MIDVAAL
LOCAL MUNICIPALITY

Final 2026/2027 Integrated Development Plan (IDP) Review

Annexure E:

Water Conservation and Water Demand Management Strategy and Business Plan (2020)

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Water Conservation and Water Demand Management Strategy and Business Plan

June 2020

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FC/02610 front cover.cdr
Last updated: 2020/03/02

Title:	**WATER CONSERVATION AND WATER DEMAND MANAGEMENT STRATEGY AND BUSINESS PLAN**
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Report No:	**P0415**
Report Date:	**June 2020**
Status of Report:	**Final**

LIST OF ABBREVIATIONS AND ACRONYMS

CS2016	Community Survey 2016 (StatsSA)
DM	District Municipality
DWS	Department of Water and Sanitation
IVRS	Integrated Vaal River System
LHWP	Lesotho Highlands Water Project
LOS	Level of Service
MTREF	Medium Term Revenue & Expenditure Framework
MLM	Midvaal Local Municipality
NRW	Non-Revenue Water
PRV	Pressure Reducing Valve
WCWDM	Water Conservation and Water Demand Management
WSA	Water Service Authority
WSP	Water Service Provider
WSS	Water Supply Scheme
WTW	Water Treatment Works

EXECUTIVE SUMMARY

INTRODUCTION

Midvaal Local Municipality (MLM) forms part of the Integrated Vaal River System (IVRS). The IVRS provides water to one of the most densely populated and economic significant areas in the country as reflected by the magnitude of the developments located in the Vaal, the Olifants and the upper portion of the Crocodile West / Marico Water Management areas. These developments include many of the country's power stations, gold mines, platinum mines, petro-chemical plants, sprawling urban developments as well as various other strategic industries. The water requirements in the area are therefore very important to sustain the economy of the country and the well-being of its people. The latest results from the IVRS indicate that the demand is currently exceeding the available supply, and Rand Water's abstraction licence will not be increased until the next Lesotho Highlands Water Project (LHWP) Phase II is commissioned in 2025 at a total estimated cost of R 23 billion.

The need for Water Conservation and Water Demand Management (WCWDM) in the Municipal Water Services Sector is essential, and perhaps of the highest priority, despite the fact that this sector uses less than 15% of South Africa's resources. Together with large industry, this is the sector with the largest expected future growth in demand, which requires the continuous development of new water resources and new infrastructure. The WCWDM paradigm and the principles proposed in these strategies integrate some of the relevant principles recognised in both the Water Services Act (No. 108 of 1997) and the National Water Act (No. 36 of 1998). The need to implement WCWDM is also based on economic efficiency objectives, due to the significant and rising costs associated with the provision of water services.

Five key interventions were identified in the Vaal River System Reconciliation Strategy to ensure sufficient future water availability to its users:

- Eradicate extensive unlawful water use in the irrigation sector as a national priority by 2011;
- Implement WCWDM measures to reduce losses and the urban demand with at least 15% by 2014;
- Undertake a feasibility study into the re-use of water with gold mines as first priority;
- Implement the Vaal River Integrated Water Quality Management Strategy focussing on salinity, eutrophication, microbiological pollution and institutional challenges, and;
- Implement Phase II of the Lesotho Highlands Water Project.

The five-point plan highlights the significant contribution that the municipal sector can make in ensuring that the surface water resources are managed in a sustainable manner.

STATUS QUO ASSESSMENT

Figure 1 shows the 2019 water balance for MLM and indicates unit consumption of 309 l/c/d and water losses and NRW of 27.4%. The unit consumption is high because of the inclusion of Sedibeng Breweries that accounts for approximately 20% of the total consumption. The unit consumption reduces to approximately 225 l/c/d if the eight largest users are excluded which, is below the national average of 233 l/c/d (DWS, 2017). The municipality has managed to reduce the unit consumption over the past 5 years as shown in **Figure 2** and the water losses and NRW are both below the national averages.

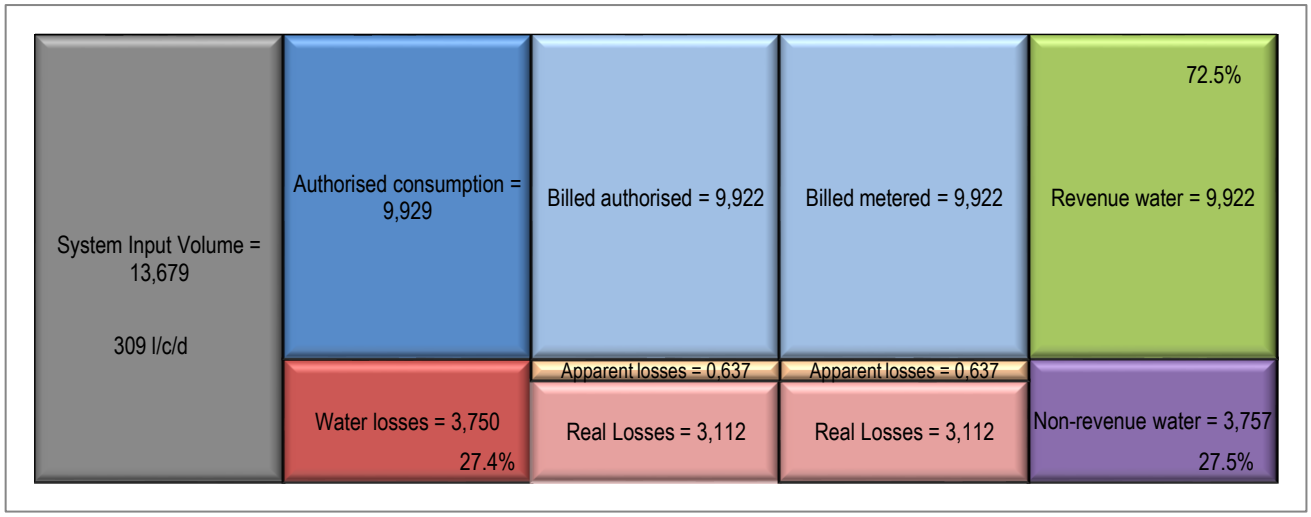

Figure 1: NRW water balance (2019)

MLM has, for the past four years, achieved or exceeded the targets set under the IVRS reconciliation strategy as shown in **Figure 2** and is well positioned to achieve the 2022 target. The IVRS targets are considerably higher than the Rand Water Project 1600.

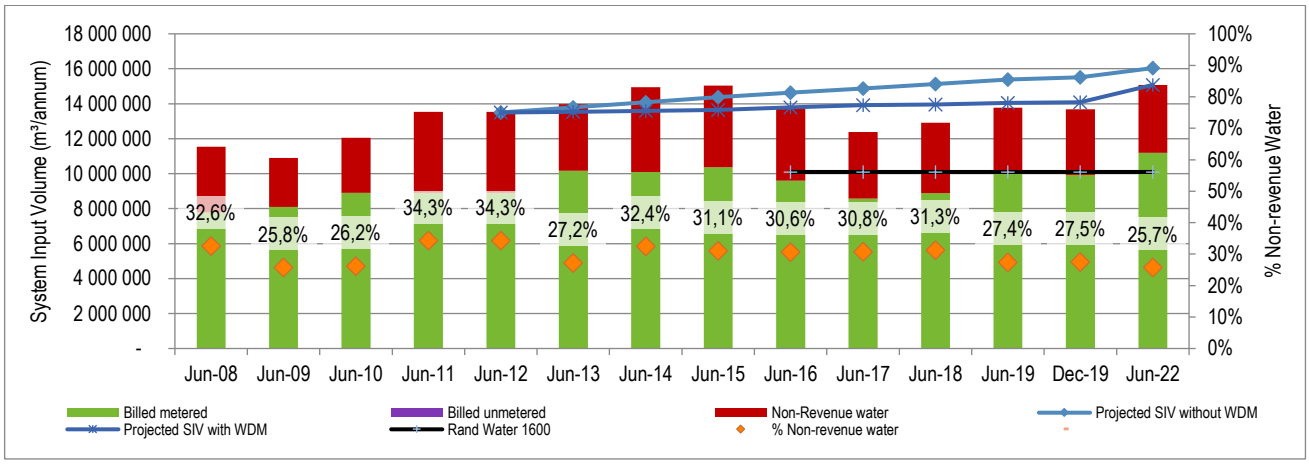

Figure 2: NRW water balance trend

WCWDM TARGET

The following targets have been set by the municipality, in line with the regional and national targets.

Table 1: Projection and target KPI summary (m³/annum)

Year ending	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23	Jun-24	Jun-25
Population served	**94 816**	**97 922**	**106 681**	**110 607**	**114 678**	**116 972**	**119 311**	**121 697**	**124 131**	**126 614**	**129 146**	**131 729**
Households served	**32 711**	**34 537**	**36 364**	**39 617**	**42 105**	**42 947**	**43 806**	**44 682**	**45 575**	**46 487**	**47 417**	**48 365**
Projected SIV without WDM	14 077 512	14 375 468	14 629 161	14 882 854	15 182 440	15 460 687	15 739 613	16 017 777	16 295 941	16 574 105	16 853 031	17 131 195
Projected SIV with WDM	13 595 972	13 653 158	13 786 467	13 919 775	13 956 299	14 037 903	14 120 549	14 202 970	14 285 391	14 367 812	14 450 458	14 532 879
Project 1600				12 134 976	12 134 976	12 134 976	12 134 976	12 134 976	12 134 976	12 134 976	12 134 976	12 134 976
System input volume (SIV)	14 946 866	15 037 482	13 842 674	12 389 557	12 915 967	13 770 363	13 494 956	13 225 057	12 960 555	12 701 344	12 447 317	12 198 371
Billed consumption (BC)	10 098 777	10 365 657	9 604 062	8 577 362	8 879 379	9 991 983	10 052 934	10 114 257	10 175 954	10 238 027	10 300 479	10 363 312
Unbilled consumption (UBC)	**310 311**	**346 283**	**415 321**	**340 815**	**320 406**	**245 056**	**235 254**	**225 844**	**216 810**	**208 137**	**199 812**	**191 819**
Non-revenue water	**4 848 089**	**4 671 825**	**4 238 612**	**3 812 195**	**4 036 588**	**3 778 380**	**3 442 022**	**3 110 800**	**2 784 602**	**2 463 317**	**2 146 838**	**1 835 059**
% Non-revenue water	**32.4%**	**31.1%**	**30.6%**	**30.8%**	**31.3%**	**27.4%**	**25.5%**	**23.5%**	**21.5%**	**19.4%**	**17.2%**	**15.0%**

Year ending	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23	Jun-24	Jun-25
% Water Losses	**30.4%**	**28.8%**	**27.6%**	**28.0%**	**28.8%**	**25.7%**	**23.8%**	**21.8%**	**19.8%**	**17.8%**	**15.6%**	**13.5%**
Litres / capita / day	**387**	**376**	**334**	**307**	**309**	**323**	**310**	**298**	**286**	**275**	**264**	**254**
% Reduction in SIV required							-2.0%	-2.0%	-2.0%	-2.0%	-2.0%	-2.0%
% Increase in BC required							0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
% Reduction in UBC required							-4.0%	-4.0%	-4.0%	-4.0%	-4.0%	-4.0%
Previous NRW targets	**32.4%**	**29.4%**	**26.7%**	**24.3%**	**22.1%**	**20.0%**						
Revised NRW targets				**28.5%**	**28.5%**	**26.5%**	**25.5%**	**24%**	**23%**	**22%**	**21%**	**20%**
Over / under target	**0.00%**	**1.70%**	**3.90%**	**2.30%**	**2.80%**	**0.90%**						

The municipality was unable to achieve the targets set in the previous WCWDM strategy and were revised in 2017. The new targets are now set to achieve 20% NRW by 2025.

If the above saving could be achieved, the potential financial benefits are summarised in **Table 2**. An 8% annual increase in Rand Water purchase cost and water sales cost was assumed. The municipality stands to gain R 34.2 million over 6 years if escalation is included.

Table 2: Nett benefit of reduced purchases and sales

Year ending	Jun-20	Jun-21	Jun-22	Jun-23	Jun -24	Jun-25
Reduction in purchases (m^3/annum)	275 407	269 899	264 501	259 211	254 027	248 946
Rand Water tariff (R/m^3) (increase @8%)	R 10.40	R 11.24	R 12.14	R 13.11	R 14.16	R 15.29
Reduced purchases (R/annum)	R 2 865 589	R 3 032 940	R 3 210 063	R 3 397 531	R 3 595 947	R 3 805 950
A: Cumulative reduced purchases (Rand)	**R 2 865 589**	**R 5 898 529**	**R 9 108 592**	**R 12 506 123**	**R 16 102 070**	**R 19 908 020**
Increase in sales (m^3/annum)	60 951	61 323	61 697	62 073	62 452	62 833
Average selling price (R/m^3)(increase @8%)	R 31.54	R 34.06	R 36.78	R 39.73	R 42.90	R 46.34
Increased income (R/annum)	R 1 922 154	R 2 088 589	R 2 269 436	R 2 465 942	R 2 679 463	R 2 911 472
B: Cumulative increased income (Rand)	**R 1 922 154**	**R 4 010 743**	**R 6 280 179**	**R 8 746 121**	**R 11 425 584**	**R 14 337 056**
A plus B: Nett benefit (Rand)	R 4 787 743	R 9 909 272	R 15 388 771	R 21 252 244	R 27 527 654	R 34 245 076

BUDGET REQUIREMENTS

The total estimated cost for implementation of a comprehensive WCWDM programme amounts to approximately R 130.17 million until 2025**.** The total amount is split between OPEX and CAPEX as shown in **Table 1.**

Table 1: NRW reduction budget

Year	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	Total	Budget
Institutional and Local Regulation Pillar	R 0	R 3 000 000	R 3 200 000	R 3 000 000	R 3 000 000	R 3 200 000	R 3 000 000	R 18 400 000	
Establishment of a WCWDM Steering Committee	R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0	OPEX
Organisation and Human Resource Plan	R 0	R 3 000 000	R 3 000 000	R 3 000 000	R 3 000 000	R 3 000 000	R 3 000 000	R 18 000 000	OPEX
Review and update policies and bylaws	R 0	R 0	R 200 000	R 0	R 0	R 200 000	R 0	R 400 000	CAPEX
Technical pillar	R 5 900 000	R 9 540 000	R 10 310 000	R 11 330 000	R 12 300 000	R 12 300 000	R 12 300 000	R 74 380 000	
Calculation and Preparation of Monthly Water Balance	R 100 000	R 140 000	R 150 000	R 160 000	R 170 000	R 170 000	R 170 000	R 1 060 000	OPEX
Cathodic Protection of Steel Pipes	R 0	R 800 000	R 700 000	R 800 000	R 900 000	R 900 000	R 900 000	R 5 000 000	CAPEX
	R 0	R 220 000	R 220 000	R 220 000	R 220 000	R 220 000	R 220 000	R 1 320 000	OPEX
Pressure Management	R 200 000	R 500 000	R 600 000	R 700 000	R 800 000	R 800 000	R 800 000	R 4 400 000	CAPEX
	R 0	R 300 000	R 300 000	R 300 000	R 300 000	R 300 000	R 300 000	R 2 200 000	OPEX
Document and Update Asset Register	R 0	R 50 000	R 60 000	R 70 000	R 80 000	R 80 000	R 80 000	R 420 000	OPEX
Bulk meter and Sectorisation	R 200 000	R 200 000	R 250 000	R 300 000	R 350 000	R 350 000	R 350 000	R 2 000 000	CAPEX
Valve audit	R 0	R 200 000	R 250 000	R 250 000	R 300 000	R 300 000	R 300 000	R 1 600 000	CAPEX
Asset Management Replacement Programme	R 4 400 000	R 5 000 000	R 5 500 000	R 6 000 000	R 6 500 000	R 6 500 000	R 6 500 000	R 40 400 000	CAPEX
Timeous Leak Detection & Repairs	R 500 000	R 550 000	R 600 000	R 650 000	R 700 000	R 700 000	R 700 000	R 4 400 000	OPEX
Telemetry of Water Supply and Distribution Systems	R 0	R 500 000	R 500 000	R 600 000	R 600 000	R 600 000	R 600 000	R 3 400 000	CAPEX
		R 280 000	R 280 000	R 280 000	R 280 000	R 280 000	R 280 000	R 1 680 000	OPEX
Master Planning of Water System	R 500 000	R 800 000	R 900 000	R 1 000 000	R 1 100 000	R 1 100 000	R 1 100 000	R 6 500 000	CAPEX
Financial pillar	R 4 040 000	R 4 360 000	R 4 180 000	R 4 200 000	R 4 470 000	R 4 220 000	R 4 220 000	R 29 690 000	
War on Leaks	R 300 000	R 320 000	R 340 000	R 360 000	R 380 000	R 380 000	R 380 000	R 2 460 000	OPEX
Consumer Meter Management Plan	R 3 500 000	R 3 500 000	R 3 500 000	R 3 500 000	R 3 500 000	R 3 500 000	R 3 500 000	R 24 500 000	CAPEX
Consumer Data Base Audit	R 140 000	R 140 000	R 140 000	R 140 000	R 140 000	R 140 000	R 140 000	R 980 000	CAPEX
Indigent Leak Repair Programme and Retro Fitting of Toilet Plumbing	R 100 000	R 150 000	R 200 000	R 200 000	R 200 000	R 200 000	R 200 000	R 1 250 000	CAPEX
Tariff review	R 0	R 250 000	R 0	R 0	R 250 000	R 0	R 0	R 500 000	CAPEX
Social pillar	R 1 100 000	R 1 100 000	R 1 100 000	R 1 100 000	R 1 100 000	R 1 100 000	R 1 100 000	R 7 700 000	
Schools awareness programme	R 300 000	R 300 000	R 300 000	R 300 000	R 300 000	R 300 000	R 300 000	R 2 100 000	CAPEX
Community Awareness programme	R 800 000	R 800 000	R 800 000	R 800 000	R 800 000	R 800 000	R 800 000	R 5 600 000	CAPEX
Total	**R 11 040 000**	**R 18 000 000**	**R 18 790 000**	**R 19 630 000**	**R 20 870 000**	**R 20 820 000**	**R 20 620 000**	**R 130 170 000**	
CAPEX	R 10 140 000	R 13 140 000	R 13 840 000	R 14 590 000	R 15 740 000	R 15 690 000	R 15 490 000	R 98 630 000	
OPEX	R 900 000	R 4 860 000	R 4 950 000	R 5 040 000	R 5 130 000	R 5 130 000	R 5 130 000	R 31 140 000	

CONCLUSIONS AND RECOMMENDATIONS

- The analysis of the MLM water supply system indicates water losses, inefficiencies and NRW figures below the national averages. There is scope for improvement to bring the MLM in line with international best practice;
- The Rand Water target is unrealistically low and should be further investigated. For the purposes of this strategy the average consumption for the past five years was accepted as the target;
- The current demand is exceeding average supply for the past five years and the MLM needs to reduce its current consumption by 12% over the next 6 years (2% per annum);
- Most bulk meters are working and the municipality is preparing a water balance on a monthly basis;
- The water supply from Rand Water decreased by 1.1% per annum while the cost increased by 10% per annum over the past five years. The municipality needs to increase its water tariffs and manage billed metered consumption to ensure the MLM remains financially sustainable;
- Approximately R 20 million/annum is required for the next five years to improve the NRW, water losses and inefficiencies in the MLM. An estimated R 25 million m^3/annum, excluding escalation, could be saved through reduced water purchases and increased water sales.

It is recommended that the WCWDM interventions identified are implemented and the targets are achieved as a matter of priority. The WCWDM strategy and business plan will focus on the enhancement of long-term water security and protection, climate change adaptation and catchment resilience through the reduction of water losses, NRW and the improvement of water use efficiency over a five-year period.

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1 INTRODUCTION

South Africa is a water stressed country with an average rainfall of 450 mm, compared to a global average of 860 mm (Wikipedia). The disparate and low average rainfall, climate change, droughts and environmental degradation calls for the proper management of our water resources and efficient water use. The Water Services Act, Act 108 of 1997 stipulates that all spheres of government must provide water supply services in an efficient, equitable and sustainable manner. The Act also requires municipalities that have been given Water Services Provider (WSP) status to implement measures to promote water conservation and water demand management (WCWDM) which should be included in their WCWDM strategy and business plan and Water Services Development Plan (WSDP).

Midvaal Local Municipality (MLM) forms part of the Integrated Vaal River System (IVRS). The IVRS provides water to one of the most densely populated and economic significant areas in the country as reflected by the magnitude of the developments located in the Vaal, the Olifants and the upper portion of the Crocodile West / Marico Water Management areas. These developments include many of the country's power stations, gold mines, platinum mines, petro-chemical plants, sprawling urban developments as well as various other strategic industries. The water requirements in the area are therefore very important to sustain the economy of the country and the well-being of its people. The latest results from the IVRS indicate that the demand is currently exceeding the available supply, and Rand Water's abstraction licence will not be increased until the next Lesotho Highlands Water Project (LHWP) Phase II is commissioned in 2025 at a total estimated cost of R 23 billion. Rand Water has been restricted to 1600 million m^3/annum and is enforcing this restriction onto its water users through Project 1600. The result is that all municipalities in the IVRS must target a zero or negative growth in water demand for the next 7 years until the next augmentation scheme has been commissioned. This is assuming there will not be a drought and the dams will be filled in the first years following construction.

The need for WCWDM in the Municipal Water Services Sector is essential, and perhaps of the highest priority, despite the fact that this sector uses less than 15% of South Africa's fresh water resources. Together with large industry, this is the sector with the largest expected future growth in demand, which requires the continuous development of new water resources and new infrastructure. The need to implement WCWDM is also based on economic efficiency objectives, due to the significant and rising costs associated with the provision of water services. It is estimated that the potential economic benefit of WCWDM over the next fifteen years in the Water Services Sector in South Africa will be approximately R50 billion. This could be achieved through cost savings in postponing capital infrastructure and savings in operating costs. The WCWDM paradigm and the principles proposed in these strategies integrate some of the relevant principles recognised in both the Water Services Act (No. 108 of 1997) and the National Water Act (No. 36 of 1998). The strategies developed are related to existing requirements promulgated through both Acts, and in particular, the Water Services Act Regulations, Water Services Development Plans and the Water Board Business Plans.

This report explains the current water efficiency, loss and non-revenue water (NRW) situation in MLM, which have been used to develop a customised WCWDM strategy and business plan, complete with interventions, budgets and timelines, to achieve the set targets.

2 TERMINOLOGY

2.1 Definitions

The Department of Water and Sanitation (DWS) has adopted the collective term of WCWDM, which has been defined in the Water Services Sector Strategy (DWAF, 2004) as follows:

- WC is the minimisation of loss or waste, the care and protection of water resources and the efficient and effective use of water; and
- WDM is the adaptation and implementation of a strategy by a water institution or consumer to influence the water demand and usage of water in order to meet any of the following objectives: economic efficiency, social development, social equity, environmental protection, sustainability of water supply and services and political acceptability.

WCWDM can also be defined as follows (Butler and Memon, 2006):

- water conservation means ***doing less with less*** and is particularly applicable in drought scenarios and water restrictions (example: take shorter showers; do not irrigate the lawn);
- water efficiency means ***doing the same (or more) with less*** (example: fix leaks; use hydraulically efficient toilet pan and cistern design);
- water sufficiency means ***enough is enough*** (example: use automatic shut-off of taps; dual flush toilets; careful garden watering);
- water substitution means ***replace water with something else****, say air* (example: waterless urinals; vacuum drainage; dry cleaning); and
- water **reuse**, (example: grey water reuse on-site; shared bath water; groundwater abstraction on-site).

2.2 IWA Water Balance

South Africa has adopted the standard International Water Association (IWA) water balance, which provides a breakdown of the system input volume (SIV), authorised consumption, water losses and NRW in a water supply system as shown in **Figure 2.1.**

The components of the IWA water balance are defined as follows (Seago & McKenzie 2007):

- *SIV* represents the potable water volume input to the water supply system from the water utility's own sources, as measured at the water treatment works (WTW) outlet, allowing for all known errors (i.e. errors on bulk water meters) as well as any water imported from other sources, also corrected for known bulk metering errors;
- *Authorised Consumption* is the volume of metered and / or unmetered water used by registered customers, the water utility and others who are implicitly or explicitly authorised to do so by the water utility, for residential, commercial and industrial purposes;

<table>
<tr><td rowspan="8">System Input Volume</td><td rowspan="3">Authorised Consumption</td><td rowspan="2">Billed Authorised Consumption</td><td>Billed Metered Consumption</td><td>Free basic Revenue Water</td></tr>
<tr><td>Billed Unmetered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorised Consumption</td><td>Unbilled Metered Consumption</td><td rowspan="5">Non Revenue Water</td></tr>
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<tr><td>Leakage on Service Connections up to point of Customer Meter</td></tr>
</table>

Figure 2.1: Modified IWA water balance

- *Water Losses are* the sum of the physical and commercial losses and are calculated as the difference between the SIV and the authorised consumption. In most countries, water losses are also considered to be unaccounted for water (UFW) although the exact definition of UFW can vary from country to country;
- *Billed Authorised consumption* is effectively the revenue water, and is the volume of authorised metered and unmetered consumption which is billed by the water utility and paid for by the customer;
- *Unbilled \ Authorised consumption* is the volume of authorised metered and unmetered consumption that is not billed or paid for;
- *Commercial Losses or Apparent Losses* are made up from the unauthorised consumption (theft or illegal use), plus all technical and administrative inaccuracies associated with customer metering. If commercial losses are reduced, generally more revenue will be generated by and for the water utility;
- *Real Losses* are the physical water losses from the pressurised system, up to the point of measurement of customer use. In most cases, real losses represent the unknown component in the overall water balance. The purpose of most water balance models is therefore to estimate the magnitude of real losses so that the water utility can gauge whether or not it has a serious leakage problem. Real losses are generally calculated as the difference between total losses and estimated commercial losses; and
- *NRW* is the volume of water supplied by the water utility but for which it receives no income. NRW incorporates unbilled (metered or unmetered) authorised consumption, apparent / commercial losses and real / physical losses.

2.3 *Potential benefit*

WCWDM affects all aspects of the water services cycle and has several potential direct and indirect benefits as summarised in **Figure 2.2.**

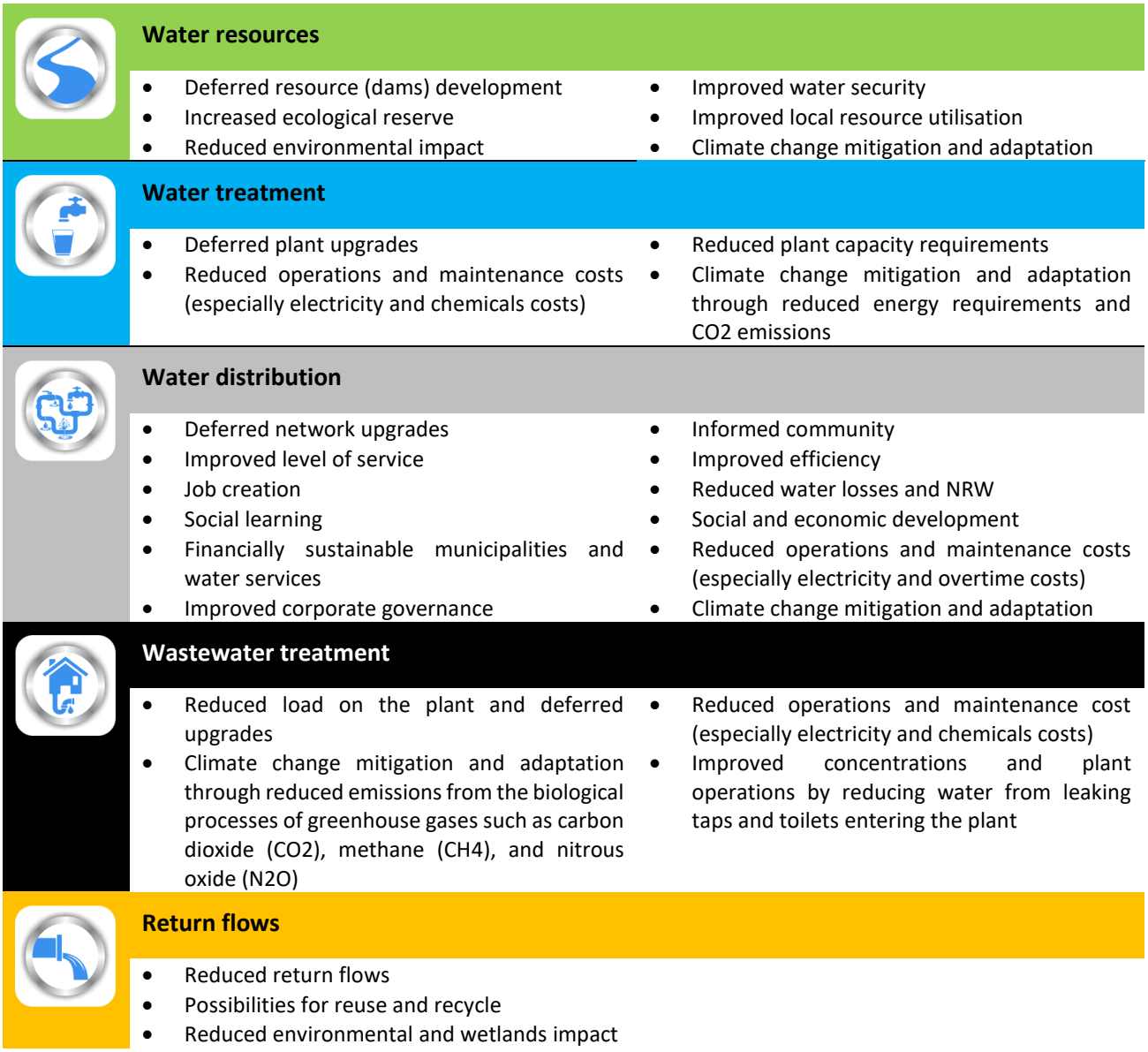


Figure 2.2: Benefits of water demand management throughout the water services cycle

3 EXISTING STRATEGIES

3.1 NDP, NWRS2 and Master Plan

The "National Development Plan – Vision 2030" (NDP) and the Second Edition of the National Water Resource Strategy (NWRS2) state that reducing growth in water demand is just as important as increasing the supply. South Africa is a water-stressed country and is facing a number of water challenges and concerns, which include security of supply, environmental degradation and resource pollution, as well as the inefficient use of water. In light of the urgency to protect our water resources and the adverse effects of climate change, the NWRS2 highlights that WCWDM should be one of the top priorities, and measures to reconcile demand and supply in order to provide for the national goals of a better life for all through job creation and inclusive economic growth.

The main proposals of the National Development Plan - Vision for 2030, (NPD 2030), related to the efficient use of South Africa's scarce water resources, or the implementation of WCWDM measures, are as follows:

- "Establishment of a national water conservation programme with clear targets to improve water use efficiency;"
- "Reducing demand, rather than just increasing supply, is important. Current planning assumes that it will be possible to achieve an average reduction in water demand of 15 percent below business-as-usual levels in urban areas over the period leading to 2030;"
- "Specific savings estimates can be made in different localities;"
- "Achieving demand reductions on this scale will require active programmes to reduce water leakage in distribution networks and to increase the efficiency of water use by domestic and commercial water users;"
- "A dedicated national water conservation and demand management programme by 2012, with clear national and local targets for 2017 and 2022, and sub-programmes focused on municipalities, industry and agriculture;" and
- "... a dedicated national program to provide support to local and sectoral efforts to reduce water demand and improve water efficiency. Water-saving demand-management projects should be considered as part of the overall range of water supply investment programmes."

The National Water and Sanitation Master Plan (DWS, 2018) goes further and states that South Africa is facing a water crisis caused by insufficient water infrastructure maintenance and investment, recurrent droughts driven by climatic variation, inequities in access to water and sanitation, environmental degradation and resource pollution, and a lack of skilled water engineers. This crisis is already having significant impacts on economic growth and on the well-being of everyone in South Africa.

3.2 Integrated Vaal River System

The geographical area of the IVRS is shown in **Figure** 3.1.

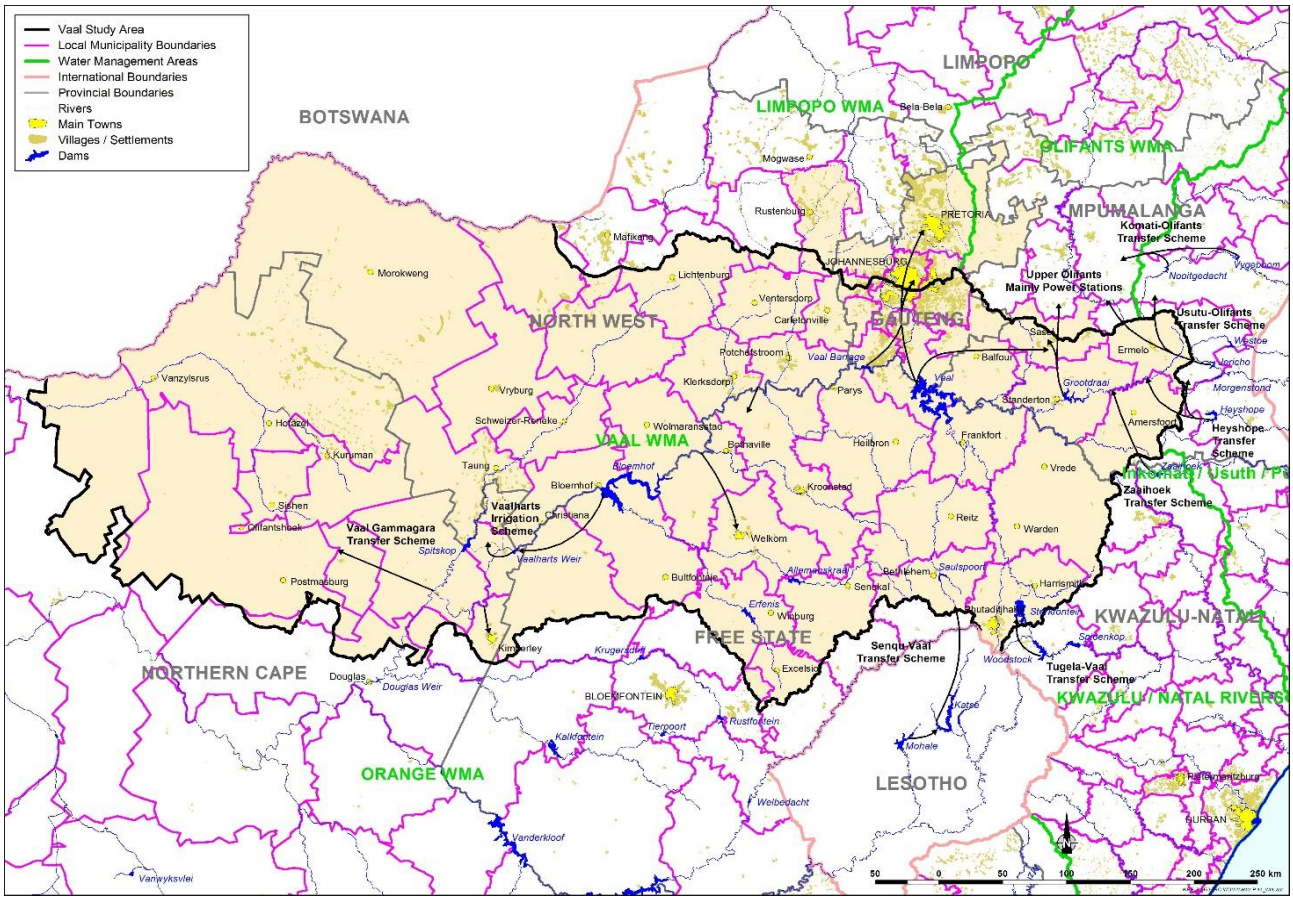


Figure 3.1: Vaal River Water Supply System

The IVRS consists of the Vaal River water management area (WMA). Due to the numerous inter-basin transfers that link this core area with other WMAs, reconciliation planning has to be undertaken in the context of the IVRS which also includes portions of the Komati, Usutu, Thukela and Senqu River (located in Lesotho) catchments. In addition, significant water transfers occur to water users in the Olifants and Crocodile (West) River catchments, of which most are completely dependent on the water resources of the IVRS.

Based on the *Second Stage Reconciliation Strategy of the Vaal River System* (DWA, 2009), a WCWDM assessment was undertaken for the nine largest urban water users accounting for a demand of 1 186 million m³/a in the year 2004. Potential savings, resulting from the implementation of WCWDM measures, were determined based on detailed assessments of supply districts in the various municipalities. The findings from this study were based on the contents of a parallel study i.e. *Potential Savings through WCWDM in the Upper and Middle Vaal Water Management Areas (DWS, 2007)*.

Five key interventions were identified in the Vaal River System Reconciliation Strategy to ensure sufficient future water availability to its users:

- Eradicate extensive unlawful water use in the irrigation sector as a national priority by 2011;
- Implement WCWDM measures to reduce losses and the urban demand with at least 15% by 2014;
- Undertake a feasibility study into the re-use of water with gold mines as first priority;

- Implement the Vaal River Integrated Water Quality Management Strategy focussing on salinity, eutrophication, microbiological pollution and institutional challenges, and;
- Implement Phase II of the Lesotho Highlands Water Project.

From the WCWDM assessments in the Upper and Middle Vaal basin, it was concluded that the Rand Water demand would increase from 1 200 million m³/a in 2007 to 1 500 million m³/a in 2024/25 had WCWDM measures not been implemented. According to the results based on scenario E, which were the most conservative and realistic among the scenarios, the demand could drop to 1 300 million m³/a by 2024/25 indicating an estimated potential saving of 200 million m³/a.

The latest water resource balance diagram for the IVRS is shown in **Figure 3.2** and highlights the urgent need for WCWDM to reconcile the water supply and demand. The following interventions are essential to maintain the balance until LHWP Phase 2 can deliver water:

- Water conservation and water demand management;
- Eradication of unlawful use;
- Desalination and re-use of mine water, and;
- Tshwane re-use project.

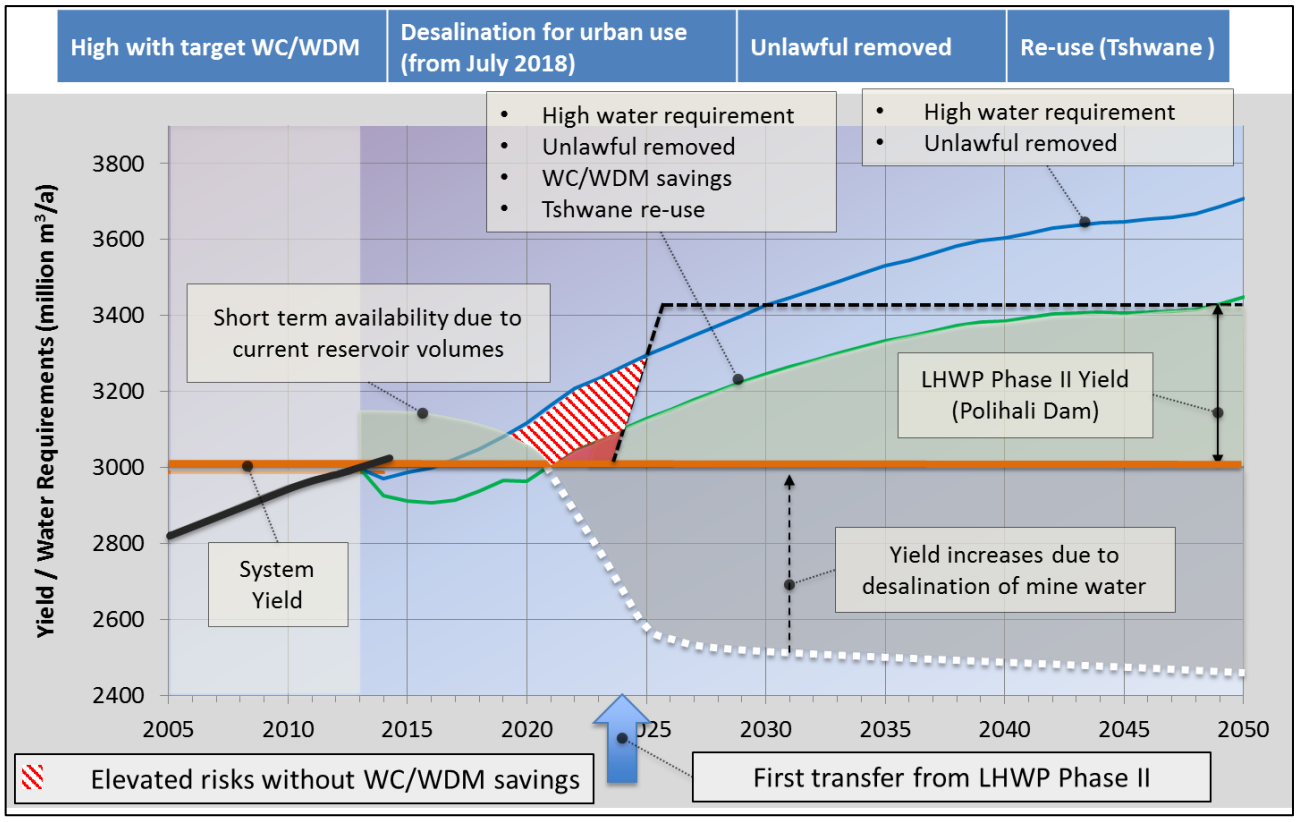


Figure 3.2: Vaal River WSS water resource balance diagram (DWS, Feb 2018)

3.3 Rand Water supply and cost

The Rand Water supply versus cost is shown in **Figure 3.3**. The results show that the supply from Rand Water decreased by 1.1% per annum while the cost increased by 10.0% per annum over the past five years. The

municipality needs to ensure its water tariffs are adjusted and revenue water maintained or increased to ensure the sustainability of the municipality.

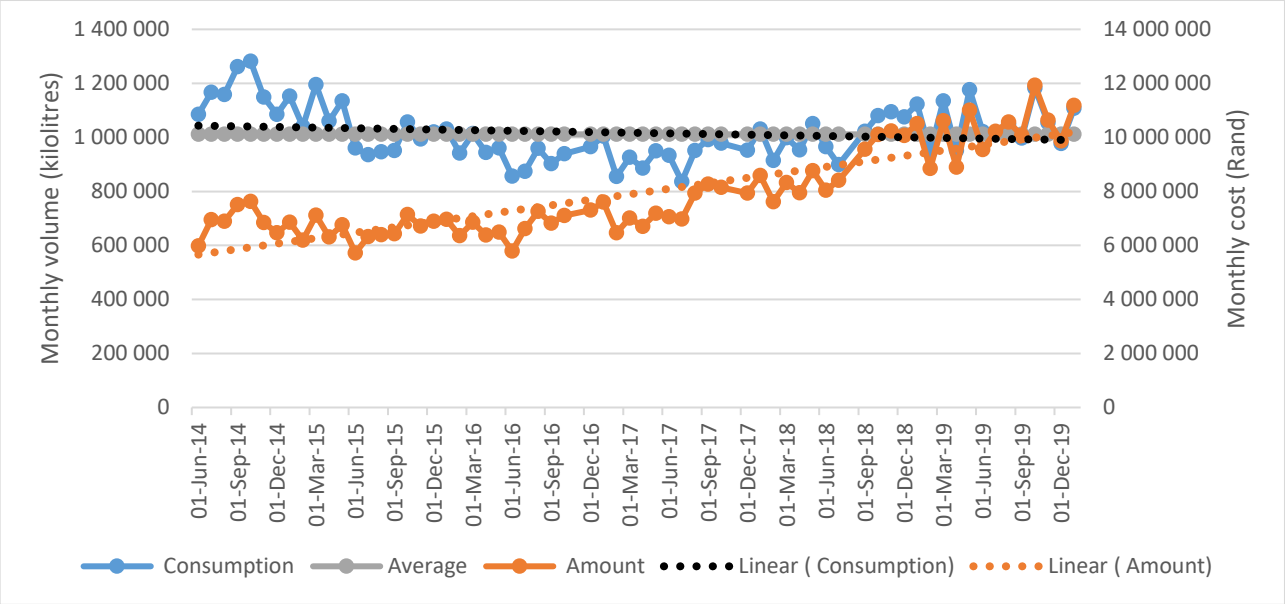


Figure 3.3: Rand Water supply and cost

3.4 Rand Water "Project 1600"

Rand Water introduced "Project 1600" in 2017. The objective of the programme is to limit all Rand Water users to 1600 million m^3/annum until the LHWP Phase II is commissioned in 2025. The performance targets for MLM are summarised in **Figure 3.4**.

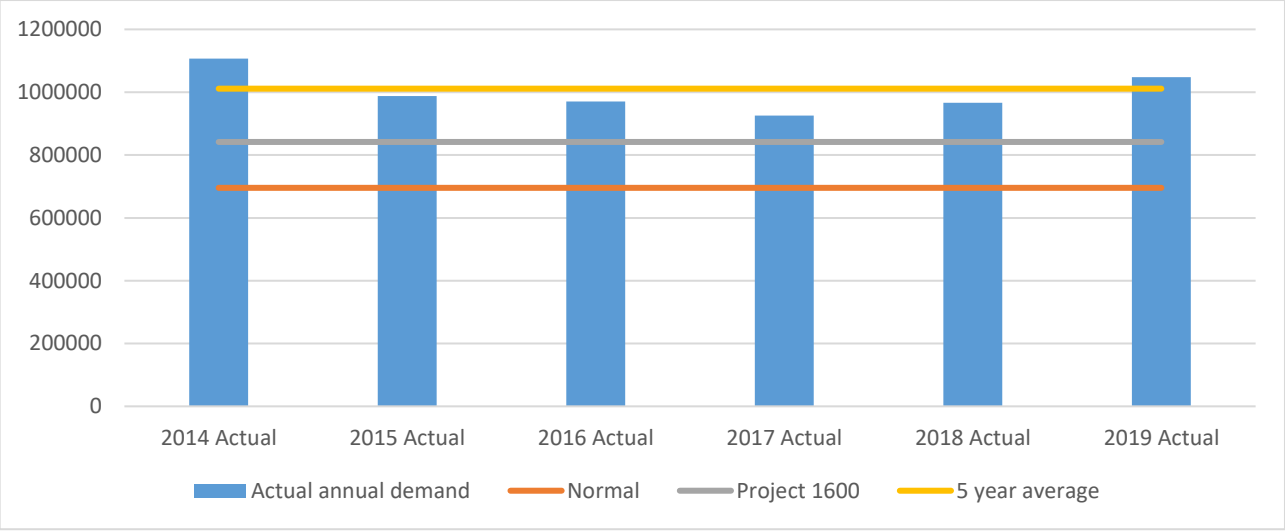


Figure 3.4: Performance against IVRS licensed target

The results indicate that in the period July 2018 to March 2019, MLM operated above the Project 1600 target of 841 587 m^3/month and the normal average monthly demand of 695 527 m^3/month. The Project 1600 target is set by Rand Water and the normal average monthly demand is the theoretical water demand as calculated by Rand Water based on the population and level of service (LOS). MLM needs to reduce its

consumption by 25% to achieve the Project 1600 target as shown in **Table 3.1** through a concerted effort to reduce physical water losses and to increase revenue where feasible.

Table 3.1: Summary of Project 1600 license target per supply areas

Rand Water connection and supply area	Normal Total (kl/m)	Project 1600 license target (kl/m)	2018/19 YTD actual (kl/m)	Over / under Project 1600 (kl/m)	Over / under Project 1600 (%)
5800 + 5801 + 5802 + 5803 + 5804 + 5805 + 5813 + 5816 + 5862 Walkerville	73 384	88 795	239 567	150 772	170%
5629 Sedibeng Brewery	101 591	122 925	189 756	66 830	54%
4524 Portion 20	17 288	20 918	46 403	25 485	122%
4337 Henley on Klip	6 123	7 409	19 144	11 736	158%
1616 + 4373 + 4060 Meyerton	21 624	26 165	32 154	5 989	23%
2853 Klipriver Valley	97 206	117 620	122 833	5 214	4%
2854 Portion 5 Nooitgedacht	390	472	216	-255	-54%
1871 Eastern Gauteng Services Council	9 068	10 972	7 872	-3 100	-28%
4369 Riversdale	21 605	26 142	22 973	-3 168	-12%
2561 + 4164 Midvaal	15 078	18 244	14 502	-3 743	-21%
2940 Boven Road Garthdale	15 880	19 215	15 099	-4 116	-21%
2279 Reservoir	316 290	382 711	340 000	-42 711	-11%
Total	**695 527**	**841 587**	**1 050 520**	**208 932**	**25%**

These targets are considered unrealistic and are currently under review by Rand Water. Concerns raised by Midvaal include the following:

- Midvaal's eight largest water users for 2018/19 have an average consumption of 346 849 kl/month. Water use is mostly for production purposes, which promotes business development and job creation. These users cannot reduce their consumption without compromising their production except for one or two users, which might have limited scope for improvement.
- Large water users account for 50% of the normal use target and 41% of the Project 1600 target. To expect a further 25% reduction in demand is unrealistic and will affect the economy of MLM. Key performance indicators for the municipality are already well within international best practice as summarised in **Table 3.2.**

Table 3.2: Summary of KPIs for various targets

Indicator	NORMAL TOTAL (kl/m) 2019	Project 1600 license target	YTD actual AAMD (kl/m) 2019
Rand Water supply	695 527	841 587	1 147 530
Large users	346 849	346 849	346 849
% of Rand Water supply	50%	41%	30%
Normal use	348 678	494 738	800 681
Population	116 972	116 972	116 972

Indicator	NORMAL TOTAL (kl/m) 2019	Project 1600 license target	YTD actual AAMD (kl/m) 2019
Households	42 947	42 947	42 947
KPIs excluding large users			
l/c/d	98	139	225
m^3/hh/month	8	12	19
KPIs including large users			
l/c/d	195	237	323
m^3/hh/month	16	20	27

For the purposes of this strategy, it was assumed that Midvaal's current water consumption is within acceptable range. A realistic target would be if the municipality could reduce the average consumption of the past five years by 12% over the next 6 years. For the purposes of this strategy, a Rand Water target of 1 011 284 kl/month or 12 134 976 kl/annum was assumed.

4 STATUS QUO

4.1 National perspective

The report on *Benchmarking of Water Loss, Water Use Efficiency and Non-Revenue Water in South African Municipalities 2004/05 to 2015/16* (DWS, July 2017) indicates water losses of 1462.01 million m^3/a (35.9%) and NRW of 1659.6 million m^3/a (41.0%) for all municipalities in 2015/16. The national IWA water balance for 2015/16 is shown in **Figure 4.1**.

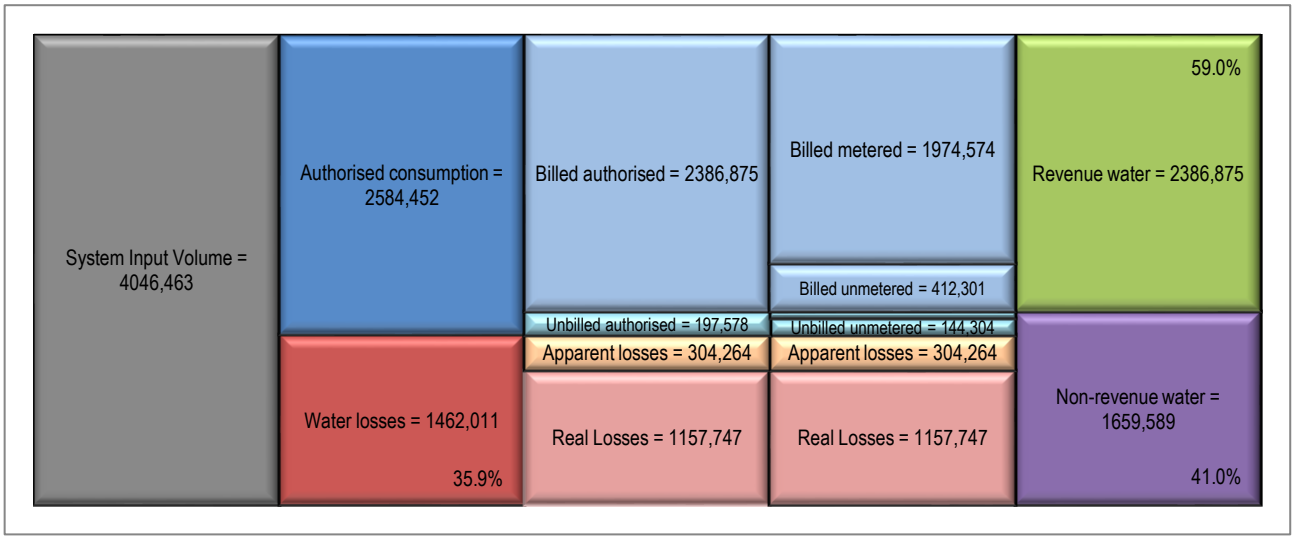


Figure 4.1: National IWA water balance (2015/16)

The estimated national water balance for 2015 /16, broken down per province, is summarised in **Table 4.1**. The highest and lowest figure for each key performance indicator are highlighted in red and green respectively.

Table 4.1: Summary of provincial water loss indicators

Province	Population	System input volume (m^3/annum)	NRW (m^3/annum)	% NRW	% Water loss	ℓ/c/d	ILI
EC	4 477 918	332 151 376	158 647 165	47.8%	45.0%	200	4.8
FS	2 723 028	207 835 805	106 908 574	51.4%	46.6%	209	4.8
GT	12 978 281	1 473 100 700	528 839 540	35.9%	27.4%	305	5.8
LIM	4 225 967	281 235 907	155 016 679	55.1%	55.1%	182	5.0
KZN	8 491 508	697 751 184	327 444 107	46.9%	43.0%	225	6.2
NW	3 039 995	206 496 825	105 577 898	51.1%	51.1%	186	4.7
NC	1 085 944	94 205 305	45 418 308	48.2%	45.5%	238	7.1
WC	6 108 993	482 695 411	102 720 237	21.3%	16.7%	201	2.4
MP	3 622 506	270 990 713	129 852 490	47.9%	43.9%	205	4.3
National	**46 754 140**	**4 046 463 225**	**1 659 588 711**	**41.0%**	**35.9%**	**233**	**5.3**

Gauteng is the largest water user in the country, and with KwaZulu-Natal and Western Cape, account for 66% of the total demand. Gauteng and KwaZulu-Natal account for 52% of the NRW by volume. Limpopo has the highest percentage NRW and water losses but the lowest litres / capita / day. Limpopo has a high prevalence of rural water supply schemes, which support the low l/c/d, however, should be verified.

Western Cape is the overall best performing province. Gauteng has the highest per capita consumption due to the high number of wet industries in the supply area.

4.2 Metropolitan perspective

The 2016/17 key water loss performance indicators for the eight metros are summarised in **Table 4.2.**

Table 4.2: Summary of metro KPIs

Metro	Population	System input volume (m^3/annum)	NRW (m^3/annum)	Water loss (m^3/annum)	% NRW	% Water loss	ℓ/c/d	ILI
Johannesburg	5 054 084	558 916 194	225 204 419	149 596 607	40.29%	26.77%	301	8.3
City of Cape Town	4 677 410	335 498 796	76 911 359	58 113 549	22.92%	17.32%	181	2.6
eThekwini	3 570 797	311 073 884	97 188 131	92 922 189	31.24%	29.87%	239	4.9
City of Tshwane	3 211 261	332 387 892	91 129 188	88 471 775	27.42%	26.62%	271	6.2
City of Ekurhuleni	3 194 088	338 445 271	117 478 608	103 475 428	34.71%	30.57%	285	4.5
Nelson Mandela Bay	1 337 666	107 036 037	43 774 249	41 633 528	40.90%	38.90%	207	8.5
Buffalo City	789 289	62 490 024	21 332 354	13 524 474	34.14%	21.64%	217	2.3
Mangaung	749 802	69 103 990	24 337 427	18 219 490	35.22%	26.37%	253	3.1
Total	**22 584 398**	**2 114 952 088**	**697 355 736**	**565 957 040**	**32.97%**	**26.76%**	**256**	**5.0**

City of Johannesburg is the largest metro based on the population served and the largest municipal water user in the country. City of Cape Town is the best performing metro mainly driven by the extreme drought of the past three years. City of Cape Town has done extremely well to reduce consumption without reverting to intermittent supply.

The litres per capita per day is based on the system input volume divided by the total population and include the industrial and commercial water use. City of Ekurhuleni has the second highest litres per capita per day of the metros but also has the highest number of wet industries.

4.3 MLM perspective

4.3.1 Water balance

Figure 4.2 shows the 2019 water balance for MLM and indicates unit consumption of 309 l/c/d, water losses of 27.4% and NRW of 27.5%. The unit consumption is high because of the inclusion of Sedibeng Breweries that accounts for approximately 20% of the total consumption. The unit consumption reduces to approximately 225 l/c/d if the eight largest users are excluded which, is still below the national average of 233 l/c/d (DWS, 2017). The municipality has managed to reduce the unit consumption over the past 5 years as shown in **Figure 4.5**. The water losses and NRW are both below the national averages.

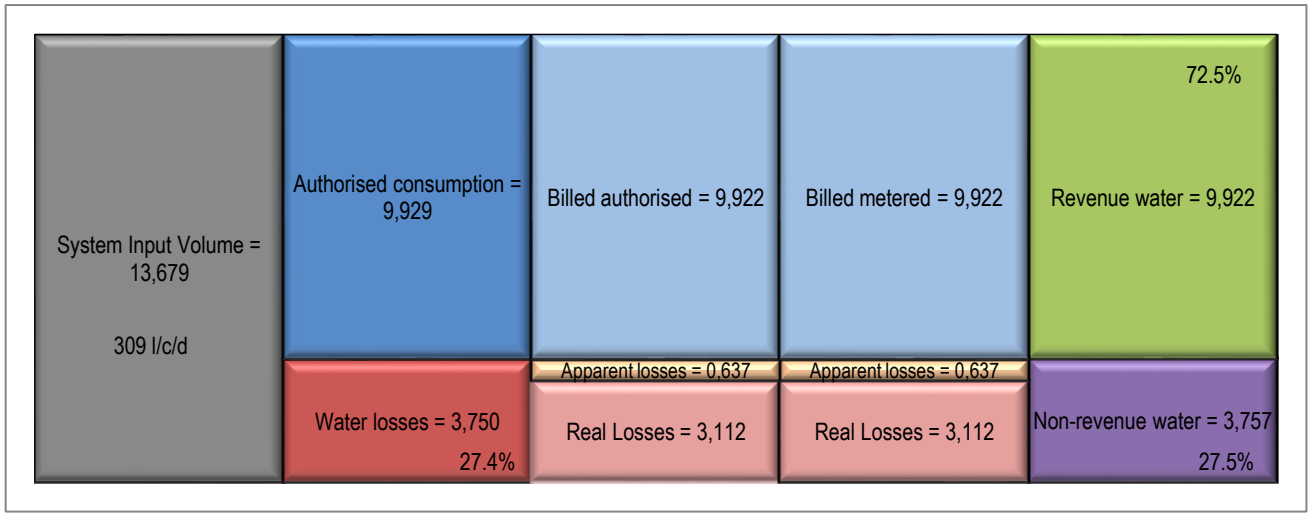


Figure 4.2: NRW water balance (2019)

MLM has, for the past four years, achieved or exceeded the targets set under the IVRS reconciliation strategy as shown in **Figure 4.3** and is well positioned to achieve the 2022 target. The IVRS target is considerably higher than the Rand Water Project 1600 target. **Figure 4.4** and **Figure 4.5** show a steady decline in physical water losses since 2014 and unit consumption over the past few years.

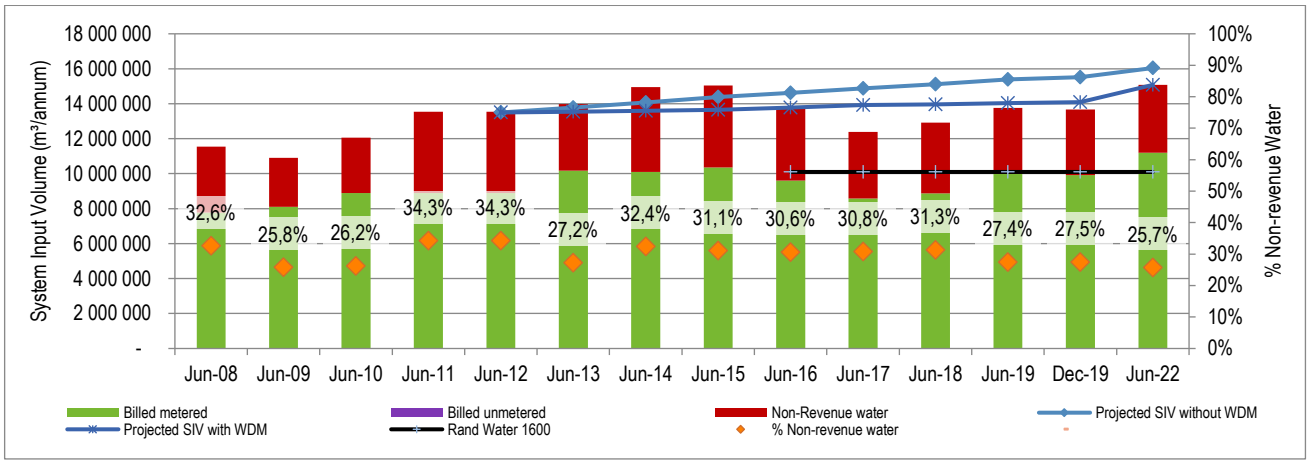


Figure 4.3: NRW water balance trend

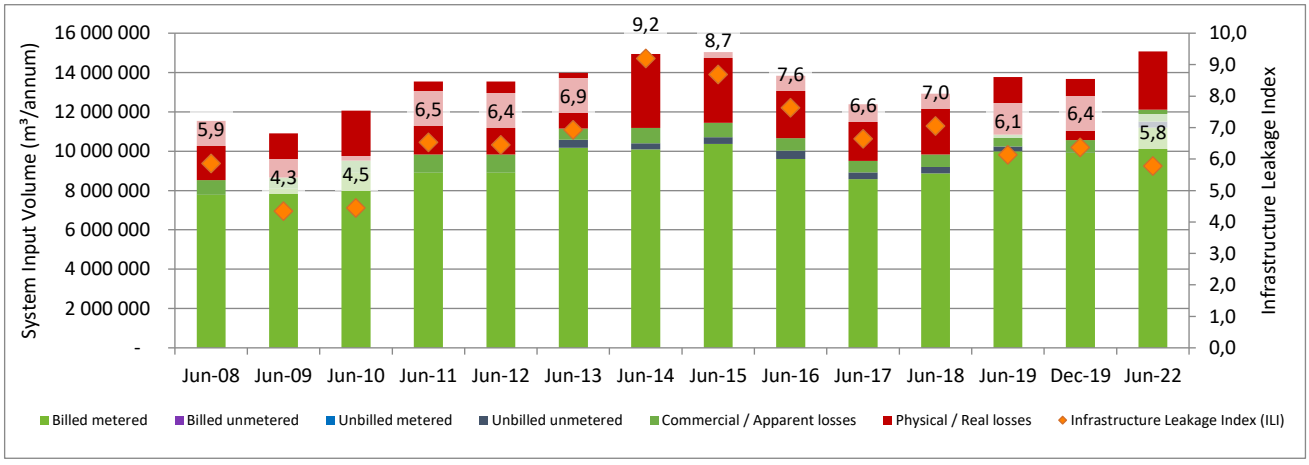


Figure 4.4: Physical water loss trend

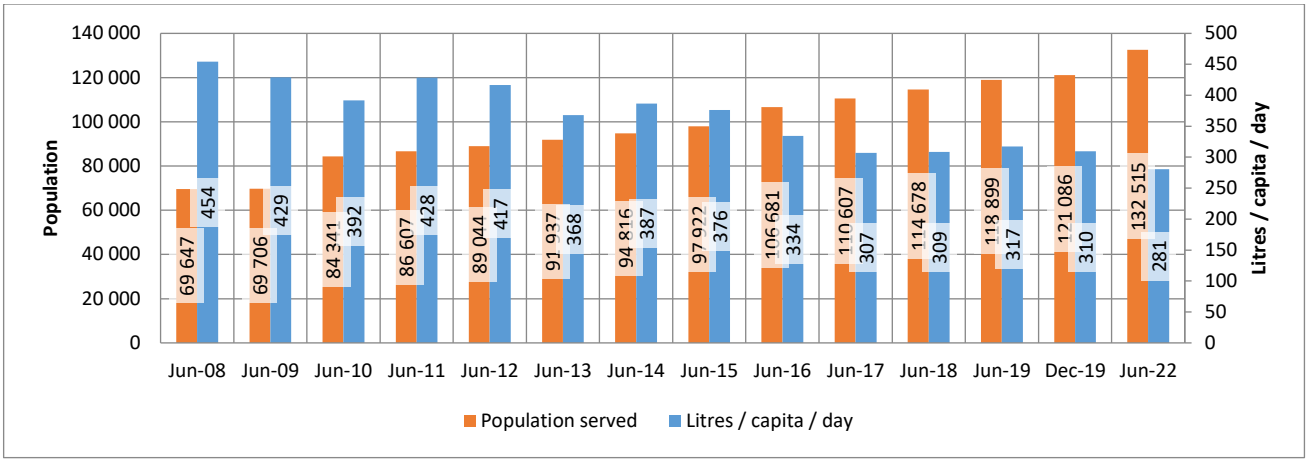


Figure 4.5: Litres per capita per day trend

4.3.2 Water supply cost analysis

Results from the MTREF budget indicate that the municipality operated at a 27% surplus in 2018/19 and plan for an annualised growth of 4.6% in revenue and 6.6% in water expenditure over the next three years. The projections are significantly lower than the 16.5% increase in revenue and 10.7% in expenditure over the past three years. The average selling / production cost ratio is 1.9, which is on par with the average of 1.9 for all large municipalities and suggests good metering, billing and cost recovery for large parts of the municipality supported by a low NRW. The average cost per household per month of R 840 is well above the average of R 347 for large municipalities and implies extensive cross subsidisation and potentially unaffordable water services for paying consumers. Overall, the results indicate that financially the municipality has been doing well and operates sustainably.

Table 4.3: Water supply cost analysis

Description	2015/16	2016/17	2017/18	2018/19	Medium Term Revenue & Expenditure Framework		
	Audited Outcome	Audited Outcome	Audited Outcome	Full Year Forecast	Budget 2019/20	Budget 2020/21	Budget 2021/22
Water Revenue ('000)	161 383	195 361	220 434	255 425	273 317	291 576	292 216
Water Expenditure ('000)	138 140	142 741	149 731	187 391	201 413	214 629	226 994
Surplus / Deficit ('000)	**23 243**	**52 619**	**70 704**	**68 033**	**71 904**	**76 947**	**65 222**
System input volume (m^3/annum)	13 842 674	12 389 557	12 915 967	12 270 169	11 656 660	11 073 827	10 520 136
Billed authorised (m^3/annum)	9 604 062	8 577 362	8 879 379	8 746 188	8 614 995	8 485 771	8 358 484
Average production cost (R/kl)	**R 9.98**	**R 11.52**	**R 11.59**	**R 15.27**	**R 17.28**	**R 19.38**	**R 21.58**
Average selling cost (R/kl)	**R 16.80**	**R 22.78**	**R 24.83**	**R 29.20**	**R 31.73**	**R 34.36**	**R 34.96**
Selling / production cost ratio	**1.7**	**2.0**	**2.1**	**1.9**	**1.8**	**1.8**	**1.6**
Piped Water inside Dwelling	19 461	19 461	19 461	19 850	19 850	19 850	19 850
Piped Water inside Yard	5 376	5 376	5 376	5 484	5 484	5 484	5 484
Using Public Tap	1 467	1 467	1 467	1 496	1 496	1 496	1 496
Other Water Supply	–	–	–	–	–	–	–
Sub-total	**26 304**	**26 304**	**26 304**	**26 830**	**26 830**	**26 830**	**26 830**
Avg cost/household/month	**R 541**	**R 655**	**R 740**	**R 840**	**R 899**	**R 959**	**R 961**

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

4.3.3 Institutional arrangements

The Executive Director: Engineering Services is responsible for WCWDM in the MLM. Most of the functions are performed by the Directorate Technical Support with a team of 17 people. Currently two of the positions are vacant and three are unfunded. There are only four technical staff members in the Directorate with all other staff members performing administrative or clerical duties.

The Directorate Technical Support works closely with the Directorate Water and Sanitation, which is responsible for the day-to-day operations and maintenance of the water distribution network and wastewater treatment plants. The Directorate Technical Support also works closely with the Finance Department, which is responsible for Billing and Revenue, Credit Control, Rates and Tariffs, Budget Control, Valuation, Asset Management, Risk Management and Supply Chain Management. Both these departments have vacant and unfunded positions. The Directorate Water and Sanitation has currently has six vacant positions and nine unfunded positions.

The latest organisational structures are included in Appendix A.

It is recommended that the technical capacity of the Directorate Technical Support be increased to perform WCWDM functions and all vacant and unfunded positions be filled. WCWDM should also be entrenched in all departments to improve efficiency, water loss and NRW.

4.3.4 Existing projects

The operational and capital budgets for 2018/19 are summarised in **Table 4.4**. The municipality is spending 71% of the budget on water purchases from Rand Water. The municipality is spending R 15.975 million (10%) on its water loss reduction programme in 2018/19. The water loss items are marked in blue.

Table 4.4: 2018/19 Operational and capital budgets

Project description	Original Budget Amount	% of budget
Operational Budget		
Connections	R 318 834.00	0.2%
Stores and Materials	R 195 412.00	0.1%
Indigent Relief	R 525 672.00	0.3%
Purchase of Water	R 115 852 934.00	71.2%
Contracted Services	R 2 896 727.00	1.8%
Contracted Services: Master planning	R 215 180.00	0.1%
Buildings, Fences and Sites	R 11 379.00	0.0%
Network / Infrastructure: Bulk Services	R 1 810 862.00	1.1%
Contracted services: Water Loss Programme	R 318 834.00	0.2%
Pump Stations	R 271 297.00	0.2%
Water Meters	R 724 133.00	0.4%
Water Loss Programme	R 1 241 370.00	0.8%
Contracted Services: Water Loss Program	R 2 012 660.00	1.2%
Contracted Services: Water Demand Management	R 380 000.00	0.2%
HIRE Charges	R 200 000.00	0.1%
Total operational budget	**R 126 975 294.00**	78.0%

Project description	Original Budget Amount	% of budget
Capital Budget		
Roller Compactor Wacker	R 45 000.00	0.0%
Re-allocation of Vaal Marina Ring feed	R 150 000.00	0.1%
Water Pipe Installation - W/L Programme	R 500 000.00	0.3%
Telemetry of Water Supply and Distribution	R 600 000.00	0.4%
Bulk Water Meters W/L Programme	R 500 000.00	0.3%
Mamello Bulk Water (MIG)	R 430 000.00	0.3%
Refurbishment / Replacement - Supply Valve	R 1 500 000.00	0.9%
Bulk Water meters	R 2 000 000.00	1.2%
Installation: Domestic w/meters (Lakeside)	R 2 000 000.00	1.2%
Water Meter Replacement Programme	R 1 150 000.00	0.7%
Pressure management infra, pipes ,valves	R 2 500 000.00	1.5%
Aged Bulk Water Pipe Replacement	R 6 850 000.00	4.2%
Sicelo/Highbury (Valley Settlements) Re	R 15 000 000.00	9.2%
Replacement-Prepaid & Conventional Water	R 500 000.00	0.3%
Vehicles Water Demand Management	R 400 000.00	0.2%
PRV 'S W/L Programme	R 500 000.00	0.3%
Reservoir Refurbishment - W/L Programme	R 730 000.00	0.4%
1 Ton Double Cabs	R 400 000.00	0.2%
Total capital budget	**R 35 755 000.00**	**22.0%**
Total capital and operational budget	**R 162 730 294.00**	**100.0%**

5 TARGETS

The following targets have been set by the municipality, in line with the regional and national targets.

Table 5.1: Projection and target KPI summary (m^3/annum)(see Appendix A)

	Actual						Projected					
Year ending	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23	Jun-24	Jun-25
Population served	94 816	97 922	106 681	110 607	114 678	116 972	119 311	121 697	124 131	126 614	129 146	131 729
Households served	32 711	34 537	36 364	39 617	42 105	42 947	43 806	44 682	45 575	46 487	47 417	48 365
Projected SIV without WDM	14 077 512	14 375 468	14 629 161	14 882 854	15 182 440	15 460 687	15 739 613	16 017 777	16 295 941	16 574 105	16 853 031	17 131 195
Projected SIV with WDM	13 595 972	13 653 158	13 786 467	13 919 775	13 956 299	14 037 903	14 120 549	14 202 970	14 285 391	14 367 812	14 450 458	14 532 879
Project 1600				12 134 976	12 134 976	12 134 976	12 134 976	12 134 976	12 134 976	12 134 976	12 134 976	12 134 976
System input volume (SIV)	14 946 866	15 037 482	13 842 674	12 389 557	12 915 967	13 770 363	13 494 956	13 225 057	12 960 555	12 701 344	12 447 317	12 198 371
Billed consumption (BC)	10 098 777	10 365 657	9 604 062	8 577 362	8 879 379	9 991 983	10 052 934	10 114 257	10 175 954	10 238 027	10 300 479	10 363 312
Unbilled consumption (UBC)	310 311	346 283	415 321	340 815	320 406	245 056	235 254	225 844	216 810	208 137	199 812	191 819
Non-revenue water	4 848 089	4 671 825	4 238 612	3 812 195	4 036 588	3 778 380	3 442 022	3 110 800	2 784 602	2 463 317	2 146 838	1 835 059
% Non-revenue water	32.4%	31.1%	30.6%	30.8%	31.3%	27.4%	25.5%	23.5%	21.5%	19.4%	17.2%	15.0%
% Water Losses	30.4%	28.8%	27.6%	28.0%	28.8%	25.7%	23.8%	21.8%	19.8%	17.8%	15.6%	13.5%
Litres / capita / day	387	376	334	307	309	323	310	298	286	275	264	254
% Reduction in SIV required							-2.0%	-2.0%	-2.0%	-2.0%	-2.0%	-2.0%
% Increase in BC required							0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
% Reduction in UBC required							-4.0%	-4.0%	-4.0%	-4.0%	-4.0%	-4.0%
Previous NRW targets	32.4%	29.4%	26.7%	24.3%	22.1%	20.0%						
Revised NRW targets				28.5%	28.5%	26.5%	25.5%	23.5%	21.5%	19.4%	17.2%	15.0%
Over / under target	0.00%	1.70%	3.90%	2.30%	2.80%	0.90%						

The municipality was unable to achieve the targets set in the previous WCWDM strategy and were revised in 2017. The new targets are now set to achieve 15% NRW by 2025.

If the above saving could be achieved, the potential financial benefits are summarised in **Table 5.2.** An 8% annual increase in Rand Water purchase cost and water sales cost was assumed. The municipality stands to gain R 34.2 million over 5 years if escalation is included.

Table 5.2: Nett benefit of reduced purchases and sales

Year ending	Jun-20	Jun-21	Jun-22	Jun-23	Jun -24	Jun-25
Reduction in purchases (m^3/annum)	275 407	269 899	264 501	259 211	254 027	248 946
Rand Water tariff (R/m^3) (increase @8%)	R 10.40	R 11.24	R 12.14	R 13.11	R 14.16	R 15.29
Reduced purchases (R/annum)	R 2 865 589	R 3 032 940	R 3 210 063	R 3 397 531	R 3 595 947	R 3 805 950
A: Cumulative reduced purchases (Rand)	**R 2 865 589**	**R 5 898 529**	**R 9 108 592**	**R 12 506 123**	**R 16 102 070**	**R 19 908 020**
Increase in sales (m^3/annum)	60 951	61 323	61 697	62 073	62 452	62 833
Average selling price (R/m^3)(increase @8%)	R 31.54	R 34.06	R 36.78	R 39.73	R 42.90	R 46.34
Increased income (R/annum)	R 1 922 154	R 2 088 589	R 2 269 436	R 2 465 942	R 2 679 463	R 2 911 472
B: Cumulative increased income (Rand)	**R 1 922 154**	**R 4 010 743**	**R 6 280 179**	**R 8 746 121**	**R 11 425 584**	**R 14 337 056**
A plus B: Nett benefit (Rand)	R 4 787 743	R 9 909 272	R 15 388 771	R 21 252 244	R 27 527 654	R 34 245 076

The matrix shown in **Table 5.3** shows the impact of increasing the billed consumption and reducing the Rand Water purchases. The table does not allow for inflation. A 12% reduction in Rand Water purchases will save the municipality R 15.92 million per annum, while a 3% increase in billed consumption will generate an additional income of R 8.75 million. The combined saving would be R 24.67 million per annum.

Table 5.3: Nett benefit of reduced purchases and sales

Percentage reduction in system input volume	Percentage increase in billed consumption									
		0.0%	0.5%	1.0%	1.5%	2.0%	2.5%	3.0%	3.5%	4.0%
	0.0%	R 0.00	R 1.46	R 2.92	R 4.38	R 5.84	R 7.30	R 8.75	R 10.21	R 11.67
	2.0%	R 2.65	R 4.11	R 5.57	R 7.03	R 8.49	R 9.95	R 11.41	R 12.87	R 14.33
	4.0%	R 5.31	R 6.77	R 8.22	R 9.68	R 11.14	R 12.60	R 14.06	R 15.52	R 16.98
	6.0%	R 7.96	R 9.42	R 10.88	R 12.34	R 13.80	R 15.26	R 16.71	R 18.17	R 19.63
	8.0%	R 10.61	R 12.07	R 13.53	R 14.99	R 16.45	R 17.91	R 19.37	R 20.83	R 22.29
	10.0%	R 13.27	R 14.73	R 16.18	R 17.64	R 19.10	R 20.56	R 22.02	R 23.48	R 24.94
	12.0%	R 15.92	R 17.38	R 18.84	R 20.30	R 21.76	R 23.22	R 24.67	R 26.13	R 27.59
	14.0%	R 18.57	R 20.03	R 21.49	R 22.95	R 24.41	R 25.87	R 27.33	R 28.79	R 30.25
	16.0%	R 21.23	R 22.69	R 24.14	R 25.60	R 27.06	R 28.52	R 29.98	R 31.44	R 32.90

Table 5.4 shows the impact on the water loss key performance indicators. If the system input volume could be reduced by 12% and billed consumption increased by 3% the NRW will reduce to 15% and unit consumption to 284 l/c/d. This will bring the municipality in line with international best practice and one of the best performing municipalities in the country.

Table 5.4: Impact on key performance indicators

% reduction in SIV	SIV (m^3/annum)	% increase in billed consumption	Billed consumption (m^3/annum)	NRW (m^3/annum)	% NRW	l/c/d
0.0%	13 770 363	0.0%	9 991 983	3 778 380	27%	323
2.0%	13 494 956	0.5%	10 041 943	3 453 013	26%	316
4.0%	13 219 548	1.0%	10 091 903	3 127 646	24%	310
6.0%	12 944 141	1.5%	10 141 863	2 802 278	22%	303
8.0%	12 668 734	2.0%	10 191 823	2 476 911	20%	297
10.0%	12 393 327	2.5%	10 241 783	2 151 544	17%	290
12.0%	12 117 919	3.0%	10 291 742	1 826 177	15%	284
14.0%	11 842 512	3.5%	10 341 702	1 500 810	13%	277
16.0%	11 567 105	4.0%	10 391 662	1 175 443	10%	271

6 INTERVENTION PROGRAMME

The proposed interventions would be undertaken over a period of five years with focus on interventions providing the highest return on investment. Interventions will be prioritised according to:

- **Reducing the Rand Water bill** – this will include all interventions that will reduce visible water losses and improve efficiency in areas which lack effective metering, billing and or cost recovery systems.
- **Increasing revenue** – this will include all interventions that will improve revenue collection.

The interventions are split into five pillars and programmes. A number of projects will be identified under each programme. The pillars and programmes are summarised in the following sections.

6.1 Institutional and Local Regulation Pillar

6.1.1 Establishment of a WCWDM Steering Committee

A WCWDM Steering Committee should be established in order to manage and implement this plan. This is essential to obtain the necessary buy-in from all role players through participative, collective decision-making and to monitor the implementation progress.

It is recommended that the HOD: Engineering establishes a Steering Committee in conjunction with the MMC: Engineering Services to promote political buy-in. In addition, this steering committee should include relevant members from other Departments such as finance, customer care, water and sanitation to ensure that WCWDM becomes well entrenched in the institution.

6.1.2 Organisation and Human Resource Plan

The MLM does not have the necessary capacity and skills for the efficient management of the water supply and distribution system as well as what is required to reduce the NRW from 27.4% to 15% over a 5 year period. Filling and funding of the existing vacant and unfunded positions will greatly contribute to the effective operation of the municipality and reducing NRW.

It is recommended that the all the vacant and unfunded positions in the Engineering Services - Technical Support and Engineering Services – Water are filled and funded as a matter of priority. Once the positions are filled and funded, the HOD: Engineering Services should conduct a detail gap analysis with regards to existing capacity and skills available, versus the capacity and skills required to meet these targets. The gap analysis should detail the additional skills and training requirements, affordability and succession planning.

6.1.3 Review and update policies and bylaws

Clear and up to date policies and bylaws are required to guide the implementation and enforcement of WCWDM. Policies and bylaws that need to be reviewed and updated to ensure they are in line with the latest national government policies and promote WCWDM are:

- Metering, billing and credit control policy;
- Consumer meter replacement strategy;
- Municipal bylaws;
- Consumer charter; and
- Indigent policy and register and the requisite registration process.

It is recommended that all policies and bylaws older than five years are reviewed and updated. New policies should be approved by council and the new bylaws promulgated.

6.2 Technical pillar

6.2.1 Calculation and Preparation of Monthly Water Balance

The essential first step in the practical management of NRW, is to calculate the monthly IWA water balances for each distribution area. It is important to prepare a water balance for each distribution area in order to identify problem areas, prioritise budgets and projects, to avoid wasteful expenditure and obtain the quickest return on investment.

It is thus recommended that the HOD: Engineering Services prepare monthly water balances for each water distribution area.

6.2.2 Cathodic Protection of Steel Pipes

Cathodic Protection is a technique used to control the corrosion of a metal pipe surface by making it the cathode of an electrochemical cell, a more easily corroded "sacrificial metal" to act as the anode. The sacrificial metal then corrodes instead of the protected metal. For structures such as long pipelines, where passive galvanic cathodic protection is not adequate, and where stay currents from electric power distribution systems such as power lines and railway lines are present, an external DC electric power source is used on the steel pipeline to neutralise such external induced stray currents. Stray currents from external sources can have a major negative impact on the life expectancy of a steel pipeline.

It is recommended that the HOD Engineering Services appoints a specialist service provider to analyse existing steel pipelines and cathodic protection systems and develop a five year implementation plan.

6.2.3 Pressure Management

Pressure management is a concept whereby the water pressure in a distribution system is reduced and controlled to an optimal point within acceptable volume and pressure standards. The Guidelines for Human Settlement Planning and Design (Red Book) (CSIR) provides the following guidelines:

- Minimum residual pressure house connections = 2.4 bar
- Minimum residual pressure yard and public tap connections = 1.0 bar
- Recommended maximum pressure in a distribution system = 6.0 to 7.0 bar
- Maximum static pressure in a distribution system = 9.0 bar

Advanced water pressure management can also be implemented whereby the water pressure is automatically further reduced during off-peak demand periods. Advanced pressure management has its own challenges, and additional benefits should be weighed up against the costs, skills required, operations and maintenance.

The benefits of pressure management include the reduction of leak flow rates, reduction of burst frequency of water pipes and extension of residual water infrastructure life.

It is recommended that the HOD: Engineering Services appoints a specialist service provider to implement the existing pressure management plan.

6.2.4 Document and Update Asset Register

In order to efficiently manage a water supply and distribution system, the management and operational staff should have access to accurate and clear water supply plans.

The Engineering Department is continuously developing and updating the Information Management Query System (IMQS). The IMQS system is effectively an asset register and GIS system. The system can also be linked to a water modelling system (WADISO) and meter reading, billing analysis system (VENUS) and procedure system for new developments, replacements and upgrading of the water system (IMaS).

It is recommended that the HOD: Engineering Services ensures that the IMQS system and associated systems are continuously updated.

6.2.5 Bulk meter and Sectorisation

Sectorisation of a municipal water distribution is a concept and process whereby the distribution network is divided into smaller supply and distribution areas. This is required in order to separate distribution areas because of the topography, assist in identifying areas with high water losses and to prioritise projects within a water loss reduction programme.

The installation and maintenance of valves within a water supply and distribution system is crucial for the efficient management of such a system. In the past, it was common to install anti-clock wise closing valves. Later on, the same municipalities converted to clockwise closing valves. Unfortunately, especially with the demarcation of Local Government and changing of boundaries, most municipalities have ended up with systems where both anti-clockwise and clockwise valves are present in their water systems. Should these valves not be marked clearly, operations and maintenance staff open valves with the understanding that they are closing valves and vice versa. This obviously can cause havoc in the operations and maintenance of water systems. Many water systems capacity has reduced drastically because of this confusion, whereby many system valves are closed that should be open and vice versa.

It is recommended that the HOD Engineering appoints a specialist service provider to analyse the water supply and distribution network and implement a sectorisation plan. The implementation plan should be combined with a valve audit and replacement programme.

6.2.6 Asset Management Replacement Programme

It is estimated that replacement value of the MLM's water supply and distribution network is R900 million. Some of the infrastructure has reached or surpassed its life expectancy, which is affecting service delivery and contributing to water losses. Preventative maintenance, retrofitting and upgrading of infrastructure will assist in increasing the life expectancy of the water infrastructure.

It is recommended that the HOD: Engineering Services develops an Asset Management replacement programme that will inform the annual budgeting process. This programme should run parallel with the master planning programme.

6.2.7 Timeous Leak Detection & Repairs

The Department of Human Settlements, Water and Sanitation has encouraged Municipalities to declare War on Leaks. It is estimated that at least 30% of a municipality's water losses is attributed to leaking network pipes, pipe bursts, leaking stand connection pipes, leaking reservoirs and overflowing of reservoirs.

It is thus important that municipal maintenance teams are well equipped and alert to immediately address these problems, and have such wastage of water addressed within 24 hours or preferably even less.

The following aspects should be taken into consideration in preparing a War on Leaks Programme:

- An Informed public;
- Dedicated, well trained and equipped committed maintenance teams;
- Efficient Call Centre and system (generation and allocation of job cards, dispatch, reporting and control);
- Good communication between stakeholders;
- Service delivery charter (all leaks, wastage of water systems to be fixed within acceptable time frames); and
- Record keeping and analysis of identified problematic areas.

The cost for purchasing, operating and maintaining leak detection equipment and systems is very expensive and dedicated trained staff needs to be employed to perform such investigations. It may be cost effective for large municipalities such as metros to put together a leak detection section, but it is more cost effective for smaller municipalities such as MLM to outsource such function.

It is recommended that a three-year annual leak detection and repair contract be rolled-out to assist the Engineering Department to detect and repair leaks when required.

It is recommended that the HOD: Engineering Services develops a War on Leaks programme for immediate implementation.

6.2.8 Telemetry of Water Supply and Distribution Systems

Telemetry can be defined as a system whereby important information such as reservoir water levels, pressures, flows, pump activation is logged in order to have accurate information on the functioning and performance of a water supply and distribution network.

MLM covers a very large area and with limited water staff. It is very difficult to manage and operate the water distribution network without an efficient telemetry system. Water is lost because of protracted response times to overflowing reservoirs and burst pipes.

It is recommended that the HOD: Engineering Services implements a cost effective telemetry system to monitor the water supply and distribution system of MLM.

6.2.9 Master Planning of Water System

A Master Plan for a Water System takes into consideration, the existing water system and through predictive modelling, develops a 20 to 25 year water supply and distribution system. It is a planning tool especially in preparing a long-term investment plan, future capacity plan and an upgrading plan.

With regards to NRW reduction, the more successful a water service provider is in reducing its NRW, the more it can save in terms of provision capacity and capital investment in extending its water system. MLM has developed a "Computer Model Analysis and Master Planning of Water System-Summary Report, December 2012."

The project entailed the establishment of computer models for all the water networks in MLM, the linking of these models to the stand and water meter database of the Finance Departments financial system, and evaluation and master planning of the water networks, and the posting of all information to the IMaS viewer. There is a separate report for each of the 25 distribution zones, addressing both the bulk and the distribution network aspects of each area's water system. This should then also be linked to each distribution zones water balance.

It is recommended that the HOD: Engineering Services ensures that the outcomes and capacity siting from this study be utilized strictly during upgrading and replacement of water infrastructure in MLM and that the master plan be updated at least every two years.

6.3 Financial pillar

6.3.1 Consumer Meter Management Plan

The Water Services Department of a municipality has the responsibility to generate income from the water produced/ purchased and distributed to its customers in terms of the Municipal Systems Act and Municipal Finance Management Act. In order to meet the legislative requirement, the Engineering and Finance Departments are responsible for the accurate metering, billing and revenue collection system.

The Water Services Division of a Municipality therefore needs to install and maintain water meters with the objective of reducing apparent or commercial losses. Commercial losses include the following:

- Unauthorised water use and illegal connections;
- Customer meter inaccuracies;
- Wrong sizing of meters;
- Wrong meter readings;
- Connections not metered;
- Connections metered but meters not visible; and
- Connection metered but not read and billed.

It is recommended that the HOD: Engineering Services prepare a meter management plan, which should at least include the following and be implemented over the five-year period:

- *Meter replacement policy and programme;*
- *Plan to meter unmetered areas;*
- *Plan to meter informal settlements;*
- *Procedure for the correct sizing of meters for customers other than residential stands/consumers;*
- *Audit plan for all meter installations larger than 15mm; and*
- *Accurate metering of council properties.*

6.3.2 Consumer Data Base Audit

It is estimated that unbilled authorised water consumption makes up 2,0% of the MLM NRW. In most cases, this is caused by the anomaly between the actual meter information of the meter/s installed on a property and the information on the Venus billing system. This anomaly also causes inaccurate billing and consumer dissatisfaction.

It is recommended that the HOD: Engineering Services and the Chief Financial Officer initiate a meter database and site audit as explained above and that such audit be executed within the first two years of the five year programme.

6.3.3 Indigent Leak Repair Programme and Retro Fitting of Toilet Plumbing

A preliminary desktop study revealed that indigents are consuming on average more than 40 kl per household per month with some households that consume more than 200 kl/month. It was found that most of the consumption was wasted and ends up in the sewer system, because of malfunctioning toilet systems. These consumers are expected to make use of the 6 kl/month free basic water supply.

It is recommended that approval be obtained from Council that the Engineering Services Department be authorised to repair leaks and retrofitting of toilet plumbing together with education of consumers at indigent households and other households where specific conditions apply.

6.3.4 Tariff review

Cost effective water and sanitation tariffs should be developed that comply with the requirements of Notice 1153 of 2015 - *Revised Norms and Standards in Respect of Tariffs for Water Services* in terms of Section 10 (1) of the Water Services Act (Act no. 108 of 1997) as published in the Government Gazette, 13 November 2015. Water utilities should ensure water services are provided in an efficient, equitable and sustainable manner, which is sufficient for subsistence and sustainable economic activity.

It is recommended that the HOD: Engineering Services and the Chief Financial Officer initiate a project to ensure water tariffs are reviewed in terms of the Norms and Standards on a 3 year cycle. It is also recommended that the indigent register be reviewed to ensure that all consumers that can pay for service, start to pay for the water services provided.

6.4 Social pillar

6.4.1 Community Awareness programme

Community awareness plays an integral part of any WDM project. The community can save water through the reporting of leaks, fixing household plumbing and using water efficiently in the home and garden. Community awareness could be undertaken through outreach activities and schools awareness campaigns. Outreach activities are usually undertaken at public gatherings such as clinics, sport events, shopping centres and public meetings. The political leadership of the WSA should participate in all awareness activities and lead by example. Community awareness programmes should be supported by proper training and awareness material such as brochures, T-shirts, fridge magnets, licence disk holders, water bottles, etc. to strengthen consumer participation in ensuring efficient water use and in looking after the water infrastructure installed eg. distribution pipes, meters (conventional and prepaid), valves etc.

It is recommended that the HOD: Engineering Services initiates project specific awareness programmes to create opportunities to inform, consult, involve, collaborate and empower the local community. Involving the community create support, upliftment, empowerment, economic and socio economic growth and ultimate sustainability of the programme.

6.4.2 Schools awareness programme

There are 29 schools in Midvaal with 18 272 learners and 719 educators. Eleven of these schools are no fee schools, which typically mean income is limited and leakage levels are high.

It is recommended that the HOD: Engineering Services initiates a schools awareness campaign. Schools awareness programmes should focus on the management teams, teachers and caretakers of the schools to create momentum, awareness and sustainability. Once the management teams, teachers and caretakers are on board, they can involve the learners and include WCWDM in the curriculum. The learners can then promote and implement the awareness campaign at school, at home and in the greater community to the benefit of the catchment and country.

7 FINANCIAL IMPLICATIONS AND BUDGET

The total estimated cost for implementation of a comprehensive WCWDM programme amounts to approximately R 130.17 million**.** The total amount is split between OPEX and CAPEX as shown in **Table 7.1.**

Table 7.1: NRW reduction budget

Year	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	Total	Budget
Institutional and Local Regulation Pillar	R 0	R 3 000 000	R 3 200 000	R 3 000 000	R 3 000 000	R 3 200 000	R 3 000 000	R 18 400 000	
Establishment of a WCWDM Steering Committee	R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0	OPEX
Organisation and Human Resource Plan	R 0	R 3 000 000	R 3 000 000	R 3 000 000	R 3 000 000	R 3 000 000	R 3 000 000	R 18 000 000	OPEX
Review and update policies and bylaws	R 0	R 0	R 200 000	R 0	R 0	R 200 000	R 0	R 400 000	CAPEX
Technical pillar	R 5 900 000	R 9 540 000	R 10 310 000	R 11 330 000	R 12 300 000	R 12 300 000	R 12 300 000	R 74 380 000	
Calculation and Preparation of Monthly Water Balance	R 100 000	R 140 000	R 150 000	R 160 000	R 170 000	R 170 000	R 170 000	R 1 060 000	OPEX
Cathodic Protection of Steel Pipes	R 0	R 800 000	R 700 000	R 800 000	R 900 000	R 900 000	R 900 000	R 5 000 000	CAPEX
	R 0	R 220 000	R 220 000	R 220 000	R 220 000	R 220 000	R 220 000	R 1 320 000	OPEX
Pressure Management	R 200 000	R 500 000	R 600 000	R 700 000	R 800 000	R 800 000	R 800 000	R 4 400 000	CAPEX
	R 0	R 300 000	R 300 000	R 300 000	R 300 000	R 300 000	R 300 000	R 2 200 000	OPEX
Document and Update Asset Register	R 0	R 50 000	R 60 000	R 70 000	R 80 000	R 80 000	R 80 000	R 420 000	OPEX
Bulk meter and Sectorisation	R 200 000	R 200 000	R 250 000	R 300 000	R 350 000	R 350 000	R 350 000	R 2 000 000	CAPEX
Valve audit	R 0	R 200 000	R 250 000	R 250 000	R 300 000	R 300 000	R 300 000	R 1 600 000	CAPEX
Asset Management Replacement Programme	R 4 400 000	R 5 000 000	R 5 500 000	R 6 000 000	R 6 500 000	R 6 500 000	R 6 500 000	R 40 400 000	CAPEX
Timeous Leak Detection & Repairs	R 500 000	R 550 000	R 600 000	R 650 000	R 700 000	R 700 000	R 700 000	R 4 400 000	OPEX
Telemetry of Water Supply and Distribution Systems	R 0	R 500 000	R 500 000	R 600 000	R 600 000	R 600 000	R 600 000	R 3 400 000	CAPEX
		R 280 000	R 280 000	R 280 000	R 280 000	R 280 000	R 280 000	R 1 680 000	OPEX
Master Planning of Water System	R 500 000	R 800 000	R 900 000	R 1 000 000	R 1 100 000	R 1 100 000	R 1 100 000	R 6 500 000	CAPEX
Financial pillar	R 4 040 000	R 4 360 000	R 4 180 000	R 4 200 000	R 4 470 000	R 4 220 000	R 4 220 000	R 29 690 000	
War on Leaks	R 300 000	R 320 000	R 340 000	R 360 000	R 380 000	R 380 000	R 380 000	R 2 460 000	OPEX
Consumer Meter Management Plan	R 3 500 000	R 3 500 000	R 3 500 000	R 3 500 000	R 3 500 000	R 3 500 000	R 3 500 000	R 24 500 000	CAPEX
Consumer Data Base Audit	R 140 000	R 140 000	R 140 000	R 140 000	R 140 000	R 140 000	R 140 000	R 980 000	CAPEX
Indigent Leak Repair Programme and Retro Fitting of Toilet Plumbing	R 100 000	R 150 000	R 200 000	R 200 000	R 200 000	R 200 000	R 200 000	R 1 250 000	CAPEX
Tariff review	R 0	R 250 000	R 0	R 0	R 250 000	R 0	R 0	R 500 000	CAPEX

Year	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	Total	Budget
Social pillar	R 1 100 000	R 1 100 000	R 1 100 000	R 1 100 000	R 1 100 000	R 1 100 000	R 1 100 000	R 7 700 000	
Schools awareness programme	R 300 000	R 300 000	R 300 000	R 300 000	R 300 000	R 300 000	R 300 000	R 2 100 000	CAPEX
Community Awareness programme	R 800 000	R 800 000	R 800 000	R 800 000	R 800 000	R 800 000	R 800 000	R 5 600 000	CAPEX
Total	**R 11 040 000**	**R 18 000 000**	**R 18 790 000**	**R 19 630 000**	**R 20 870 000**	**R 20 820 000**	**R 20 620 000**	**R 130 170 000**	
CAPEX	R 10 140 000	R 13 140 000	R 13 840 000	R 14 590 000	R 15 740 000	R 15 690 000	R 15 490 000	R 98 630 000	
OPEX	R 900 000	R 4 860 000	R 4 950 000	R 5 040 000	R 5 130 000	R 5 130 000	R 5 130 000	R 31 140 000	

The budget allocation is inline with the current budget.

Source of funding:

CAPEX

VOTE NUMBER	SECTION	SOURCE OF FUNDING	PROJECT DESCRIPTION	2020-2021
12056444420F5H22ZZWM	Water Network	Capital Operational Revenue	Reservior refurbishment - w/l programme	500 000
12056444420FNJ44ZZWM	Water Network	Water Service Infrastructure Grant	Aged bulk water pipe replacement	10 325 000
12056444420FNJ45ZZWM	Water Network	Water Service Infrastructure Grant	Refurbishment/replacement-supply valves	1 000 000
12056444420FNJ47ZZWM	Water Network	Water Service Infrastructure Grant	Pressure management infrastructure	1 000 000
12056444420FPH87ZZWM	Water Network	External Loans	Pre-paid water meter project	2 000 000

12056444420FPH88ZZWM	Water Network	External Loans	Replacement-prepaid&conventional water m	1 000 000
12056444420FPH89ZZ02	Water Network	External Loans	Rissiville water network (new)	4 500 000
12056446020F5D89ZZWM	Water Network	Capital Operational Revenue	Water meter replacement programme	700 000

OPEX

Contracted Services:Water Demand Management	12052265130F9P15ZZWM	4 369 550,00
Contracted Services:Water Loss Programm	**12052265130F9P16ZZWM**	2 208 391,00
Indigent Leaks Repairs Project (WSIG)	**12052265120WSQ43ZZWM**	1 500 000,00

8 CONCLUSIONS

- The analysis of the MLM water supply system indicates water losses, inefficiencies and NRW figures below the national averages. There is scope for improvement to bring the MLM in line with international best practice;
- The Rand Water target is unrealistically low and should be further investigated. A realistic target would be if the municipality could reduce the average consumption of the past five years by 10% over the next 5 years;
- The current demand is exceeding average supply for the past five years and the MLM needs to reduce its current consumption by 10% over the next 5 years;
- Most bulk meters are working and the municipality is preparing a water balance on a monthly basis;
- The water supply from Rand Water decreased by 1.1% per annum while the cost increased by 10% per annum over the past five years.
- Approximately R 20 million/annum is required for the next five years to improve the NRW, water losses and inefficiencies in the MLM. An estimated R 25 million m^3/annum, excluding escalation, could be saved through reduced bulk water purchases from Rand Water and increased water accounted for through water metering.

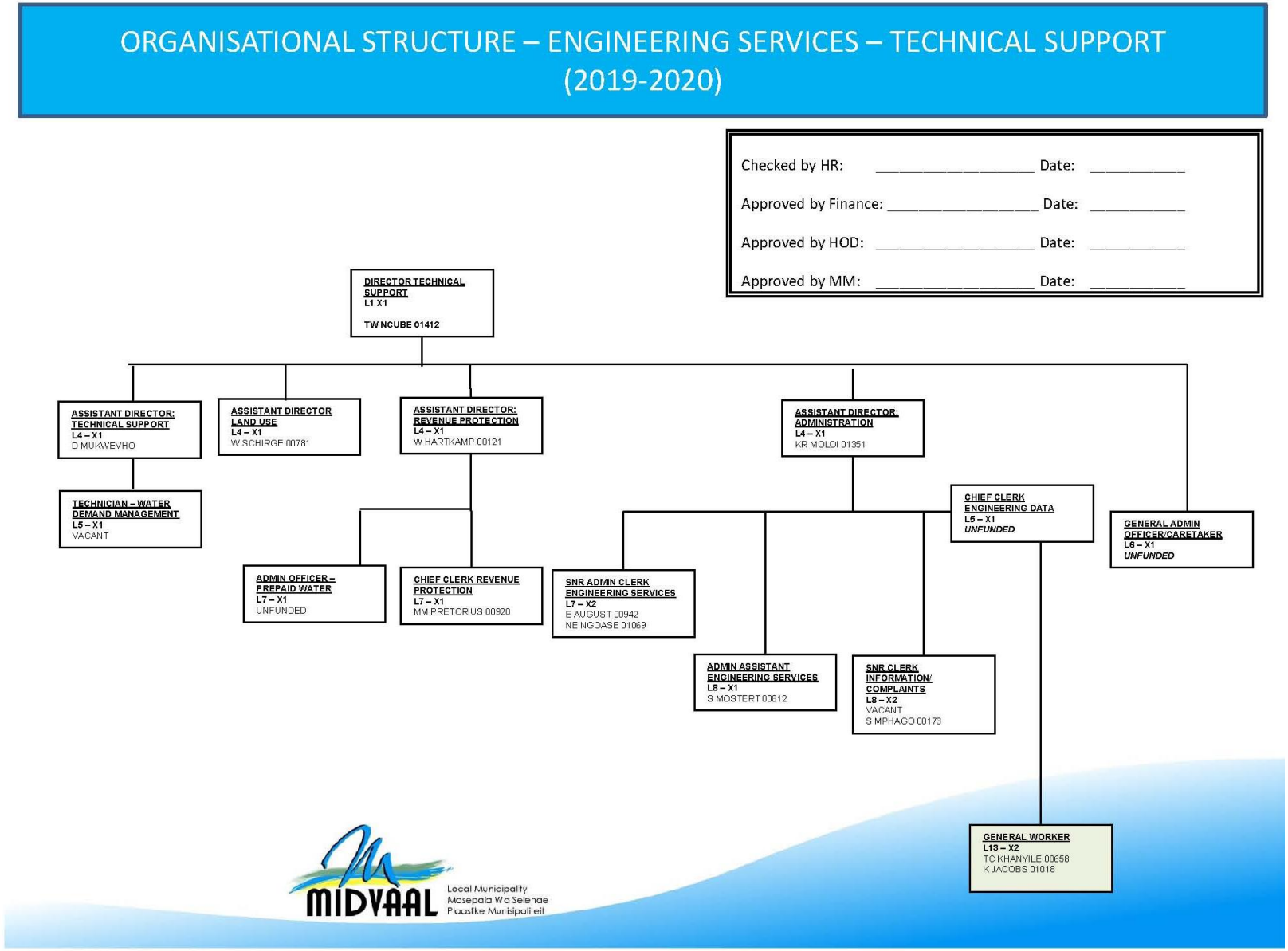
9 RECOMMENDATIONS

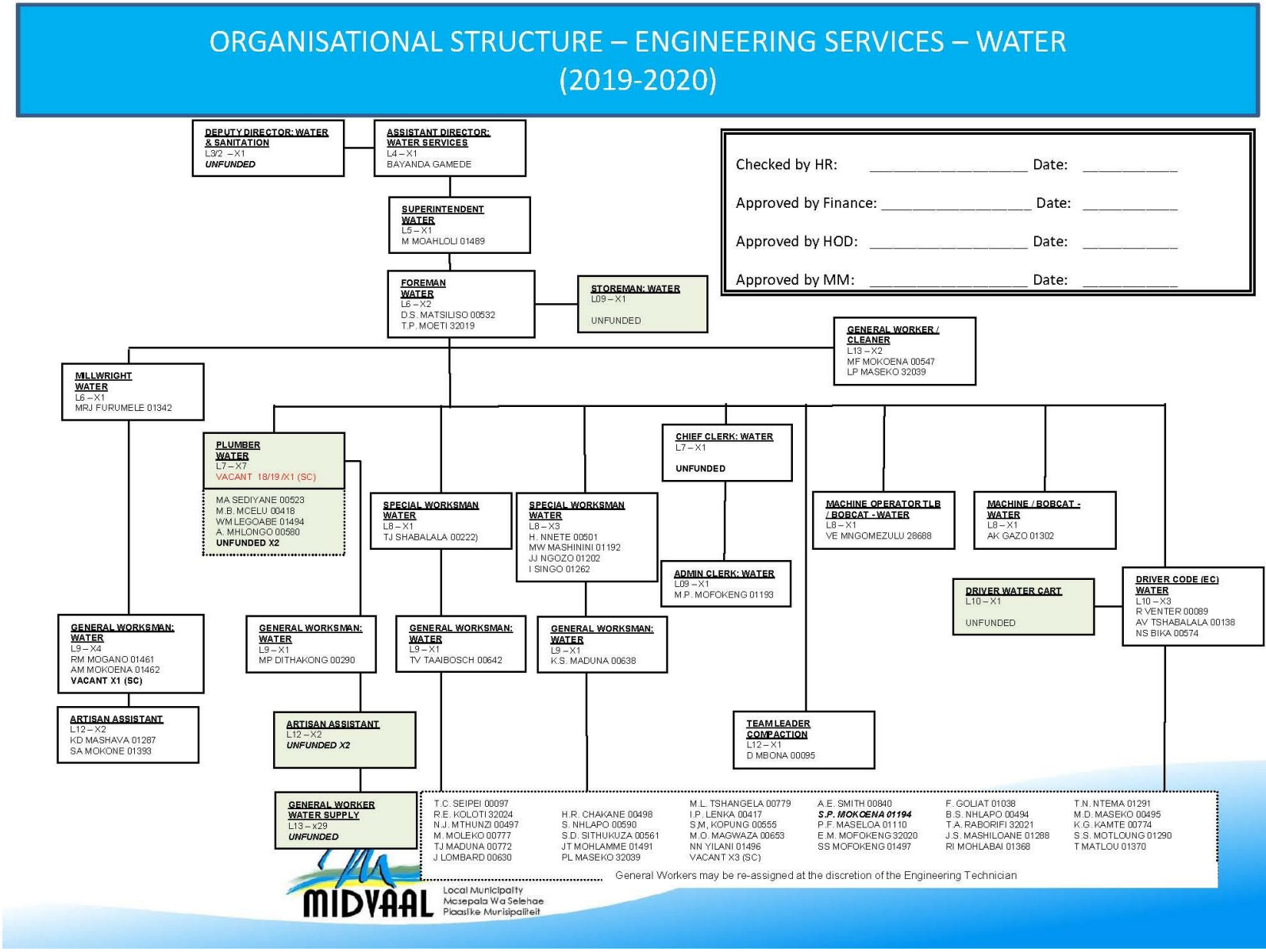
It is recommended that the WCWDM interventions identified are implemented and the targets are achieved as a matter of priority. The WCWDM strategy and business plan will focus on the enhancement of long-term water security and protection, climate change adaptation and catchment resilience through the reduction of water losses, NRW and the improvement of water use efficiency over a five-year period.

Appendix A - Table 5.1: Projection and target KPI summary (m^3/annum)

	Actual						Projected					
Year ending	Jun-14	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23	Jun-24	Jun-25
Population served	94 816	97 922	106 681	110 607	114 678	116 972	119 311	121 697	124 131	126 614	129 146	131 729
Households served	32 711	34 537	36 364	39 617	42 105	42 947	43 806	44 682	45 575	46 487	47 417	48 365
Projected SIV without WDM	14 077 512	14 375 468	14 629 161	14 882 854	15 182 440	15 460 687	15 739 613	16 017 777	16 295 941	16 574 105	16 853 031	17 131 195
Projected SIV with WDM	13 595 972	13 653 158	13 786 467	13 919 775	13 956 299	14 037 903	14 120 549	14 202 970	14 285 391	14 367 812	14 450 458	14 532 879
Project 1600				12 134 976	12 134 976	12 134 976	12 134 976	12 134 976	12 134 976	12 134 976	12 134 976	12 134 976
System input volume (SIV)	14 946 866	15 037 482	13 842 674	12 389 557	12 915 967	13 770 363	13 494 956	13 225 057	12 960 555	12 701 344	12 447 317	12 198 371
Billed consumption (BC)	10 098 777	10 365 657	9 604 062	8 577 362	8 879 379	9 991 983	10 052 934	10 114 257	10 175 954	10 238 027	10 300 479	10 363 312
Unbilled consumption (UBC)	310 311	346 283	415 321	340 815	320 406	245 056	235 254	225 844	216 810	208 137	199 812	191 819
Non-revenue water	4 848 089	4 671 825	4 238 612	3 812 195	4 036 588	3 778 380	3 442 022	3 110 800	2 784 602	2 463 317	2 146 838	1 835 059
% Non-revenue water	32.4%	31.1%	30.6%	30.8%	31.3%	27.4%	25.5%	23.5%	21.5%	19.4%	17.2%	15.0%
% Water Losses	30.4%	28.8%	27.6%	28.0%	28.8%	25.7%	23.8%	21.8%	19.8%	17.8%	15.6%	13.5%
Litres / capita / day	387	376	334	307	309	323	310	298	286	275	264	254
% Reduction in SIV required							-2.0%	-2.0%	-2.0%	-2.0%	-2.0%	-2.0%
% Increase in BC required							0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
% Reduction in UBC required							-4.0%	-4.0%	-4.0%	-4.0%	-4.0%	-4.0%
Previous strategy NRW targets	32.4%	29.4%	26.7%	24.3%	22.1%	20.0%						
Revised NRW targets				28.5%	28.5%	26.5%	25.5%	23.5%	21.5%	19.4%	17.2%	15.0%

Appendix B: Organisational structures




ORGANISATIONAL STRUCTURE – ENGINEERING SERVICES – WATER
(2019-2020)
DEPUTY DIRECTOR: WATER & SANITATION
L3/2 – X1
UNFUNDED
ASSISTANT DIRECTOR: WATER SERVICES
L4 – X1
BAYANDA GAMEDE
Checked by HR: _____ Date: _____
Approved by Finance: _____ Date: _____
Approved by HOD: _____ Date: _____
Approved by MM: _____ Date: _____
SUPERINTENDENT WATER
L5 – X1
M MOAHLOLI 01489
FOREMAN WATER
L6 – X2
D.S. MATSILISO 00532
T.P. MOETI 32019
STOREMAN: WATER
L09 – X1
UNFUNDED
GENERAL WORKER / CLEANER
L13 – X2
MF MOKOENA 00547
LP MASEKO 32039
MILLWRIGHT WATER
L6 – X1
MRJ FURUMELE 01342
PLUMBER WATER
L7 – X7
VACANT 18/19 /X1 (SC)
MA SEDIYANE 00523
M.B. MCELU 00418
WM LEGOABE 01494
A. MHLONGO 00580
UNFUNDED X2
SPECIAL WORKSMAN WATER
L8 – X1
TJ SHABALALA 00222)
SPECIAL WORKSMAN WATER
L8 – X3
H. NNETE 00501
MW MASHININI 01192
JJ NGOZO 01202
I SINGO 01262
CHIEF CLERK: WATER
L7 – X1
UNFUNDED
ADMIN CLERK: WATER
L09 – X1
M.P. MOFOKENG 01193
MACHINE OPERATOR TLB / BOBCAT - WATER
L8 – X1
VE MNGOMEZULU 28688
MACHINE / BOBCAT - WATER
L8 – X1
AK GAZO 01302
DRIVER WATER CART
L10 – X1
UNFUNDED
DRIVER CODE (EC) WATER
L10 – X3
R VENTER 00089
AV TSHABALALA 00138
NS BIKA 00574
GENERAL WORKSMAN: WATER
L9 – X4
RM MOGANO 01461
AM MOKOENA 01462
VACANT X1 (SC)
GENERAL WORKSMAN: WATER
L9 – X1
MP DITHAKONG 00290
GENERAL WORKSMAN: WATER
L9 – X1
TV TAAIBOSCH 00642
GENERAL WORKSMAN: WATER
L9 – X1
K.S. MADUNA 00638
ARTISAN ASSISTANT
L12 – X2
KD MASHAVA 01287
SA MOKONE 01393
ARTISAN ASSISTANT
L12 – X2
UNFUNDED X2
TEAM LEADER COMPACTION
L12 – X1
D MBONA 00095
GENERAL WORKER WATER SUPPLY
L13 – X29
UNFUNDED
T.C. SEIPEI 00097
R.E. KOLOTI 32024
N.J. MTHUNZI 00497
M. MOLEKO 00777
TJ MADUNA 00772
J LOMBARD 00630
H.R. CHAKANE 00498
S. NHLAPO 00590
S.D. SITHUKUZA 00561
JT MOHLAMME 01491
PL MASEKO 32039
M.L. TSHANGELA 00779
I.P. LENKA 00417
S.M. KOPUNG 00555
M.O. MAGWAZA 00653
NN YILANI 01496
VACANT X3 (SC)
A.E. SMITH 00840
S.P. MOKOENA 01194
P.F. MASELOA 01110
E.M. MOFOKENG 32020
SS MOFOKENG 01497
F. GOLIAT 01038
B.S. NHLAPO 00494
T.A. RABORIFI 32021
J.S. MASHILOANE 01288
RI MOHLABAI 01368
T.N. NTEMA 01291
M.D. MASEKO 00495
K.G. KAMTE 00774
S.S. MOTLOUNG 01290
T MATLOU 01370
General Workers may be re-assigned at the discretion of the Engineering Technician
MIDVAAL
Local Municipality
Masepala Wa Selehae
Plaaslike Munisipaliteit