supply in some parts of Vulindlela and in some cases receive water through water tankers filling up the communal storage tanks. According to the municipality the main reason for the intermittent supply in some areas , is the limited bulk infrastructure and resources to supply water constantly and the rapid growth of informal areas exceeds the current systems. This has a negative impact on service delivery and the life span of the water supply infrastructure. The municipality has initiated a pipe replacement programmes in areas that were supplied through communal tanks to increase the system capacity.

3.3 Water Treatment Works Summary

The water treatment works (WTW) for CoM LM area are summarised in **Table 3-2**

Table 3-2: CoM LM WTW Summary

WTW Names	Design capacity	Design capacity	Operating capacity (Blue Drop 2012)	Operating capacity (DWS Recon 2015/16))	Resource
	Mℓ/d	million m^3/a	Mℓ/d	Mℓ/d	
Esikhaweni	36	13.4	30	30.56	Lake Cubhu
Ngwelezane	8	2.92	8	6.95	Mhlathuze River
Mzingazi	65	23.73	23	39.02	Lake Mzingazi
Nsezi	204	74.83	11	25.58	Lake Nsezi
Total	**313**	**114.88**	**72.00**	**102.11**	

Source: DWS Blue Drop Report 2012 and DWS Reconciliation Strategy 2015/16

The 2012 Blue Drop assessment report indicates a combined SIV of 72 Mℓ/d (26.28 million m3/a). The 2016 reconciliation strategy indicates a combined SIV of 102.11 Mℓ/d (37.27 million m3/a). The 2016 figure has increased by 29% although most WTWs are not operating at full capacity. Mzingazi WTW supplies Nseleni area since Nseleni WTW has been decommissioned as shown in **Figure 3-1.**

Figure 3-1: Decommisioned Nseleni WTW (Left) and Mzingazi WTW (Right)

3.4 Revenue Collection

The CoMLM acknowledged that the existing tariffs do not account fully for the cost of water services. One of the challenges mentioned was the high indigent and rural population in the

WSA which make both cost recovery and tariff setting a difficult process taking into account the limited urban areas which can be metered and billed for consumption versus the affordability for the consumers. The current tariff structure for residential and business does not promote water use efficiency as shown below in **Table 3-3**. The municipality did adjust the water tariffs during the drought periods as presented in **Source:** City of uMhlathuze Local Municipality

Table 3-4 to enforce restrictions, the drought water tariffs has remained active to discourage consumers from wasting water even after the restrictions were partialy lifted. The municipality also indicated that it can be difficult to enforce credit control policies and Bylaw enforcement in some areas of the municipality due to limited support from the Councillors and tribal authorities. A review of water tariffs is necessary to effect sound cost recovery provided the municipality has large formal areas where cost recovery is possible, this will required strong support from the political constituencies. Payment for water services must be strongly and decisively driven by the political heads to ensure that the water service provision is sustainable and to improve water security.

Proper arrangements are also required for new low cost housing developments with services installed, which should also be billed for consumption. These areas, when not managed closely, become an area of significant water losses with poor quality fittings and general misuse of water resources. In addition, the tariff setting process should ideally include both the finance and technical departments to ensure that all aspects of water services are taken into account with the aim to continuously improve the cost reflectiveness of the tariffs, and to support the future sustainability of the municipality.

Table 3-3: CoMLM Water Tariffs Structure (Normal)

Water tariffs (2017/18)	Domestic Tariff (R / kℓ)
0 – 0.2 (consumption < 0.2 kℓ /day)	0.00
0 – 0.2 (consumption > 0.2 kℓ /day)	4.29
0.2 – 0.5 kℓ/day	5.15
0.5 – 1.0 kℓ/day	12.07
1.0 – 2.0 kℓ/day	15.99
> 2.0 kℓ/day	20.87

Source: City of uMhlathuze Local Municipality

Table 3-4: CoMLM Water Tariffs Structure (Drought)

Water tariffs (2017/18)	Domestic Tariff (R / kℓ)			
	Stage 1	Stage 2	Stage 3	Stage 4
0 – 0.2 (consumption < 0.2 kℓ /day)	0.00	0.00	0.00	0.00
0 – 0.2 (consumption > 0.2 kℓ /day)	4.68	5.87	6.40	6.97

Water tariffs (2017/18)	Domestic Tariff (R / kℓ)			
	Stage 1	Stage 2	Stage 3	Stage 4
0.2 – 0.5 kℓ/day	5.62	7.04	7.68	8.37
0.5 – 1.0 kℓ/day	13.16	16.49	17.98	19.59
1.0 – 2.0 kℓ/day	17.43	21.86	23.82	25.97
> 2.0 kℓ/day	22.74	28.51	31.07	33.87

Source: City of uMhlathuze Local Municipality

The municipality has an operational billing system, with accounts being sent to consumers on a monthly basis however, this can be limited to formal areas, while in rural areas it is difficult to collect revenue as well as enforcement of revenue collection policies. It has been noted that the cost of water no way reflects the cost of service provision, which is a serious concern; as this significantly compromises the sustainability of the municipality. The revenue and expenditure of water services, based on the *2018/19 Medium Term Revenue and Expenditure Framework* is summarised in **Table 3-5**.

Table 3-5: Medium Term Revenue & Expenditure Framework

Description	2014/15	2015/16	2016/17	2017/18	2018/19 Medium Term Revenue & Expenditure Framework		
	Audited Outcome	Audited Outcome	Audited Outcome	Full Year Forecast	Budget Year 2018/19	Budget Year 2019/20	Budget Year 2020/21
Water Revenue ('000)	413 667	428 199	501 980	498 028	518 720	575 818	622 630
Water Expenditure ('000)	428 830	382 189	483 166	496 521	477 952	507 278	540 069
Surplus / Deficit ('000)	**(15 163)**	**46 009**	**18 814**	**1 507**	**40 768**	**68 540**	**82 561**
System input volume (m^3/annum)	48 144 953	46 642 034	46 642 034	46 642 034	46 642 034	46 642 034	46 642 034
Billed authorised (m^3/annum)	34 965 348	28 121 345	28 121 345	28 121 345	28 121 345	28 121 345	28 121 345
Average production cost (R/kl)	**R 8.91**	**R 8.19**	**R 10.36**	**R 10.65**	**R 10.25**	**R 10.88**	**R 11.58**
Average selling cost (R/kl)	**R 11.83**	**R 15.23**	**R 17.85**	**R 17.71**	**R 18.45**	**R 20.48**	**R 22.14**
Selling / production cost ratio	**1.3**	**1.9**	**1.7**	**1.7**	**1.8**	**1.9**	**1.9**
Piped Water inside Dwelling	35 752	44 308	44 308	47 511	47 511	47 511	47 511
Piped Water inside Yard	35 619	41 301	41 846	54 778	55 778	56 778	57 778
Using Public Tap	–	–	–	–	–	–	–
Other water supply (> RDP)	–	–	–	–	–	–	–
Other water supply (< RDP)	–	–	–	–	–	–	–
Sub-total - Households	**71 371**	**85 609**	**86 154**	**102 289**	**103 289**	**104 289**	**105 289**
Avg cost/household/month	**R 483**	**R 417**	**R 486**	**R 406**	**R 419**	**R 460**	**R 493**

*Average cost / household / month = Water revenue / (Piped water inside dwelling + inside yard) / 12

Results from the MTREF budget indicate that the municipality operated at a 0.3% surplus in 2017/18 and plans for an annualised growth of 7.7% in revenue and 2.8% in water expenditure over the next three years. It is commendable that the planned annualised growth in expenditure is below inflation but might not be realistic. The projections are

optimistic considering the municipality could be implementing water restrictions, which will reduce revenue, and the municipality does not have aggressive drought water tariffs. The average selling / production cost ratio is 1.7, which is slightly above the ratio for all large municipalities, and suggests average metering, billing and cost recovery for most of the municipality. The average cost per household per month of R 406 compares well with the average for large municipalities. The results indicate that financially the municipality has been reasonably well but has been unable to translate this into effective WCWDM. The municipality should expand its paying consumer base to ensure water services remain affordable for all customers.

4 OVERVIEW OF DEMAND CENTRES

A locality map of the main demand centres of the RBWSS is as illustrated in **Figure 4-1**. The colours of the map and the schematic have been kept consistent for ease of reference.

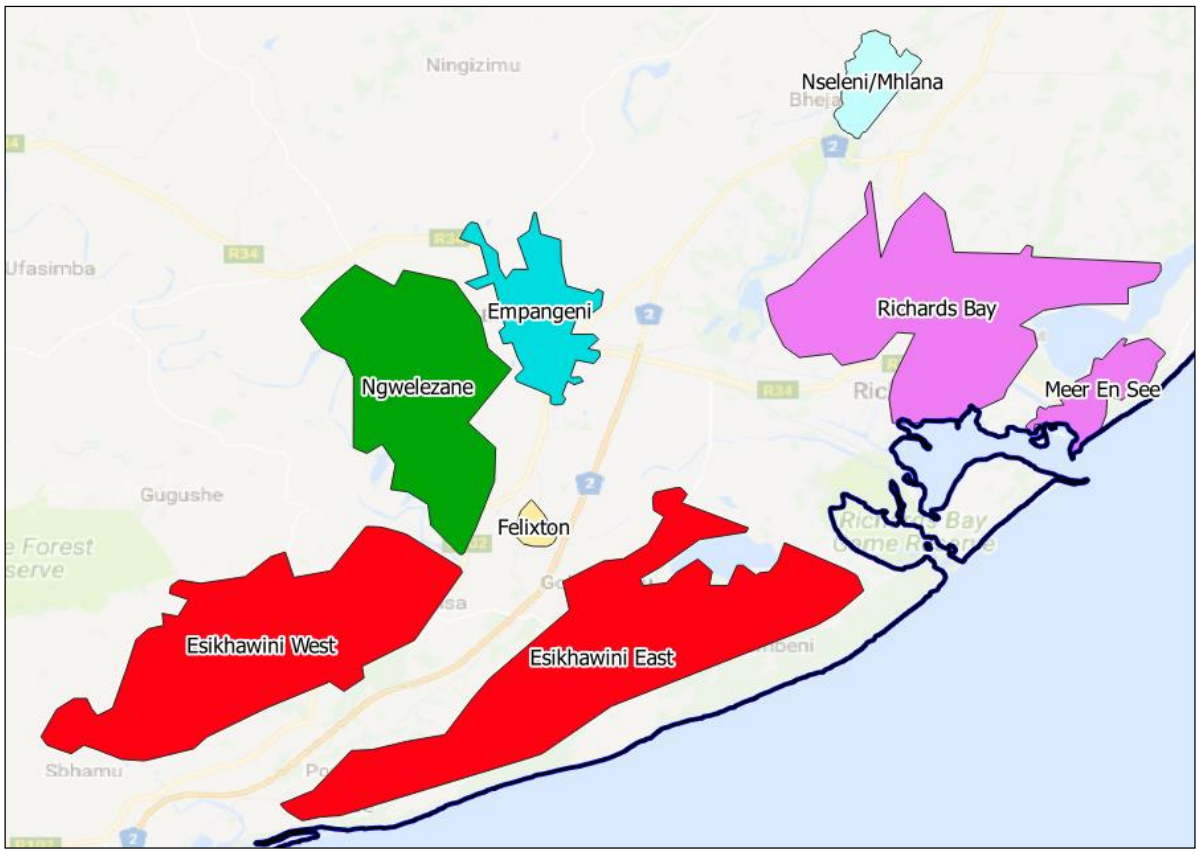

Figure 4-1: Schematic Layout for the Demand Centres

4.1 Richards Bay

The demand centre very well established town with well developed industries, commercial areas and business centres. The existing developments in the town consist of several surbubs as well as several industries and commercial businesses. Richards Bay comprises the main places of Meer En See and Arboretum, Veld en Vlei, Alton (light industrial), Brackenham, Richards Bay Central (light industrial) and Aquadene. The supply area is largely formal with formal infrastructure, which enables proper metering, billing, and cost recovery. The level of services is generally at a minimum RDP to above RDP standards for all consumers within the demand centre. There are limited WCWDM measures being undertaken in the demand centre and in general there is management information partialy available to perform a proper assessment of the water losses and potential savings. There is scope for WCWDM programmes, which will aid in improving the availability of macro management information and water loss control.

4.1.1 Richards Bay Institutional Arrangements

The institutional arrangements for water services in the Richards Bay demand centre area is summarised in **Table 4-1.**

Table 4-1: Institutional Arrangements for Richards Bay

Municipality	Demand Centre	Water Service Authority	Water Service Provider
City of uMhlathuze	Richards Bay	CoMLM	CoMLM and MW

4.1.2 Richards Bay Water Requirements

The primary water supply for the Richards Bay demand centre is the Mzingazi WTW. The production volume (2016) for this plant is estimated at 21.9 million m^3/a with a design capacity of 23.7 million m3/a. The abstraction source is Lake Mzingazi. Nsezi WTW is used as a secondary supply for the Richards Bay demand centre. These water treatment plants are managed by Mhlathuze Water (MW) and is contracted with the CoMLM to operate the plant on the municipality behalf.

The augmentation of the water supply from Nsezi WTW to the Richards Bay demand centre became necessary during the drought when the supply from Mzingazi WTW was problematic because Mzingazi Lake levels were very low.

4.1.3 Bulk Metering

There are bulk meters in place and the information obtained from the meters is recorded and utilised. **Figure 4-2** below shows the state of the existing bulk meters. In many cases, the bulk meters are functional and some were relatively new.

The current bulk metering status can be summarised by the following key points:

- The main bulk water components such as the WTWs and key reservoirs are managed and metered by Mhlathuze Water (MW);
- Reservoirs managed by the municipality are metered, but the meter functionality is unknown. According to the municipality, most of their bulk meters are being read and manually recorded on monthly basis but no records could not be sourced;
- The bulk supply readings from the Mzingazi WTW were provided by MW;
- According to the municipality, there are no records to verify the operational condition and status of bulk meters in the area.

Figure 4-2: Typical bulk and Non-Domestic metering

4.1.4 Reticulation Network and Domestic Metering

From the Mzingazi WTW, water is pumped and stored in the main reservoirs and gravitate to the network and pumped to secondary reservoirs and towers. The municipality confirmed that the network comprised of very old asbestos cement pipes in some areas and PVC pipes in other areas. There are no network replacement programmes taking place and the pipes are replaced reactively, as and when required.

A few consumer meters in Brackenham, Richards Bay Central and Aquadene were randomly selected and photographed as shown in **Figure 4-3**. Based on the photos, it appears that most properties are metered and that some of the meters are not read on a regular basis hence the meter chambers were full of debris and buried.

Figure 4-3: Typical Industrial and Domestic Consumer Meters

KPI's for Richards Bay

The water balance information is based on the basic information provided by the *Reconciliation Strategy of 2016;* CoMLM and MW as well assumptions made for the 2016/17 financial year. The KPI's for Richards Bay are summarised in **Table 4-2**.

Table 4-2: Richards Bay KPI's

Indicator	Current Value	Realistic Target value 15% Reduction	Optimistic Target Value 25% Reduction
System Input volume (million m^3/a)	14	12.04	10.62
System Input volume (Mℓ / day)	38,8	33.0	29.1
Billed Authorised Consumption (million m^3/a)	12,04	9.63	9.03
Unbilled Authorised Consumption (million m^3/a)	0,55	0.55	0.53
Water Losses (million m^3/a)	1,57	1.85	1.06
Non-revenue Water (million m^3/a)	2,12	2.41	1.59
% Non-revenue water	30%	20%	15%
% Water Losses	10%	15%	10%
Input Volume (litres / capita / day)	672	571	504
Input Volume (m^3 / household / month)	92	78	69
Authorised Consumption (litres / capita / day)	598	483	454
Authorised Consumption (m^3 / household / month)	82	66	62

The results indicate water losses (10%), NRW (30%) and an average consumption of 672 ℓ/c/d. The unit consumption is well above national and international standards for the level of service, this may indicate the possibility of wet industries within the demand centre. Therefore WCWDM interventions should be prioritised to ensure proper assessments and audits are done by the municipality to ensure the system remains efficient.

4.1.5 Strategy

Undertaking water demand management requires commitment and technical expertise, which can be developed over time. Training and skills transfer is required to address many challenges facing the municipality. The strategy for Richards Bay demand centre is summarised in **Table 4-3**.

Table 4-3: Richards Bay Strategy

Item	Strategy	Priority	Estimated 5 Year Budget
Intitutional Strategy	Consider institutionalising the WCWDM team and fill vacancies if necessary	1	R1 150 000
	Build on the existing skills base by continuosly training the technical staff	1	

Item	Strategy	Priority	Estimated 5 Year Budget
	Undertake a councillor WCWDM induction programme to capitalise on the existing relationship and build a communication bridge between the municipality and the customers	1	
Financial Strategy	Undertake bulk and consumer meter audit, expose buried meters and to ensure meters are easily accessible	1	R14 484 400
	Improve monthly water balance with the necessary NRW KPIs included	1	
	Include infrastructure leakage reporting as part of the employment profile for the meter readers to facilitate passive and cost effective leak detection	1	
	Include WCWDM training for the meters readers to facilitate their understanding of the water business	1	
	Undertake a community survey to determine the effectiveness of the municipality's mentor programme and where the short falls are in aiding people to better understand the water business and the billing system.	2	
	Consider including water conservation tips and information in the water bill.	1	
	Review water tariff and ensure that the rising block tariff is sufficiently differentiated in cost at each level to promote WCWDM with the highest tariff at least twice the amount of the lowest tariff.	1	
Social Strategy	Undertake social awareness and education on annual basis	1	R6 667 680
Technical Strategy	Improve pressure management	1	R 55 220 080
	Zone metering and sectorisation to improve micro management	1	
	Undertake an infrastructure cleaning programme such as valves, reservoirs, PRVs and meter chambers. Utilise the opportunity to create local ward based employment and improve asset management	1	

Summary

The City of uMhlathuze Municipality has implemented some WCWDM measures in Richards Bay, however there is scope for WCWDM in the Richards Bay area which may result in reduction of the total SIV and NRW. There is institutional capacity to deal with water loss management, although it is not formally institutionalised. The current WCWDM initiatives include measuring of NRW as well as passive leakage detection based on responding to consumers reporting leaks. There are limited awareness and education programmes to

inform consumers on the water scarcity and the need to conserve water, however this can improve. The demand centre should focus on the following interventions:

- Reviewing water tariff to be more cost reflective and promote WCWDM;
- Zone metering and sectorisation to improve macro management;
- Improve pressure management to minimise burst pipes;
- Improve community awareness programme.

4.2 Empangeni

The demand centre is largely formal and the level of services is mainly RDP standard and above with scattered villages on the outskirts of the main town. There are a number of WCWDM activities, which have been undertaken in the demand to improve system efficiency as well as improving the availability of management information including monthly reporting and meetings in the technical department in order to identify and prioritise areas experiencing high water losses.

4.2.1 Empangeni Institutional Arrangements

The institutional arrangements for water services in the Empangeni demand centre is summarised in **Table 4-4**.

Table 4-4: Empangeni Institutional Arrangements

Municipality	Demand Centre	Water Service Authority	Water Service Provider
City of uMhlathuze	Empangeni	CoMLM	CoMLM

4.2.2 Empangeni Water Requirements

The primary supply for the Empangeni demand centre is from the Nsezi WTW. The production volume (2016) for this plant is 48.0 million m^3/a with a design capacity of 78.4 million m^3/a. The abstraction source is Lake Nsezi and the Mhlathuze weir is used as an emergency supply for the Empangeni demand centre.

4.2.3 Bulk Metering

The inlet to the WTW is equipped with a Mag flow meter and the meter readings are recorded on a daily basis. The records are kept in a logbook by MW personnel. According to the municipality, there are no records to verify the operational condition and status of bulk meters in the area. The inlets and outlets of the reservoirs are also equipped with mechanical meters.

4.2.4 Reticulation Network and Domestic Metering

According to the municipal officials, households have house connections that are metered with some villages on the outskirts of the town getting water from the yard connections. It should be noted that some of these villages might be falling outside the boundaries of the demand centre. The following with respect to the network reticulation and metering was also noted:

- Empangeni has street side water reticulation with piped water into the properties;
- The informal area visited on the outskirts of Empangeni town had house and yard connections and most sites were metered;
- Some consumer meters in the villages as well as the non-domestic meters in the industrial areas are inside the premises as shown in **Figure 4-4**. Domestic consumer water meters are generally visible outside and inside premises;
- According to municipality personnel the water network is sectorised for the larger parts of the demand centre;
- It was also mentioned that the network comprises of very old AC pipes and PVC in some areas, and there is high occurrence of pipe bursts taking place in this demand centre due to the aging infrastructure and it is one of the contributors to water losses;
- The water meters are read manually and the data is recorded in a register for billing processes.

Figure 4-4: Typical domestic water meters

KPI's for Empangeni

The KPIs for Empangeni are summarised in **Table 4-5** and the results indicate high water losses (19%), NRW (39%) and an average consumption of 336 ℓ/c/d, which is higher that the national standards. The KPIs are indicating the need to address some of WCWDM interventions to reduce NRW and the unit consumption to acceptable levels.

Table 4-5: Empangeni KPI's

Indicator	Current Value	Realistic Target value 15% Reduction	Optimistic Target Value 20% Reduction
System Input volume (million m^3/a)	7	6.32	5.94
System Input volume (Mℓ / day)	20,3	17.3	16.3
Billed Authorised Consumption (million m^3/a)	5,92	4.61	4.52
Unbilled Authorised Consumption (million m^3/a)	0,10	1.14	1.19
Water Losses (million m^3/a)	1,41	0.57	0.24
Non-revenue Water (million m^3/a)	1,51	1.71	1.43
% Non-revenue water	39%	27%	24%
% Water Losses	19%	9%	4%
Input Volume (litres / capita / day)	336	286	269
Input Volume (m^3 / household / month)	61	52	49
Authorised Consumption (litres / capita / day)	272	260	258
Authorised Consumption (m^3 / household / month)	50	47	47

4.2.5 Strategy

Table 4-6: Empangeni Strategy

Item	Strategy	Priority	Estimated 5 Year Budget
Intitutional Strategy	Consider intitutionalising the WCWDM team and fill vacancies if necessary	1	R1 150 000
	Improve monthly meetings and discuss WCWDM issue, the meetings should be chaired by senior officials	1	
	Review bylaws to address WCWDM	1	
	Improve monthly meetings and discuss WCWDM issue, the meetings should be chaired by senior officials	1	
Financial Strategy	Improve monthly monitoring and capture of the bulk meter readings, develop a comprehensive monthly water balance with the necessary NRW KPIs included	1	R5 448 200
	Maintain and install bulk meters at key point of the network to improve monitoring and evaluation	1	
	Undertake an infrastructure cleaning programme. Utilise the opportunity management to create local ward based employment and improve asset	1	
	Review the current billing system and make recommendations.	1	
	Undertake a community survey to determine the effectiveness of the municipality's mentor programme and where the short falls are in aiding people to better understand the water business and the billing system.	2	
	Consider including water conservation tips and information in the water bill.	1	
	Review water tariff and ensure that the rising block tariff	1	

Item	Strategy	Priority	Estimated 5 Year Budget
	is sufficiently differentiated in cost at each level to promote WCWDM with the highest tariff at least twice the amount of the lowest tariff.		
Social Strategy	Schools awareness	1	R5 536 960
	Undertake social awareness and education on annual basis	1	
	Water wise gardening	2	
Technical Strategy	Budget and embark on pipe replacement programme for areas experiencing high burst frequency to reduce physical losses	1	R 28 102 260
	Improve/implement pressure management to minimise pipe bursts, maintain the satisfactory operating pressure and ensure that operating pressures never exceed the DWS regulatory standard of 9 bar	1	
	Zone metering and sectorisation to improve micro management	1	
	Undertake an infrastructure cleaning programme such as valves, reservoirs, PRVs and meter chambers. Utilise the opportunity to create local ward based employment and improve asset management	1	

Summary

The CoMLM has implemented some WCWDM in Empangeni. There are personnel dedicated to water loss management, although it is not formally institutionalised. The current WCWDM initiatives include mesuring of NRW, pressure management as well as passive leakage detection based on responding to consumers reporting leaks. There are limited awareness and education programmes taking place to inform consumers on the water scarcity and the need to conserve water, however this can improve. There is scope for WCWDM in Empangeni demand centre which will result in reducing the total system input volumes and unit consumption. The demand centre should focus on the following interventions:

- Review and improve water tariff to reflect cost of water and promote WCWDM;
- Improve pressure management and infrastructure maintenance;
- Promote water wise gardening;
- Undertake WCWDM training for meter readers to eliminate inaccuracies and estimates as well as leakage reporting;
- Pipe replacement and removal of wasteful devices;

- Improve zone metering and sectorisation to improce micro management information. This will assist the demand centre to identify problematic areas and reduce the number of pipe bursts;
- Network replacement for areas with very old network within the demand centre which can be the source of water loss.

4.3 Esikhaweni

Esikhaweni is one of the most densely populated demand centres, surrounded with low income settlements. The Esikhaweni-Vulindlela Corridor has been identified as key relocation area for the uMzingwenya communities, the level of service ranges from low and medium income residential income. The demand centre serves largely informal and rural areas, which is partially supplied by the Mtunzini water scheme. The demand centre is beleaguered by a large indigent population and limited economic activity and employment opportunities, which limits further reduction of NRW through increased metering and billing. The community is this area relies mostly on seasonal farm work for economic opportunities.

4.3.1 Esikhaweni Institutional Arrangements

The institutional arrangements for water services in the Esikhaweni demand centre is summarised in **Table 4-7**.

Table 4-7: Institutional arrangements for Esikhaweni

Municipality	Demand Centre	Water Service Authority	Water Service Provider
City of uMhlathuze	Esikhaweni	CoMLM	CoMLM and MW

4.3.2 Esikhaweni Water Requirements

The primary supply for the Esikhaweni demand centre is the Esikhaweni WTW. The production volume (2016) for this plant is 10.4 million m^3/a with a Design Capacity of 13.1 million m^3/a and the abstraction source is Lake Cubhu. The uMhlathuze weir is used as an emergency supply for the Esikhaweni demand centre when Lake Cubhu levels are low. The Esikhaweni WTW supplies the Esikhaweni area and other neighbouring areas such as Vulindlela and Felixton.

4.3.3 Bulk Metering

The municipality personnel mentioned that there are bulk meters in place around Esikhaweni and the readings are recorded on a monthly basis. During the site visit it was evident that some bulk meters and valve installations are located inside consumer fence and this may cause reading of meters difficult as seen below in **Figure 4-5**.

Figure 4-5: Infrastructure inside consumer property (Left) and Non-Domestic meter installation (Right)

4.3.4 Reticulation Network and Domestic Metering

From the Esikhaweni WTW, water is stored in primary reservoirs and pumped to elevated pressure towers and reservoirs in other areas. Some of the network pipes are leaking and require maintenance. The municipality confirmed that the network comprises of very old AC pipes in older areas and PVC pipes in the newly developed areas. Most chambers have covers installed to protect the infrastructure. Infrastructure accessories such as control valves are in a reasonable condition and in some instances, they are not enclosed which renders them vulnerable to vandalism and weather damage.

It was evident that consumers within the Esikhaweni demand centre have storage tanks on site for rain water harvesting and in some cases where the level of service is below and RDP standarts the municipality has installed storage tanks with communal stand pipes as a short term measure for addressing water scarcity and to improve service delivery to the communities as shown in **Figure 4-6**. Most of these communal storage tanks are not metered. Parts of the demand center such as Vulindlela are experiencing intermittent water supply. The following with respect to the network reticulation and metering was also noted:

- The formal parts of Esikhaweni has street side water reticulation with piped water into the properties;
- Logging of bulk water meters is taking place in some reservoir outlets, however the operational condition of loggers was not clear;
- The communal storage tanks are being filled once or twice per week;
- Pipe replacement and upgrades is taking place in some parts Vulindlela to increase capacity;

- Most consumer stands are equipped with meters;
- The types of domestic meters used are mostly the Sensus plastic meters installed above ground;
- There is limited pressure management taking place, however the operation condition of pressure reducing valve was not confirmed.

Figure 4-6: Rainwater harvesting in areas below RDP level of service, Individual (left), communal (right)

KPIs for Esikhaweni

The KPIs for Esikhaweni are summarised in **Table 4-8.** The results indicate water losses (35%), NRW (54%) and an average consumption of 172 ℓ/c/d. The kPIs are within national standards for the level of service and WCWDM interventions should continuously be implemented and maintained to ensure system efficiency is maintained at acceptable levels in order for the savings to be redistributed to areas with deficit.

Table 4-8: Esikhaweni KPI's

Indicator	Current Value	Realistic Target value 5% Reduction	Optimistic Target Value 10% Reduction
System Input volume (million m^3/a)	10	9.79	9.28
System Input volume (Mℓ / day)	28,2	26.8	25.4
Billed Authorised Consumption (million m^3/a)	8,37	5.97	6.12
Unbilled Authorised Consumption (million m^3/a)	0,49	1.86	1.76
Water Losses (million m^3/a)	1,44	1.96	1.39
Non-revenue Water (million m^3/a)	1,94	3.82	3.15
% Non-revenue water	54%	39%	34%
% Water Losses	35%	20%	15%
Input Volume (litres / capita / day)	172	163	154

Indicator	Current Value	Realistic Target value 5% Reduction	Optimistic Target Value 10% Reduction
Input Volume (m^3 / household / month)	21	20	19
Authorised Consumption (litres / capita / day)	148	130	131
Authorised Consumption (m^3 / household / month)	18	16	16

4.3.5 Strategy

Table 4-9: Esikhaweni Strategy

Item	Strategy	Priority	Estimated 5 Year Budget
Intitutional Strategy	Undertake a councillor WCWDM induction programme to capitalise on the existing relationship and build a communication bridge between the municipality and the customers	1	R1 150 000
	Build on the existing skills base by continuosly training the technical staff	1	
	Consider intitutionalising the WCWDM team and fill vacancies if necessary	1	
Financial Strategy	Undertake bulk and consumer meter audit, expose buried meters and to ensure meters are easily accessible	1	R44 764 100
	Improve monthly water balance with the necessary NRW KPIs included	1	
	Consider expanding the revenue base by installation of consumer meters gradually starting from areas where water network has been finalised	1	
	Include WCWDM training for the meters readers to facilitate their understanding of the water business	1	
	Consider including water conservation tips and information in the water bill	1	
	Review water tariff and ensure that the rising block tariff is sufficiently differentiated in cost at each level to promote WCWDM with the highest tariff at least twice the amount of the lowest tariff	1	
Social Strategy	Retrofit internal leakage in public and private household targeting low cost areas	1	R18 239 020
	Budget and undertake a continuous annual education and awareness campaign focusing on promoting water use efficiency. Develop simple visual material in the form of pamphlets to be attached to the water bill which can be used to educate consumers on efficient water use. Once the initial communication has been established, consider periodically publicising water tips on local media such as radio stations and newspapers		
Technical Strategy	Implement pressure management to minimise pipe bursts, maintain the satisfactory operating pressure and ensure that operating pressures never exceed the DWS	1	R 81 393 995

Item	Strategy	Priority	Estimated 5 Year Budget
	regulatory standard of 9 bar		
	Zone metering and sectorisation to improve micro management	1	
	Undertake an infrastructure cleaning programme such as valves, reservoirs, PRVs and meter chambers. Utilise the opportunity to create local ward based employment and improve asset management	1	

Summary

The CoM has implemented some WCWDM measures in the demand centre. The current WCWDM initiatives include measuring of NRW as well as passive leakage detection based on responding to consumers reporting leaks. There are limited awareness and education programmes taking place. Consumers are experiencing intermittent water supply and rely on communal storage tanks for consistant supply in Vulindlela,Mzingwenya. Consumers around Mzingwenya indicated that they have to purchase bottled water for drinking and cooking but only utilise water from the communal tanks for general usage as a health precaution. There is scope for WCWDM in the demand centre which will result in reducing the total system input volumes, NRW and water loss. The demand centre should focus on the following interventions

- Improve the relationship between the municipality, local authorities and politicians to ensure speedy decisiveness on WCWDM matters;
- Undetake a consumer meter replacement programme for meters older then 10 years, target 10%of all metered consumers.to replace on annual basis;
- Infrastructure maintenance and repair visible leaks;
- Review water tariffs to reflect cost of water and promote WCWDM;
- Implement pressure management to reduce pipe bursts and zone metering to improve management information;
- Undertake community awareness programme that empasies fixing of internal plumbing leakage.

4.4 Ngwelezane

Ngwelezane is adjacent to Empangeni and is a low-income peri-urban area. The demand centre comprises of mostly formal areas such as townships with formal infrastructure. The level of service is mostly at RDP standard and above which enables metering, billing, and cost recovery systems to take place adequately, athough most of the population is indigent. The municipality has undertaken a number of WCWDM activities including improved bulk

metering as well as sectorisation and zone metering. The informal and rural areas are still problematic with regards to cost recovery.

4.4.1 Ngwelezane Institutional Arrangements

The institutional arrangements for water services in the Ngwelezane demand centre is summarised in **Table 4-10**.

Table 4-10: Institutional arrangements for Ngwelezane

Municipality	Demand Centre	Water Service Authority	Water Service Provider
City of uMhlathuze	Ngwelezane	CoMLM	CoMLM

4.4.2 Ngwelezane Water Requirements

Ngwelezane demand centre is supplied from the Ngwelezane WTW. The production volume (2016) for the plant is 1.9 million m3/a with a design capacity of 2.9 million m3/a. The abstraction is from the Mhlathuze River. The Ngwelezane WTW supplies Ngwelezane and surrounding areas such as Madlebe North and South.

4.4.3 Bulk Metering

According to the municipality most reservoirs are metered and the zone outlets are also metered. Most bulk meters are operational and the readings are recorded monthly by the municipal officials.

4.4.4 Reticulation Network and Domestic Metering

The municipal officials confirmed that the network is comprised of very old asbestos cement pipes in most areas and PVC pipes in some areas. There is no network replacement programmes taking place and the pipes are replaced reactively, as and when required. The ageing networks was noted to be a relatively significant contributor to the water losses in the Ngwelezane area which must be addressed. **Figure 4-7** shows the status of the network accessories and domestic metering.

- Most indigent consumer stands are equipped with meters in the newly developed areas;
- Domestic consumer water meters are generally visible outside and inside premises. A number of the water meters and meter boxes were found to be dirty and it is evident that these meters are not read regularly;
- There are storage reservoirs available and below ground hydrants that are marked clearly;
- Municipal officials also indicated that in certain areas, water must be closed off at some of the reservoirs if pipe bursts must be repaired; which suggests that proactive maintenance is required in these areas;

- There is limited pressure management taking place.

Figure 4-7: Typical photographs of the domestic metering and network hydrants

KPIs for Ngwelezane

The KPIs for Ngwelezane are summarised in **Table 4-11**

Table 4-11: Ngwelezane KPIs

Indicator	Current Value	Realistic Target value 10% Reduction	Optimistic Target Value 15% Reduction
System Input volume (million m^3/a)	3	2.50	2.36
System Input volume (Mℓ / day)	7,6	6.9	6.5
Billed Authorised Consumption (million m^3/a)	1,56	1.60	1.64
Unbilled Authorised Consumption (million m^3/a)	0,39	0.53	0.49
Water Losses (million m^3/a)	0,83	0.38	0.24
Non-revenue Water (million m^3/a)	1,22	0.90	0.73
% Non-revenue water	55%	36%	31%
% Water Losses	30%	15%	10%
Input Volume (litres / capita / day)	124	112	106
Input Volume (m^3 / household / month)	14	13	12
Authorised Consumption (litres / capita / day)	87	95	95
Authorised Consumption (m^3 / household / month)	10	11	11

The key performance indicators of 55% NRW and 30% water loss suggest that there is significant scope for WCWDM activities with potential for NRW and water loss reduction within Ngwelezane. The per capita consumption of 124 ℓ/c/d is inline with the national average.

With limited economic activities in the area and the high levels of indigent population within the demand centre the billed metered consumption can be increased to a limited extent in order to reduce the NRW. There is potential to reduce the apparent losses and to a limited extent the physical losses. This includes establishment of Pressure Management Areas (PMAs), implementation of consumer meter installation programme to reduce the current water loss through unauthorised connections.

4.4.5 Strategy

Table 4-12: Ngwelezane Strategy

Item	Strategy	Priority	Estimated 5 Year Budget
Intitutional Strategy	Undertake a councillor WCWDM induction programme to capitalise on the existing relationship and build a communication bridge between the municipality and the customers	1	R1 150 000
	Build on the existing skills base by continuosly training the technical staff	1	
	Consider intitutionalising the WCWDM team and fill vacancies if necessary	1	
Financial Strategy	Undertake bulk and consumer meter audit, expose buried meters and to ensure meters are easily accessible	1	R18 663 300
	Improve monthly water balance with the necessary NRW KPIs included	1	
	Consider expanding the revenue base by installation of consumer meters gradually starting from areas where water network has been finalised	1	
	Include WCWDM training for the meters readers to facilitate their understanding of the water business	1	
	Consider including water conservation tips and information in the water bill	1	
	Review water tariff and ensure that the rising block tariff is sufficiently differentiated in cost at each level to promote WCWDM with the highest tariff at least twice the amount of the lowest tariff	1	
Social Strategy	Retrofit internal leakage in public and private household targeting low cost areas	1	R8 273 260
	Budget and undertake a continuous annual education and awareness campaign focusing on promoting water use efficiency. Develop simple visual material in the form of pamphlets to be attached to the water bill which can be used to educate consumers on efficient water use. Once the initial communication has been established, consider periodically publicising water tips on local media such as radio stations and newspapers		
Technical	Implement pressure management to minimise pipe	1	R 19 870 660

Item	Strategy	Priority	Estimated 5 Year Budget
Strategy	bursts, maintain the satisfactory operating pressure and ensure that operating pressures never exceed the DWS regulatory standard of 9 bar		
	Zone metering and sectorisation to improve micro management	1	

Summary

The CoM has implemented some WCWDM in Ngwelezane and there are personnel dedicated to water loss management. The current WCWDM initiatives include bulk and consumer metering, pressure management as well as passive leakage detection based on responding to consumers reporting leaks. There are limited awareness and education programmes taking place to inform consumers on the water scarcity and the need to conserve water, however this can improve. There is scope for WCWDM in Ngwelezane which will result in reducing the total system input volumes and NRW. The demand centre should focus on the following interventions:

- Review and improve water tariff to reflect cost of water and promote WCWDM;
- Improve pressure management and infrastructure maintenance;
- Undertake WCWDM training for meter readers to eliminate inaccuracies and estimates as well as leakage reporting;
- Improve zone metering and sectorisation to improve micro management information; This will assist the demand centre to identify problematic areas and reduce the number of pipe bursts;
- Community awareness programmes.

4.5 Nseleni

Nseleni town is located in the North-East of CoMLM and comprises of the formal town and informal settlements in the northern part of Nseleni. A large portion of the demand centre is considered to be informal and rural, with a significant indigent population, which leaves limited scope for further improvements in metering and billing. A portion of the network is old and dilapidated and must be replaced in the near future to prevent system failure. There are limited WCWDM activities undertaken in the demand and there is little management information available to perform a proper assessment of the water losses and potential savings.

4.5.1 Nseleni Institutional Arrangements

The institutional arrangements for water services in the Nseleni demand centre is summarised in **Table 4-13**.

Table 4-13: Institutional arrangements for Nseleni

Municipality	Demand Centre	Water Service Authority	Water Service Provider
City of uMhlathuze	Nseleni	CoMLM	CoMLM

4.5.2 Nseleni Water Requirements

Nseleni is supplied from the Mzingazi WTW and the demand centres water requirements was assumed to be 5 million m^3/a.

4.5.3 Bulk Metering

The main bulk components such as, reservoirs, and towers are metered. According to municipal personnel most bulk meters are operational and the readings are recorded monthly by the officials. At the WTW the MW is managing and monitoring the site taking monthly readings of the water supplied from Mzingazi WTW.

The inlets of the elevated pressure towers are equipped with mechanical meters as shown in **Figure 4-8**.

Figure 4-8: Typical bulk metering at the WTW

4.5.4 Reticulation Network and Domestic Metering

It was indicated during the site visit that most domestic and non-domestic consumers are metered. The following with respect to metering was also noted:

- Bulk infrastructure such as reservoir outlets and towers are metered and meters are visible and easy to read;

- The informal areas has communal taps and some communal taps are metered. Meters are generally visible on the inside and outside the premises;
- The water meters are read manually and the data is recorded in a register for billing processes however, the municipality has been experiencing some challenges in completing this process especially in the informal areas;
- The reticulation network is not sectorised in some parts of the demand centre, the isolating valves are visible and easy to find in most areas. Municipal officials also indicated that in certain areas there is limited pressure management taking place;
- There is no preventative maintenance taking place, the network is maintained as and when required.

KPIs for Nselen

Table 4-14: Nseleni key performance indicators

Indicator	Current Value	Realistic Target value 20% Reduction	Optimistic Target Value 30% Reduction
System Input volume (million m^3/a)	4,47	3,58	3,13
System Input volume (Mℓ / day)	12,2	9,8	8,6
Billed Authorised Consumption (million m^3/a)	1,98	2,11	2,01
Unbilled Authorised Consumption (million m^3/a)	0,55	0,37	0,39
Water Losses (million m^3/a)	1,94	1,09	0,73
Non-revenue Water (million m^3/a)	2,49	1,47	1,12
% Non-revenue water	56%	41%	36%
% Water Losses	43%	31%	23%
Input Volume (litres / capita / day)	288	230	202
Input Volume (m^3 / household / month)	30	24	21
Authorised Consumption (litres / capita / day)	163	160	155
Authorised Consumption (m^3 / household / month)	17	17	16

The key performance indicators of 56% of NRW and 43% water loss suggest that there is significant potential for NRW and water loss reduction in Nseleni. The per capita consumption of 288 ℓ/c/d is higher than the national average. Reductions in the total system input volume can be achieved, however due to the limited economic activities in the area and the high levels of indigent population residing within the Nseleni demand centre, the billed metered consumption can be increased to a limited extent in certain areas in order to reduce the NRW. The informal areas can be formalised to expand revenue base where possible.

4.5.5 Strategy

Table 4-15: Nseleni Strategy

Item	Strategy	Priority	Estimated 5 Year Budget
Intitutional Strategy	Consider institutionalising the WCWDM team and fill vacancies if necessary	1	R1 150 000
	Build on the existing skills base by continuosly training the technical staff	1	
	Undertake a councillor WCWDM induction programme to capitalise on the existing relationship and build a communication bridge between the municipality and the customers	1	
Financial Strategy	Undertake bulk and consumer meter audit, expose buried meters and to ensure meters are easily accessible	1	R13 853 000
	Improve monthly water balance with the necessary NRW KPIs included	1	
	Include infrastructure leakage reporting as part of the employment profile for the meter readers to facilitate passive and cost effective leak detection	1	
	Include WCWDM training for the meters readers to facilitate their understanding of the water business	1	
	Consider including water conservation tips and information in the water bill.	1	
	Review water tariff and ensure that the rising block tariff is sufficiently differentiated in cost at each level to promote WCWDM with the highest tariff at least twice the amount of the lowest tariff.	1	
Social Strategy	Budget and undertake a continuous annual education and awareness campaign focusing on promoting water use efficiency. Develop simple visual material in the form of pamphlets to be attached to the water bill which can be used to educate consumers on efficient water use. Once the initial communication has been established, consider periodically publicising water tips on local media such as radio stations and newspapers	1	R6 436 600
Technical Strategy	Improve pressure management	1	R 20 879 600
	Zone metering and sectorisation to improve micro management	1	

Summary

The CoM has implemented some WCWDM in Nseleni. There are personnel dedicated to water loss management, although it is not formally institutionalised. The current WCWDM

initiatives include mesuring of NRW. There are limited awareness and education programmes taking place to inform consumers on the water scarcity and the need to conserve water. There is scope for WCWDM in Nseleni which will result in reducing the total system input volumes, NRW and water loss. The demand centre should focus on the following interventions:

- Review and improve water tariff to reflect cost of water and promote WCWDM;
- Improve pressure management and infrastructure maintenance;
- Improve zone metering and sectorisation to improce micro management information; This will assist the demand centre to identify problematic areas and reduce the number of pipe bursts;
- Expand consumer metering where possible;
- Improve relationship with politicians and tribal authorities to promote WCWDM activities;
- Network replacement for areas with very old network within the demand centre which can is the contributor to water losses.

4.6 Overview of the Surrounding Towns

The surrounding towns assessed at a desktop level are Eshowe, Melmoth, Mtunzini, Gingindlovu and Amatikulu. Historical data has been sourced from previous *All Towns Strategies (DWA, 2011)* and updated water use data was requested from the KCDM, the Water Services Authority (WSA) for the surrounding towns.

Historical Water Use

The latest *All Towns Strategies* completed in 2011 for the surrounding towns only contain historic data of raw and treated volumes up to the year of 2008. The historic raw and treated water volumes are shown in **Table 4-16** for the period from 2015 to 2017. The KCDM was unable to provide data from 2009 to 2014. The water use for these towns in 2015 and 2016 is low as a result of the drought.

Table 4-16: Historical water use for surrounding towns

Town	Raw or Treated	2008	2015	2016	2017
		million m^3/a			
Eshowe	Raw from Rutledge Dam	3.28	0.15	0.29	1.45

	Total Treated*	2.88	1.94	2.08	3.16
Gingindlovu (incl. Amatikulu)	Raw	0.34	0.18	0.44	0.47
	Treated	0.30	0.15	0.33	0.37
Mtunzini	Raw	0.66	0.04	0.00	0.00
	Treated**	0.58	0.49	0.46	0.46
Melmoth	Raw	0.9	NA	NA	NA
	Treated	0.79	NA	NA	NA

*Supplemented by Greater Mthonjaneni WTW with 1.83 million m3/a

** Supplemented by CoMLM with 0.46 million m^3/a

The future growth in requirements for the surrounding towns are summarized in **Table 4-17**.

Table 4-17: Future requirements of the surroundings towns

Town	2016	2020	2025	2030	2035	2040	2045	Compounded Growth (%)
	million m^3/a							
Eshowe	4.25	4.71	5.3	5.93	6.78	7.76	8.88	2.73%
Gingindlovu	0.44	0.49	0.54	0.59	0.67	0.76	0.86	2.54%
Mtunzini	0.92	1.05	1.21	1.38	1.63	1.93	2.28	3.41%
Melmoth	1.17	1.3	1.44	1.59	1.81	2.06	2.34	2.62%

Institutional Overview

The King Cetshwayo District Municipality's core function is to facilitate development within the District while supporting and capacitating Local Municipalities in their efforts to develop their various communities. As a principle, Local Municipalities are to function as the preferred service providers of municipal services as such, the role of (KCDM) is defined as an organisation that is both supportive and facilitative in nature in terms of:

- Serving as a district wide integrated development planning authority;
- Serving as an infrastructure development agent mainly the small towns and rural communities;
- Serving as a technical and institutional capacity resource to the local municipalities.

KCDM noted a particularly limited skills base in the WSA at operations and maintenance level. The capacity of the local municipalities to act as WSP varies greatly. In general the municipalities do not have the adequate technical skills and managerial capacity to ensure sustainable water resource management and sufficient water services. Due to the budgetary and capacity constraints, no training on WCWDM is taking place in the WSA. It appears that the municipalities have IDP and WSDP in place which are updated on a continuous basis. What is crucial is the uncertainty regarding the accuracy of the data captured in the WSDP

and IDP with the existing limitations in management information prevalent within the municipalities.

Key Perfomance Indicators for Surrounding Towns

The estimated 2016/17 key performance indicators for the surrounding towns indicated a total NRW of 49% and water loss to be the order of 41% respectively. The unit consumption of 149 ℓ/c/d for the four towns as indicated in **Table 4-18**.

Table 4-18: Surrounding towns KPIs

Demand Centre	Population	System Input (million m^3/a)	% Water Losses	% Non-revenue water	litres / capita / day
Eshowe	82 836	4.25	42%	50%	140
Mthunzini	4 532	0.46	35%	45%	278
Gingindlovu and Amatikulu	2 842	0.37	25%	30%	356
Melmoth	24 660	1.17	45%	55%	130
Total	**114 870**	**6.25**	**41%**	**49%**	**149**

Based on the results from **Table 4-18** above, indicating that there is scope for WCWDM in the KCDM managed areas. The high non-revenue water and water losses can be addressed through WCWDM initiatives such as pressure management and sectorisation and metering of DMA's. The intermittent water supply challenges facing surrounding towns need to be resolved.

4.6.1 Eshowe

The town of Eshowe consists of several smaller villages which are serviced by the uMlalazi LM. The town is located in the Matigulu and Mlalazi River Catchments. The town is an agricultural and tourist town, with some industrial activity related to commercial forestry and sugarcane.

Institutional Arrangements

Table 4-19: Eshowe Institutional Arangements

Municipality	Demand Centre	Water Service Authority	Water Service Provider
King Cetshwayo DM	Eshowe	KCDM	KCDM and uMlalazi LM

Eshowe Water Requirements

The Eshowe Water Supply Scheme area is supplied by a water treatment works (WTW) situated in Eshowe which gets its raw water from Rutledge and Eshlazi Dams situated in the

Mlalazi River, a tributary of the Mhlatuze River. The Rutledge Dam is very small and is supplemented by raw water from Goedertrouw Dam in the Mhlatuze River. The current water demand for Eshowe WSS amounts to approximately 2.88 million m^3/a (2017).

Bulk Water Supply

The Eshowe Water Supply Scheme comprises of the Eshowe WTW and two small treatment works at Catherine Booth Hospital and Obanjeni, supplying the surrounding communities. A number of the communities surrounding Eshowe town are also supplied from Eshowe WTW. Eshowe WTW is operated by uMlalazi LM as well as Mthonjaneni WTW operated by Mthonjaneni LM, water is supplied to to Eshowe through a dedicated pipeline. A schematic representation of the Eshowe bulk water supply is shown in **Figure 4-9: Eshowe Bulk Water Supply Schematic**

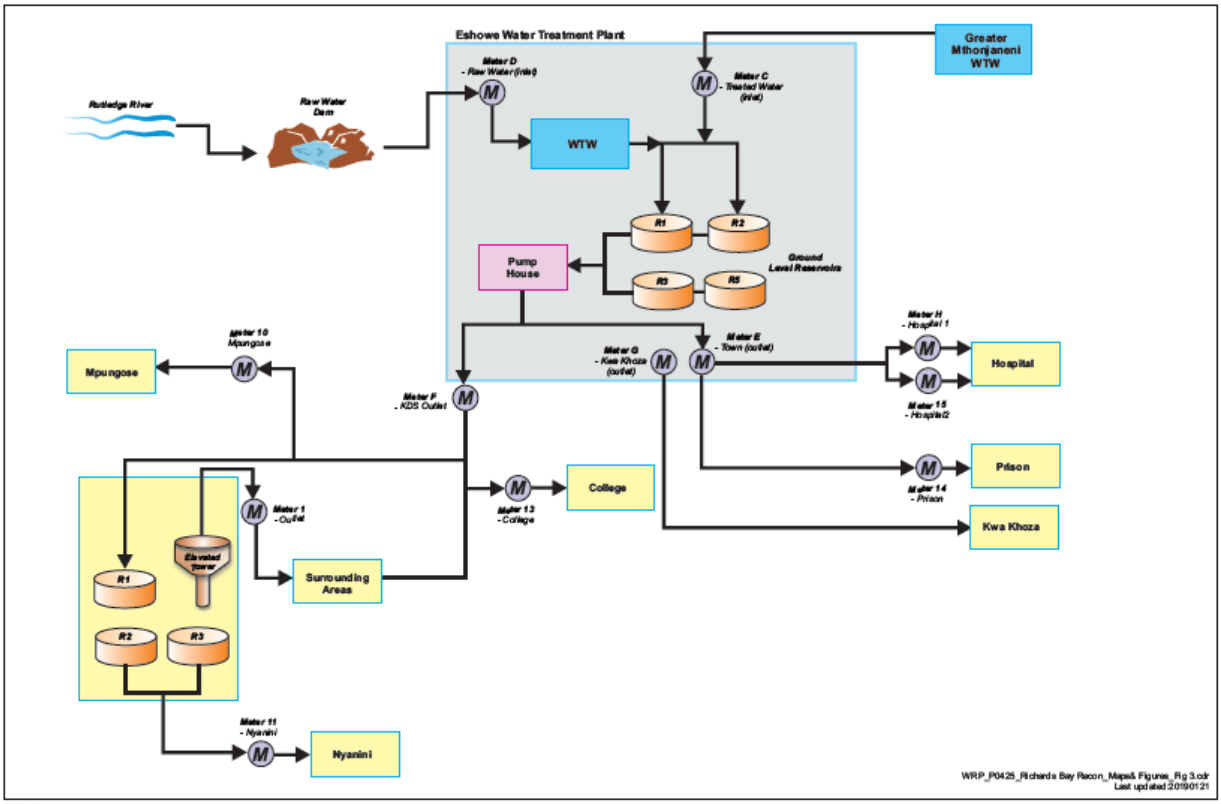

Figure 4-9: Eshowe Bulk Water Supply Schematic

Water Services and Backlog

The service levels are generally above RDP standards in the urban areas such as the main town of Eshowe and Gezinsila township, although they may be below RDP standards in certain areas (i.e. former townships and informal settlements). The levels of service in the scattered rural areas such as Emngcongweni; Mawundu; Thawini and Mathibelana are generally at or below RDP standards. The larger parts of the demand centre is characterised by scheduled intermitted water supply, and some consumers have installaed storage water

tanks on site to ensure consintant water supply. Eshowe currently does not have a formalised Water Conservation and Water Demand Management (WCWDM) strategy and business plan for implementation and there are no targets set to reduce water losses in the water supply area. There are limited WCWDM initiatives taking place and KCDM indicated budget constraints and currently the WSA rely on reactive maintenance as well as passive leakage control through local consumers reporting leakages.

Water Balance and KPI's

Table 4-20: Eshowe KPIs

Indicator	Current Value	Realistic Target value 10% Reduction	Optimistic Target Value 15% Reduction
System Input volume (million m^3/a)	4	3.83	3.61
System Input volume (Mℓ / day)	11.6	10.5	9.9
Billed Authorised Consumption (million m^3/a)	2.13	2.49	2.53
Unbilled Authorised Consumption (million m^3/a)	0.34	0.11	0.11
Water Losses (million m^3/a)	1.79	1.22	0.98
Non-revenue Water (million m^3/a)	2.13	1.34	1.08
% Non-revenue water	50%	35%	30%
% Water Losses	42%	32%	27%
Input Volume (litres / capita / day)	140	126	119
Input Volume (m^3 / household / month)	17	15	14
Authorised Consumption (litres / capita / day)	81	86	87
Authorised Consumption (m^3 / household / month)	10	10	11

Possible Interventions

In order to alleviate the shortfall in water supply and to allow for the required upgrade in the level of water services, several local intervention options are available:

- Implement WCWDM measures, to limit losses;
- Development of proper water balance and improve management information;
- Resolve intermittent water supply;
- Replacement of non fuctional meters bulk and consumer meters;
- Sectorisation and zone metering;
- Pressure management;
- Gradually install consumer meters where possible to increase revenue base;
- Upgrade of existing infrastructure to increase yield or assurance of supply to the informal areas;
- Groundwater development for the rural areas where possible;
- Water re-use for urban areas;

- Rainwater harvesting.

4.6.2 Mthunzini

The town of Mtunzini is situated on the north coast of KwaZulu-Natal and is linked by the N2 highway to Durban, approximately 130 km in a southerly direction and Richards Bay and Empangeni, approximately 40 km to the north. The town of Mtunzini forms part of a WSS which supplies the main town and surrounding areas, which includes the University of Zululand and forms part of the uMlalazi LM. Mtunzini is reliant on tourism, commercial afforestation and mining. The Fairbreeze mining operations of Tronox is supplied by the Mtunzini WSS.

Institutional Arrangements

Table 4-21: Mthunzini Institutional Arrangements

Municipality	Demand Centre	Water Service Authority	Water Service Provider
King Cetshwayo D M	Mthunzini	KCDM	KCDM and uMlalazi LM

Mthunzini Water Requirements

The current water demand for Mthunzini WSS amounts to approximately 0.46 million m3/a (2017). The projected future water requirements for the scheme is presented in **Table 4-17**

Mtunzini Water Supply Scheme relies on the Ntuze River, a tributary of the Matigulu River, as well as eight boreholes, which supplement the surface water supplies. Furthermore, the King Cetshwayo District Municipality (KCDM) has a Service Level Agreement (SLA) with the uMhlathuze Local Municipality, for the purchase of treated bulk water, via bulk water supply infrastructure.

Bulk Water Supply

Mthunzini gets water from the Mthunzini WTW operated by uMlalazi LM and the Mthonjaneni WTW operated by Mthonjaneni LM through a dedicated pipeline. The current water demand for the Mthunzini WSS amounts to approximately 1 129 654 kℓ/ annum (2017/2018).

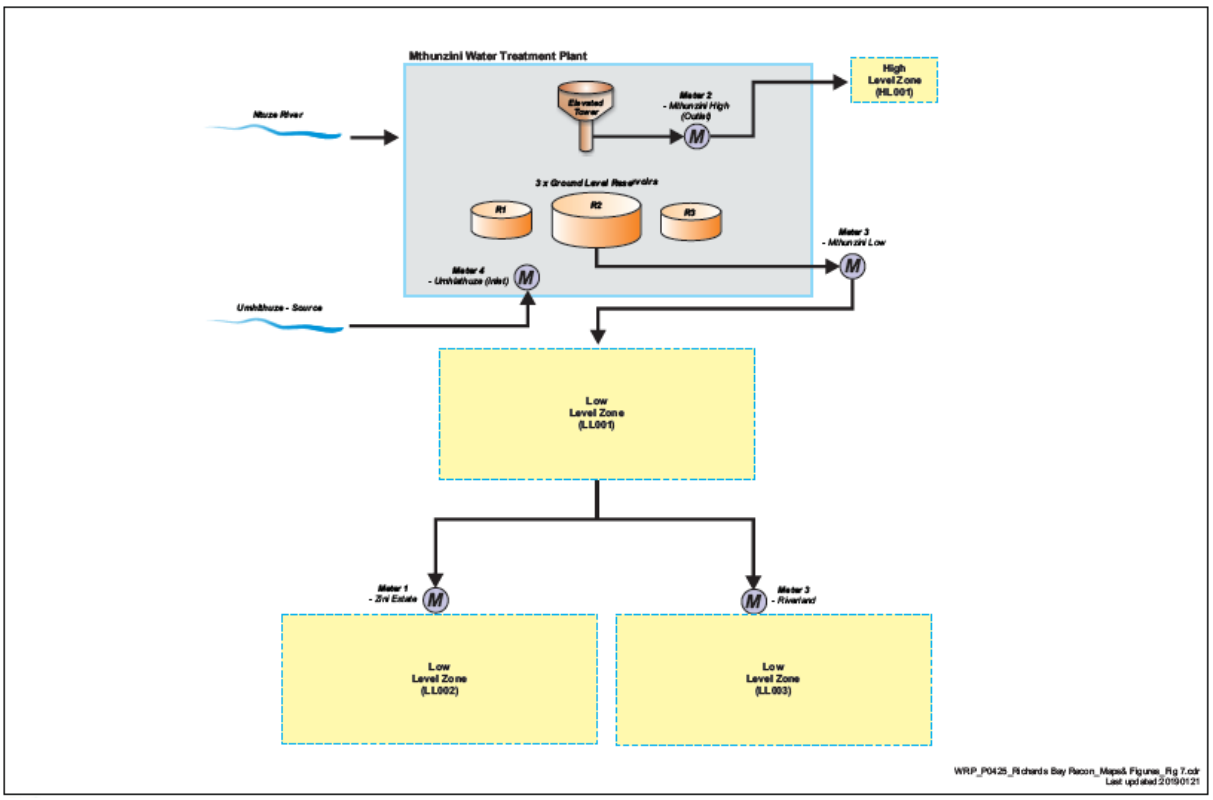

Figure 4-10: Mthunzini Bulk Water Supply Schematic

Water Services and Backlog

The levels of service in the Mthunzini area are largely at RDP and above standards. The formal areas have proper metering and there is cost recovery taking place mainly in town and surrounding area such as Zini River Estate, however some of the meters appeared to be very old and possibly under-reading. The municipality has initiated a pipe replacement programme in some parts of the town to minimise water losses.

Water Balance and KPI's

The water losses are due to the leakages on the networks and in some cases at the reservoirs as the condition of the water infrastructure deteriorates due limited infrastructure maintenance and poor planning. The water losses will continue to increase if WCWDM measures are not implemented and no preventative maintenance is undertaken.

Table 4-22: Mthunzini KPIs

Indicator	Current Value	Realistic Target value 15% Reduction	Optimistic Target Value 25% Reduction
System Input volume (million m^3/a)	0.46	0,39	0,35
System Input volume (Mℓ / day)	1.3	1,1	0,9
Billed Authorised Consumption (million m^3/a)	0.25	0,27	0,26
Unbilled Authorised Consumption (million m^3/a)	0.05	0,02	0,02
Water Losses (million m^3/a)	0.16	0,10	0,07
Non-revenue Water (million m^3/a)	0.21	0,12	0,09
% Non-revenue water	45%	30%	25%
% Water Losses	35%	25%	20%
Input Volume (litres / capita / day)	278	236	208
Input Volume (m^3 / household / month)	21	18	16
Authorised Consumption (litres / capita / day)	181	177	167
Authorised Consumption (m^3 / household / month)	14	13	13

Possible Interventions

In order to address the inefficienies in the water supply and to allow for the required upgrade in the level of water services, several local intervention options are available

- Installation of bulk and zone water meters to ensure that complete water balance assessments can be undertaken;
- Consumer meter replacement programme;
- Replacement of broken pipes;
- Implement pressure management to minimise burst pipes;
- Improve management information;
- Network sectorisation to identify problematic areas;
- Water re-use for urban areas;
- Rainwater harvesting.

4.6.3 Amatikulu and Gingindlovu

Gingindlovu including Amatikulu are small towns with urban areas which acts as a service centre for the surrounding scattered rural villages. Similar to neighbouring towns, Amatikulu and Gingindlovu is dependent on tourism, commercial afforestation and sugar cane farming.

Institutional Arrangments

Table 4-23: Institutional arrangement fo Amatikulu and Gingindlovu

Municipality	Demand Centre	Water Service Authority	Water Service Provider
King Cetshwayo DM	Gingindlovu	KCDM	KCDM and uMlalazi LM
	Amatikulu	KCDM	KCDM and uMlalazi LM

Amatikulu and Gingindlovu Water Requirements

The main source of supply for Gingindlovu Water Supply Scheme is the Matigulu River and Msunduzi River which is a tributary of the Matigulu River. The current water demand for Amatikulu and Gingindlovu amounts to approximately 0.37 million m^3/a (2017

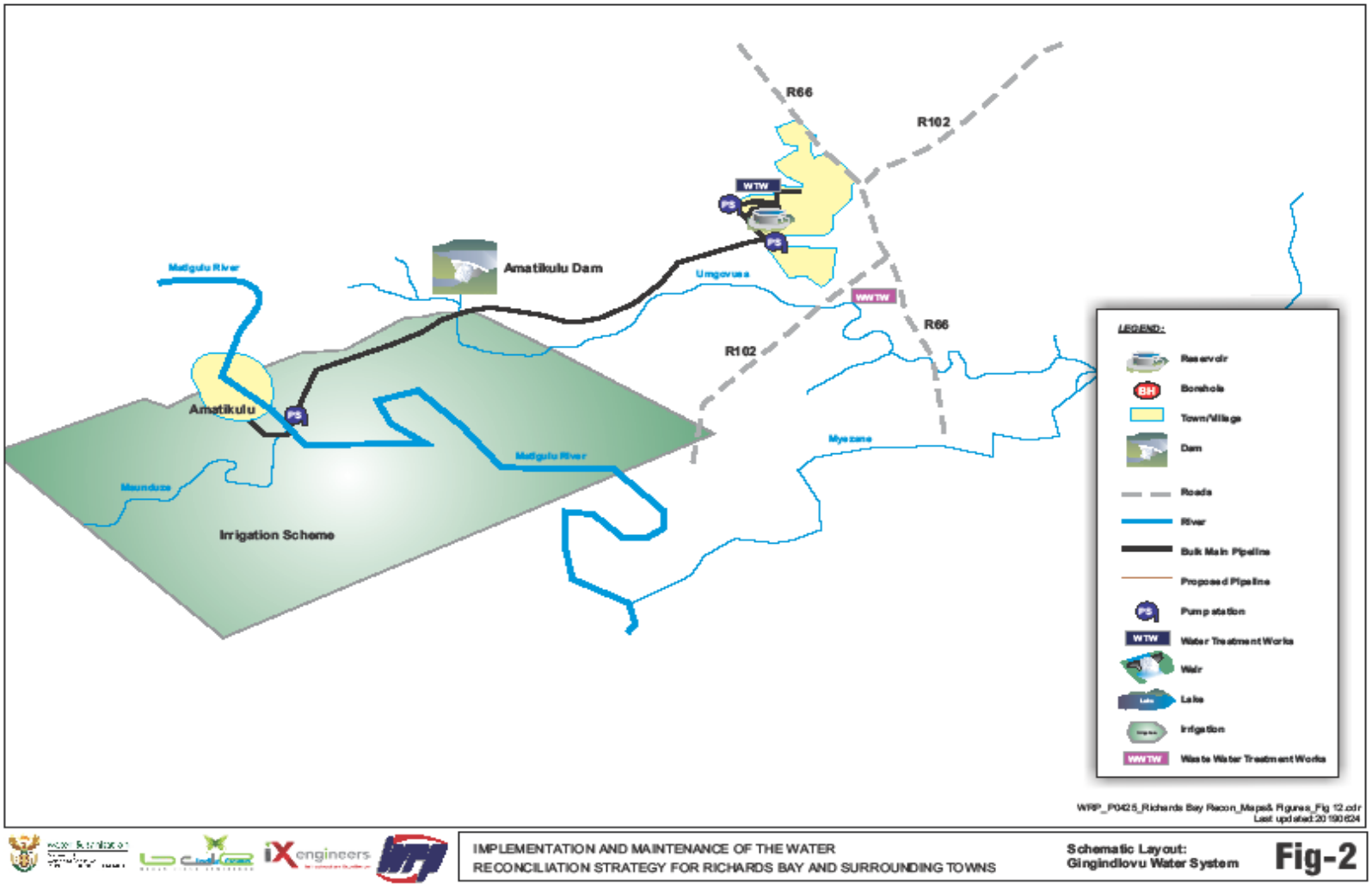

Figure 4-11: Amatikulu Bulk water Schematic

Water Services and Backlog

The Gingindlovu WTW abstracts raw water from the Matigulu River through a raw water abstraction works, a pumping station and a raw water pumping main to the town of Gingindlovu. The raw water is pumped to the Gingindlovu WTW in the town where it is treated to potable drinking water quality standards.

The service levels for Amatikulu and Gingindlovu are ranging from RDP and above standards in the urban areas, although they may be below RDP standards in certain areas (rural settlements). The formal areas are equiped with water meters and there is limited cost recovery taking place. KCDM indicated that indigent households are equipped with prepaid meters fitted with water restrictors as an initiative to curb inefficiencies by consumers as well as a measure to force consumers to pay for services after exceeding the FBW allocation. The system is characterised by intermittent water supply.

Water Balance and KPI's

The water losses are due to the leakages on the networks and in some cases at the reservoirs as the condition of the water infrastructure deteriorates due limited infrastructure maintenance and poor planning. The water losses will continue to increase if WCWDM measures are not implemented and no preventative maintenance done.

Table 4-24: Amatikulu and Gingindlovu KPIs

Indicator	Current Value	Realistic Target value 5% Reduction	Optimistic Target Value 10% Reduction
System Input volume (million m^3/a)	0.37	0,30	0,26
System Input volume (Mℓ / day)	1.0	0,8	0,7
Billed Authorised Consumption (million m^3/a)	0.26	0,22	0,21
Unbilled Authorised Consumption (million m^3/a)	0.02	0,01	0,01
Water Losses (million m^3/a)	0.09	0,06	0,04
Non-revenue Water (million m^3/a)	0.11	0,07	0,05
% Non-revenue water	30%	25%	20%
% Water Losses	25%	20%	15%
Input Volume (litres / capita / day)	356	285	250
Input Volume (m^3 / household / month)	35	28	25
Authorised Consumption (litres / capita / day)	267	228	212
Authorised Consumption (m^3 / household / month)	26	23	21

Possible Interventions

In order to alleviate the shortfall in water supply and to allow for the required upgrade in the level of water services, several local intervention options are available

- Implement WCWDM measures, to reduce system inefficiencies;
- Passive leakage control;
- Water balance;
- Improve management information;
- Implementation of pressure management;
- Replacement of old water meters and install new meters in areas where the network is formalised;
- Upgrade of existing infrastructure to increase yield or assurance of supply for the rural villages;
- Water re-use for urban areas;
- Review water tariffs to be cost reflective and promote WCWDM.

4.6.4 Melmoth

The town of Melmoth is part of the Melmoth WSS and is situated in the upper parts of the Mhlathuze Catchment. Similar to the other small towns in the area, Melmoth is dependent on tourism and agricultural activities.

Melmoth Water Requirements

The projected future water requirements for the scheme is presented in **Table 4-17**.

Bulk Water Supply

The Melmoth Water Supply Scheme area is located in the area of jurisdiction of the Mthonjaneni Local Municipality. The Melmoth Water Supply Scheme area is supplied mainly from local dams from the Mfulazane River and two water treatment works (WTW) in Melmoth, KwaMagwaza and Thubalethu villages. The scheme is supplemented from groundwater which service the area of KwaMagwaza rural area and surrounding as indicated in **Figure 4-12**. Melmoth WTW is operated by Mthonjaneni LM.

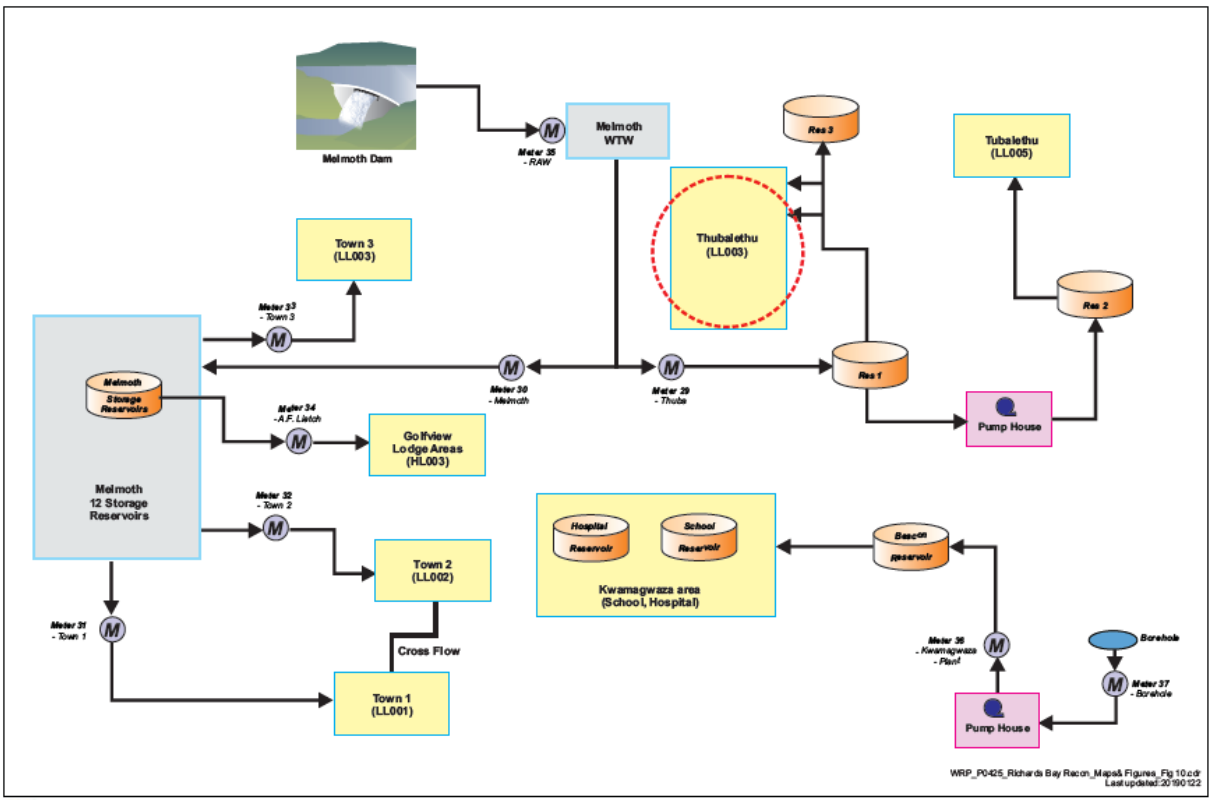

Figure 4-12: Melmoth Bulk Water Supply Schematic

Water Services and Backlog

The service levels are ranging from RDP and above standards in the urban areas, although they are below RDP standards in rural settlements such as kwaMagwaza and Thubalethu. The formal areas are equiped with water meters and there is limited cost recovery taking place. There are visible water leakages in some part of Melmoth town and this is an indication that leakage reporting is poor and passive leakage control is almost non existent. KCDM indicated that indigent households are equipped with prepaid meters fitted with water restrictors as an initiative to curb inefficiencies by consumers as well as a measure to force consumers to pay for services after exceeding the FBW allocation. The system is characterised by intermittent water supply and some consumers have water storage tanks on site to ensure continuous water supply.

Water Balance and KPI's

Table 4-25: Melmoth KPIs

Indicator	Current Value	Realistic Target value 5% Reduction	Optimistic Target Value 10% Reduction
System Input volume (million m^3/a)	1	1.11	1.05
System Input volume (Mℓ / day)	3.2	3.0	2.9
Billed Authorised Consumption (million m^3/a)	0.53	0.72	0.79
Unbilled Authorised Consumption (million m^3/a)	0.12	0.00	0.00
Water Losses (million m^3/a)	0.53	0.39	0.26
Non-revenue Water (million m^3/a)	0.64	0.39	0.26
% Non-revenue water	55%	35%	25%
% Water Losses	45%	35%	25%
Input Volume (litres / capita / day)	130	123	117
Input Volume (m^3 / household / month)	13	13	12
Authorised Consumption (litres / capita / day)	71	80	88
Authorised Consumption (m^3 / household / month)	7	8	9

Possible Interventions

In order to alleviate the shortfall in water supply and to allow for the required upgrade in the level of water services, several local intervention options are available:

- Implement WCWDM measures, to reduce system inefficiencies;
- Repair visible leaks;
- Pipe replacement programme;
- Pressure management to minimise pipe burst;
- Improve management information;
- Replacement of old and non functioning water meters;
- Upgrade of existing infrastructure to increase yield or assurance of supply;
- Community awareness and education;
- Water re-use for urban areas;
- Rainwater harvesting.

Recommended action plan for surrounding towns

Although each LM acts as WSP, there are some general issues and recommendations that apply to KCDM all LMs. These relate to institutional arrangements and future planning, which should be supported by KCDM.

Table 4-26: Surrounding towns action plan

Assessment	Action	Responsibility	Schedule
Inadequate information about reticulation network and asset management	Update the WSDP accordingly	WSA and WSP	12 months
Limited management information	Investigate the available yield or allocation from each current water source, and determine the actual usage	WSA and WSP	12 months
No operation and maintenance plan in place	Develop and implement an operation and maintenance plan	WSA and WSP	12 months
Limited or no comprehensive monitoring system in place.	Develop and implement a comprehensive monitoring system that includes resource availability and KPIs	WSA and WSP	12 months
Drought management plan in place	Update and implement a drought management plan, if an existing plan is not addressed adequately	WSA and WSP	12 months
No WCWDM strategy in place or fully implemented	Develop, budget and implement a WCWDM strategy for the individual municipalities to address the current water loss issues	WSA and WSP	12 months
No community awareness and education taking place	Budget and undertake community awareness programme	WSA and WSP	Continuous

5 RISK FACTORS

The following key risk factors have been identified in within the municipality regarding the implementation WCWDM and are summarised in the following sections:

Inadequate tariffs which do not support WCWDM: A key concern throughout the assessments conducted has been the inadequacy of the water tariffs to not only encourage demand management, but to sustain service delivery as well. During the meeting with municipality it was made mention of the fact that the cost of water charged to the consumer, in many cases does not in any way reflect the cost of providing water services. This is a pertinent risk, as municipality have no hope of future sustainability if the revenue cannot sustain the cost of services. It is acknowledged that many municipalities are plagued by high levels of indigent populations however increased internal engagement between departments and with the political constituencies is required in order to arrive at more cost reflective tariff setting which will also encourage consumers to save water.

Co-ordination between CoMLM, KCDM and MW: It is important to keep positive collaboration between King Centshwayo District Uunicipality, City of uMhlathuze LM and uMhalthuze Water. Critical matters include areas of jurisdiction, water tariff setting for respective areas of jusisdiction, as well as the update and signing of the service level agreement and budgets.

Limited political support for WCWDM: The importance of the political support for WCWDM cannot be stressed enough as this impact significantly on how the consumers view water conservation. Political, traditional leaders and gatekeepers should lead by example and ensure budgets and resources are prioritised for WCWDM.

Inadequate billing and metering: Proper billing and metering is essential for the sustainability of a municipality and for the delivery of quality services. Unless metering and billing are implemented, municipality run the risk that water demands will continue to rise as consumers will not be encouraged to change or adapt water use practices in the absence of some consequence for wasteful behavior.

Perception as an impairment to social and economical development: The perception is that WCWDM will have a negative impact on financial and economic considerations and changes in tariff structure will lead to increased cost of water and further put a strain on domestic consumers and businesses. WCWDM is also widely associated with water restrictions. The motivation of WCWDM strategy should be separated from that of water restrictions. The purpose of WCWDM is not to imposed water restrictions or to make water unaffordable but to increase water use efficiency and promote a sustainable and reliable supply.

6 BUSINESS PLAN

6.1 Assumptions

The business plan is based on the following assumptions:

- The business plan budget allows for international best practice such as replacement of consumer water meters every 10 years and continuous monitoring;
- The cost benefit ratio is an average of all interventions but it should be noted that some interventions will have a much better cost benefit ratio than others
- Some of the budget items are probably already included in other CAPEX or OPEX budgets but have been included here for sake of completeness;
- The success of the strategy and business plan also depends on issues such as:
- Appointment suitably qualified staff to perform and maintain the programme;
- Allocation of required budgets;
- Expediting procurement processes to ensure consultant and / or contractors are appointed;
- Proper baseline assessment and measurement of savings to show results;
- Raising WCWDM awareness within the whole organisation and collaboration between all stakeholders.

6.2 City of uMhlathuze Targets and Budgets

The realistic and optimistic targets for CoM are summarised in **Table 6-1**

Table 6-1: Summary of CoMLM realistic and optimistic targets

Indicator	Current Value	Realistic Target value 10% Reduction	Optimistic Target Value 20% Reduction
System Input volume (million m^3/a)	39,15	34.89	32.23
System Input volume (Mℓ / day)	107,19	95.54	88.24
Billed Authorised Consumption (million m^3/a)	30,00	24.32	23.89
Unbilled Authorised Consumption (million m^3/a)	1,95	4.52	4.47
Water Losses (million m^3/a)	7,20	6.06	3.87
Non-revenue Water (million m^3/a)	9,15	10.57	8.34
% Non-revenue water	43%	30%	26%
% Water Losses	24%	17%	12%
Input Volume (litres / capita / day)	277	246	228
Input Volume (m^3 / household / month)	35	31	29
Authorised Consumption (litres / capita / day)	226	204	200
Authorised Consumption (m^3 / household / month)	29	26	26

If the above targets could be achieved, the future realistic water balance for the municipality is shown in **Figure 6-1**

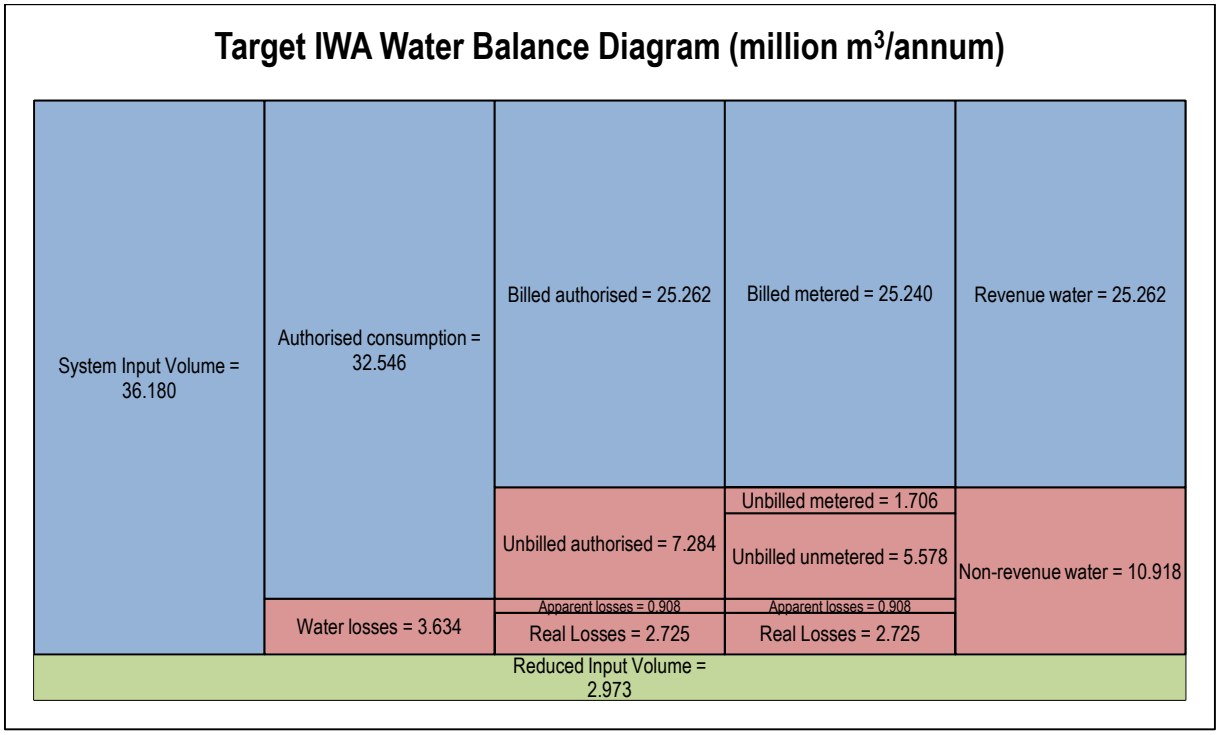

Figure 6-1: Target Water Balance

The targets are based on a 10% reduction in total demand and 20% increase in billed consumption. It is recommended that water tariffs are increased by 10% per annum for 5 years to promote water use efficiency and increase revenue.

6.2.1 Five year budget requirements and cost benefit ratio

The recommendations for WCWDM measures are based on the findings of the various analyses undertaken. The assessments include recommendations on interventions, estimated costs, and priorities for the period of five years and the WCWDM budget summary is presented in **Table 6-2**.

The budget shows that approximately R 60 million per annum is required over the next five years to address WCWDM. The budget details are summarised **Appendix B.**

Table 6-2: CoM WCWDM Budget Summary

Interventions	Type	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Institutional	Capex	100 000	300 000		0	0	400 000
	Opex	375 000	375 000	375 000	375 000	375 000	1 875 000
	Sub Total	**475 000**	**675 000**	**375 000**	**375 000**	**375 000**	**2 275 000**
Financial	Capex	200 000	200 000	0	0	0	400 000
	Opex	19 139 840	19 139 840	19 139 840	19 139 840	19 139 840	95 699 200
	Sub Total	**19 339 840**	**19 339 840**	**19 139 840**	**19 139 840**	**19 139 840**	**96 099 200**
Social	Capex	3369 952	3 369 952	2 219 952	2 219 952	2 219 952	13 399 760
	Opex	5 859 880	5 859 880	5 859 880	5 859 880	5 859 880	5 859 880
	Sub Total	**9 229 832**	**9 229 832**	**8 079 832**	**8 079 832**	**8 079 832**	**42 600 160**
Technical	Capex	19 321 360	23 757 200	17 202 200	16 524 700	16 524 700	93 330 160
	Opex	17 527 445	17 527 445	17 527 445	17 527 445	17 527 445	87 637 275
	Sub Total	**36 848 816**	**41 284 655**	**34 729 655**	**34 052 155**	**34 052 155**	**180 967 435**
Total		**65 893 487**	**70 529 327**	**62 324 327**	**61 646 827**	**61 646 827**	**322 040 795**

Table 6-3 shows that if the municipality can achieve the realistic saving scenario, the payback period would be approximately 3.8 years. This is based on the assumption that the municipality improve its water tariff structure to promote WCWDM and increase revenue.

Table 6-3: Cost benefit ratio

Item	Unit	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Reduced Input Volume							
Volume	m^3/annum	522 000	1 044 000	1 566 000	2 088 000	2 610 000	7 830 000
Amount	R / annum	2 610 000	5 220 000	7 830 000	10 440 000	13 050 000	39 150 000
Increase revenue water							
Volume	m^3/annum	435 400	780 800	1 306 200	1 741 600	2 177 000	6 531 000
Amount	R / annum	3 047 800	6 095 600	9 143 400	12 191 200	15 239 000	45 717 000
Total							
Volume	m^3/annum	957 400	1 914 800	2 872 200	3 829 600	4 787 000	14 131 000
Amount	R / annum	5 657 800	11 315 600	16 973 400	22 631 200	28 289 000	84 867 000
						Payback period - years	**3.8**

6.2.2 Unit reference values

Unit reference values for demand centres are summarised in **Table 6-4** the unit reference values have been discounted over 20 years at 6%; 8% and 10%.

Table 6-4: Summary of Unit Reference Values

Demand Centre	Scenario	6%	8%	10%
Richards Bay	Realistic	R 17.57	R 18.02	R 18.50
	Optimistic	R 15.06	R 15.45	R 15.85
Esikhaweni	Realistic	R 28.44	R 29.18	R 29.97
	Optimistic	R 19.63	R 20.14-	R 20.69
Ngwelezane	Realistic	R 16.81	R 17.26	R 17.73
	Optimistic	R 15.99	R 16.41-	R 16.86
Empangeni	Realistic	R 9.03	R 9.28	R 9.54
	Optimistic	R 11.53	R 11.85-	R 12.18
Nseleni	Realistic	R 13.10	R 13.45	R 13.81
	Optimistic	R 9.24	R 9.48	R 9.74
Total	**Realistic**	**R 15.98**	**R 16.38**	**R 16.80**
	Optimistic	**R 13.58**	**R 13.91**	**R 14.27**

7 IMPLEMENTATION PLAN

This implementation plan is based on the recommendations provided in this report on the current status of WCWDM for the City of uMhlathuze. The recommendations focus on the following WCWDM measures:

- Organisational structures;
- Education and awareness;
- Water balance;
- Bulk Metering;
- Consumer metering and cost recovery;
- Retrofit and replacement of inefficient devices;
- Pressure management and sectorisation.

• **Organisational Structures**
Recommendation: Establish a NRW steering committee comprising representatives from the technical, communications and finance departments to improve communication and access to information. Institute monthly reporting meetings to facilitate coordinated planning and implementation of WCWDM projects.
Objectives o Improve micro and macro management o WCWDM induction training programme for councillors o Improved skills base of technical staff o Review bylaws to address WCWDM **Key Outputs** *Short Term* o Improved macro management per demand centre o Identify key issues and resources (*technical, financial and capacity*) for the demand centres.
Stakeholder Involvement Training and capacity building Update organogram and fill vacant positions
Human Resources Limited technical skills to undertake WCWDM within the municipalities
Financial Resources Refer to Appendix B
Timeframe 12 Months

• **Bulk Metering**
Recommendation: It is recommended that bulk meter audits be considered for reservoirs, towers and non domestic consumers. Large consumers that are not located within the industrial areas can also be included. Budget and plan meter replacement programmes for areas identified as having older under registering and non functioning meters as well as unmetered connection. An added benefit of such initiatives is that the increase in water bills frequently motivates the user to identify water wastegas and reduce consumption. Review water tariff to be cost reflective for bulk users.
Objectives: Determine the current status of bulk metering for the key demand centres. The audit should take place at the municipal level for each demand centre focusing on the following: o General condition and age of bulk meters o Effective meter reading and billing of consumers o Record keeping o Reporting of faulty meters and informal connections o Meter replacement programmes o Review tariff structure for bulk consumers **Key Outputs** *Short Term* o Improved macro management per demand centre o Identify key issues and resources (*finance and capacity*) for demand centres o Determine cost benefit analysis for implementing replacement programmes o Improved cost recovery through effective billing
Stakeholder Involvement Municipality should be encouraged to build a positive relationship with industrial consumers by keeping the communication channels open and inform consumers on regular basis about activities taking place and the benefits thereof.
Human Resources Identify capacity problems at the municipality level to be identified during the assessment
Financial Resources Refer to Appendix B
Timeframe 12 months

• **Water Balance**
Recommendation: CoM should be encouraged to maintain primary meters and cary out regular water audits and water balance in order to adequately monitor consumption per supply area. The water balance process is the first step for the municipality to determining water losses and benchmarking.
Objectives: The main objective is to promote the establishment of the water audit and water balance process as a

• **Water Balance**
fundamental requirement of the municipality to implement in order to properly manage water demand. In order to achieve this the following must be carried out: o Determine the current status of of the water audits and water balance for each demand centre o Usage of monitoring devices within the water system o Determine the current status of guidelines for water balance (DWA) o Develompment of water audit strategy for all demand centres **Key Outputs** *Short Term* o Generate monthly water balance reports o Implement water saving strategy for key areas
Stakeholder Involvement Municipality should be encouraged to consult stakeholders for the implementation bylaws.
Human Resources Capacity limitations at the municipality level to be identified during the assessment Training and capacity building
Financial Resources Refer to Appendix B
Timeframe Ongoing

• **Education and Awareness**
Recommendation: Undertake a continuous annual education and awareness campaign focusing on promoting water use efficiency. Develop simple visual material in the form of pamphlets to be attached to the water bill which can be used to educate consumers on efficient water use
Objectives: o Determine the inefficient water use practices each demand centre o Level of awareness of water conservation amongst communities and municipality employees o The schools awareness campaigns **Key Outputs** *Short Term* o Getting an understanding of poor water use practices within different sectors o Development of educational material that addresses issues faced by the municipality *Medium Term* o Water wise consumer base
Stakeholder Involvement Inputs from the community leaders and local authorities will be vital in providing assistance and taking leadership in identifying poor water use practices Awareness programmes should form part of the municipality strategy with ongoing annual initiatives
Human Resources

• **Education and Awareness**
○ Specialist professional service provider to supplement and develop educational and awareness material ○ Support from DWS in developing and mentoring the process
Financial Resources Refer to Appendix B
Timeframe Ongoing (short to long term outputs)

• **Retrofitting and replacement of inefficient devices**
Recommendation: Municipality should be encouraged to embark on removal of wateful deviced in public areas such as schools, community halls, public clinics and taxi ranks. Part of this initiative can also include low cost houses and indigent households. The return of investment for such initiative is often sufficient motivation to retrofit water efficient devices.
Objectives: ○ To promote the use of water efficient devices for domestic and industrial use ○ To provide information based on case studies that can be easily available to the municipality on retrofitting of water efficient devices ○ Promote water use efficiency **Key Outputs** *Short Term* ○ Establish record keeping and resource centre that can provide information on new technology ○ Identify new projects / case studies
Stakeholder Involvement This initiative can be undertaken on availability of capacity and funding Community involvement in job opportunities
Human Resources ○ Specialist professional service provider to support the municipality ○ Local job creation
Financial Resources Refer to Appendix B
Timeframe 24 Months (for short term outputs)

• **Pressure Management and Sectorisation**
Recommendation: Undertake an infrastructure replacement programme. Improve pressure management and install PRV's in areas experiencing high pressures and high burst frequencies. Network sectorisation and zone metering

• **Pressure Management and Sectorisation**
Objectives: o Replacement of wasteful devices o Reduction of water losses o Improved micro management o Asset management **Key Outputs** *Short Term* o Improved service delivery o Monthly reporting o Improved water balance information
Stakeholder Involvement Political support for projects planning and implementation Job opportunities for the local communities
Human Resources o Technical department capacity to undertake the various tasks o Adequate skills within the technical department o Specialist professional service provider to support the municipality
Financial Resources Refer to Appendix B
Timeframe 24 months

• **Consumer metering and cost recovery**
Recommendation: Undertake an infrastructure cleaning programme. Utilise the opportunity to create local ward based employment and improve asset management. This process will improve the accessibility of the meters which are the cash register of the municipality and simultaneously garner community support for cost recovery programmes. Review water tariff for domestic and non domestic users.
Objectives: o To promote payment of services o Develop partnerships with the credit control and legal departments o Improved cost recovery o Promote cost reflective water tariff **Key Outputs** *Short Term* o Improved service delivery o Improved consumer base that is paying for services o Showcase professional customer care and ensure that the personnel can advise consumers on reducing water losses and where to refer queries.

• **Consumer metering and cost recovery**
Stakeholder Involvement Utilise the positive relationship with the councillor to promote payment for services at public meetings and other public forums.
Human Resources o Finance department o Undertake mandatory ongoing WCWDM training for the finance personnel responsible for receiving payment and build capacity within the municipality
Financial Resources Refer to **Appendix B**
Timeframe 12 months

8 WCWDM IN OTHER SECTORS

While WCWDM has traditionally been focussed on and applied in the urban/domestic water sector, it is important to note that savings can also be achieved in other water user sectors such as the industrial and irrigation sectors. The typical savigs that can be achieve differ fro place to place and are usually related to specific dynamics of the catchment.

8.1 WCWDM in Irrigation

Prior to the undertaing of Compulsory Licensing in the Mhathuze Catchment in 2015, the irrigation sector held the majority of the allocated water with a volume of 187 million m^3/annum. It was well known, however, that the actual use by the irrigation sector fell well below this volume, and was as little as 30% in some years. The irrigators used to state that the large allocation compared with actual use was necessary in the dry years when they would be restricted, and they would then require the additional water to survive. The Mhathuze Catchment was previously overallocated, however, was able to fuction due to the large difference between allocated water and actual use. This is typically known as paper water. It was for this reason that the Mhlathuze catchment underwent Compusory Licensing, with the eventual outcome being that the Licensed water for the irrigation sector was reduced to 128.5 million m^3/annum.

The irrigators rely heavily on rainfall, and make use of irrigation only when climatic conditions require it. This is caused by high electricity costs which makes pumping and irrigation expensive. As a result of this, it is understood that the irrigation sector is already operating in an efficient manner, and there is little scope for savings as a result of applying WCWDM techniques. Furthermore, as a result of the large reduction in allocations after Compulsory Licensing, it is believed that any savings in irrigation use will be further used on farm to expand activities, and this water will not be available to other user sectors.

8.2 WCWDM in Industries

Richards Bay and its surrounding areas contain many industrial users, considered both light industries as well as bulk raw water users. The area has experienced a major drought in recent years, with most users being restricted over this time. Feedback from representitives from the sector indicated that many industries have sought more efficient water use practices in their processes in order to continue their business under restricted water conditions. Both water reuse practices and rainwater harvesting have been implemented at many industries over recent years. These savings have been incorporated into the future water requirements of the users and will therefore form part of the water balance in the reconciliation strategy.

9 CONCLUSION AND RECOMMENDATIONS

Based on the findings of the municipal water sector, it is clear that there is significant scope for WCWDM in the study area. WCWDM will result in both a reduction of NRW and the total system input volume. A serious concern however, is the pervasive limitation in institutional capacity and technical skills to embark on WCWDM programmes in the municipality.

WCWDM interventions should focus on the following interventions:

- Reduce the high water losses and inefficiencies with set targets and timelines;
- KCDM and CoMLM should improve service delivery, as this will minimise informal and unauthorised connections in some areas;
- Develop and implement an operation and maintenance plan, if an existing plan is not in place;
- Install bulk meters to measure supply from the zones and districts;
- Maintain satisfactory operating pressures and install control valves in areas experiencing high pressures to ensure that operating pressures do not exceed the DWS regulation of 9 bar;
- Properly investigate the status of the service level for drinking water and sanitation in order to assess the situation and formulate recommendations for future improvements of servicing the entire area;
- Investigate the situation of water supply infrastructure on the base of new data in order to assess properly which investments in the refurbishment of the system are required;
- Provide training technical staff and for meter readers and perform monthly audits to eliminate estimates and other inaccuracies; and
- Embark on community awareness programmes that promote the value of water wise gardening.

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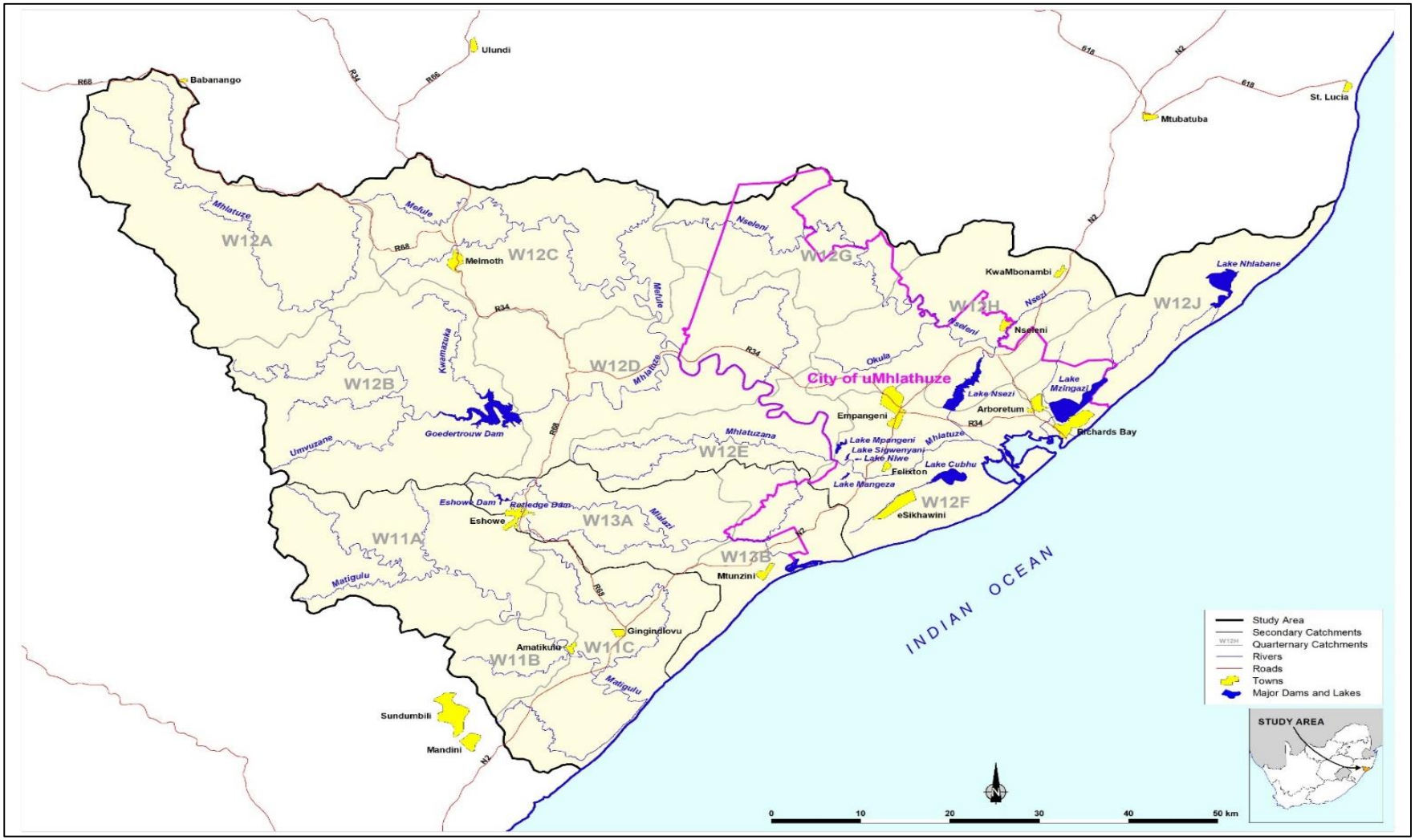
APPENDIX A

Study Area


Ulundi
Babanango
R68
R34
R66
618
N2
St. Lucia
Mtubatuba
Mhlatuze
Melulo
W12A
Melmoth
W12C
Nseleni
W12G
KwaMbonambi
Lake Nhlabane
W12H
W12J
Nseleni
Nseleni
Okula
Kwamzuzuka
W12D
Mhlatuze
City of uMhlathuze
Lake Nsezi
Lake Mzingazi
W12B
Arboretum
Empangeni
Goedertrouw Dam
R66
Richards Bay
Umuzane
Mhlatuzana
W12E
Lake Mpangeni
Lake Sigwenyani
Lake Nhwe
Mhlatuze
Lake Cubhu
Felixton
Lake Mangeza
Eshowe Dam
Renledge Dam
W12F
eSikhawini
Eshowe
W13A
Mtalazi
W11A
W13B
Mtunzini
Matigulu
INDIAN OCEAN
Gingindlovu
Amatikulu
W11C
W11B
Matigulu
Sundumbili
Mandini
N2
Study Area
Secondary Catchments
Quarternary Catchments
Rivers
Roads
Towns
Major Dams and Lakes
STUDY AREA
0
10
20
30
40
50 km

APPENDIX B

Business Plan for Demand Centres

WCWDM STRATEGY AND BUSINESS PLAN : BUDGET AND CASHFLOW

Municipality name Richards Bay

COSTS

Item		Unit	Quantity / year	Rate	Year 1	Year 2	Year 3	Year 4	Year 5	Total
INSTITUTIONAL / LEGISLATIVE INTERVENTIONS										
Institutional review:					50%	50%				100%
CAPEX	Review organogram and fill vacancies	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX		Sum			R 0	R 0	R 0	R 0	R 0	R 0
Training and education :					50%	50%				
CAPEX	Not applicable	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
OPEX	Assume one training course / employee / annum	No	10	R 5 000	R 50 000	R 50 000	R 50 000	R 50 000	R 50 000	R 250 000
Customer charter, policy, bylaws :						100%				100%
CAPEX	Review bylaws on 5 year cycles	Sum	1	R 200 000	R 0	R 200 000	R 0	R 0	R 0	R 200 000
OPEX	Enforce bylaws	Sum	1	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 500 000
FINANCIAL INTERVENTIONS										
Effective metering and billing :					50%	50%				100%
CAPEX	Perform meter audit	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
OPEX	Ensure proper metering and billing of all consumers	No	12 804	R 100	R 1 280 400	R 1 280 400	R 1 280 400	R 1 280 400	R 1 280 400	R 6 402 000
Water tariffs :					50%	50%				100%
CAPEX	Review water tariffs	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Not applicable	Sum		R 0	R 0	R 0	R 0	R 0	R 0	R 0
Informative billing :					50%	50%				100%
CAPEX	Improve invoice to show monthly consumption	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Distribute information with bill	Sum	12 804	R 120	R 1 536 480	R 1 536 480	R 1 536 480	R 1 536 480	R 1 536 480	R 7 682 400
SOCIAL INTERVENTIONS										
Consumer Awareness Campaign :					20%	20%	20%	20%	20%	100%
CAPEX	Install bill boards, design pamphlets, radio campaigns	Sum	12 804	R 120	R 307 296	R 307 296	R 307 296	R 307 296	R 307 296	R 1 536 480
OPEX	Target households on monthly basis with awareness can	No	12 804	R 60	R 768 240	R 768 240	R 768 240	R 768 240	R 768 240	R 3 841 200
Consumer Help and Support Desk :					50%	50%				100%
CAPEX	Improve existing help-desk to provide one-stop service	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Maintain help-desk	Sum	1	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 500 000

Schools awareness :					50%	50%				100%
CAPEX	Prepare schools competition, awareness, retrofit	No	20	R 20 000	R 200 000	R 200 000	R 0	R 0	R 0	R 400 000
OPEX	Monthly schools awareness campaign	No	20	R 2 000	R 40 000	R 40 000	R 40 000	R 40 000	R 40 000	R 200 000
TECHNICAL INTERVENTIONS										
Bulk metering :					50%	50%				100%
CAPEX	New meter installations required	No	20	R 50 000	R 500 000	R 500 000	R 0	R 0	R 0	R 1 000 000
OPEX	Maintenance of existing bulk meters	No	20	R 1 000	R 20 000	R 20 000	R 20 000	R 20 000	R 20 000	R 100 000
Sectorisation :					50%	50%				100%
CAPEX	Setup of new DMA / PMAs	No	20	R 50 000	R 500 000	R 500 000	R 0	R 0	R 0	R 1 000 000
OPEX	Maintenance of DMA / PMAs including step testing	No	20	R 25 000	R 500 000	R 500 000	R 500 000	R 500 000	R 500 000	R 2 500 000
Active Leakage Control :					50%	50%				100%
CAPEX	Not applicable	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
OPEX	Fix all visible and reported leaks	No	40	R 1 000	R 40 000	R 40 000	R 40 000	R 40 000	R 40 000	R 200 000
Valve audits					50%	50%				100%
CAPEX	Locate, clean, repair, document network valves	No	160	R 4 000	R 320 000	R 320 000	R 0	R 0	R 0	R 640 000
OPEX	Maintain network valves	No	32	R 1 000	R 32 000	R 32 000	R 32 000	R 32 000	R 32 000	R 160 000
Leak and logging equipment :					50%	50%				100%
CAPEX	Procure basic WDM equipment	Sum	5	R 20 000	R 50 000	R 50 000	R 0	R 0	R 0	R 100 000
OPEX	Not applicable	Sum			R 0	R 0	R 0	R 0	R 0	R 0
Telemetry :						50%	50%			100%
CAPEX	Install telemetry sites	No	20	R 15 000	R 0	R 150 000	R 150 000	R 0	R 0	R 300 000
OPEX	Maintain telemetry sites	No	20	R 1 500	R 30 000	R 30 000	R 30 000	R 30 000	R 30 000	R 150 000
Retrofitting and removal of wasteful devices :					20%	20%	20%	20%	20%	100%
CAPEX	Retrofit government buildings, schools, etc.	No	1 280	R 1 000	R 256 080	R 256 080	R 256 080	R 256 080	R 256 080	R 1 280 400
OPEX	Not applicable	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
Mains replacement :					20%	20%	20%	20%	20%	100%
CAPEX	Replace critical leaking mains	km	8.0	R 100 000	R 160 000	R 160 000	R 160 000	R 160 000	R 160 000	R 800 000
OPEX	Not applicable	km		R 0	R 0	R 0	R 0	R 0	R 0	R 0
Pressure management :					20%	80%				100%
CAPEX	New pressure management installations	No	5	R 75 000	R 75 000	R 300 000	R 0	R 0	R 0	R 375 000
OPEX	Maintain pressure management installations	No	5	R 5 000	R 25 000	R 25 000	R 25 000	R 25 000	R 25 000	R 125 000
Control valve management :					50%	50%				100%
CAPEX	New control valve installations	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
OPEX	Maintain all control valve installations	No	20	R 5 000	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 500 000
Consumer metering :						25%	25%	25%	25%	100%
CAPEX	Replacement of old water meters	No	1 280	R 1 200	R 0	R 384 120	R 384 120	R 384 120	R 384 120	R 1 536 480
OPEX	Replacement of broken and cycled water meters	No	640	R 1 200	R 768 240	R 768 240	R 768 240	R 768 240	R 768 240	R 3 841 200
Top consumer audit :					20%	20%	20%	20%	20%	100%
CAPEX	Audit and retrofit non domestic consumers	No	640	R 10 000	R 1 280 400	R 1 280 400	R 1 280 400	R 1 280 400	R 1 280 400	R 6 402 000
OPEX	Maintain non domestic consumers installations	No	12 804	R 500	R 6 402 000	R 6 402 000	R 6 402 000	R 6 402 000	R 6 402 000	R 32 010 000
GIS / CAD system :					50%	50%				100%

CAPEX	Replacement of old water meters	No	1 280	R 1 200	R 0	R 384 120	R 384 120	R 384 120	R 384 120	R 1 536 480
OPEX	Replacement of broken and cycled water meters	No	640	R 1 200	R 768 240	R 768 240	R 768 240	R 768 240	R 768 240	R 3 841 200
Top consumer audit :					20%	20%	20%	20%	20%	100%
CAPEX	Audit and retrofit non domestic consumers	No	640	R 10 000	R 1 280 400	R 1 280 400	R 1 280 400	R 1 280 400	R 1 280 400	R 6 402 000
OPEX	Maintain non domestic consumers installations	No	12 804	R 500	R 6 402 000	R 6 402 000	R 6 402 000	R 6 402 000	R 6 402 000	R 32 010 000
GIS / CAD system :					50%	50%				100%
CAPEX	Setup CAD/ GIS system	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Maintain CAD / GIS system	Sum	1	R 200 000	R 200 000	R 200 000	R 200 000	R 200 000	R 200 000	R 1 000 000
Management Information System :					50%	50%				100%
CAPEX	Setup basic MIS system to support WDM	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Maintain MIS system	Sum	1	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 500 000
Water loss monitoring and audits:						50%	50%			100%
CAPEX	Perform proper analysis of distribution network	Sum	1	R 200 000	R 0	R 100 000	R 100 000	R 0	R 0	R 200 000
OPEX	Perform ad hoc analysis to monitor interventions	Sum	1	R 20 000	R 20 000	R 20 000	R 20 000	R 20 000	R 20 000	R 100 000

Item	Type			Year 1	Year 2	Year 3	Year 4	Year 5	Total
TOTAL COSTS									
Institutional	CAPEX			R 100 000	R 300 000	R 0	R 0	R 0	R 400 000
	OPEX			R 150 000	R 150 000	R 150 000	R 150 000	R 150 000	R 750 000
	TOTAL			**R 250 000**	**R 450 000**	**R 150 000**	**R 150 000**	**R 150 000**	**R 1 150 000**
Financial	CAPEX			R 200 000	R 200 000	R 0	R 0	R 0	R 400 000
	OPEX			R 2 816 880	R 2 816 880	R 2 816 880	R 2 816 880	R 2 816 880	R 14 084 400
	TOTAL			**R 3 016 880**	**R 3 016 880**	**R 2 816 880**	**R 2 816 880**	**R 2 816 880**	**R 14 484 400**
Social	CAPEX			R 607 296	R 607 296	R 307 296	R 307 296	R 307 296	R 2 136 480
	OPEX			R 908 240	R 908 240	R 908 240	R 908 240	R 908 240	R 4 541 200
	TOTAL			**R 1 515 536**	**R 1 515 536**	**R 1 215 536**	**R 1 215 536**	**R 1 215 536**	**R 6 677 680**
Technical	CAPEX			R 3 341 480	R 4 200 600	R 2 330 600	R 2 080 600	R 2 080 600	R 14 033 880
	OPEX			R 8 237 240	R 8 237 240	R 8 237 240	R 8 237 240	R 8 237 240	R 41 186 200
	TOTAL			**R 11 578 720**	**R 12 437 840**	**R 10 567 840**	**R 10 317 840**	**R 10 317 840**	**R 55 220 080**
Total	CAPEX			R 4 248 776	R 5 307 896	R 2 637 896	R 2 387 896	R 2 387 896	R 16 970 360
	OPEX			R 12 112 360	R 12 112 360	R 12 112 360	R 12 112 360	R 12 112 360	R 60 561 800
	TOTAL			**R 16 361 136**	**R 17 420 256**	**R 14 750 256**	**R 14 500 256**	**R 14 500 256**	**R 77 532 160**
				R 16 361 136	R 17 420 256	R 14 750 256	R 14 500 256	R 14 500 256	

BENEFITS

Item	Unit	Quantity	Rate	Year 1	Year 2	Year 3	Year 4	Year 5	Total
REALISTIC SCENARIO									
Reduced input volume				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	566 000		113 200	226 400	339 600	452 800	566 000	1 698 000
Amount	R / annum	566 000	R 5.00	R 566 000	R 1 132 000	R 1 698 000	R 2 264 000	R 2 830 000	R 8 490 000
Increased revenue water				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	200 000		40 000	80 000	120 000	160 000	200 000	600 000
Amount	R / annum	200 000	R 7.00	R 280 000	R 560 000	R 840 000	R 1 120 000	R 1 400 000	R 4 200 000

Reduced input volume				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	566 000		113 200	226 400	339 600	452 800	566 000	1 698 000
Amount	R / annum	566 000	R 5.00	R 566 000	R 1 132 000	R 1 698 000	R 2 264 000	R 2 830 000	R 8 490 000
Increased revenue water				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	200 000		40 000	80 000	120 000	160 000	200 000	600 000
Amount	R / annum	200 000	R 7.00	R 280 000	R 560 000	R 840 000	R 1 120 000	R 1 400 000	R 4 200 000
Total	**m^3/annum**			**153 200**	**306 400**	**459 600**	**612 800**	**766 000**	**2 298 000**
Total	**R / annum**			**R 846 000**	**R 1 692 000**	**R 2 538 000**	**R 3 384 000**	**R 4 230 000**	**R 12 690 000**
								Payback period - years	**6.1**
OPTIMISTIC SCENARIO									
Reduced input volume				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	708 000		141 600	283 200	424 800	566 400	708 000	2 124 000
Amount	R / annum	708 000	R 5.00	R 708 000	R 1 416 000	R 2 124 000	R 2 832 000	R 3 540 000	R 10 620 000
Increased revenue water				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	517 000		103 400	206 800	310 200	413 600	517 000	1 551 000
Amount	R / annum	517 000	R 7.00	R 723 800	R 1 447 600	R 2 171 400	R 2 895 200	R 3 619 000	R 10 857 000
Total	**m^3/annum**			**245 000**	**490 000**	**735 000**	**980 000**	**1 225 000**	**3 675 000**
Total	**R / annum**			**R 1 431 800**	**R 2 863 600**	**R 4 295 400**	**R 5 727 200**	**R 7 159 000**	**R 21 477 000**
								Payback period - years	**3.6**

WCWDM STRATEGY AND BUSINESS PLAN : BUDGET AND CASHFLOW

Municipality name Empangeni

COSTS

Item		Unit	Quantity / year	Rate	Year 1	Year 2	Year 3	Year 4	Year 5	Total
INSTITUTIONAL / LEGISLATIVE INTERVENTIONS										
Institutional review:					50%	50%				100%
CAPEX	Review organogram and fill vacancies	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX		Sum			R 0	R 0	R 0	R 0	R 0	R 0
Training and education :					50%	50%				
CAPEX	Not applicable	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
OPEX	Assume one training course / employee / annum	No	10	R 5 000	R 50 000	R 50 000	R 50 000	R 50 000	R 50 000	R 250 000
Customer charter, policy, bylaws :						100%				100%
CAPEX	Review bylaws on 5 year cycles	Sum	1	R 200 000	R 0	R 200 000	R 0	R 0	R 0	R 200 000
OPEX	Enforce bylaws	Sum	1	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 500 000
FINANCIAL INTERVENTIONS										
Effective metering and billing :					50%	50%				100%
CAPEX	Perform meter audit	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
OPEX	Ensure proper metering and billing of all consumers	No	10 088	R 100	R 1 008 800	R 1 008 800	R 1 008 800	R 1 008 800	R 1 008 800	R 5 044 000
Water tariffs :					50%	50%				100%
CAPEX	Review water tariffs	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Not applicable	Sum		R 0	R 0	R 0	R 0	R 0	R 0	R 0
Informative billing :					50%	50%				100%
CAPEX	Improve invoice to show monthly consumption	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Distribute information with bill	Sum	7	R 120	R 840	R 840	R 840	R 840	R 840	R 4 200
SOCIAL INTERVENTIONS										
Consumer Awareness Campaign :					20%	20%	20%	20%	20%	100%
CAPEX	Install bill boards, design pamphlets, radio campaigns	Sum	10 088	R 120	R 242 112	R 242 112	R 242 112	R 242 112	R 242 112	R 1 210 560
OPEX	Target households on monthly basis with awareness can	No	10 088	R 60	R 605 280	R 605 280	R 605 280	R 605 280	R 605 280	R 3 026 400
Consumer Help and Support Desk :					50%	50%				100%
CAPEX	Improve existing help-desk to provide one-stop service	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Maintain help-desk	Sum	1	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 500 000
Schools awareness :					50%	50%				100%
CAPEX	Prepare schools competition, awareness, retrofit	No	20	R 20 000	R 200 000	R 200 000	R 0	R 0	R 0	R 400 000
OPEX	Monthly schools awareness campaign	No	20	R 2 000	R 40 000	R 40 000	R 40 000	R 40 000	R 40 000	R 200 000
TECHNICAL INTERVENTIONS										
Bulk metering :					50%	50%				100%

Schools awareness :					50%	50%				100%
CAPEX	Prepare schools competition, awareness, retrofit	No	20	R 20 000	R 200 000	R 200 000	R 0	R 0	R 0	R 400 000
OPEX	Monthly schools awareness campaign	No	20	R 2 000	R 40 000	R 40 000	R 40 000	R 40 000	R 40 000	R 200 000
TECHNICAL INTERVENTIONS										
Bulk metering :					50%	50%				100%
CAPEX	New meter installations required	No	10	R 50 000	R 250 000	R 250 000	R 0	R 0	R 0	R 500 000
OPEX	Maintenance of existing bulk meters	No	10	R 1 000	R 10 000	R 10 000	R 10 000	R 10 000	R 10 000	R 50 000
Sectorisation :					50%	50%				100%
CAPEX	Setup of new DMA / PMAs	No	10	R 50 000	R 250 000	R 250 000	R 0	R 0	R 0	R 500 000
OPEX	Maintenance of DMA / PMAs including step testing	No	10	R 25 000	R 250 000	R 250 000	R 250 000	R 250 000	R 250 000	R 1 250 000
Active Leakage Control :					50%	50%				100%
CAPEX	Not applicable	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
OPEX	Fix all visible and reported leaks	No	255	R 1 000	R 255 000	R 255 000	R 255 000	R 255 000	R 255 000	R 1 275 000
Valve audits					50%	50%				100%
CAPEX	Locate, clean, repair, document network valves	No	510	R 4 000	R 1 020 000	R 1 020 000	R 0	R 0	R 0	R 2 040 000
OPEX	Maintain network valves	No	510	R 1 000	R 510 000	R 510 000	R 510 000	R 510 000	R 510 000	R 2 550 000
Leak and logging equipment :					50%	50%				100%
CAPEX	Procure basic WDM equipment	Sum	5	R 20 000	R 50 000	R 50 000	R 0	R 0	R 0	R 100 000
OPEX	Not applicable	Sum			R 0	R 0	R 0	R 0	R 0	R 0
Telemetry :						50%	50%			100%
CAPEX	Install telemetry sites	No	5	R 15 000	R 0	R 37 500	R 37 500	R 0	R 0	R 75 000
OPEX	Maintain telemetry sites	No	5	R 1 500	R 7 500	R 7 500	R 7 500	R 7 500	R 7 500	R 37 500
Retrofitting and removal of wasteful devices :					20%	20%	20%	20%	20%	100%
CAPEX	Retrofit government buildings, schools, etc.	No	1 009	R 1 000	R 201 760	R 201 760	R 201 760	R 201 760	R 201 760	R 1 008 800
OPEX	Not applicable	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
Mains replacement :					20%	20%	20%	20%	20%	100%
CAPEX	Replace critical leaking mains	km	51.0	R 100 000	R 1 020 000	R 1 020 000	R 1 020 000	R 1 020 000	R 1 020 000	R 5 100 000
OPEX	Not applicable	km		R 0	R 0	R 0	R 0	R 0	R 0	R 0
Pressure management :					20%	80%				100%
CAPEX	New pressure management installations	No	5	R 75 000	R 75 000	R 300 000	R 0	R 0	R 0	R 375 000
OPEX	Maintain pressure management installations	No	5	R 5 000	R 25 000	R 25 000	R 25 000	R 25 000	R 25 000	R 125 000
Control valve management :					50%	50%				100%
CAPEX	New control valve installations	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
OPEX	Maintain all control valve installations	No	15	R 5 000	R 75 000	R 75 000	R 75 000	R 75 000	R 75 000	R 375 000
Consumer metering :						25%	25%	25%	25%	100%
CAPEX	Replacement of old water meters	No	1 009	R 1 200	R 0	R 302 640	R 302 640	R 302 640	R 302 640	R 1 210 560
OPEX	Replacement of broken and cycled water meters	No	504	R 1 200	R 605 280	R 605 280	R 605 280	R 605 280	R 605 280	R 3 026 400
Top consumer audit :					20%	20%	20%	20%	20%	100%
CAPEX	Audit and retrofit non domestic consumers	No	504	R 10 000	R 1 008 800	R 1 008 800	R 1 008 800	R 1 008 800	R 1 008 800	R 5 044 000
OPEX	Maintain non domestic consumers installations	No	504	R 500	R 252 000	R 252 000	R 252 000	R 252 000	R 252 000	R 1 260 000
GIS / CAD system :					50%	50%				100%

CAPEX	Replacement of old water meters	No	1 009	R 1 200	R 0	R 302 640	R 302 640	R 302 640	R 302 640	R 1 210 560
OPEX	Replacement of broken and cycled water meters	No	504	R 1 200	R 605 280	R 605 280	R 605 280	R 605 280	R 605 280	R 3 026 400
Top consumer audit :					20%	20%	20%	20%	20%	100%
CAPEX	Audit and retrofit non domestic consumers	No	504	R 10 000	R 1 008 800	R 1 008 800	R 1 008 800	R 1 008 800	R 1 008 800	R 5 044 000
OPEX	Maintain non domestic consumers installations	No	504	R 500	R 252 000	R 252 000	R 252 000	R 252 000	R 252 000	R 1 260 000
GIS / CAD system :					50%	50%				100%
CAPEX	Setup CAD/ GIS system	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Maintain CAD / GIS system	Sum	1	R 200 000	R 200 000	R 200 000	R 200 000	R 200 000	R 200 000	R 1 000 000
Management Information System :					50%	50%				100%
CAPEX	Setup basic MIS system to support WDM	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Maintain MIS system	Sum	1	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 500 000
Water loss monitoring and audits:						50%	50%			100%
CAPEX	Perform proper analysis of distribution network	Sum	1	R 200 000	R 0	R 100 000	R 100 000	R 0	R 0	R 200 000
OPEX	Perform ad hoc analysis to monitor interventions	Sum	1	R 20 000	R 20 000	R 20 000	R 20 000	R 20 000	R 20 000	R 100 000

Item	Type			Year 1	Year 2	Year 3	Year 4	Year 5	Total
TOTAL COSTS									
Institutional	CAPEX			R 100 000	R 300 000	R 0	R 0	R 0	R 400 000
	OPEX			R 150 000	R 150 000	R 150 000	R 150 000	R 150 000	R 750 000
	TOTAL			**R 250 000**	**R 450 000**	**R 150 000**	**R 150 000**	**R 150 000**	**R 1 150 000**
Financial	CAPEX			R 200 000	R 200 000	R 0	R 0	R 0	R 400 000
	OPEX			R 1 009 640	R 1 009 640	R 1 009 640	R 1 009 640	R 1 009 640	R 5 048 200
	TOTAL			**R 1 209 640**	**R 1 209 640**	**R 1 009 640**	**R 1 009 640**	**R 1 009 640**	**R 5 448 200**
Social	CAPEX			R 542 112	R 542 112	R 242 112	R 242 112	R 242 112	R 1 810 560
	OPEX			R 745 280	R 745 280	R 745 280	R 745 280	R 745 280	R 3 726 400
	TOTAL			**R 1 287 392**	**R 1 287 392**	**R 987 392**	**R 987 392**	**R 987 392**	**R 5 536 960**
Technical	CAPEX			R 4 075 560	R 4 740 700	R 2 670 700	R 2 533 200	R 2 533 200	R 16 553 360
	OPEX			R 2 309 780	R 2 309 780	R 2 309 780	R 2 309 780	R 2 309 780	R 11 548 900
	TOTAL			**R 6 385 340**	**R 7 050 480**	**R 4 980 480**	**R 4 842 980**	**R 4 842 980**	**R 28 102 260**
Total	CAPEX			R 4 917 672	R 5 782 812	R 2 912 812	R 2 775 312	R 2 775 312	R 19 163 920
	OPEX			R 4 214 700	R 4 214 700	R 4 214 700	R 4 214 700	R 4 214 700	R 21 073 500
	TOTAL			**R 9 132 372**	**R 9 997 512**	**R 7 127 512**	**R 6 990 012**	**R 6 990 012**	**R 40 237 420**
				R 9 132 372	R 9 997 512	R 7 127 512	R 6 990 012	R 6 990 012	

BENEFITS

Item	Unit	Quantity	Rate	Year 1	Year 2	Year 3	Year 4	Year 5	Total
REALISTIC SCENARIO									
Reduced input volume				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	149 000		29 800	59 600	89 400	119 200	149 000	447 000
Amount	R / annum	149 000	R 5.00	R 149 000	R 298 000	R 447 000	R 596 000	R 745 000	R 2 235 000
Increased revenue water				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	694 000		138 800	277 600	416 400	555 200	694 000	2 082 000
Amount	R / annum	694 000	R 7.00	R 971 600	R 1 943 200	R 2 914 800	R 3 886 400	R 4 858 000	R 14 574 000

Reduced input volume				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	149 000		29 800	59 600	89 400	119 200	149 000	447 000
Amount	R / annum	149 000	R 5.00	R 149 000	R 298 000	R 447 000	R 596 000	R 745 000	R 2 235 000
Increased revenue water				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	694 000		138 800	277 600	416 400	555 200	694 000	2 082 000
Amount	R / annum	694 000	R 7.00	R 971 600	R 1 943 200	R 2 914 800	R 3 886 400	R 4 858 000	R 14 574 000
Total	**m^3/annum**			**168 600**	**337 200**	**505 800**	**674 400**	**843 000**	**2 529 000**
Total	**R / annum**			**R 1 120 600**	**R 2 241 200**	**R 3 361 800**	**R 4 482 400**	**R 5 603 000**	**R 16 809 000**
								Payback period - years	**2.4**
OPTIMISTIC SCENARIO									
Reduced input volume				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	372 000		74 400	148 800	223 200	297 600	372 000	1 116 000
Amount	R / annum	372 000	R 5.00	R 372 000	R 744 000	R 1 116 000	R 1 488 000	R 1 860 000	R 5 580 000
Increased revenue water				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	463 000		92 600	185 200	277 800	370 400	463 000	1 389 000
Amount	R / annum	463 000	R 7.00	R 648 200	R 1 296 400	R 1 944 600	R 2 592 800	R 3 241 000	R 9 723 000
Total	**m^3/annum**			**167 000**	**334 000**	**501 000**	**668 000**	**835 000**	**2 505 000**
Total	**R / annum**			**R 1 020 200**	**R 2 040 400**	**R 3 060 600**	**R 4 080 800**	**R 5 101 000**	**R 15 303 000**
								Payback period - years	**2.6**

WCWDM STRATEGY AND BUSINESS PLAN : BUDGET AND CASHFLOW

Municipality name Esikhaweni

COSTS

Item		Unit	Quantity / year	Rate	Year 1	Year 2	Year 3	Year 4	Year 5	Total
INSTITUTIONAL / LEGISLATIVE INTERVENTIONS										
Institutional review:					50%	50%				100%
CAPEX	Review organogram and fill vacancies	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX		Sum			R 0	R 0	R 0	R 0	R 0	R 0
Training and education :					50%	50%				
CAPEX	Not applicable	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
OPEX	Assume one training course / employee / annum	No	10	R 5 000	R 50 000	R 50 000	R 50 000	R 50 000	R 50 000	R 250 000
Customer charter, policy, bylaws :						100%				100%
CAPEX	Review bylaws on 5 year cycles	Sum	1	R 200 000	R 0	R 200 000	R 0	R 0	R 0	R 200 000
OPEX	Enforce bylaws	Sum	1	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 500 000
FINANCIAL INTERVENTIONS										
Effective metering and billing :					50%	50%				100%
CAPEX	Perform meter audit	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
OPEX	Ensure proper metering and billing of all consumers	No	40 331	R 100	R 4 033 100	R 4 033 100	R 4 033 100	R 4 033 100	R 4 033 100	R 20 165 500
Water tariffs :					50%	50%				100%
CAPEX	Review water tariffs	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Not applicable	Sum		R 0	R 0	R 0	R 0	R 0	R 0	R 0
Informative billing :					50%	50%				100%
CAPEX	Improve invoice to show monthly consumption	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Distribute information with bill	Sum	40 331	R 120	R 4 839 720	R 4 839 720	R 4 839 720	R 4 839 720	R 4 839 720	R 24 198 600
SOCIAL INTERVENTIONS										
Consumer Awareness Campaign :					20%	20%	20%	20%	20%	100%
CAPEX	Install bill boards, design pamphlets, radio campaigns	Sum	40 331	R 120	R 967 944	R 967 944	R 967 944	R 967 944	R 967 944	R 4 839 720
OPEX	Target households on monthly basis with awareness can	No	40 331	R 60	R 2 419 860	R 2 419 860	R 2 419 860	R 2 419 860	R 2 419 860	R 12 099 300
Consumer Help and Support Desk :					50%	50%				100%
CAPEX	Improve existing help-desk to provide one-stop service	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Maintain help-desk	Sum	1	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 500 000
Schools awareness :					50%	50%				100%
CAPEX	Prepare schools competition, awareness, retrofit	No	20	R 20 000	R 200 000	R 200 000	R 0	R 0	R 0	R 400 000
OPEX	Monthly schools awareness campaign	No	20	R 2 000	R 40 000	R 40 000	R 40 000	R 40 000	R 40 000	R 200 000
TECHNICAL INTERVENTIONS										
Bulk metering :					50%	50%				100%

Schools awareness :					50%	50%				100%
CAPEX	Prepare schools competition, awareness, retrofit	No	20	R 20 000	R 200 000	R 200 000	R 0	R 0	R 0	R 400 000
OPEX	Monthly schools awareness campaign	No	20	R 2 000	R 40 000	R 40 000	R 40 000	R 40 000	R 40 000	R 200 000
TECHNICAL INTERVENTIONS										
Bulk metering :					50%	50%				100%
CAPEX	New meter installations required	No	20	R 50 000	R 500 000	R 500 000	R 0	R 0	R 0	R 1 000 000
OPEX	Maintenance of existing bulk meters	No	20	R 1 000	R 20 000	R 20 000	R 20 000	R 20 000	R 20 000	R 100 000
Sectorisation :					50%	50%				100%
CAPEX	Setup of new DMA / PMAs	No	20	R 50 000	R 500 000	R 500 000	R 0	R 0	R 0	R 1 000 000
OPEX	Maintenance of DMA / PMAs including step testing	No	20	R 25 000	R 500 000	R 500 000	R 500 000	R 500 000	R 500 000	R 2 500 000
Active Leakage Control :					50%	50%				100%
CAPEX	Not applicable	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
OPEX	Fix all visible and reported leaks	No	597	R 1 000	R 597 000	R 597 000	R 597 000	R 597 000	R 597 000	R 2 985 000
Valve audits					50%	50%				100%
CAPEX	Locate, clean, repair, document network valves	No	2 388	R 4 000	R 4 776 000	R 4 776 000	R 0	R 0	R 0	R 9 552 000
OPEX	Maintain network valves	No	478	R 1 000	R 477 600	R 477 600	R 477 600	R 477 600	R 477 600	R 2 388 000
Leak and logging equipment :					50%	50%				100%
CAPEX	Procure basic WDM equipment	Sum	5	R 20 000	R 50 000	R 50 000	R 0	R 0	R 0	R 100 000
OPEX	Not applicable	Sum			R 0	R 0	R 0	R 0	R 0	R 0
Telemetry :						50%	50%			100%
CAPEX	Install telemetry sites	No	20	R 15 000	R 0	R 150 000	R 150 000	R 0	R 0	R 300 000
OPEX	Maintain telemetry sites	No	20	R 1 500	R 30 000	R 30 000	R 30 000	R 30 000	R 30 000	R 150 000
Retrofitting and removal of wasteful devices :					20%	20%	20%	20%	20%	100%
CAPEX	Retrofit government buildings, schools, etc.	No	4 033	R 1 000	R 806 620	R 806 620	R 806 620	R 806 620	R 806 620	R 4 033 100
OPEX	Not applicable	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
Mains replacement :					20%	20%	20%	20%	20%	100%
CAPEX	Replace critical leaking mains	km	119.4	R 100 000	R 2 388 000	R 2 388 000	R 2 388 000	R 2 388 000	R 2 388 000	R 11 940 000
OPEX	Not applicable	km		R 0	R 0	R 0	R 0	R 0	R 0	R 0
Pressure management :					20%	80%				100%
CAPEX	New pressure management installations	No	5	R 75 000	R 75 000	R 300 000	R 0	R 0	R 0	R 375 000
OPEX	Maintain pressure management installations	No	5	R 5 000	R 25 000	R 25 000	R 25 000	R 25 000	R 25 000	R 125 000
Control valve management :					50%	50%				100%
CAPEX	New control valve installations	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
OPEX	Maintain all control valve installations	No	20	R 5 000	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 500 000
Consumer metering :						25%	25%	25%	25%	100%
CAPEX	Replacement of old water meters	No	4 033	R 1 200	R 0	R 1 209 930	R 1 209 930	R 1 209 930	R 1 209 930	R 4 839 720
OPEX	Replacement of broken and cycled water meters	No	2 017	R 1 200	R 2 419 860	R 2 419 860	R 2 419 860	R 2 419 860	R 2 419 860	R 12 099 300
Top consumer audit :					20%	20%	20%	20%	20%	100%
CAPEX	Audit and retrofit non domestic consumers	No	2 017	R 10 000	R 4 033 100	R 4 033 100	R 4 033 100	R 4 033 100	R 4 033 100	R 20 165 500
OPEX	Maintain non domestic consumers installations	No	2 017	R 500	R 1 008 275	R 1 008 275	R 1 008 275	R 1 008 275	R 1 008 275	R 5 041 375
GIS / CAD system :					50%	50%				100%

CAPEX	Replacement of old water meters	No	4 033	R 1 200	R 0	R 1 209 930	R 1 209 930	R 1 209 930	R 1 209 930	R 4 839 720
OPEX	Replacement of broken and cycled water meters	No	2 017	R 1 200	R 2 419 860	R 2 419 860	R 2 419 860	R 2 419 860	R 2 419 860	R 12 099 300
Top consumer audit :					20%	20%	20%	20%	20%	100%
CAPEX	Audit and retrofit non domestic consumers	No	2 017	R 10 000	R 4 033 100	R 4 033 100	R 4 033 100	R 4 033 100	R 4 033 100	R 20 165 500
OPEX	Maintain non domestic consumers installations	No	2 017	R 500	R 1 008 275	R 1 008 275	R 1 008 275	R 1 008 275	R 1 008 275	R 5 041 375
GIS / CAD system :					50%	50%				100%
CAPEX	Setup CAD/ GIS system	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Maintain CAD / GIS system	Sum	1	R 200 000	R 200 000	R 200 000	R 200 000	R 200 000	R 200 000	R 1 000 000
Management Information System :					50%	50%				100%
CAPEX	Setup basic MIS system to support WDM	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Maintain MIS system	Sum	1	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 500 000
Water loss monitoring and audits:						50%	50%			100%
CAPEX	Perform proper analysis of distribution network	Sum	1	R 200 000	R 0	R 100 000	R 100 000	R 0	R 0	R 200 000
OPEX	Perform ad hoc analysis to monitor interventions	Sum	1	R 20 000	R 20 000	R 20 000	R 20 000	R 20 000	R 20 000	R 100 000

Item	Type			Year 1	Year 2	Year 3	Year 4	Year 5	Total
TOTAL COSTS									
Institutional	CAPEX			R 100 000	R 300 000	R 0	R 0	R 0	R 400 000
	OPEX			R 150 000	R 150 000	R 150 000	R 150 000	R 150 000	R 750 000
	TOTAL			**R 250 000**	**R 450 000**	**R 150 000**	**R 150 000**	**R 150 000**	**R 1 150 000**
Financial	CAPEX			R 200 000	R 200 000	R 0	R 0	R 0	R 400 000
	OPEX			R 8 872 820	R 8 872 820	R 8 872 820	R 8 872 820	R 8 872 820	R 44 364 100
	TOTAL			**R 9 072 820**	**R 9 072 820**	**R 8 872 820**	**R 8 872 820**	**R 8 872 820**	**R 44 764 100**
Social	CAPEX			R 1 267 944	R 1 267 944	R 967 944	R 967 944	R 967 944	R 5 439 720
	OPEX			R 2 559 860	R 2 559 860	R 2 559 860	R 2 559 860	R 2 559 860	R 12 799 300
	TOTAL			**R 3 827 804**	**R 3 827 804**	**R 3 527 804**	**R 3 527 804**	**R 3 527 804**	**R 18 239 020**
Technical	CAPEX			R 13 328 720	R 15 013 650	R 8 687 650	R 8 437 650	R 8 437 650	R 53 905 320
	OPEX			R 5 497 735	R 5 497 735	R 5 497 735	R 5 497 735	R 5 497 735	R 27 488 675
	TOTAL			**R 18 826 455**	**R 20 511 385**	**R 14 185 385**	**R 13 935 385**	**R 13 935 385**	**R 81 393 995**
Total	CAPEX			R 14 896 664	R 16 781 594	R 9 655 594	R 9 405 594	R 9 405 594	R 60 145 040
	OPEX			R 17 080 415	R 17 080 415	R 17 080 415	R 17 080 415	R 17 080 415	R 85 402 075
	TOTAL			**R 31 977 079**	**R 33 862 009**	**R 26 736 009**	**R 26 486 009**	**R 26 486 009**	**R 145 547 115**
				R 31 977 079	R 33 862 009	R 26 736 009	R 26 486 009	R 26 486 009	

BENEFITS

Item	Unit	Quantity	Rate	Year 1	Year 2	Year 3	Year 4	Year 5	Total
REALISTIC SCENARIO									
Reduced input volume				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	412 000		82 400	164 800	247 200	329 600	412 000	1 236 000
Amount	R / annum	412 000	R 5.00	R 412 000	R 824 000	R 1 236 000	R 1 648 000	R 2 060 000	R 6 180 000
Increased revenue water				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	809 000		161 800	323 600	485 400	647 200	809 000	2 427 000
Amount	R / annum	809 000	R 7.00	R 1 132 600	R 2 265 200	R 3 397 800	R 4 530 400	R 5 663 000	R 16 989 000

Reduced input volume				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	412 000		82 400	164 800	247 200	329 600	412 000	1 236 000
Amount	R / annum	412 000	R 5.00	R 412 000	R 824 000	R 1 236 000	R 1 648 000	R 2 060 000	R 6 180 000
Increased revenue water				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	809 000		161 800	323 600	485 400	647 200	809 000	2 427 000
Amount	R / annum	809 000	R 7.00	R 1 132 600	R 2 265 200	R 3 397 800	R 4 530 400	R 5 663 000	R 16 989 000
Total	**m^3/annum**			**244 200**	**488 400**	**732 600**	**976 800**	**1 221 000**	**3 663 000**
Total	**R / annum**			**R 1 544 600**	**R 3 089 200**	**R 4 633 800**	**R 6 178 400**	**R 7 723 000**	**R 23 169 000**
								Payback period - years	**6.3**
OPTIMISTIC SCENARIO									
Reduced input volume				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	722 000		144 400	288 800	433 200	577 600	722 000	2 166 000
Amount	R / annum	722 000	R 5.00	R 722 000	R 1 444 000	R 2 166 000	R 2 888 000	R 3 610 000	R 10 830 000
Increased revenue water				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	1 047 000		209 400	418 800	628 200	837 600	1 047 000	3 141 000
Amount	R / annum	1 047 000	R 7.00	R 1 465 800	R 2 931 600	R 4 397 400	R 5 863 200	R 7 329 000	R 21 987 000
Total	**m^3/annum**			**353 800**	**707 600**	**1 061 400**	**1 415 200**	**1 769 000**	**5 307 000**
Total	**R / annum**			**R 2 187 800**	**R 4 375 600**	**R 6 563 400**	**R 8 751 200**	**R 10 939 000**	**R 32 817 000**
								Payback period - years	**4.4**

WCWDM STRATEGY AND BUSINESS PLAN : BUDGET AND CASHFLOW

Municipality name Ngwelezane

COSTS

Item		Unit	Quantity / year	Rate	Year 1	Year 2	Year 3	Year 4	Year 5	Total
INSTITUTIONAL / LEGISLATIVE INTERVENTIONS										
Institutional review:					50%	50%				100%
CAPEX	Review organogram and fill vacancies	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX		Sum			R 0	R 0	R 0	R 0	R 0	R 0
Training and education :					50%	50%				
CAPEX	Not applicable	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
OPEX	Assume one training course / employee / annum	No	10	R 5 000	R 50 000	R 50 000	R 50 000	R 50 000	R 50 000	R 250 000
Customer charter, policy, bylaws :						100%				100%
CAPEX	Review bylaws on 5 year cycles	Sum	1	R 200 000	R 0	R 200 000	R 0	R 0	R 0	R 200 000
OPEX	Enforce bylaws	Sum	1	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 500 000
FINANCIAL INTERVENTIONS										
Effective metering and billing :					50%	50%				100%
CAPEX	Perform meter audit	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
OPEX	Ensure proper metering and billing of all consumers	No	16 603	R 100	R 1 660 300	R 1 660 300	R 1 660 300	R 1 660 300	R 1 660 300	R 8 301 500
Water tariffs :					50%	50%				100%
CAPEX	Review water tariffs	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Not applicable	Sum		R 0	R 0	R 0	R 0	R 0	R 0	R 0
Informative billing :					50%	50%				100%
CAPEX	Improve invoice to show monthly consumption	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Distribute information with bill	Sum	16 603	R 120	R 1 992 360	R 1 992 360	R 1 992 360	R 1 992 360	R 1 992 360	R 9 961 800
SOCIAL INTERVENTIONS										
Consumer Awareness Campaign :					20%	20%	20%	20%	20%	100%
CAPEX	Install bill boards, design pamphlets, radio campaigns	Sum	16 603	R 120	R 398 472	R 398 472	R 398 472	R 398 472	R 398 472	R 1 992 360
OPEX	Target households on monthly basis with awareness can	No	16 603	R 60	R 996 180	R 996 180	R 996 180	R 996 180	R 996 180	R 4 980 900
Consumer Help and Support Desk :					50%	50%				100%
CAPEX	Improve existing help-desk to provide one-stop service	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Maintain help-desk	Sum	1	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 500 000
Schools awareness :					50%	50%				100%
CAPEX	Prepare schools competition, awareness, retrofit	No	20	R 20 000	R 200 000	R 200 000	R 0	R 0	R 0	R 400 000
OPEX	Monthly schools awareness campaign	No	20	R 2 000	R 40 000	R 40 000	R 40 000	R 40 000	R 40 000	R 200 000
TECHNICAL INTERVENTIONS										
Bulk metering :					50%	50%				100%

Schools awareness :					50%	50%				100%
CAPEX	Prepare schools competition, awareness, retrofit	No	20	R 20 000	R 200 000	R 200 000	R 0	R 0	R 0	R 400 000
OPEX	Monthly schools awareness campaign	No	20	R 2 000	R 40 000	R 40 000	R 40 000	R 40 000	R 40 000	R 200 000
TECHNICAL INTERVENTIONS										
Bulk metering :					50%	50%				100%
CAPEX	New meter installations required	No	20	R 50 000	R 500 000	R 500 000	R 0	R 0	R 0	R 1 000 000
OPEX	Maintenance of existing bulk meters	No	20	R 1 000	R 20 000	R 20 000	R 20 000	R 20 000	R 20 000	R 100 000
Sectorisation :					50%	50%				100%
CAPEX	Setup of new DMA / PMAs	No	20	R 50 000	R 500 000	R 500 000	R 0	R 0	R 0	R 1 000 000
OPEX	Maintenance of DMA / PMAs including step testing	No	20	R 25 000	R 500 000	R 500 000	R 500 000	R 500 000	R 500 000	R 2 500 000
Active Leakage Control :					50%	50%				100%
CAPEX	Not applicable	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
OPEX	Fix all visible and reported leaks	No	30	R 1 000	R 30 000	R 30 000	R 30 000	R 30 000	R 30 000	R 150 000
Valve audits					50%	50%				100%
CAPEX	Locate, clean, repair, document network valves	No	120	R 4 000	R 240 000	R 240 000	R 0	R 0	R 0	R 480 000
OPEX	Maintain network valves	No	24	R 1 000	R 24 000	R 24 000	R 24 000	R 24 000	R 24 000	R 120 000
Leak and logging equipment :					50%	50%				100%
CAPEX	Procure basic WDM equipment	Sum	5	R 20 000	R 50 000	R 50 000	R 0	R 0	R 0	R 100 000
OPEX	Not applicable	Sum			R 0	R 0	R 0	R 0	R 0	R 0
Telemetry :						50%	50%			100%
CAPEX	Install telemetry sites	No	20	R 15 000	R 0	R 150 000	R 150 000	R 0	R 0	R 300 000
OPEX	Maintain telemetry sites	No	20	R 1 500	R 30 000	R 30 000	R 30 000	R 30 000	R 30 000	R 150 000
Retrofitting and removal of wasteful devices :					20%	20%	20%	20%	20%	100%
CAPEX	Retrofit government buildings, schools, etc.	No	888	R 1 000	R 177 660	R 177 660	R 177 660	R 177 660	R 177 660	R 888 300
OPEX	Not applicable	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
Mains replacement :					20%	20%	20%	20%	20%	100%
CAPEX	Replace critical leaking mains	km	6.0	R 100 000	R 120 000	R 120 000	R 120 000	R 120 000	R 120 000	R 600 000
OPEX	Not applicable	km		R 0	R 0	R 0	R 0	R 0	R 0	R 0
Pressure management :					20%	80%				100%
CAPEX	New pressure management installations	No	5	R 75 000	R 75 000	R 300 000	R 0	R 0	R 0	R 375 000
OPEX	Maintain pressure management installations	No	5	R 5 000	R 25 000	R 25 000	R 25 000	R 25 000	R 25 000	R 125 000
Control valve management :					50%	50%				100%
CAPEX	New control valve installations	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
OPEX	Maintain all control valve installations	No	20	R 5 000	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 500 000
Consumer metering :						25%	25%	25%	25%	100%
CAPEX	Replacement of old water meters	No	888	R 1 200	R 0	R 266 490	R 266 490	R 266 490	R 266 490	R 1 065 960
OPEX	Replacement of broken and cycled water meters	No	444	R 1 200	R 532 980	R 532 980	R 532 980	R 532 980	R 532 980	R 2 664 900
Top consumer audit :					20%	20%	20%	20%	20%	100%
CAPEX	Audit and retrofit non domestic consumers	No	444	R 10 000	R 888 300	R 888 300	R 888 300	R 888 300	R 888 300	R 4 441 500
OPEX	Maintain non domestic consumers installations	No	444	R 500	R 222 000	R 222 000	R 222 000	R 222 000	R 222 000	R 1 110 000
GIS / CAD system :					50%	50%				100%

CAPEX	Replacement of old water meters	No	888	R 1 200	R 0	R 266 490	R 266 490	R 266 490	R 266 490	R 1 065 960
OPEX	Replacement of broken and cycled water meters	No	444	R 1 200	R 532 980	R 532 980	R 532 980	R 532 980	R 532 980	R 2 664 900
Top consumer audit :					20%	20%	20%	20%	20%	100%
CAPEX	Audit and retrofit non domestic consumers	No	444	R 10 000	R 888 300	R 888 300	R 888 300	R 888 300	R 888 300	R 4 441 500
OPEX	Maintain non domestic consumers installations	No	444	R 500	R 222 000	R 222 000	R 222 000	R 222 000	R 222 000	R 1 110 000
GIS / CAD system :					50%	50%				100%
CAPEX	Setup CAD/ GIS system	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Maintain CAD / GIS system	Sum	1	R 200 000	R 200 000	R 200 000	R 200 000	R 200 000	R 200 000	R 1 000 000
Management Information System :					50%	50%				100%
CAPEX	Setup basic MIS system to support WDM	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Maintain MIS system	Sum	1	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 500 000
Water loss monitoring and audits:						50%	50%			100%
CAPEX	Perform proper analysis of distribution network	Sum	1	R 200 000	R 0	R 100 000	R 100 000	R 0	R 0	R 200 000
OPEX	Perform ad hoc analysis to monitor interventions	Sum	1	R 20 000	R 20 000	R 20 000	R 20 000	R 20 000	R 20 000	R 100 000

Item	Type			Year 1	Year 2	Year 3	Year 4	Year 5	Total
TOTAL COSTS									
Institutional	CAPEX			R 100 000	R 300 000	R 0	R 0	R 0	R 400 000
	OPEX			R 150 000	R 150 000	R 150 000	R 150 000	R 150 000	R 750 000
	TOTAL			**R 250 000**	**R 450 000**	**R 150 000**	**R 150 000**	**R 150 000**	**R 1 150 000**
Financial	CAPEX			R 200 000	R 200 000	R 0	R 0	R 0	R 400 000
	OPEX			R 3 652 660	R 3 652 660	R 3 652 660	R 3 652 660	R 3 652 660	R 18 263 300
	TOTAL			**R 3 852 660**	**R 3 852 660**	**R 3 652 660**	**R 3 652 660**	**R 3 652 660**	**R 18 663 300**
Social	CAPEX			R 698 472	R 698 472	R 398 472	R 398 472	R 398 472	R 2 592 360
	OPEX			R 1 136 180	R 1 136 180	R 1 136 180	R 1 136 180	R 1 136 180	R 5 680 900
	TOTAL			**R 1 834 652**	**R 1 834 652**	**R 1 534 652**	**R 1 534 652**	**R 1 534 652**	**R 8 273 260**
Technical	CAPEX			R 2 750 960	R 3 492 450	R 1 702 450	R 1 452 450	R 1 452 450	R 10 850 760
	OPEX			R 1 803 980	R 1 803 980	R 1 803 980	R 1 803 980	R 1 803 980	R 9 019 900
	TOTAL			**R 4 554 940**	**R 5 296 430**	**R 3 506 430**	**R 3 256 430**	**R 3 256 430**	**R 19 870 660**
Total	CAPEX			R 3 749 432	R 4 690 922	R 2 100 922	R 1 850 922	R 1 850 922	R 14 243 120
	OPEX			R 6 742 820	R 6 742 820	R 6 742 820	R 6 742 820	R 6 742 820	R 33 714 100
	TOTAL			**R 10 492 252**	**R 11 433 742**	**R 8 843 742**	**R 8 593 742**	**R 8 593 742**	**R 47 957 220**
				R 10 492 252	R 11 433 742	R 8 843 742	R 8 593 742	R 8 593 742	

BENEFITS

Item	Unit	Quantity	Rate	Year 1	Year 2	Year 3	Year 4	Year 5	Total
REALISTIC SCENARIO									
Reduced input volume				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	250 000		50 000	100 000	150 000	200 000	250 000	750 000
Amount	R / annum	250 000	R 5.00	R 250 000	R 500 000	R 750 000	R 1 000 000	R 1 250 000	R 3 750 000
Increased revenue water				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	375 000		75 000	150 000	225 000	300 000	375 000	1 125 000
Amount	R / annum	375 000	R 7.00	R 525 000	R 1 050 000	R 1 575 000	R 2 100 000	R 2 625 000	R 7 875 000

Reduced input volume				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	250 000		50 000	100 000	150 000	200 000	250 000	750 000
Amount	R / annum	250 000	R 5.00	R 250 000	R 500 000	R 750 000	R 1 000 000	R 1 250 000	R 3 750 000
Increased revenue water				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	375 000		75 000	150 000	225 000	300 000	375 000	1 125 000
Amount	R / annum	375 000	R 7.00	R 525 000	R 1 050 000	R 1 575 000	R 2 100 000	R 2 625 000	R 7 875 000
Total	**m^3/annum**			**125 000**	**250 000**	**375 000**	**500 000**	**625 000**	**1 875 000**
Total	**R / annum**			**R 775 000**	**R 1 550 000**	**R 2 325 000**	**R 3 100 000**	**R 3 875 000**	**R 11 625 000**
								Payback period - years	**4.1**
OPTIMISTIC SCENARIO									
Reduced input volume				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	278 000		55 600	111 200	166 800	222 400	278 000	834 000
Amount	R / annum	278 000	R 5.00	R 278 000	R 556 000	R 834 000	R 1 112 000	R 1 390 000	R 4 170 000
Increased revenue water				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	438 000		87 600	175 200	262 800	350 400	438 000	1 314 000
Amount	R / annum	438 000	R 7.00	R 613 200	R 1 226 400	R 1 839 600	R 2 452 800	R 3 066 000	R 9 198 000
Total	**m^3/annum**			**143 200**	**286 400**	**429 600**	**572 800**	**716 000**	**2 148 000**
Total	**R / annum**			**R 891 200**	**R 1 782 400**	**R 2 673 600**	**R 3 564 800**	**R 4 456 000**	**R 13 368 000**
								Payback period - years	**3.6**

WCWDM STRATEGY AND BUSINESS PLAN : BUDGET AND CASHFLOW

Municipality name Nseleni

COSTS

Item		Unit	Quantity / year	Rate	Year 1	Year 2	Year 3	Year 4	Year 5	Total
INSTITUTIONAL / LEGISLATIVE INTERVENTIONS										
Institutional review:					50%	50%				100%
CAPEX	Review organogram and fill vacancies	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX		Sum			R 0	R 0	R 0	R 0	R 0	R 0
Training and education :					50%	50%				
CAPEX	Not applicable	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
OPEX	Assume one training course / employee / annum	No	10	R 5 000	R 50 000	R 50 000	R 50 000	R 50 000	R 50 000	R 250 000
Customer charter, policy, bylaws :						100%				100%
CAPEX	Review bylaws on 5 year cycles	Sum	1	R 200 000	R 0	R 200 000	R 0	R 0	R 0	R 200 000
OPEX	Enforce bylaws	Sum	1	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 500 000
FINANCIAL INTERVENTIONS										
Effective metering and billing :					50%	50%				100%
CAPEX	Perform meter audit	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
OPEX	Ensure proper metering and billing of all consumers	No	12 230	R 100	R 1 223 000	R 1 223 000	R 1 223 000	R 1 223 000	R 1 223 000	R 6 115 000
Water tariffs :					50%	50%				100%
CAPEX	Review water tariffs	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Not applicable	Sum		R 0	R 0	R 0	R 0	R 0	R 0	R 0
Informative billing :					50%	50%				100%
CAPEX	Improve invoice to show monthly consumption	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Distribute information with bill	Sum	12 230	R 120	R 1 467 600	R 1 467 600	R 1 467 600	R 1 467 600	R 1 467 600	R 7 338 000
SOCIAL INTERVENTIONS										
Consumer Awareness Campaign :					20%	20%	20%	20%	20%	100%
CAPEX	Install bill boards, design pamphlets, radio campaigns	Sum	12 230	R 120	R 293 520	R 293 520	R 293 520	R 293 520	R 293 520	R 1 467 600
OPEX	Target households on monthly basis with awareness can	No	12 230	R 60	R 733 800	R 733 800	R 733 800	R 733 800	R 733 800	R 3 669 000
Consumer Help and Support Desk :					50%	50%				100%
CAPEX	Improve existing help-desk to provide one-stop service	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Maintain help-desk	Sum	1	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 500 000
Schools awareness :					50%	50%				100%
CAPEX	Prepare schools competition, awareness, retrofit	No	20	R 20 000	R 200 000	R 200 000	R 0	R 0	R 0	R 400 000
OPEX	Monthly schools awareness campaign	No	20	R 2 000	R 40 000	R 40 000	R 40 000	R 40 000	R 40 000	R 200 000
TECHNICAL INTERVENTIONS										
Bulk metering :					50%	50%				100%

Schools awareness :					50%	50%				100%
CAPEX	Prepare schools competition, awareness, retrofit	No	20	R 20 000	R 200 000	R 200 000	R 0	R 0	R 0	R 400 000
OPEX	Monthly schools awareness campaign	No	20	R 2 000	R 40 000	R 40 000	R 40 000	R 40 000	R 40 000	R 200 000
TECHNICAL INTERVENTIONS										
Bulk metering :					50%	50%				100%
CAPEX	New meter installations required	No	15	R 50 000	R 375 000	R 375 000	R 0	R 0	R 0	R 750 000
OPEX	Maintenance of existing bulk meters	No	15	R 1 000	R 15 000	R 15 000	R 15 000	R 15 000	R 15 000	R 75 000
Sectorisation :					50%	50%				100%
CAPEX	Setup of new DMA / PMAs	No	10	R 50 000	R 250 000	R 250 000	R 0	R 0	R 0	R 500 000
OPEX	Maintenance of DMA / PMAs including step testing	No	10	R 25 000	R 250 000	R 250 000	R 250 000	R 250 000	R 250 000	R 1 250 000
Active Leakage Control :					50%	50%				100%
CAPEX	Not applicable	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
OPEX	Fix all visible and reported leaks	No	20	R 1 000	R 20 000	R 20 000	R 20 000	R 20 000	R 20 000	R 100 000
Valve audits					50%	50%				100%
CAPEX	Locate, clean, repair, document network valves	No	80	R 4 000	R 160 000	R 160 000	R 0	R 0	R 0	R 320 000
OPEX	Maintain network valves	No	16	R 1 000	R 16 000	R 16 000	R 16 000	R 16 000	R 16 000	R 80 000
Leak and logging equipment :					50%	50%				100%
CAPEX	Procure basic WDM equipment	Sum	5	R 20 000	R 50 000	R 50 000	R 0	R 0	R 0	R 100 000
OPEX	Not applicable	Sum			R 0	R 0	R 0	R 0	R 0	R 0
Telemetry :						50%	50%			100%
CAPEX	Install telemetry sites	No	10	R 15 000	R 0	R 75 000	R 75 000	R 0	R 0	R 150 000
OPEX	Maintain telemetry sites	No	10	R 1 500	R 15 000	R 15 000	R 15 000	R 15 000	R 15 000	R 75 000
Retrofitting and removal of wasteful devices :					20%	20%	20%	20%	20%	100%
CAPEX	Retrofit government buildings, schools, etc.	No	1 223	R 1 000	R 244 600	R 244 600	R 244 600	R 244 600	R 244 600	R 1 223 000
OPEX	Not applicable	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
Mains replacement :					20%	20%	20%	20%	20%	100%
CAPEX	Replace critical leaking mains	km	4.0	R 100 000	R 80 000	R 80 000	R 80 000	R 80 000	R 80 000	R 400 000
OPEX	Not applicable	km		R 0	R 0	R 0	R 0	R 0	R 0	R 0
Pressure management :					20%	80%				100%
CAPEX	New pressure management installations	No	5	R 75 000	R 75 000	R 300 000	R 0	R 0	R 0	R 375 000
OPEX	Maintain pressure management installations	No	5	R 5 000	R 25 000	R 25 000	R 25 000	R 25 000	R 25 000	R 125 000
Control valve management :					50%	50%				100%
CAPEX	New control valve installations	No		R 0	R 0	R 0	R 0	R 0	R 0	R 0
OPEX	Maintain all control valve installations	No	15	R 5 000	R 75 000	R 75 000	R 75 000	R 75 000	R 75 000	R 375 000
Consumer metering :						25%	25%	25%	25%	100%
CAPEX	Replacement of old water meters	No	1 223	R 1 200	R 0	R 366 900	R 366 900	R 366 900	R 366 900	R 1 467 600
OPEX	Replacement of broken and cycled water meters	No	612	R 1 200	R 733 800	R 733 800	R 733 800	R 733 800	R 733 800	R 3 669 000
Top consumer audit :					20%	20%	20%	20%	20%	100%
CAPEX	Audit and retrofit non domestic consumers	No	612	R 10 000	R 1 223 000	R 1 223 000	R 1 223 000	R 1 223 000	R 1 223 000	R 6 115 000
OPEX	Maintain non domestic consumers installations	No	612	R 500	R 306 000	R 306 000	R 306 000	R 306 000	R 306 000	R 1 530 000
GIS / CAD system :					50%	50%				100%

CAPEX	Replacement of old water meters	No	1 223	R 1 200	R 0	R 366 900	R 366 900	R 366 900	R 366 900	R 1 467 600
OPEX	Replacement of broken and cycled water meters	No	612	R 1 200	R 733 800	R 733 800	R 733 800	R 733 800	R 733 800	R 3 669 000
Top consumer audit :					20%	20%	20%	20%	20%	100%
CAPEX	Audit and retrofit non domestic consumers	No	612	R 10 000	R 1 223 000	R 1 223 000	R 1 223 000	R 1 223 000	R 1 223 000	R 6 115 000
OPEX	Maintain non domestic consumers installations	No	612	R 500	R 306 000	R 306 000	R 306 000	R 306 000	R 306 000	R 1 530 000
GIS / CAD system :					50%	50%				100%
CAPEX	Setup CAD/ GIS system	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Maintain CAD / GIS system	Sum	1	R 200 000	R 200 000	R 200 000	R 200 000	R 200 000	R 200 000	R 1 000 000
Management Information System :					50%	50%				100%
CAPEX	Setup basic MIS system to support WDM	Sum	1	R 200 000	R 100 000	R 100 000	R 0	R 0	R 0	R 200 000
OPEX	Maintain MIS system	Sum	1	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 100 000	R 500 000
Water loss monitoring and audits:						50%	50%			100%
CAPEX	Perform proper analysis of distribution network	Sum	1	R 200 000	R 0	R 100 000	R 100 000	R 0	R 0	R 200 000
OPEX	Perform ad hoc analysis to monitor interventions	Sum	1	R 20 000	R 20 000	R 20 000	R 20 000	R 20 000	R 20 000	R 100 000

Item	Type			Year 1	Year 2	Year 3	Year 4	Year 5	Total
TOTAL COSTS									
Institutional	CAPEX			R 100 000	R 300 000	R 0	R 0	R 0	R 400 000
	OPEX			R 150 000	R 150 000	R 150 000	R 150 000	R 150 000	R 750 000
	TOTAL			**R 250 000**	**R 450 000**	**R 150 000**	**R 150 000**	**R 150 000**	**R 1 150 000**
Financial	CAPEX			R 200 000	R 200 000	R 0	R 0	R 0	R 400 000
	OPEX			R 2 690 600	R 2 690 600	R 2 690 600	R 2 690 600	R 2 690 600	R 13 453 000
	TOTAL			**R 2 890 600**	**R 2 890 600**	**R 2 690 600**	**R 2 690 600**	**R 2 690 600**	**R 13 853 000**
Social	CAPEX			R 593 520	R 593 520	R 293 520	R 293 520	R 293 520	R 2 067 600
	OPEX			R 873 800	R 873 800	R 873 800	R 873 800	R 873 800	R 4 369 000
	TOTAL			**R 1 467 320**	**R 1 467 320**	**R 1 167 320**	**R 1 167 320**	**R 1 167 320**	**R 6 436 600**
Technical	CAPEX			R 2 657 600	R 3 424 500	R 2 089 500	R 1 914 500	R 1 914 500	R 12 000 600
	OPEX			R 1 775 800	R 1 775 800	R 1 775 800	R 1 775 800	R 1 775 800	R 8 879 000
	TOTAL			**R 4 433 400**	**R 5 200 300**	**R 3 865 300**	**R 3 690 300**	**R 3 690 300**	**R 20 879 600**
Total	CAPEX			R 3 551 120	R 4 518 020	R 2 383 020	R 2 208 020	R 2 208 020	R 14 868 200
	OPEX			R 5 490 200	R 5 490 200	R 5 490 200	R 5 490 200	R 5 490 200	R 27 451 000
	TOTAL			**R 9 041 320**	**R 10 008 220**	**R 7 873 220**	**R 7 698 220**	**R 7 698 220**	**R 42 319 200**
				R 9 041 320	R 10 008 220	R 7 873 220	R 7 698 220	R 7 698 220	

BENEFITS

Item	Unit	Quantity	Rate	Year 1	Year 2	Year 3	Year 4	Year 5	Total
REALISTIC SCENARIO									
Reduced input volume				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	671 000		134 200	268 400	402 600	536 800	671 000	2 013 000
Amount	R / annum	671 000	R 5.00	R 671 000	R 1 342 000	R 2 013 000	R 2 684 000	R 3 355 000	R 10 065 000
Increased revenue water				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	99 000		19 800	39 600	59 400	79 200	99 000	297 000
Amount	R / annum	99 000	R 7.00	R 138 600	R 277 200	R 415 800	R 554 400	R 693 000	R 2 079 000

Reduced input volume				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	671 000		134 200	268 400	402 600	536 800	671 000	2 013 000
Amount	R / annum	671 000	R 5.00	R 671 000	R 1 342 000	R 2 013 000	R 2 684 000	R 3 355 000	R 10 065 000
Increased revenue water				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	99 000		19 800	39 600	59 400	79 200	99 000	297 000
Amount	R / annum	99 000	R 7.00	R 138 600	R 277 200	R 415 800	R 554 400	R 693 000	R 2 079 000
Total	**m^3/annum**			**154 000**	**308 000**	**462 000**	**616 000**	**770 000**	**2 310 000**
Total	**R / annum**			**R 809 600**	**R 1 619 200**	**R 2 428 800**	**R 3 238 400**	**R 4 048 000**	**R 12 144 000**
								Payback period - years	**3.5**
OPTIMISTIC SCENARIO									
Reduced input volume				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	894 000		178 800	357 600	536 400	715 200	894 000	2 682 000
Amount	R / annum	894 000	R 5.00	R 894 000	R 1 788 000	R 2 682 000	R 3 576 000	R 4 470 000	R 13 410 000
Increased revenue water				20%	40%	60%	80%	100%	300%
Volume	m^3/annum	198 000		39 600	79 200	118 800	158 400	198 000	594 000
Amount	R / annum	198 000	R 7.00	R 277 200	R 554 400	R 831 600	R 1 108 800	R 1 386 000	R 4 158 000
Total	**m^3/annum**			**218 400**	**436 800**	**655 200**	**873 600**	**1 092 000**	**3 276 000**
Total	**R / annum**			**R 1 171 200**	**R 2 342 400**	**R 3 513 600**	**R 4 684 800**	**R 5 856 000**	**R 17 568 000**
								Payback period - years	**2.4**

APPENDIX C

URV Per Demand Centre

City of uMhlathuze Local Municipality Water Conservation and Water Demand Management Potential Assessment, Strategy and Business Plan

Unit Reference Value Calculation Sheet for : eMpangeni

Year	CAPEX	OPEX	TOTAL	NPV @ 6%	NPV @ 8%	NPV @ 10%	Saving Realistic	NPV @ 6%	NPV @ 8%	NPV @ 10%	Saving Realistic	NPV @ 6%	NPV @ 8%	NPV @ 10%
1	R 4 917 672	R 4 214 700	R 9 132 372	R 8 615 445	R 8 455 900	R 8 302 156	168 600	159 057	156 111	153 273	167 000	157 547	154 630	151 818
2	R 5 782 812	R 4 214 700	R 9 997 512	R 8 897 750	R 8 571 255	R 8 262 407	337 200	300 107	289 095	278 678	334 000	297 259	286 351	276 033
3	R 2 912 812	R 4 214 700	R 7 127 512	R 5 984 397	R 5 658 049	R 5 355 005	505 800	424 679	401 520	380 015	501 000	420 649	397 710	376 409
4	R 2 775 312	R 4 214 700	R 6 990 012	R 5 536 744	R 5 137 867	R 4 774 272	674 400	534 188	495 704	460 624	668 000	529 119	491 000	456 253
5	R 2 775 312	R 4 214 700	R 6 990 012	R 5 223 344	R 4 757 285	R 4 340 247	843 000	629 939	573 732	523 437	835 000	623 961	568 287	518 469
6	R 4 917 672	R 4 214 700	R 9 132 372	R 6 437 962	R 5 754 943	R 5 154 986	843 000	594 282	531 233	475 852	835 000	588 642	526 192	471 336
7	R 5 782 812	R 4 214 700	R 9 997 512	R 6 648 916	R 5 833 452	R 5 130 304	843 000	560 643	491 882	432 592	835 000	555 323	487 214	428 487
8	R 2 912 812	R 4 214 700	R 7 127 512	R 4 471 889	R 3 850 773	R 3 325 037	843 000	528 909	455 447	393 266	835 000	523 889	451 125	389 534
9	R 2 775 312	R 4 214 700	R 6 990 012	R 4 137 377	R 3 496 746	R 2 964 447	843 000	498 970	421 710	357 514	835 000	494 235	417 708	354 122
10	R 2 775 312	R 4 214 700	R 6 990 012	R 3 903 186	R 3 237 728	R 2 694 952	843 000	470 727	390 472	325 013	835 000	466 260	386 767	321 929
11	R 4 917 672	R 4 214 700	R 9 132 372	R 4 810 820	R 3 916 718	R 3 200 841	843 000	444 082	361 548	295 466	835 000	439 868	358 117	292 662
12	R 5 782 812	R 4 214 700	R 9 997 512	R 4 968 457	R 3 970 150	R 3 185 515	843 000	418 945	334 767	268 606	835 000	414 969	331 590	266 057
13	R 2 912 812	R 4 214 700	R 7 127 512	R 3 341 656	R 2 620 771	R 2 064 586	843 000	395 231	309 969	244 187	835 000	391 481	307 028	241 870
14	R 2 775 312	R 4 214 700	R 6 990 012	R 3 091 689	R 2 379 827	R 1 840 689	843 000	372 860	287 009	221 988	835 000	369 321	284 285	219 882
15	R 2 775 312	R 4 214 700	R 6 990 012	R 2 916 688	R 2 203 543	R 1 673 353	843 000	351 754	265 749	201 807	835 000	348 416	263 227	199 892
16	R 4 917 672	R 4 214 700	R 9 132 372	R 3 594 924	R 2 665 652	R 1 987 470	843 000	331 844	246 064	183 461	835 000	328 695	243 729	181 720
17	R 5 782 812	R 4 214 700	R 9 997 512	R 3 712 720	R 2 702 017	R 1 977 954	843 000	313 060	227 837	166 783	835 000	310 089	225 675	165 200
18	R 2 912 812	R 4 214 700	R 7 127 512	R 2 497 080	R 1 783 653	R 1 281 946	843 000	295 340	210 960	151 621	835 000	292 537	208 958	150 182
19	R 2 775 312	R 4 214 700	R 6 990 012	R 2 310 290	R 1 619 670	R 1 142 923	843 000	278 622	195 333	137 837	835 000	275 978	193 480	136 529
20	R 2 775 312	R 4 214 700	R 6 990 012	R 2 179 519	R 1 499 695	R 1 039 021	843 000	262 851	180 864	125 307	835 000	260 357	179 148	124 117
TOTAL				**R 93 280 853**	**R 80 115 695**	**R 69 698 113**		**8 166 090**	**6 827 006**	**5 777 327**		**8 088 595**	**6 762 218**	**5 722 501**
							URV	**R 11.42**	**R 11.74**	**R 12.06**	**URV**	**R 11.53**	**R 11.85**	**R 12.18**

City of uMhlathuze Local Municipality Water Conservation and Water Demand Management Potential Assessment, Strategy and Business Plan

Unit Reference Value Calculation Sheet for : eSikhaweni

Year	CAPEX	OPEX	TOTAL	NPV @ 6%	NPV @ 8%	NPV @ 10%	Saving Realistic	NPV @ 6%	NPV @ 8%	NPV @ 10%	Saving Realistic	NPV @ 6%	NPV @ 8%	NPV @ 10%
1	R 14 896 664	R 17 080 415	R 31 977 079	R 30 167 056	R 29 608 406	R 29 070 072	244 200	230 377	226 111	222 000	353 800	333 774	327 593	321 636
2	R 16 781 594	R 17 080 415	R 33 862 009	R 30 137 067	R 29 031 215	R 27 985 131	488 400	434 674	418 724	403 636	707 600	629 761	606 653	584 793
3	R 9 655 594	R 17 080 415	R 26 736 009	R 22 448 069	R 21 223 906	R 20 087 159	732 600	615 105	581 561	550 413	1 061 400	891 172	842 574	797 446
4	R 9 405 594	R 17 080 415	R 26 486 009	R 20 979 400	R 19 468 007	R 18 090 301	976 800	773 717	717 977	667 168	1 415 200	1 120 971	1 040 214	966 601
5	R 9 405 594	R 17 080 415	R 26 486 009	R 19 791 887	R 18 025 933	R 16 445 728	1 221 000	912 402	830 992	758 145	1 769 000	1 321 900	1 203 952	1 098 410
6	R 14 896 664	R 17 080 415	R 31 977 079	R 22 542 579	R 20 150 984	R 18 050 227	1 221 000	860 757	769 437	689 223	1 769 000	1 247 075	1 114 770	998 554
7	R 16 781 594	R 17 080 415	R 33 862 009	R 22 520 170	R 19 758 157	R 17 376 565	1 221 000	812 035	712 442	626 566	1 769 000	1 176 486	1 032 195	907 777
8	R 9 655 594	R 17 080 415	R 26 736 009	R 16 774 503	R 14 444 634	R 12 472 546	1 221 000	766 071	659 668	569 606	1 769 000	1 109 892	955 736	825 252
9	R 9 405 594	R 17 080 415	R 26 486 009	R 15 677 028	R 13 249 599	R 11 232 653	1 221 000	722 708	610 804	517 823	1 769 000	1 047 068	884 940	750 229
10	R 9 405 594	R 17 080 415	R 26 486 009	R 14 789 649	R 12 268 147	R 10 211 503	1 221 000	681 800	565 559	470 748	1 769 000	987 800	819 389	682 026
11	R 14 896 664	R 17 080 415	R 31 977 079	R 16 845 126	R 13 714 421	R 11 207 771	1 221 000	643 208	523 666	427 953	1 769 000	931 887	758 694	620 024
12	R 16 781 594	R 17 080 415	R 33 862 009	R 16 828 381	R 13 447 070	R 10 789 480	1 221 000	606 800	484 876	389 048	1 769 000	879 139	702 494	563 658
13	R 9 655 594	R 17 080 415	R 26 736 009	R 12 534 884	R 9 830 775	R 7 744 469	1 221 000	572 452	448 959	353 680	1 769 000	829 376	650 458	512 416
14	R 9 405 594	R 17 080 415	R 26 486 009	R 11 714 787	R 9 017 454	R 6 974 594	1 221 000	540 049	415 703	321 527	1 769 000	782 430	602 276	465 833
15	R 9 405 594	R 17 080 415	R 26 486 009	R 11 051 686	R 8 349 495	R 6 340 540	1 221 000	509 481	384 910	292 298	1 769 000	738 142	557 663	423 485
16	R 14 896 664	R 17 080 415	R 31 977 079	R 12 587 658	R 9 333 805	R 6 959 144	1 221 000	480 642	356 398	265 725	1 769 000	696 360	516 354	384 986
17	R 16 781 594	R 17 080 415	R 33 862 009	R 12 575 145	R 9 151 850	R 6 699 418	1 221 000	453 436	329 998	241 568	1 769 000	656 944	478 106	349 987
18	R 9 655 594	R 17 080 415	R 26 736 009	R 9 366 795	R 6 690 660	R 4 808 706	1 221 000	427 770	305 554	219 608	1 769 000	619 758	442 691	318 170
19	R 9 405 594	R 17 080 415	R 26 486 009	R 8 753 971	R 6 137 128	R 4 330 674	1 221 000	403 556	282 920	199 643	1 769 000	584 678	409 899	289 246
20	R 9 405 594	R 17 080 415	R 26 486 009	R 8 258 463	R 5 682 526	R 3 936 976	1 221 000	380 714	261 963	181 494	1 769 000	551 583	379 536	262 951
TOTAL				**R 336 344 304**	**R 288 584 170**	**R 250 813 658**		**11 827 754**	**9 888 225**	**8 367 873**		**17 136 197**	**14 326 184**	**12 123 478**
							URV	**R 28.44**	**R 29.18**	**R 29.97**	**URV**	**R 19.63**	**R 20.14**	**R 20.69**

City of uMhlathuze Local Municipality Water Conservation and Water Demand Management Potential Assessment, Strategy and Business Plan

Unit Reference Value Calculation Sheet for : Ngwelezane

Year	CAPEX	OPEX	TOTAL	NPV @ 6%	NPV @ 8%	NPV @ 10%	Saving Realistic	NPV @ 6%	NPV @ 8%	NPV @ 10%	Saving Realistic	NPV @ 6%	NPV @ 8%	NPV @ 10%
1	R 3 749 432	R 6 742 820	R 10 492 252	R 9 898 351	R 9 715 048	R 9 538 411	125 000	117 925	115 741	113 636	143 200	135 094	132 593	130 182
2	R 4 690 922	R 6 742 820	R 11 433 742	R 10 175 990	R 9 802 591	R 9 449 374	250 000	222 499	214 335	206 612	286 400	254 895	245 542	236 694
3	R 2 100 922	R 6 742 820	R 8 843 742	R 7 425 376	R 7 020 448	R 6 644 434	375 000	314 857	297 687	281 743	429 600	360 700	341 030	322 765
4	R 1 850 922	R 6 742 820	R 8 593 742	R 6 807 049	R 6 316 657	R 5 869 641	500 000	396 047	367 515	341 507	572 800	453 711	421 025	391 230
5	R 1 850 922	R 6 742 820	R 8 593 742	R 6 421 744	R 5 848 756	R 5 336 038	625 000	467 036	425 364	388 076	716 000	535 037	487 298	444 580
6	R 3 749 432	R 6 742 820	R 10 492 252	R 7 396 624	R 6 611 899	R 5 922 603	625 000	440 600	393 856	352 796	716 000	504 752	451 201	404 163
7	R 4 690 922	R 6 742 820	R 11 433 742	R 7 604 091	R 6 671 479	R 5 867 318	625 000	415 661	364 681	320 724	716 000	476 181	417 779	367 421
8	R 2 100 922	R 6 742 820	R 8 843 742	R 5 548 673	R 4 777 999	R 4 125 671	625 000	392 133	337 668	291 567	716 000	449 227	386 833	334 019
9	R 1 850 922	R 6 742 820	R 8 593 742	R 5 086 623	R 4 299 011	R 3 644 586	625 000	369 937	312 656	265 061	716 000	423 799	358 178	303 654
10	R 1 850 922	R 6 742 820	R 8 593 742	R 4 798 701	R 3 980 565	R 3 313 260	625 000	348 997	289 496	240 965	716 000	399 811	331 647	276 049
11	R 3 749 432	R 6 742 820	R 10 492 252	R 5 527 187	R 4 499 947	R 3 677 470	625 000	329 242	268 052	219 059	716 000	377 180	307 080	250 954
12	R 4 690 922	R 6 742 820	R 11 433 742	R 5 682 219	R 4 540 496	R 3 643 143	625 000	310 606	248 196	199 144	716 000	355 830	284 333	228 140
13	R 2 100 922	R 6 742 820	R 8 843 742	R 4 146 291	R 3 251 826	R 2 561 717	625 000	293 024	229 811	181 040	716 000	335 689	263 272	207 400
14	R 1 850 922	R 6 742 820	R 8 593 742	R 3 801 020	R 2 925 834	R 2 263 001	625 000	276 438	212 788	164 582	716 000	316 687	243 770	188 545
15	R 1 850 922	R 6 742 820	R 8 593 742	R 3 585 868	R 2 709 106	R 2 057 274	625 000	260 791	197 026	149 620	716 000	298 762	225 713	171 405
16	R 3 749 432	R 6 742 820	R 10 492 252	R 4 130 236	R 3 062 588	R 2 283 420	625 000	246 029	182 432	136 018	716 000	281 851	208 994	155 822
17	R 4 690 922	R 6 742 820	R 11 433 742	R 4 246 085	R 3 090 185	R 2 262 105	625 000	232 103	168 918	123 653	716 000	265 897	193 513	141 657
18	R 2 100 922	R 6 742 820	R 8 843 742	R 3 098 350	R 2 213 138	R 1 590 625	625 000	218 965	156 406	112 412	716 000	250 846	179 178	128 779
19	R 1 850 922	R 6 742 820	R 8 593 742	R 2 840 344	R 1 991 274	R 1 405 145	625 000	206 571	144 820	102 192	716 000	236 647	165 906	117 072
20	R 1 850 922	R 6 742 820	R 8 593 742	R 2 679 569	R 1 843 772	R 1 277 405	625 000	194 878	134 093	92 902	716 000	223 252	153 617	106 429
TOTAL				**R 110 900 392**	**R 95 172 618**	**R 82 732 638**		**6 054 337**	**5 061 540**	**4 283 309**		**6 935 849**	**5 798 501**	**4 906 959**
							URV	**R 18.32**	**R 18.80**	**R 19.32**	**URV**	**R 15.99**	**R 16.41**	**R 16.86**

City of uMhlathuze Local Municipality Water Conservation and Water Demand Management Potential Assessment, Strategy and Business Plan

Unit Reference Value Calculation Sheet for : Nseleni

Year	CAPEX	OPEX	TOTAL	NPV @ 6%	NPV @ 8%	NPV @ 10%	Saving Realistic	NPV @ 6%	NPV @ 8%	NPV @ 10%	Saving Realistic	NPV @ 6%	NPV @ 8%	NPV @ 10%
1	R 3 551 120	R 5 490 200	R 9 041 320	R 8 529 547	R 8 371 593	R 8 219 382	154 000	145 283	142 593	140 000	218 400	206 038	202 222	198 545
2	R 4 518 020	R 5 490 200	R 10 008 220	R 8 907 280	R 8 580 436	R 8 271 256	308 000	274 119	264 060	254 545	436 800	388 750	374 486	360 992
3	R 2 383 020	R 5 490 200	R 7 873 220	R 6 610 507	R 6 250 016	R 5 915 267	462 000	387 904	366 750	347 107	655 200	550 119	520 119	492 261
4	R 2 208 020	R 5 490 200	R 7 698 220	R 6 097 711	R 5 658 422	R 5 257 988	616 000	487 930	452 778	420 736	873 600	691 973	642 122	596 681
5	R 2 208 020	R 5 490 200	R 7 698 220	R 5 752 558	R 5 239 279	R 4 779 989	770 000	575 389	524 049	478 109	1 092 000	816 006	743 197	678 046
6	R 3 551 120	R 5 490 200	R 9 041 320	R 6 373 774	R 5 697 565	R 5 103 589	770 000	542 820	485 231	434 645	1 092 000	769 817	688 145	616 406
7	R 4 518 020	R 5 490 200	R 10 008 220	R 6 656 038	R 5 839 700	R 5 135 799	770 000	512 094	449 288	395 132	1 092 000	726 242	637 172	560 369
8	R 2 383 020	R 5 490 200	R 7 873 220	R 4 939 756	R 4 253 656	R 3 672 915	770 000	483 108	416 007	359 211	1 092 000	685 134	589 974	509 426
9	R 2 208 020	R 5 490 200	R 7 698 220	R 4 556 565	R 3 851 027	R 3 264 797	770 000	455 762	385 192	326 555	1 092 000	646 353	546 272	463 115
10	R 2 208 020	R 5 490 200	R 7 698 220	R 4 298 646	R 3 565 765	R 2 967 997	770 000	429 964	356 659	296 868	1 092 000	609 767	505 807	421 013
11	R 3 551 120	R 5 490 200	R 9 041 320	R 4 762 855	R 3 877 667	R 3 168 928	770 000	405 626	330 240	269 880	1 092 000	575 252	468 340	382 739
12	R 4 518 020	R 5 490 200	R 10 008 220	R 4 973 779	R 3 974 402	R 3 188 927	770 000	382 666	305 778	245 346	1 092 000	542 691	433 648	347 945
13	R 2 383 020	R 5 490 200	R 7 873 220	R 3 691 273	R 2 894 967	R 2 280 591	770 000	361 006	283 127	223 042	1 092 000	511 972	401 526	316 314
14	R 2 208 020	R 5 490 200	R 7 698 220	R 3 404 930	R 2 620 944	R 2 027 182	770 000	340 572	262 155	202 765	1 092 000	482 993	371 783	287 558
15	R 2 208 020	R 5 490 200	R 7 698 220	R 3 212 198	R 2 426 800	R 1 842 893	770 000	321 294	242 736	184 332	1 092 000	455 653	344 244	261 416
16	R 3 551 120	R 5 490 200	R 9 041 320	R 3 559 082	R 2 639 075	R 1 967 655	770 000	303 108	224 756	167 574	1 092 000	429 862	318 744	237 651
17	R 4 518 020	R 5 490 200	R 10 008 220	R 3 716 697	R 2 704 911	R 1 980 073	770 000	285 951	208 107	152 340	1 092 000	405 530	295 134	216 046
18	R 2 383 020	R 5 490 200	R 7 873 220	R 2 758 334	R 1 970 266	R 1 416 068	770 000	269 765	192 692	138 491	1 092 000	382 575	273 272	196 406
19	R 2 208 020	R 5 490 200	R 7 698 220	R 2 544 362	R 1 783 770	R 1 258 720	770 000	254 495	178 418	125 901	1 092 000	360 920	253 030	178 551
20	R 2 208 020	R 5 490 200	R 7 698 220	R 2 400 341	R 1 651 639	R 1 144 291	770 000	240 090	165 202	114 456	1 092 000	340 491	234 287	162 319
TOTAL				**R 97 746 232**	**R 83 851 899**	**R 72 864 307**		**7 458 944**	**6 235 818**	**5 277 037**		**10 578 138**	**8 843 523**	**7 483 798**
							URV	**R 13.10**	**R 13.45**	**R 13.81**	**URV**	**R 9.24**	**R 9.48**	**R 9.74**

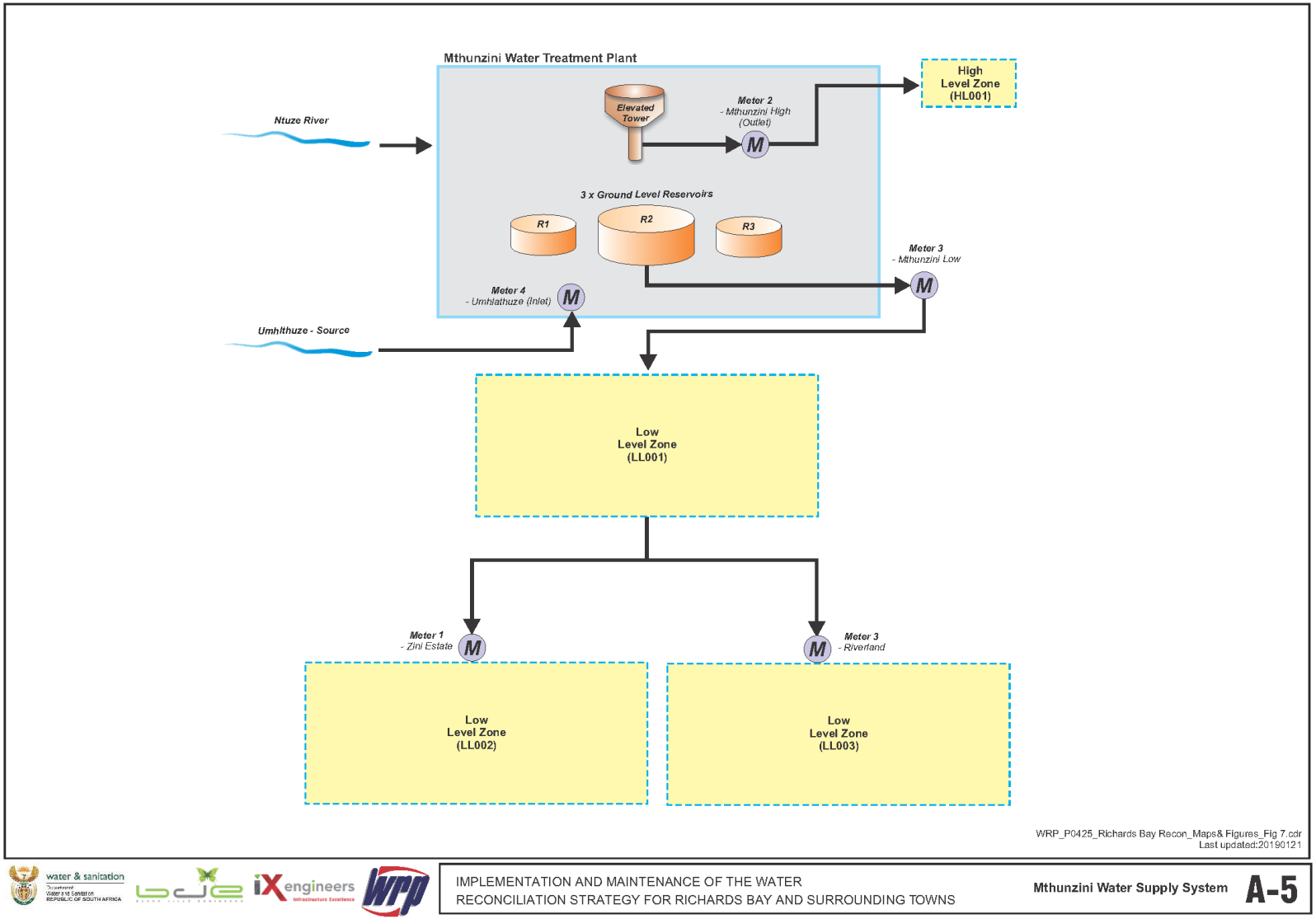
City of uMhlathuze Local Municipality Water Conservation and Water Demand Management Potential Assessment, Strategy and Business Plan

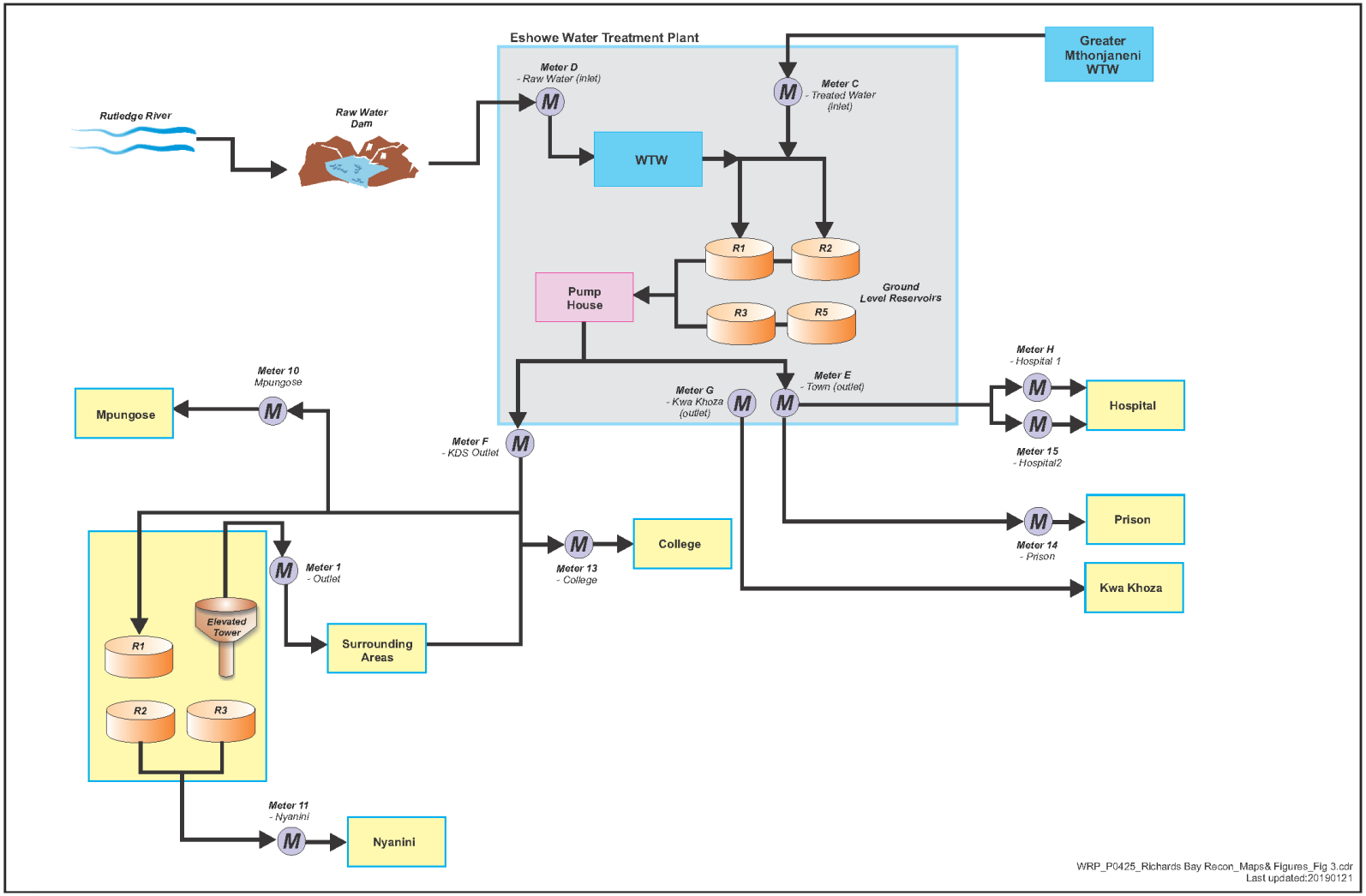
Unit Reference Value Calculation Sheet for : Richards Bay

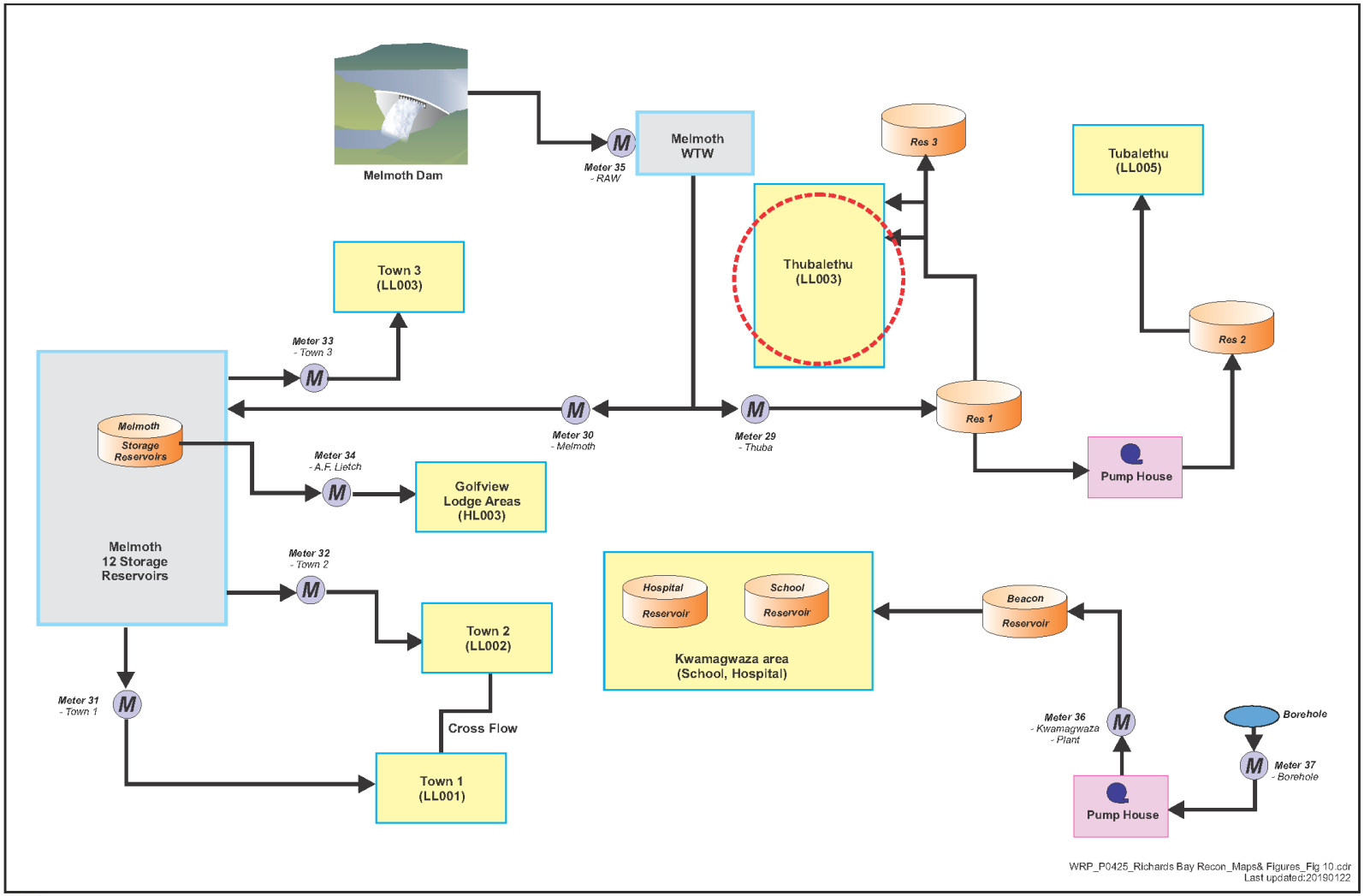
Year	CAPEX	OPEX	TOTAL	NPV @ 6%	NPV @ 8%	NPV @ 10%	Saving Realistic	NPV @ 6%	NPV @ 8%	NPV @ 10%	Saving Realistic	NPV @ 6%	NPV @ 8%	NPV @ 10%
1	R 4 248 776	R 12 112 360	R 16 361 136	R 15 435 034	R 15 149 200	R 14 873 760	153 200	144 528	141 852	139 273	245 000	231 132	226 852	222 727
2	R 5 307 896	R 12 112 360	R 17 420 256	R 15 503 966	R 14 935 062	R 14 396 906	306 400	272 695	262 689	253 223	490 000	436 098	420 096	404 959
3	R 2 637 896	R 12 112 360	R 14 750 256	R 12 384 599	R 11 709 229	R 11 082 086	459 600	385 889	364 845	345 304	735 000	617 120	583 467	552 216
4	R 2 387 896	R 12 112 360	R 14 500 256	R 11 485 561	R 10 658 121	R 9 903 870	612 800	485 395	450 426	418 551	980 000	776 252	720 329	669 353
5	R 2 387 896	R 12 112 360	R 14 500 256	R 10 835 435	R 9 868 631	R 9 003 518	766 000	572 400	521 327	475 626	1 225 000	915 391	833 714	760 629
6	R 4 248 776	R 12 112 360	R 16 361 136	R 11 533 955	R 10 310 291	R 9 235 435	766 000	540 000	482 710	432 387	1 225 000	863 577	771 958	691 481
7	R 5 307 896	R 12 112 360	R 17 420 256	R 11 585 465	R 10 164 552	R 8 939 346	766 000	509 434	446 954	393 079	1 225 000	814 695	714 776	628 619
8	R 2 637 896	R 12 112 360	R 14 750 256	R 9 254 493	R 7 969 104	R 6 881 103	766 000	480 598	413 846	357 345	1 225 000	768 580	661 829	571 472
9	R 2 387 896	R 12 112 360	R 14 500 256	R 8 582 679	R 7 253 738	R 6 149 524	766 000	453 394	383 191	324 859	1 225 000	725 076	612 805	519 520
10	R 2 387 896	R 12 112 360	R 14 500 256	R 8 096 867	R 6 716 424	R 5 590 476	766 000	427 730	354 806	295 326	1 225 000	684 034	567 412	472 291
11	R 4 248 776	R 12 112 360	R 16 361 136	R 8 618 842	R 7 017 011	R 5 734 478	766 000	403 519	328 524	268 478	1 225 000	645 315	525 382	429 355
12	R 5 307 896	R 12 112 360	R 17 420 256	R 8 657 334	R 6 917 823	R 5 550 630	766 000	380 679	304 189	244 071	1 225 000	608 787	486 464	390 323
13	R 2 637 896	R 12 112 360	R 14 750 256	R 6 915 496	R 5 423 639	R 4 272 624	766 000	359 131	281 657	221 883	1 225 000	574 328	450 430	354 839
14	R 2 387 896	R 12 112 360	R 14 500 256	R 6 413 477	R 4 936 772	R 3 818 371	766 000	338 803	260 793	201 712	1 225 000	541 819	417 065	322 581
15	R 2 387 896	R 12 112 360	R 14 500 256	R 6 050 450	R 4 571 085	R 3 471 246	766 000	319 625	241 475	183 374	1 225 000	511 150	386 171	293 255
16	R 4 248 776	R 12 112 360	R 16 361 136	R 6 440 500	R 4 775 660	R 3 560 660	766 000	301 533	223 588	166 704	1 225 000	482 217	357 566	266 596
17	R 5 307 896	R 12 112 360	R 17 420 256	R 6 469 263	R 4 708 154	R 3 446 505	766 000	284 465	207 026	151 549	1 225 000	454 921	331 079	242 360
18	R 2 637 896	R 12 112 360	R 14 750 256	R 5 167 661	R 3 691 237	R 2 652 963	766 000	268 363	191 691	137 772	1 225 000	429 171	306 555	220 327
19	R 2 387 896	R 12 112 360	R 14 500 256	R 4 792 523	R 3 359 884	R 2 370 908	766 000	253 173	177 491	125 247	1 225 000	404 878	283 847	200 297
20	R 2 387 896	R 12 112 360	R 14 500 256	R 4 521 248	R 3 111 004	R 2 155 371	766 000	238 842	164 344	113 861	1 225 000	381 961	262 822	182 088
TOTAL				**R 178 744 850**	**R 153 246 621**	**R 133 089 779**		**7 420 196**	**6 203 424**	**5 249 624**		**11 866 501**	**9 920 619**	**8 395 286**
							URV	**R 24.09**	**R 24.70**	**R 25.35**	**URV**	**R 15.06**	**R 15.45**	**R 15.85**

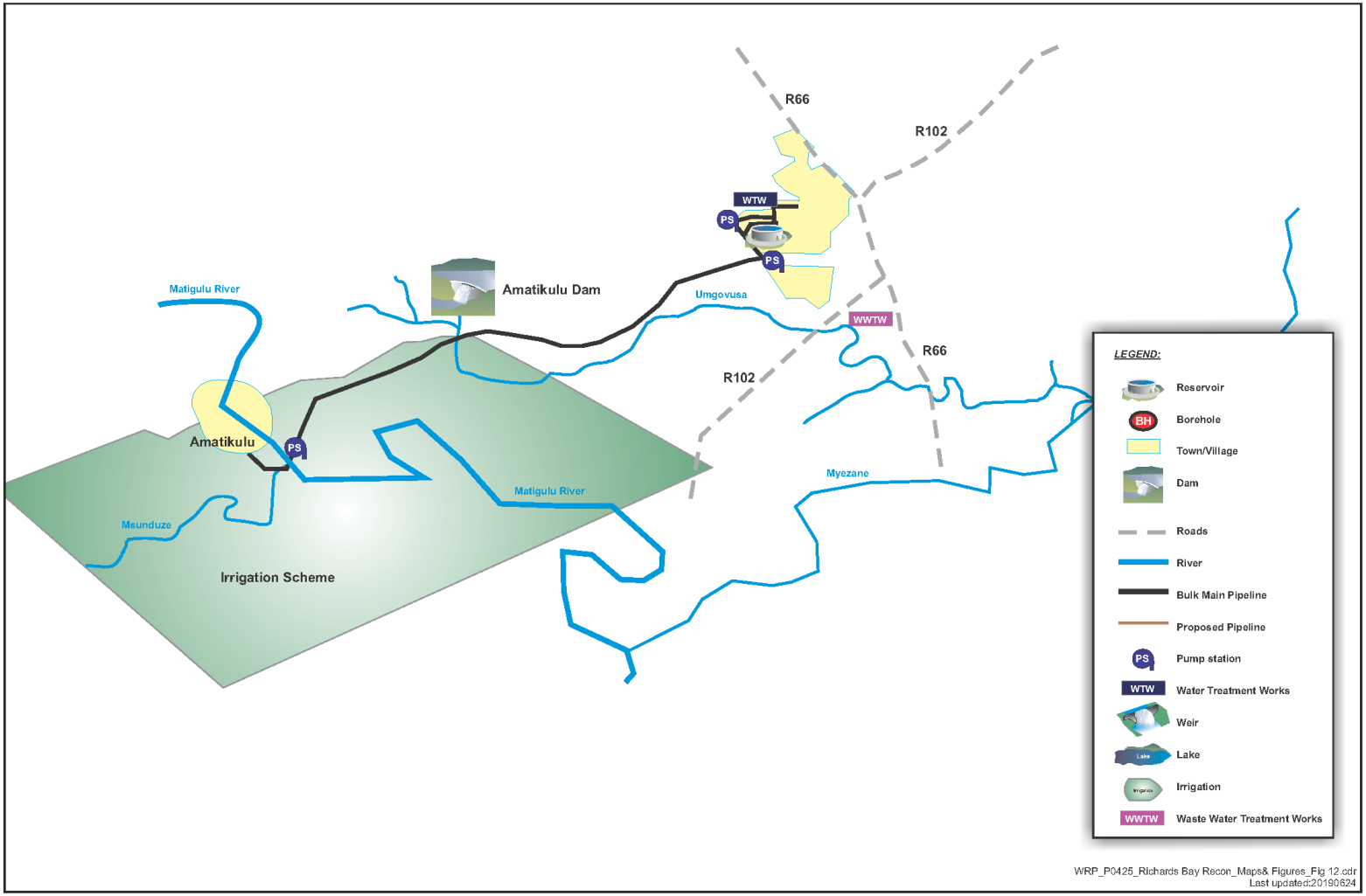
APPENDIX D

Schematics Layouts


Mthunzini Water Treatment Plant
Ntuze River
Elevated Tower
Meter 2
- Mthunzini High (Outlet)
High Level Zone (HL001)
3 x Ground Level Reservoirs
R1
R2
R3
Meter 3
- Mthunzini Low
Meter 4
- Umhlathuze (Inlet)
Umhlthuze - Source
Low Level Zone (LL001)
Meter 1
- Zini Estate
Meter 3
- Riverland
Low Level Zone (LL002)
Low Level Zone (LL003)
WRP_P0425_Richards Bay Recon_Maps& Figures_Fig 7.cdr
Last updated:20190121
IMPLEMENTATION AND MAINTENANCE OF THE WATER RECONCILIATION STRATEGY FOR RICHARDS BAY AND SURROUNDING TOWNS
Mthunzini Water Supply System
A-5


Eshowe Water Treatment Plant
Greater Mthonjaneni WTW
Meter D
- Raw Water (inlet)
Meter C
- Treated Water (inlet)
Rutledge River
Raw Water Dam
WTW
R1
R2
Pump House
Ground Level Reservoirs
R3
R5
Meter H
- Hospital 1
Meter 10
Mpungose
Meter G
- Kwa Khoza (outlet)
Meter E
- Town (outlet)
Mpungose
Hospital
Meter F
- KDS Outlet
Meter 15
- Hospital2
Prison
Meter 14
- Prison
College
Meter 13
- College
Meter 1
- Outlet
Kwa Khoza
Elevated Tower
R1
Surrounding Areas
R2
R3
Meter 11
- Nyanini
Nyanini
WRP_P0425_Richards Bay Recon_Maps& Figures_Fig 3.cdr
Last updated:20190121
IMPLEMENTATION AND MAINTENANCE OF THE WATER RECONCILIATION STRATEGY FOR RICHARDS BAY AND SURROUNDING TOWNS
Eshowe Water Supply System
A-1


Melmoth Dam
Meter 35
- RAW
Melmoth
WTW
Res 3
Tubalethu
(LL005)
Thubalethu
(LL003)
Town 3
(LL003)
Meter 33
- Town 3
Res 2
Meter 30
- Melmoth
Meter 29
- Thuba
Res 1
Melmoth
Storage
Reservoirs
Meter 34
- A.F. Lietch
Pump House
Golfview
Lodge Areas
(HL003)
Melmoth
12 Storage
Reservoirs
Meter 32
- Town 2
Hospital
Reservoir
School
Reservoir
Beacon
Reservoir
Kwamagwaza area
(School, Hospital)
Town 2
(LL002)
Meter 31
- Town 1
Cross Flow
Meter 36
- Kwamagwaza
- Plant
Borehole
Meter 37
- Borehole
Pump House
Town 1
(LL001)
WRP_P0425_Richards Bay Recon_Maps& Figures_Fig 10.cdr
Last updated:20190122
water & sanitation
IMPLEMENTATION AND MAINTENANCE OF THE WATER
RECONCILIATION STRATEGY FOR RICHARDS BAY AND SURROUNDING TOWNS
Melmoth, Thubalethu & Kwamagwaza
Water Supply System
A-8



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IMPLEMENTATION AND MAINTENANCE OF THE WATER RECONCILIATION STRATEGY FOR RICHARDS BAY AND SURROUNDING TOWNS

Schematic Layout: Gingindlovu Water System

Fig-2