UNIVERSAL ACCESS PLAN PHASE III – PROGRESSIVE DEVELOPMENT OF A REGIONAL CONCEPT SECONDARY BULK WATER MASTER PLAN FOR THE UMGUNGUNDLOVU DISTRICT MUNICIPALITY

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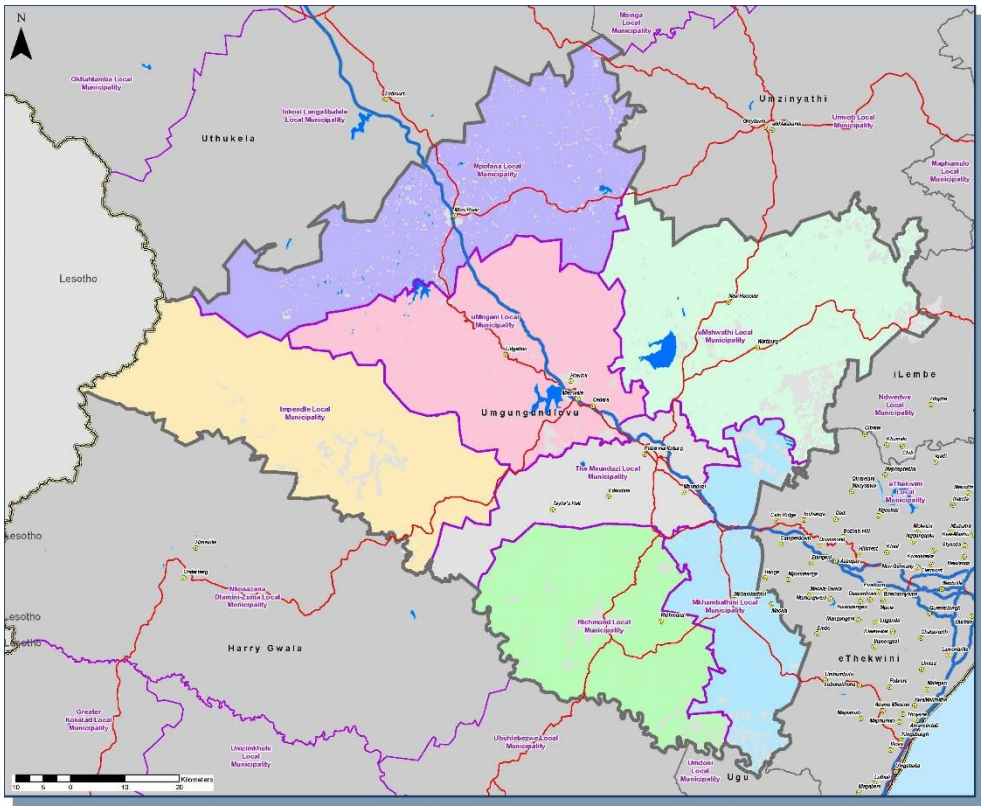

Reconnaissance Report

January 2021

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EXECUTIVE SUMMARY

A. Introduction

Phase III follows on the Phase II study for the Development of a Universal Access Plan (UAP) for Water Supply in the KwaZulu-Natal Province which was completed in June 2016 by various Professional Service Providers (PSP's) that were appointed by Umgeni Water.

The deliverables for UAP Phase II were divided in two phases where Phase 1 included the information review and development of a High Level Status Quo Assessment and Phase 2 included the development of a demand model and needs development plan, culminating in a Reconnaissance Study Report for each Water Services Authority (WSA) on bulk water supply. Water Supply Intervention Areas (WSIAs) were identified during UAP Phase II and were based on areas that could be served either by existing schemes or through planned scheme developments (planned projects).

However, the level of detail within the final outcome of UAP Phase II varied between the various PSP's and the magnitude of the cost requirement resulted in Umgeni Water to revisit the process and the need for UAP Phase III was initiated. The main objective of Phase III will be to further develop the conceptual bulk water master plan that would clearly distinguish between primary and secondary bulk water supply systems.

B. Demographics

The Umgungundlovu District Municipality (UMDM) is located in the south-western region of the Kwazulu-Natal Province in South Africa. The UMDM and consists of the following Local Municipalities:

- ✓ uMshwathi Local Municipality (KZN221);
- ✓ uMngeni Local Municipality (KZN222);
- ✓ Mpofana Local Municipality (KZN223);
- ✓ Impendle Local Municipality (KZN224);
- ✓ Msunduzi Local Municipality (KZN225);
- ✓ Mkhambathini Local Municipality (KZN226); and
- ✓ Richmond Local Municipality (KZN227).

Msunduzi Local Municipality is its own WSA and is covered in a separate UAP Phase III study to UMDM.

UMDM recorded a total population of 1 142 862 and 315 383 households, resulting in an average of 3.62 persons per household.

Table B-1: UMDM Population and Households per Local Municipalities

LM Name	No of Households	No of Population	People per Household
The Msunduzi Local Municipality	191 054	708 496	3.71
uMshwathi Local Municipality	30 606	116 112	3.79
uMngeni Local Municipality	40 134	115 253	2.87
Richmond Local Municipality	18 416	74 361	4.04
Mkhambathini Local Municipality	16 338	59 229	3.63
Mpofana Local Municipality	11 404	38 917	3.41
Impendle Local Municipality	7 431	30 494	4.10
Umgungundlovu DM	**315 383**	**1 142 862**	**3.62**

Source: DWS Reference Framework, April 2019

Population growth was determined until 2050 that resulted in the projected number of people residing within UMDM will be approximately 685 000 people. The projected population per Municipality is tabled within **Table B-2** below.

Table B-2: Project Population per Local Municipality until 2050

Municipality	DWS RF Pop 2019	Population						
		2020	2025	2030	2035	2040	2045	2050
uMshwathi	116 112	129 892	137 828	147 298	157 045	167 437	178 516	190 329
uMngeni	115 253	112 664	119 548	127 762	136 216	145 229	154 839	165 085
Richmond	74 361	80 482	85 400	91 267	97 306	103 745	110 610	117 930
Mkhambathini	59 229	66 214	70 260	75 088	80 056	85 354	91 002	97 023
Mpofana	38 917	41 968	44 532	47 592	50 741	54 098	57 678	61 495
Impendle	30 494	35 586	37 760	40 355	43 025	45 872	48 908	52 144
Total	**434 366**	**466 806**	**495 328**	**529 362**	**564 389**	**601 735**	**641 553**	**684 006**

C. Service Levels

C.1 Water

The main source for 45% of households within UMDM is piped (tap) water inside the yard of households and 36% of households is piped (tap) water inside the dwelling/house. The UMDM exhibits a water backlog of approximately 20%.

C.2 Sanitation

Approximately 40% of households within UMDM use a flush toilet connected to a public sewerage system. The current sanitation backlog within UMDM is at approximately 24%.

D. Water Resources

The UMDM area is served by many different water resources. The Mooi and Mngeni River systems are the most important resources for a large proportion of the population. Other significant river systems are the uMkomazi, Lovu, and Mvoti, as well as some of their tributaries. Groundwater also plays an important role in the district, with rural villages, and large tracts of farmland being served via boreholes.

UMDM is supplied via the Upper Mngeni Water Supply System. The current demand off the Upper Mgeni System is approximately 304.56Mℓ/day (14% for uMgungundlovu DM, 58% for Msunduzi, and 28% for eThekwini). With the completion of the second phase of the Mooi Mngeni Transfer Scheme, the 99% assured yield of the Mgeni System, at Midmar Dam, has increased from 322.5 Mℓ/day to 476.2 Mℓ/day.

E. Existing Water Supply Schemes and Water Requirements

The UMDM water supply infrastructure are a mixture of individual schemes owned and operated by the DM and areas served via the Upper Mgeni System owned and operated by Umgeni Water (UW).

- ✓ **Msunduzi** is supplied from the Upper Mgeni System. (Msunduzi does not form part of this report as it is its own WSA);
- ✓ **Impendle** is supplied via stand-alone groundwater and surface water systems at present. The remainder of the LM is private farmland;
- ✓ **Mkhambathini** is supplied by both UMDM stand-alone schemes and the Upper Mgeni System;
- ✓ **Mpofana** is supplied via stand-alone surface and ground water systems owned and operated by UW;
- ✓ **Richmond** has recently been linked to the Upper Mgeni System via the Richmond pipeline and supplies water further to Hopewell, Thornville and Baynesfield. The rest of Richmond is served by boreholes and springs maintained by UMDM;
- ✓ **uMshwathi** is supplied by UMDM stand-alone schemes and the Upper Mgeni System.; and
- ✓ **uMngeni** is supplied from the Upper Mgeni System. The remaining areas are primarily farmlands and are supplied by boreholes, and no further bulk supply projects are required.

UMDM is currently supplied with water from the following systems/schemes:

- ✓ Upper Mgeni System;
  - Howick-North Sub-System;
  - Howick-West Sub-System;
    - Mill Falls Pump Station to Howick-West Reservoir;
    - Howick-West Reservoir to Groenekloof Reservoir;
    - Groenekloof Reservoir Supply;
    - Blackridge Reservoir Supply; and

- Vulindlela Water Supply Scheme.

- Umlaas Road Sub-System;
  - '57 Pipeline Supply System;
  - Eston/Umbumbulu Pipeline; and
  - Lion Park/Manyavu Pipeline.
- uMshwathi Sub-System (via Umshwathi Regional Scheme/Augmentation and Extension of the Wartburg Supply System); and
  - Msunduzi Bulk Water Supply;
  - '69 Pipeline: to Wartburg Reservoir (Augmented by the Umshwathi Regional Scheme);
  - Wartburg Reservoir to Bruyns Hill Reservoir (Augmented by the Umshwathi Regional Scheme);
  - uMshwathi Bulk Water Supply System Upgrade;
  - Dalton to Ozwathini Supply System (Umshwathi Regional Scheme); and
  - Swayimana Water Supply Scheme

✓ Greater Mpofana Water Supply Scheme Phase 1.

The projected water requirements as per the demand model generated for the UMDM (excluding Msunduzi LM) up to 2050 amounts to **158.57 Mℓ/d.**

Table E-2: Water Requirements (Mℓ/d), Per Local Municipality

LM	2050 Population	2020 (Mℓ/d)	2025 (Mℓ/d)	2030 (Mℓ/d)	2035 (Mℓ/d)	2040 (Mℓ/d)	2045 (Mℓ/d)	2050 (Mℓ/d)
uMshwathi	190 329	25.09	26.72	28.67	30.70	32.89	35.26	37.83
uMngeni	165 085	35.12	37.37	40.06	42.85	45.84	49.05	52.49
Richmond	117 930	16.23	17.30	18.58	19.91	21.35	22.91	24.59
Mkhambathini	97 023	12.77	13.60	14.60	15.63	16.75	17.96	19.27
Mpofana	61 495	9.83	10.46	11.22	12.01	12.86	13.78	14.77
Impendle	52 144	6.35	6.77	7.27	7.79	8.35	8.97	9.63
Umgungundlovu DM	684 005	105.39	112.22	120.40	128.89	138.05	147.92	158.57

Census 2011 Base Figures

F. Existing Sanitation Supply Schemes

There are eight (8) sanitation schemes and nine (9) wastewater treatment works currently in operation within UMDM (excluding Msunduzi). Seven (7) of the WWTP's are operated by Umgeni Water while two (2) are owned by Umgeni Water (Albert Falls North & South WWTP's).

G. Planned and Implementation Projects

The existing regional bulk projects were considered and evaluated to identify potential gaps within the existing project footprints to the extent that a total “wall-to-wall” bulk water services needs perspective is visualised and realised. This was done in the context to improve access to basic services but at the same time support economic growth and development and ensure sustainable services.

The funding streams available for infrastructure development over the next three years within UMDM amount to approximately R590 951 000.

H. Bulk Water Supply Interventions Considered

This study aims to ensure that the UMDM can make provision for and plan to supply all consumers within its area of jurisdiction with at least basic water supply services. Not all consumers are currently supplied with formal schemes and part of the objectives of this study were to determine where these consumers are, what their water requirements are and the options that could be considered to ensure universal access to water supply up to 2050

Water Supply Intervention Areas (WSIA’s) were identified during this process based on areas that can be served either by linkage to existing schemes or through planned scheme developments (planned projects). These WSIA’s, number of applicable households, population and their water requirements are illustrated within **Table H-1** overleaf.

Table H-1 Conceptual Scheme Areas, Households and Water Requirements

WSIA No	WSIA Name	Population 2020	Population 2050	Water Demand 2020 (Mℓ/day)	Water Demand 2050 (Mℓ/day)
UM001	Howick North	16 956	24 846	5.80	8.70
UM002	Howick West	57 668	284 353	45.34	88.58
UM003	Groenekloof Reservoir	142 033	8 267	26.10	11.00
UM004	Extension (Lidgetton to Howick North)	16 956	24 846	5.80	8.70
UM005	kwaMavena	4 739	6 549	0.98	1.49
UM006	Claridge Reservoir	198 638	291 061	54.47	173.10
UM007	Pipeline to Wartburg	54 629	80 047	9.54	51.00
UM008	Pipeline to Bruyns Hill Reservoir	40 556	59 427	7.10	10.60
UM009	Dalton Reservoir	21 052	30 847	10.00	37.30
UM010	Ozwathini	21 052	30 847	6.30	28.00
UM011	Umlaas Road	66 214	97 023	115.18	56.40
UM012	Lion Park/Manyavu	24 954	36 565	4.40	7.50
UM013	Table Mountain Reservoir	24 954	36 565	1.73	2.70
UM014	Mpofana BWSS	41 968	61 495	9.80	14.80
UM015	Mpofana Rural 6	3 063	4 488	0.54	0.82
UM016	Thornville/Hopewell	14 712	21 023	3.00	5.10
UM017	Liliefontein	14 347	21 023	5.27	23.58
UM018	Richmond	40 209	58 919	3.47	18.48
UM019	Impendle	35 586	52 144	6.40	9.60
UM020	Reservoir 5 to Impendle	8 542	13 782	1.55	2.33
UM021	Stephen Dlamini to Impendle & Res 5	**44 128**	65 926	7.95	11.93

The Claridge WSIA and the Howick West WSIA has the highest water demand of approximately 32% and 16% respectively. These WSIAs are also the biggest two (2) supply areas within the UMDM and would be serving close to 48% of the UMDM population.

The total volume of water required is compared to the existing proposed water supply interventions and tabled within **Table H2** below:

Table H2: Water Resources Required vs proposed WSI

WSIA	WSIA Name	Population (2050)	2050 Demand (Mℓ/day)	2050 Demand (Mm^3/a)	Existing Resources (Mm^3/a)	Proposed Additional under UAP Phase 3 (Mm^3/a)	Total (Mm^3/a)	Balance (Mm^3/a)
UM001	Howick North	24 846	8.7	3.18	-	-	-	-3.18
UM002	Howick West	284 353	88.58	32.33	144.18	9.49	153.67	121.33
UM003	Groenekloof Reservoir	8 267	11	4.02	-	-	-	-4.02
UM004	Extension (Lidgetton to Howick North)	24 846	8.7	3.18	-	-	-	-3.18
UM005	kwaMavena	6 549	1.49	0.54	-	-	-	-0.54
UM006	Claridge Reservoir	291 061	173.1	63.18	47.45	16.06	63.51	0.33
UM007	Pipeline to Wartburg	80 047	51	18.62	-	-	-	-18.62
UM008	Pipeline to Bruyns Hill Reservoir	59 427	10.6	3.87	-	-	-	-3.87
UM009	Dalton Reservoir	30 847	37.3	13.61	-	-	-	-13.61
UM010	Ozwathini	30 847	28	10.22	-	-	-	-10.22
UM011	Umlaas Road	97 023	56.4	20.59	-	-	-	-20.59
UM012	Lion Park/Manyavu	36 565	7.5	2.74	-	-	-	-2.74
UM013	Table Mountain Reservoir	36 565	2.7	0.99	-	-	-	-0.99
UM014	Mpofana BWSS	61 495	14.8	5.40	7.30	2.83	10.13	4.73
UM015	Mpofana Rural 6	4 488	0.82	0.30	-	-	-	-0.30
UM016	Thornville/Hopewell	21 023	5.1	1.86	-	-	-	-1.86
UM017	Liliefontein	21 023	23.58	8.61	-	-	-	-8.61
UM018	Richmond	58 919	18.48	6.75	-	-	-	-6.75
UM019	Impendle	52 144	9.6	3.50	-	-	-	-3.50
UM020	Reservoir 5 to Impendle	13 782	2.33	0.85	-	-	-	-
UM021	Stephen Dlamini to Impendle & Res 5	65 926	11.93	4.35	-	-	-	-
TOTAL		**1 310 043**	**1 310 043**	**571.71**	**208.67**	**198.93**	**28.38**	**227.31**

From the table above, it is noted that some of the schemes will not have adequate raw water resources after upgrades/interventions to meet the 2050 demand requirements. The feasibility studies for the proposed resources and, in addition, the implementation of the Reservoir 5 to Impendle Scheme should be prioritised.

A total estimate of approximately R 2.8 billion is required to address the total bulk water supply requirement by 2050. The total cost requirement per WSIA is tabled within **Table H-3**.

H-3: Total Cost requirement

WSIA	WSIA Name	Total Cost Requirement				
		Primary	Secondary	Tertiary	10% Contingencies	Total Cost (excl VAT)
UM001	Howick North	-	R8 104 392.45	-	R810 439.25	R8 914 831.70
UM002	Howick West	R41 470 000.00	R59 530 881.21	-	R1 010 008.81	R102 010 890.02
UM003	Groenekloof Reservoir	-	-	-	-	-
UM004	Extension (Lidgetton to Howick North)	-	R8 366 885.88	-	R836 688.59	R9 203 574.47
UM005	kwaMavena	-	R8 601 711.14	R445 825.44	R904 753.66	R9 952 290.24
UM006	Claridge Reservoir	R177 860 000.00	R22 267 004.54	R14 545 141.38	R21 467 214.59	R236 139 360.52
UM007	Pipeline to Wartburg	-	R51 712 389.25	-	R5 171 238.92	R56 883 628.17
UM008	Pipeline to Bruyns Hill Reservoir	-	R202 982 598.28	R36 927 603.41	R23 991 020.17	R263 901 221.85
UM009	Dalton Reservoir	-	R22 700 051.79	-	R2 270 005.18	R24 970 056.97
UM010	Ozwathini	-	R18 889 010.70	-	R1 888 901.07	R20 777 911.77
UM011	Umlaas Road	-	-	-	-	-
UM012	Lion Park/Manyavu	-	R19 176 954.04	R9 623 724.96	R2 880 067.90	R31 680 746.90
UM013	Table Mountain Reservoir 1	-	R16 661 226.93		R1 666 122.69	R18 327 349.63
	Table Mountain Reservoir 2	-	R21 080 783.15	R4 419 556.22	R2 550 033.94	R28 050 373.31
UM014	Mpofana BWSS	-	-	-	-	-
UM015	Mpofana Rural 6	-	R12 960 725.49	R4 359 014.35	R1 731 973.98	R19 051 713.83
UM016	Thornville/Hopewell	-	R750 000.00	-	R75 000.00	R825 000.00
UM017	Liliefontein	-	R22 700 051.79	-	R2 270 005.18	R24 970 056.97
UM018	Richmond	R141 560 465.81	R41 371 091.68	-	R18 293 155.75	R201 224 713.23
UM019	Impendle	-	R97 888 566.17	R19 082 288.85	R11 697 085.50	R128 667 940.52
UM020	Reservoir 5 to Impendle	R216 286 853.29	R97 888 566.17	R19 082 288.85	R33 325 770.83	R366 583 479.13
UM021	Stephen Dlamini to Impendle & Res 5	R1 020 935 626.53	R97 888 566.17	R19 082 288.85	R113 790 648.15	R1 251 697 129.70
Total		**R1 598 112 945.63**	**R831 521 456.83**	**R127 567 732.31**	**R246 630 134.16**	**R2 803 832 268.93**

I. Conclusions and Recommendations

The UMDM still faces a backlog in water supply – not only in providing all consumers within its area of jurisdiction with access to water supply according to its WSA duties, but also in ensuring sustainable water services of existing supply. Furthermore, there are areas where the existing water supply infrastructure as well as water source, are insufficient to meet current and projected future water requirements. New developments and urbanisation put further strain on existing supplies and resources.

The UMDM relies mainly on grant funding programmes to fund their water supply projects. These funding programmes are mainly MIG and WSIG. Based on all the current funding streams available to the District Municipality over the MTEF period, it will take a minimum of fifteen years for the UMDM to address their bulk water supply requirements.

The implementation programme will depend on the availability of funds from National Treasury as well as the capacity of the Municipality to implement projects. All twenty-one area interventions would be an implementation priority for the DM but the order would most likely be determined by the availability of funds or intervention programmes.

The provision of water services remains the responsibility of the UMDM as the WSA. The UMDM should ensure that they meet all the requirements to take these interventions to implementation readiness. These planning studies are in various stages of readiness to lobby for grant funding and Umgeni Water could consider as a Regional Utility to assist the UMDM to take this process further.

The twenty-one (21) proposed water supply intervention areas (WSIAs) are the appropriate solutions for bulk water supply development within UMDM and are as follows:

- ✓ UM001 WSIA: Howick North Scheme Area;
- ✓ UM002 WSIA: Howick West Scheme Area;
- ✓ UM003 WSIA: Groenekloof Reservoir Scheme Area;
- ✓ UM004 WSIA: Extension (Lidgetton to Howick North);
- ✓ UM005 WSIA: kwaMavena;
- ✓ UM006 WSIA: Claridge Reservoir Scheme Area;
- ✓ UM007 WSIA: uMshwathi RBWSS: Pipeline to Wartburg;
- ✓ UM008 WSIA: uMshwathi RBWSS: Pipeline to Bruyns Hill Reservoir;
- ✓ UM009 WSIA: uMshwathi RBWSS: Dalton Reservoir Scheme Area;
- ✓ UM010 WSIA: uMshwathi RBWSS: Ozwathini Supply Scheme Area;
- ✓ UM011 WSIA: Umlaas Road Water Supply Scheme;
- ✓ UM012 WSIA: Lion Park / Manyavu Water Supply Scheme;
- ✓ UM013 WSIA: Table Mountain Reservoir Scheme Area;
- ✓ UM014 WSIA: Mpofana Bulk Water Supply Scheme;
- ✓ UM015 WSIA: Spring Grove Rural 6 Scheme;
- ✓ UM016 WSIA: Thornville / Hopewell Water Supply Scheme;

- ✓ UM017 WSIA: Liliefontein Water Supply Scheme;
- ✓ UM018 WSIA: Richmond Water Supply Scheme;
- ✓ UM019 WSIA: Impendle Bulk Water Supply Scheme;
- ✓ UM020 WSIA: Vulindlela Reservoir 5 to Impendle; and
- ✓ UM021 WSIA: Stephen Dlamini to Impendle & Vulindlela Reservoir 5.

The implementation programme will depend on the availability of funds from National Treasury as well as the capacity of the Municipality to implement projects. Although all twenty-one (21) area interventions would be an implementation priority for the DM, it is proposed to consider the following three (3) priorities detailed within **Table I-1**. It is also proposed to follow a phased approach for implementation for e.g. initiate only the upgrade to the WTP at first and then when funding permits, can the bulk conveyance and storage be extended, upgraded or constructed.

However, the order would most likely be determined by the availability of funds or intervention programmes and should be confirmed with the WSA.

I-1: Proposed Implementation Order (Phased Approach)

Proposed Priorities (Phased Approach)	WSIA No and Name		Proposed Project Name	Proposed Estimated Project Value
1	Detailed feasibility study of the Mkhomazi to Mgeni inter-catchment raw water transfer as well as the Mzimkhulu to Mkhomazi inter-catchment transfer to augment the 2050 raw water deficit in the Upper Mgeni System.			
2	UM020	Reservoir 5 to Impendle	Augmentation of supply to the Impendle LM from the Vulindlela system	R366 583 479.13
3	UM002	Howick West	Howick West scheme upgrade	R102 010 890.02
4	UM006	Claridge Reservoir	Claridge scheme upgrade	R236 139 360.52

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LIST OF ABBREVIATIONS

CoGTA	Department of Cooperative Governance and Traditional Affairs
CR	Command Reservoir
EMF	Environmental Management Framework
DM	District Municipality
DWS	Department of Water and Sanitation
GIS	Geographical Information System
IRDP	Integrated Residential Development Programme
IDP	Integrated Development Plan
KZN	KwaZulu-Natal
ℓ/c/d	Liters per capita per day
LED	Local Economic Development Programme
LM	Local Municipality
LoS	Level of Service
m^3	Cubic meter
MIG	Municipal Infrastructure Grant
Mm^3	Million Cubic Meters
Mm^3/a	Million Cubic Meters per annum
Mℓ/day	Mega liter per day
MPNRW	Management Plan to Reduce Non-Revenue Water
NRW	Non-Revenue Water
PSP	Professional Service Provider
R ‘000	Rand Thousands
RBIG	Regional Bulk Infrastructure Grant
RDP	Reconstruction and Development Plan
Res	Reservoir
RF	Reference Framework
RWSS	Regional Water Supply Scheme
SDF	Spatial Development Programme
SIV	System Input Volume
UAP	Universal Access Plan
UMDM	Umgungundlovu District Municipality
VAT	Value Added Tax
WMA	Water Management Area
WSA	Water Services Authority

WSDP	Water Services Development Plan
WSI	Water Supply Intervention
WSIA	Water Supply Intervention Area
WSIG	Water Services Infrastructure Grant
WSP	Water Service Provider
WSS	Water Supply Scheme
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

1. OBJECTIVES AND METHODOLOGY

This report is the Bulk Water Master Plan for the study titled "Universal Access Plan Phase III – Progressive Development of a Regional Concept Secondary Bulk Water Master Plan for the Umgungundlovu District Municipality (UMDM)" – in this instance also the Water Services Authority (WSA).

This section provides the background of the study, an introduction and description of the study objectives.

1.1 Background and Introduction

This study follows on the Phase II study for the Development of a Universal Access Plan (UAP) for Water Supply in the KwaZulu-Natal Province which was completed in June 2016 by various Professional Service Providers (PSP's) that were appointed by Umgeni Water.

However, the level of detail within the final outcome of UAP Phase II varied between the various PSP's and the magnitude of the cost requirement resulted in Umgeni Water to revisit the process and the need for UAP Phase III was initiated. The main objective of Phase III will be to further develop the conceptual bulk water master plan that would clearly distinguish between primary and secondary bulk.

Umgeni Water appointed Mariswe (Pty) Limited (previously UWP Consulting), in association with JTN Consulting in November 2018 to review the UAP Phase II process by the developing of UAP Phase III for the whole of the KwaZulu-Natal province. The areas are as follows:

- ✓ Amajuba District Municipality (ADM);
- ✓ City of uMhlathuze Local Municipality (CouM);
- ✓ Harry Gwala District Municipality (HGDM);
- ✓ Ilembe District Municipality (IDM);
- ✓ King Cetshwayo District Municipality (KCDM);
- ✓ Newcastle Local Municipality (NLM);
- ✓ The Msunduzi Local Municipality (TMLM);
- ✓ Ugu District Municipality (Ugu);
- ✓ Umgungundlovu District Municipality (UMDM)
- ✓ Umkhanyakude District Municipality (UKDM);
- ✓ uMzinyathi District Municipality (UZDM);
- ✓ uThukela District Municipality (UTDM); and
- ✓ Zululand District Municipality (ZDM).

The abovementioned municipalities were allocated WSA status for their respective areas of jurisdiction. Amajuba, King Cetshwayo and Umgungundlovu's responsibilities as WSA excludes the areas covered by the Newcastle, City of uMhlathuze, and The Msunduzi Local Municipalities which themselves are WSA's. UAP Phase III reports are developed per WSA, i.e. 13 reports are prepared.

1.2 Purpose of the Report

This report is the second deliverable of the study, namely the Reconnaissance Study that outlines the conceptual master plan of primary and secondary bulk regional schemes per WSA.

The UAP Phase III aims to review and update the UAP Phase II study reports in order to clearly distinguish between primary and secondary bulk water requirements. The implementation of the UAP Phase III study will be executed in two phases and are as follows:

Phase	Description	Deliverables
Phase 1	Due diligence of the conceptual Regional Bulk Scheme Reports from UAP Phase II	High Level Water Services Intervention Areas (WSIA) due diligence report outlining the viability and sustainability of the already proposed regional schemes
Phase 2	Reconnaissance into the Proposed Regional Primary and Secondary Bulk Schemes per Water Services Authority	Reconnaissance Study that outlines the conceptual master plan of primary and bulk regional schemes

Phase 1 includes the information review and conducting a due diligence of the conceptual regional bulk schemes proposed during UAP Phase II.

Phase 2 includes the development of a demand model up to 2050 and needs development plan, culminating in a Reconnaissance Study report on primary and secondary bulk water supply.

The Report would also provide status quo information on sanitation level of service per WSA inclusive of sanitation bulk scheme components. The sanitation status quo information was collected, verified and validated during the Municipal visits and incorporated within the geo database.

The UAP Phase III study information would be used to update the DWS Reference Framework (RF) geodatabase where possible.

1.3 Information Sources

Information used in this study was obtained from current and existing reports and inputs from knowledgeable municipal officials. The following reports were reviewed to contribute to this report:

- ✓ StatsSA Community Survey, 2016;
- ✓ UAP Phase II, Umgungugndlovu District Municipality, 2016;
- ✓ Umgeni Water Infrastructure Master Plan Volume 2: Mgeni System, 2020
- ✓ Umgungugndlovu District Municipality Water Services Development Plan, 2018 – 2019
- ✓ Umgungugndlovu District Municipality Final Draft Integrated Development Plan, Review 2019 – 2020;
- ✓ Monthly water balance reports as submitted by DWS (KZN) for each WSA;
- ✓ Detailed Feasibility Study: Hydrology and Design of the Dam for a Proposed New Dam: Umzimkhulu River: Umzimkhulu District Bulk Water Supply Scheme, 2017
- ✓ uMkhomazi Water Project - Detailed Feasibility Study - Main Report - Volume 1, 2015
- ✓ Vulindlela Bulk Water Supply System Upgrade – Preliminary Design Report, 2016
- ✓ Mbhava and Mpethu-Swayimane Water Supply Scheme Extension Business Plan, 2014

Meetings were held with managers and technical staff of the UMDM to obtain their input and to ensure the latest available specifications and information is used for the purpose of this study.

Existing spatial and non-spatial data sets were used as reference such as the 2016 Community Survey, UAP Phase II Study, 2016, the Department of Water and Sanitation (DWS) Reference Framework geodatabase as well as spatial data received from the WSA itself.

1.4 Stakeholder Engagement

The PSP engaged each WSA individually during inception meetings to introduce the study, its objectives and detailed approach.

The first deliverable was a Due Diligence Report on demographics, water services levels, existing bulk water supply infrastructure, water resources, water requirements, current and planned bulk infrastructure projects and viability of water supply intervention areas. The Due Diligence also reported on a preliminary gap analysis that was conducted utilising the outcome from the proposed WSIA from UAP II and the UMDM Water Services Development Plan that is currently being updated. Following the gap analysis, specific recommendations were made when determining the 2050 water demands suggested for the UAP Phase III study. Follow-up meetings were arranged with the WSAs to share the information that are presented in the Due Diligence Report and these reports were submitted to Umgeni Water.

The Due Diligence Report has now been followed by the development of a water requirements model for 2050. Further individual engagements were held with each WSA.

This resulted in the development of a Reconciliation Report, which presents the alignment of water requirements with existing and planned bulk infrastructure and available water sources for all areas within the WSA.

The Draft Reconciliation Report will be presented to each WSA to obtain comments and inputs, which were considered for the final study report submitted to Umgeni Water, DWS and COGTA.

1.5 Water Requirements Model Methodology

A report outlining the methodology, design criteria and assumptions to be used to develop the water demand model for this study, UAP Phase III was approved by the Client. The approved water demand model was then applied to determine the demands for all areas included in the study, at least at a town level. The water demands are required to inform the concept design for a design horizon period up to 2050, with the minimum level of service a yard connection at 100ℓ capita per day.

1.5.1 Total Water Demand Calculations

This section provides information on the base data used for the modelling, assumptions made and outputs of the water demand model, based on a pilot Water Services Authority area.

1.5.1.1 Base Data

The base data used for this study includes the following:

- ✓ 2011 Census: Spatial data for the Main Places, Sub-Places and Small Areas Layer. Main Places are similar to the level of towns, Sub-Places are similar to the level of suburbs and the Small Areas Layer are of a smaller level of detail than Sub-Places, encompassing a number of enumerated census areas;
- ✓ 2011 Census: alpha-numeric data, linking to the spatial data, for household income categories, combined with water Level of Service (LoS). The derived household income and LoS information was combined into categories as follows:
    - Category 1 (Very High Income): Households with a house connection and an income more than R 1 228 000 per year;
    - Category 2 (Upper Middle Income): Households with a house connection and an income between R 153 601 and R 1 228 000 per year;
    - Category 3 (Average Middle Income): Households with a house connection and an income of between R 38 401 and R 153 600 per year;
    - Category 4 (Low Middle Income): Households with a house connection and an income of between R 9 601 and R 38 400 per year;

- Category 5 (Low Income): Households with a house connection and an income between R1 and R 9 600 per year;
- Category 6 (Yard Connections): all Households with a Yard Connection;
- Category 7 Households with access to interim services and
- Category 8 Households with access to below interim services.

✓ 2011 Census: categorisation of Main Places – similar to town level data, based on best-known characteristics of the Main Place. The types of Towns/Centre categories include:

- Category 1: Long Established Metropolitan Centres (M): Large conurbation of a number of largely independent local authorities generally functioning as an entity;
- Category 2: City (c): Substantial authority functioning as a single entity isolated or part of a regional conurbation;
- Category 3: Town: Industrial (Ti): A town serving as a centre for predominantly industrial activities;
- Category 4: Town: Isolated (Tis): A town functioning generally as a regional centre of essentially minor regional activities;
- Category 5: Town: Special (Ts): A town having significant regular variations of population consequent on special functions. (Universities, holiday resorts, etc.);
- Category 6: Town: Country (Tc): A small town serving essentially as a local centre supporting only limited local activities.
- Category 7: Contiguous (Nc): A separate statutory authority or a number of authorities adjacent to, or close to, a metropolis or city and functioning as a component part of the whole conurbation;
- Category 8: Isolated (Nis): A substantial authority or group of contiguous authorities not adjacent to an established metropolis or authority;
- Category 9: Minor (Nm): Smaller centres with identifiable new or older established centres not constituting centres of significant commercial or industrial activity;
- Category 10: Rural (Nr): All other areas not having significant centres.

✓ Population Growth: Population numbers per Small Areas Layer as provided by Umgeni Water that developed with Statistics South Africa the population growth for the following years:

- 2016; 2020; 2025; 2030; 2035; 2040; 2045 and 2050.

✓ 2019 Updated Levels of Service as provided by Water Services Authorities. The 2019 LoS may be recorded in different formats and at different spatial levels (settlement / town, ward, other). The following categories were applicable the pilot WSA, based on wards and spatially allocated to the Small Areas Layer:

- Below: Assumed for the purposes of this study to include all areas below the standpipe level of service in 2019;
- At: All areas at standpipe level of service in 2019 and
- Above: All areas above the standpipe level of service in 2019.

1.5.1.2 Assumptions

The following assumptions were made in order to calculate the demands per Small Area:

- ✓ That the ratio of population within each income category in the House Connection LoS category has not changed since 2011. The assumption is that the individuals in each category may be earning more since 2011, but that the categories themselves should have also then moved upwards by the same average quantum. The ratio of population in each category may then be assumed to have stayed more or less the same, even though the actual income values may have changed. This will not influence the demand allocated to each category.
- ✓ That the categorisation of Centres has not changed since the 2011 Census. The categorisation of Main Places may be reviewed if necessary
- ✓ The projected population growth numbers as provided by Umgeni Water was used without any further analyses.
- ✓ The 2019 updated Level of Service as provided for the pilot WSA was used, which also indicated potential future levels of service. However, it was found that some areas are marked as below standpipe level when the 2011 Census recorded these areas as above RDP level. We assumed that these areas may have been marked as below standpipe level subsequent to the Census due to factors such as water availability / reliability or other factors. It was decided, in these cases, that the infrastructure probably still exists in these areas as recorded during the Census and that it would be prudent, for water demand modelling purposes, to assume the Census RDP levels still apply. In cases where the WSA indicated areas to be in higher categories than recorded in the Census, the WSA for Level of Service was used, since it is assumed that these areas have since been upgraded to a higher level of service. No area was therefore downgraded from the Census data, but some areas were upgraded to a higher LoS with the new 2019 data.
- ✓ Average of the Annual Average Daily Demand (AADD) values (Direct Demands) were assumed, as shown in Table 1-1. These were informed by the previous UAP Phase II study.
- ✓ Indirect demands, as a ratio of AADD, were assumed, as summarised in Table 1-2 per Centre category.

Table 1-1: Assumed average AADD per person per combined income and LoS category

Category	Description of consumer category	Household Annual Income range	Average AADD (l/c/d)
1	House Connections: Very High Income	>R1 228 000	410
2	House Connections: Upper middle income	R 153 601 – R 1 228 000	295

3	House Connections: Average Middle Income	R 38 401 – R 153 600	228
4	House Connections: Low middle Income	R 9 601– R 38 400	170
5	House Connections: Low income	R 1 – R 9600	100
6	Yard Connections		100
7	Households with access to interim services		70
8	Households with access to below interim services		12

Table 1-2 Indirect demands, as a ratio of direct demands per Centre classification

				Indirect demands as a ratio of direct demands			
Classification	**Type of Centre**	**Description**	**Typical CSIR / SACN Settlement Typology**	**Commercial**	**Industrial**	**Institutional**	**Municipal**
1	Long established Metropolitan centres (M)	Large conurbation of a number of largely independent local authorities generally functioning as an entity.	City Region	0.2	0.3	0.15	0.08
2	City (c)	Substantial authority functioning as a single entity isolated or part of a regional conurbation.	City / Regional Centre 1 / Regional Centre 2				
3	Town: Industrial (Ti)	A town serving as a centre for predominantly industrial activities.	Regional Centre 1 / Regional Centre 2				
4	Town: Isolated (Tis)	A town functioning generally as a regional centre of essentially minor regional activities	Service Town				
5	Town: Special (Ts)	A town having significant regular variations of population consequent on special functions. (Universities, holiday resorts, etc.)	Service Town / Local or Niche Town	0.3	0.15	0.08	0.03
6	Town: Country (Tc)	A small town serving essentially as a local centre supporting only limited local activities	Local or Niche Town	0.1	0.15	0.03	0.1
7	Contiguous (Nc)	A separate statutory authority or a number of authorities adjacent to, or close to, a metropolis or city and functioning as a component part of the whole conurbation.	Regional Centre 2	0.15	0.08	0.08	0.08
8	Isolated (Nis)	A substantial authority or group of contiguous authorities not adjacent to an established metropolis or authority.	High Density Rural				
9	Minor (Nm)	Smaller centres with identifiable new or older established centres not constituting centres of significant commercial or industrial activity.	Local or Niche Town				
10	Rural (Nr)	All other areas not having significant centres.	Rest of South Africa				

The phased upgrading of Level of Service up to 2050 was assumed as summarised in **Table 1-3**.

Table 1-3 Level of Service Upgrade

Dwelling Type	LoS Upgrade
House Connections: Very High Income	Grows with Population growth
House Connections: Upper middle income	Grows with Population growth
House Connections: Average Middle Income	Grows with population growth + additional 2.5% increase from Low Middle Income by between 2019 and 2030 + additional 5% increase from Low Middle Income between 2031 and 2050
House Connections: Low middle Income	Grows with population growth + additional 5% increase from Low Income by between 2019 and 2030 + additional 10% increase from Low Income between 2031 and 2050
House Connections: Low income	Grows with population growth + additional 7.5% increase from Yard Connections by between 2019 and 2030 + additional 15% increase from Yard Connections between 2031 and 2050
Yard Connections	Grows with Population growth + minimum LOS by 2030
Households with access to interim services	Reduce to 0 by 2030
Households with access to below interim services	Reduce to 0 by 2030

Finally, an additional 10 % and 15% were added to the total water demand (Sum of Direct and Indirect Demands) for water treatment losses and distribution losses respectively.

1.5.1.3 Output of the Water Demand Model

The output of the water demand model is a total water demand (including direct demands, indirect demands and acceptable losses) for 2019; 2020; 2025; 2030; 2035; 2040; 2045 and 2050 per Small Area, in Million Cubic Meters per annum (Mm^3/a). This water demand will be compared to available supply demands if possible and an opinion on potential discrepancies will be given.

As the output is based on the Census Small Areas Layer and coded accordingly, it can be used in a GIS environment for further analysis.

1.6 DWS Reference Framework Geodatabase

The DWS Directorate: Water Services – Planning and Information – maintains a national database for water services planning. It is a spatial database, in a GIS format, that includes layers for settlements, water supply infrastructure, sanitation supply infrastructure, water resources and projects.

This study aims to update the service levels for settlements based on feedback from each WSA. Furthermore, where possible, the bulk and reticulation infrastructure components in the geodatabase were also updated to include not only the latest existing, but also planned water supply infrastructure.

1.7 RECONNAISSANCE REPORT

The final deliverable of this study is a Reconnaissance Report – this report – to reconcile the water requirements, with available water sources, for all areas in a WSA. This includes the evaluation of existing capacities of infrastructure, potential extensions to new areas, or scheme development options for areas where linkage to existing schemes are not feasible.

The potential costs for scheme development and timeframes were investigated and are presented in this report. Umgeni Water provided unit reference costs for infrastructure components that have been applied where possible.

Information on available water sources were mainly obtained from existing DWS Reconciliation Strategies (larger systems and from the All Towns Studies). Where available, project-specific studies or technical reports were consulted to verify information on available water sources. Information on groundwater availability and quality is however not readily available to a sufficient level of detail.

2. STUDY AREA

This section provides an overview of the study area, setting the scene and discusses the institutional arrangements for water supply. It also provides a brief overview of the demographics in the area and the development opportunities.

2.1 CONTEXT

The Umgungundlovu District Municipality (DC22) is located in the central region of the KwaZulu-Natal Province and it covers an area of approximately 9 513 km². UMDM is surrounded by uThukela DM to the north-west, uMzinyathi DM to the north-east, iLembe DM to the east, eThekwini Metro to the south-east, Ugu DM to the south and Harry Gwala DM to the south-west. A small part of the border of the Kingdom of Lesotho adjoins the DM in the West.

The DM consists of both urban and rural settlements. The settlement pattern reflects Pietermaritzburg, Edendale and Vulindlela as areas forming the core settlement areas within the DM. Outside of these dense urban/rural cores of the DM, the rest of the significant settlements are found mainly in the Ingonyama Trust land areas in other local municipalities within the district.

UMDM consists of the following seven Local Municipalities:

- ✓ uMshwathi Local Municipality (KZN221);
- ✓ uMngeni Local Municipality (KZN222);
- ✓ Mpofana Local Municipality (KZN223);
- ✓ Impendle Local Municipality (KZN224);
- ✓ Msunduzi Local Municipality (KZN225);
- ✓ Mkhambathini Local Municipality (KZN226); and
- ✓ Richmond Local Municipality (KZN227).

The provincial capital, Pietermaritzburg lies within UMDM. Msunduzi, a local municipality within UMDM is the second largest municipality in KZN. UMDM's vision is to evolve Msunduzi Local Municipality into a metropolitan municipality. UMDM serves as a Water Service Authority (WSA) for all local municipalities within its jurisdiction, except for Msunduzi Local Municipality, which has its own WSA status. Umgeni Water is the existing water board in this region and is fulfilling a WSP function on all bulk infrastructure.

Umgungundlovu DM is home to Pietermaritzburg, the capital city of KwaZulu-Natal, which is located 80km from the country's busiest harbour in Durban and is linked to the country's industrial hub, Gauteng, by the N3 which cuts through the DM. Education, historic sites and world class sporting

events are amongst the most attractive features in the DM coupled with investment opportunities in ICT, tourism, construction and property development, transport and logistics and farming. The DM has also been earmarked for major corridor development which is expected to boost the DM's economy and attract local, national and international role players.

The DM enjoys a competitive advantage in the field of agriculture as a large portion of the land falls into the high/good and relatively good potential for agriculture. This, coupled with the abundance of water resources in the form of six significant rivers and five major dams, puts Umgungundlovu DM into the country's top bracket for agriculture yield potential.

The study area and locality of UMDM is illustrated in **Figure 2-1** overleaf.

2.2 Physical Characteristics of the Study Area

The UMDM is traversed by a good network of roads. The N3 is the National road that bisects the district from the south-east to the north-west. In addition, some of the other major roads are the R103, as the old National road that is now a key tourist route; the R56 to Ixopo; the R617 to Bulwer; and the R33 and R622 to Greytown.

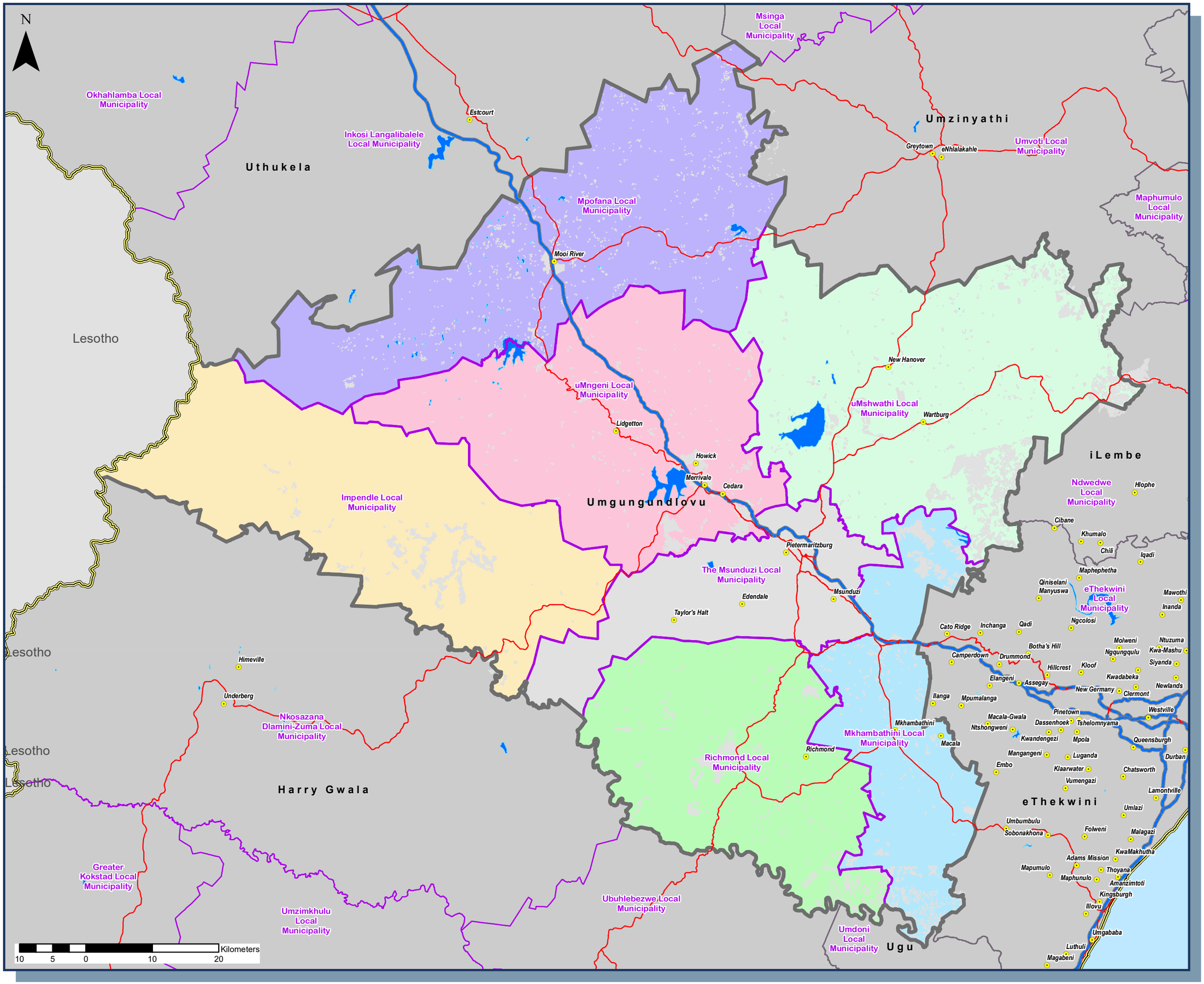
The Drakensberg Mountains cut across the Western section of Impendle and Mpofana LM's, with the foothills of the Drakensberg forming the rolling hills of the Midlands in the Central to North-Western areas of those LM's.

There are six (6) catchments in the UMDM – the Mooi, uMvoti, Mngeni, Ilovu, uMlazi and uMkomaas. The Mngeni catchment covers the largest area. The major dams are Springrove, Midmar, Albert Falls, Nagle and Inanda on the Mngeni, and the Henley Dam on the Msunduzi. There are numerous farm dams in the area, used primarily for irrigation and livestock watering.

Within the boundaries of the UMDM are the Kamberg, Highmoor, Lotheni and Mkhomazi Nature Reserves, that are all a part of the uKhahlamba Drakensberg World Heritage Site and are under the authority of Ezemvelo KZN Wildlife.

2.2.1 uMshwathi Local Municipality

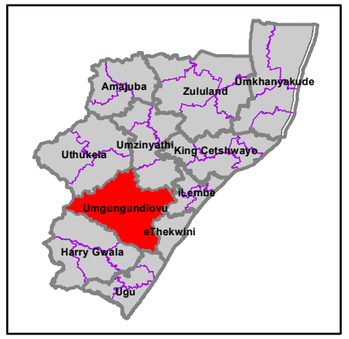
In square kilometres uMshwathi Municipality is the largest of the seven Local Municipalities in the District with major urban centres in New Hanover, Wartburg, Dalton and Cool Air. Substantial rural residential settlements are to be found at Swayimane, Mpolweni, Thokozani and Ozwathini. (UMDM IDP, 2019)



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- National Roads (N1)
- Main Roads
- Dams & Dam Names (Driel Dam)
- Rivers
- Settlements
- Major Towns (Hilton)

LOCALITY:



CLIENT:

UMGENI WATER • AMANZI

MUNICIPALITY:

UMGUNGUNDLOVU DISTRICT MUNICIPALITY

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PROJECT TITLE

Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Locality Map

Umgungundlovu District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 22 Figure 2-1

The area is characterised by good rainfall, fertile soils and a temperate climate results in the area contributing 40% of the total sugar cane and maize production of UMDM. The land is mostly agricultural, although urban development is to be found in the towns of New Hanover, Wartburg, Dalton and Cool-Air. The communities living in the underdeveloped areas have extremely limited access to basic physical and social requirements, and very few economic opportunities.

Some of the main attractions in the municipality include the Albert Falls and Nagle Dams, which offer tourism and agriculture opportunities.

2.2.2 uMngeni Local Municipality

uMngeni Municipality incorporates Howick and Hilton and is ideally situated on the N3 development corridor. Significant manufacturing and industry is already established in the municipal area, with further developments in the pipeline. (UMDM IDP, 2019)

The urban areas of Howick, Merrivale, Mphophomeni, Hilton and Worlds View together with intervening areas including Cedara and Midmar Dam are considered as the primary urban node of uMngeni LM. Secondary urban nodes are Lidgetton and Nottingham Road. The extent of the urban nodes present approximately 15% of the municipality. There are settlement areas run in a Traditional Authority manner directly to the south west of Mphophomeni (KwaNxamala/Inadi). The remaining 85% of the municipality is rural farmland with a strong tourism industry based on the Midlands Meander.

The LM boasts the Cedara Agricultural College, and lends itself to beef and dairy farming, timber production and the cultivation of vegetables.

2.2.3 Mpofana Local Municipality

Mooi River including the areas of Bruntville and Rosetta serve as the primary administrative, economic/commercial and social hub of the LM. The outlying areas are rural in nature and sparsely populated and the predominant land use is agriculture.

The municipality benefits from its strategic position as it has easy access to rail, KZN provincial roads and the N3 National Road. Almost 50% of the land in the Mpofana LM has the potential for rural farming, with products set for the international market.

Agriculture and textiles form the backbone of economic development in the Mpofana LM. Dairy farming is one of the drivers in the agricultural sector followed by crops such as maize, potatoes, beans and peas. (UMDM IDP, 2019)

2.2.4 Impendle Local Municipality

Within the Impendle LM, the proclaimed World Heritage Site of the Drakensberg-uKhahlamba Mountain Park highlights the immense potential in the area for tourism, community-based craft endeavours and micro enterprises. An abundance of water allows for a mixed agricultural economy, while the cold winters indicate opportunities for a deciduous fruit industry. (UMDM IDP, 2019)

The majority of the Impendle LM, the smallest LM within the DM, is rural with a large number of scattered settlements mainly located on Ingonyama Trust and freehold land.

2.2.5 Msunduzi Local Municipality

Pietermaritzburg, within the Msunduzi LM, is the primary urban centre and seat of the uMgungundlovu District Municipality's administration, and is the thriving, modern capital of KwaZulu-Natal. The city is a dynamic commercial and industrial centre and is also recognized as a seat of academic excellence. (UMDM IDP, 2019)

Msunduzi is the economic power house of the DM and has huge potential for agri-processing since the district is dominated by agriculture. The area of Msunduzi possess high rates of migration as it comprises of pull factors such as employment opportunities, with many people migrating into the city at high rates from a daily basis at a district context searching for better opportunities.

2.2.6 Mkhambathini Local Municipality

The LM is mainly located on the N3 corridor and is based in Camperdown. The municipality has a potential to grow through a diversified economy and on bridging the rural-urban divide.

It is the second smallest municipality of the seven in the district, with a large part of the municipality being rural in nature and underdeveloped. Mkhambathini LM is well located in relation to Durban and Pietermaritzburg and adjoins Cato Ridge, a potential industrial node. Large portions of the municipality fall within the Valley of a Thousand Hills (with Table Mountain a major landmark), an area with high potential for ecotourism, and in the Midlands Mist Belt, which has a well-established agricultural economy. (UMDM IDP, 2019)

2.2.7 Richmond Local Municipality

The majority of the population within the Richmond LM reside in areas which are predominantly rural and are characterized by low levels of basic services and facilities and substantial unemployment. Land uses within the LM are typically urban mixed uses with high levels of limited infrastructural and services development and an adequate provision of social facilities and services to support the resident populations.

The Municipality has one main urban centre namely, the town of Richmond. This centre is recognized as the main economic node of the Municipality, because of the services provided and the nature of activities.

The LM has potential with a diversified economy in agriculture, tourism as it's endowed with rich natural resources and is synonymous with timber and wood products. (UMDM IDP, 2019)

2.3 Climate and Climate Change

The Umgungundlovu DM falls predominantly within the summer rainfall area of South Africa. The typical rainfall season extends from October to April, with the highest rainfall occurring during December and January. The climate varies with the change in altitude across the area – warm to hot and humid in the lower South-Eastern sub-tropical coastal region and temperate in the North-Western escarpment region.

The Mean Annual Precipitation (MAP) average across the local municipalities within UMDM varies from 785mm in Mkhambathini LM to 986mm in the mountainous Impendle LM. The drier areas extend from Mooi River to Muden within the Mpofana LM, and from the Eston to Camperdown/Ashburton area predominantly within the Mkhambathini LM.

Table 2-1: Climate variables of UMDM per LM

	Local Municipalities							UMDM
	Mkhambathini	Richmond	Msunduzi	uMshwathi	uMngeni	Mpofana	Impendle	
Precipitation (mm)								
Annual min	543	255	663	677	721	608	762	255
Annual mean	785	900	880	920	967	806	986	899
Annual max	1 043	1 383	1 179	1 558	1 404	1 403	1 324	1 558
Temperature (°C)								
Annual min	-3	-5	-6	-5	-8	-10	-15	-15
Annual mean	19	18	17	18	16	15	14	16
Annual max	42	41	41	42	40	41	38	42

Source: Ezemvelo KZN Wildlife, 2017

It is projected that storms and rainfall intensities will increase as a result of climate change. The intermediate projection is that short duration rainfall events will increase across the entire district with the exception of northern parts of Mpofana, western Impendle and Southern Richmond. This increase in short term rainfall events will result in increased disaster management risks due to severe storms and flooding. (UMDM IDP, 2019) Climate studies indicate that he UMDM will face a warmer and wetter future according to the climate change projections undertaken and is likely to have both negative and positive impacts. Changes in the mean annual rainfall are expected and are also likely to include an increased number of flash flood and storm events due to an increase in short duration rainfall. Floods, severe storms and wildfires already being among the main hazards currently faced by communities in the UMDM and climate change projections indicate an increased risk of these climate-driven events. The potential for an increase in drought events has also been identified.

The UMDM, in partnership with the South African National Biodiversity Institute (SANBI) and the University of KwaZulu-Natal (UKZN) is implementing the uMngeni Resilience Project (URP) with its overall objectives being to reduce the vulnerability of communities and small-scale farmers in the UMDM to the impact of climate change.

2.4 Topography, Geology and Soils

Elevations across the District range from 53m above sea level in the south east extending to a height of 3 320m at the Drakensberg escarpment along the western border of Impendle LM.

Table 2-2: Topological variables of UMDM per LM (derived from a 20m DEM of KZN)

	Local Municipalities							UMDM
	Mkhambathini	Richmond	Msunduzi	uMshwathi	uMngeni	Mpofana	Impendle	
	Area (km^2)							
	891	1 256	634	1 819	1 567	1 820	1 528	9 516
Elevation (meters above sea level)								
Minimum	53	141	453	221	645	815	1067	53
Mean	618	877	940	888	1297	1466	1690	1171
Maximum	1 005	1 602	1 573	1 752	2 087	2 505	3 320	3 320
Slope (degree)								
Mean	11	12	8	8	8	8	13	10
Maximum	71	74	56	74	61	68	79	79

Source: Ezemvelo KZN Wildlife, 2017

The highly variable topography creates a unique range of biophysical habitats and micro climatic conditions which support a diverse range of biodiversity. North facing slopes are generally warmer and drier, supporting habitat types such as grasslands. South facing slopes, escarpments and sheltered kloofs tend to be cooler and wetter, commonly providing conditions favourable for supporting indigenous forest. This mosaic of habitat provides opportunity for a diversity of biota with different habitat requirements to exist within relatively smaller areas, in comparison to regions with flat topography. The cool, damp scarps and sheltered kloofs also provide refugia, for example protection of important flora and fauna against fire and utilisation/damage from anthropogenic factors. (Ezemvelo KZN Wildlife, 2017)

The Impendle municipal area is characterised by steep slopes, displaying the highest average slope and including the Drakensberg escarpment and foothills, with the uMngeni and Mpofana areas having a relatively flatter topography.

As a result of the high change in altitude across the DM, it contains a diverse range of geological forms. The Drakensberg escarpment is comprised of Drakensberg Group basalts, with the foothills being Stormberg Group sandstones. As altitude drops toward the coast these formations give way to the underlying Beaufort Group mud and sandstones and the Ecca Group shale and sand stones. A band of Dwyka Group tillite below Pietermaritzburg completes these formations of the Karoo Supergroup stratigraphic unit extending from the Drakensberg escarpment. At the lowest altitudes within the east of the DM, Natal Group sandstones and granites of the Natal Metamorphic Province are present. (Ezemvelo KZN Wildlife, 2017)

2.5 ENVIRONMENTAL[1]

The topography of the area creates a range of habitats, ecosystems and biodiversity. The UMDM contains five (5) different biomes: Forest, Grassland (60%), Indian Ocean Coastal Belt, Savanna (38%) and Azonal Vegetation. These biomes define the habitat biodiversity. The warmer and drier North facing slopes support grasslands; while the cooler, wetter South facing slopes support indigenous forests. The UMDM has several formally protected areas and conservation areas. The uKhahlamba Drakensberg Park World Heritage Site, also a Ramsar site, has international recognition for its important biodiversity and ecosystem assets. The UMDM area has several priority wetland areas: uMngeni Vlei; Stillerust Vlei; and the Nyamvuba Vlei.

[1] Sourced from SEA 2012 Status Quo Report

The area is known to support a number of endangered, and vulnerable floral (88 species) and faunal (95 species) species that are classified by the International Union for Conservation of Nature (IUCN) as species at risk of extinction and need to be protected.

A significant portion of the UMDM has been transformed from its indigenous vegetation type, and no longer provide the ecosystem services of the original land cover. The Mooi and uMngeni catchments have been significantly transformed, and as a result are now 'closed' catchments where new streamflow reduction activities (afforestation, irrigated agriculture, dams) are not allowed.

Umgungundlovu District Municipality has various sources of water which is mainly rivers and dams. UMDM is centered on catchments that supply water to the economic hubs of Durban and Pietermaritzburg. These include Midmar Dam, Springgrove Dam, Albert Falls Dam, Nagle Dam, uMsunduzi River, Mooi River, Mngeni River, and Mkomazi River. According to the UMDM Environmental Management Framework the quality of water from these rivers and dams is compromised due to nutrient loading, bacteria and pathogens from sewage and animal waste contamination. Poor management of waste water pose a threat to water resources. This is due to the treatment works and storm water which is poorly managed. The deterioration of water quality results in the increment of water tariffs. Wetlands are an important source of water filtration and serve as an important habitat for aquatic and terrestrial species. Wetlands are the most threatened ecosystems due to some of the following factors:

- ✓ Conversion of wetland habitat through draining and planting of crops such as sugar cane and timber.
- ✓ Infestation of alien species due to disturbance associated with land transformation
- ✓ Increased toxic and nutrients inputs associated with fertilizers and insecticide application.

The Municipality is aware that environmental accounting needs to be become more integrated into the development planning process and must be considered in the very initial phases of planning any new development or upgrade, prior to any costly mistakes being made.

2.6 Institutional Arrangements for Water Supply

The Umgungundlovu District Municipality (UMDM) is one (1) of the eleven district municipalities in KwaZulu-Natal. Umgeni Water is the Bulk Water Services Provider (BWSP) for UMDM. The UMDM is the Water Service Authority (WSA) and Water Service Provider (WSP) to six (6) of its seven (7) local municipalities, namely:

- ✓ uMshwathi Local Municipality (KZN221);
- ✓ uMngeni Local Municipality (KZN222);

- ✓ Mpofana Local Municipality (KZN223);
- ✓ Impendle Local Municipality (KZN224);
- ✓ Mkhambathini Local Municipality (KZN226); and
- ✓ Richmond Local Municipality (KZN227).

It is noted that Msunduzi Local Municipality is serviced directly by Umgeni Water. Msunduzi is its own WSA and is covered in a separate UAP Phase III study to UMDM.

The UMDM is mandated by the Water Services Act to progressively ensure efficient, affordable, economical and sustainable access to water services for all consumers and potential consumers within its area of jurisdiction.

Dr R Ngcobo is the Municipal Manager of UMDM. The Technical Services Department is headed by the HOD, Mr B Mbambo. The HOD for operations within UMDM is Mr Z Gumede. The position for the HOD of Infrastructure, Planning and Development is currently vacant but is filled by Dr T Hlongwane. Dr T Hlongwane holds the position of PMU Manger and the post of WSA Manager for UMDM is held by Mr B Msomi.

3. DEMOGRAPHICS

3.1 EXISTING POPULATION DISTRIBUTION

The UMDM is in the process to review their WSDP. It is noted that the population figures reflected in the UMDM WSDP 2018/2019 does not include the population figures of the Msunduzi LM.

As the WSDP demographics for UMDM has not been updated to date and does not reflect the latest demographics when compared to the reference framework, the UAP Phase III will adopt the figures reflected by the DWS Reference Framework (2019).

There is currently 1 142 862 people within 315 383 households residing within 258 communities within UMDM. Apart from Msunduzi LM that hosts 62% of the population, uMshwathi and uMngeni LM's notably host 10% of the population each respectively. The population distribution of UMDM is illustrated in **Figure 3-1** overleaf.

The population and household figures per Local Municipality are tabled in **Table 3-1** below. The average household size for the WSA is 3.62 persons per household.

Table 3-1: Population & Household Figures for UMDM

Municipality	Population	Households	People per Household
The Msunduzi	708 496	191 054	3.71
uMshwathi	116 112	30 606	3.79
uMngeni	115 253	40 134	2.87
Richmond	74 361	18 416	4.04
Mkhambathini	59 229	16 338	3.63
Mpofana	38 917	11 404	3.41
Impendle	30 494	7 431	4.10
Total	**1 142 862**	**315 383**	**3.62**

Source: DWS Reference Framework, April 2019

It is noted that within the UAP Phase II study the probable population estimate in 2020 for the UMDM was modelled to be 1 142 926. (Bigen Africa, 2016) Thus the DWS Reference Framework reflects a figure that compares reasonably to that of the UAP Phase II study.

The Community Survey 2016 yielded a growth rate of 1.9% for the UMDM from 2011 to 2016 and reports an annual average household growth of 2.1% from 2011 - 2016. Impendle Local Municipality, among a few other LM's within KwaZulu-Natal, recorded a negative growth rate from 2011 to 2016 due to communities migrating to seek better work opportunities or facilities.

N

Okhahlamba Local Municipality

Inkosi Langalibalele Local Municipality

Uthukela

Estcourt

Umzinyathi

Greytown

eNhlalakahle

Umvoti Local Municipality

Maphumulo Local Municipality

Mpofana Local Municipality

Mooi River

uMngeni Local Municipality

Lidgetton

Umgungundlovu

Howick

Merrivale

Cedara

Pietermaritzburg

uMshwathi Local Municipality

New Hanover

Wartburg

iLembe

Ndwedwe Local Municipality

Impendle Local Municipality

The Msunduzi Local Municipality

Msunduzi

Edendale

Taylor's Halt

eThekwini

Richmond Local Municipality

Richmond

Mkhambathini Local Municipality

Harry Gwala

Himeville

Underberg

Nkosazana Dlamini-Zuma Local Municipality

Umzimkhulu Local Municipality

Ubuhlebezwe Local Municipality

Ugu

Umdoni Local Municipality

eThekwini Local Municipality

Durban

Pietermaritzburg

Kilometers

10 5 0 10 20

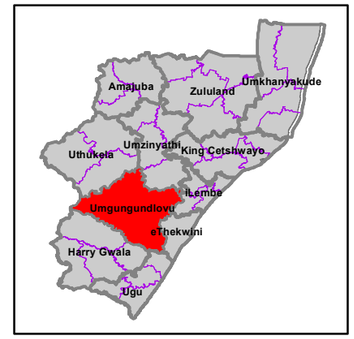
Population Distribution

- 0 - 200 people
- 201 - 500 people
- 501 - 1 000 people
- 1 001 - 5 000 people
- 5 001- 10 000 people
- 10 001 and more people

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- National Roads (N1)
- Main Roads
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns (Hilton)

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

UMGUNGUNDLOVU DISTRICT MUNICIPALITY

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PROJECT TITLE

Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Population Distribution

Umgungundlovu District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 22 Figure 3-1

3.2 Social and Economic Indicators

The UMDM constitutes 10% of the area and ±9% of the population of KZN. The district is one of the fastest growing areas in terms of both population and the economy. The district is diverse and made up of sub-areas, each with unique attributes that combine in a systematic manner to establish the district as a distinct geographic functional region with Pietermaritzburg as the main economic and service hub.

Other sub-areas include the renowned Midlands Meander, high potential agricultural areas (Midlands Mist belt), expansive rural settlements and small towns that serve the rural hinterland. The district accounts for about 13.5% of KwaZulu-Natal's Gross Geographical Product and 14.5% of the province's formal employment. (UMDM/Cogta, 2014)

The district occupies a strategic position and plays a critical role in the provincial economy. In addition to being the seat of the Provincial Cabinet and Parliament, the Umgeni River, which supplies water to the industrial and logistics hub of eThekwini rises from and runs through the district in an east-west direction. A significant portion of the N3 corridor also runs through the district.

Development challenges facing the district include urbanization and the associated informal settlements, poverty, service backlogs and general lack of investment in the rural areas, particularly traditional council areas, land issues and lack of infrastructure investment (bulk infrastructure).

UMDM's economy contributes nearly 12% to value of goods and services produced in KwaZulu-Natal. Manufacturing remains the second major economic driver, contributing 22% to total gross value added (GVA) in the province, after community services (including government services). Manufacturing activities are driven by aluminium processing, clothing and textiles as well as agro-processing (sugar milling, animal feed and leather and footwear production). In recent years, the construction and finance, insurance, real-estate and business services and transport sectors have shown an increasing growth although these sectors are still small. (DBSA, 2020)

Table 3-2 overleaf provides the total Rand value added at each stage of production in 2017 current prices, the percentage contribution of uMgungundlovu to KwaZulu-Natal's economy and each local municipality to uMgungundlovu's economy, as well as the compound average annual growth rate (CAAGR) measured over five years, in constant 2010 prices.

Table 3-2: Municipal contribution to the district economy

AREA	GVA 2017	% CONTRIBUTION	5 YR CAAGR
KwaZulu-Natal	661 739 104	-	1.6%
uMgungundlovu	68 868 628	10%	1.9%
uMshwathi	4 594 240	7%	1.8%
uMngeni	9 939 200	14%	2.6%
Mpofana	2 082 687	3%	2.0%
Impendle	679 561	1%	0.8%
Msunduzi	46 306 741	67%	1.7%
Mkhambathini	2 383 672	3%	1.7%
Richmond	2 882 529	4%	1.9%

Source: Human Settlements Sector Plan (HSSP) for the Msunduzi Local Municipality, 2019

GVA growth in uMgungundlovu is in line with that of KZN; uMngeni Local Municipality has the highest growth of all local municipalities within uMgungundlovu at 2.6%. **Table 3-3** below shows uMgungundlovu's GVA per sector, the percentage contribution of each sector to the total uMgungundlovu GVA and compound average annual growth rate CAAGR per sector.

Table 3-3: UMDM Economic sectors

Sector	GVA 2017	% Contribution	5 YR CAAGR
Agriculture, forestry and fishing	4 899 458	7%	1.2%
Mining and quarrying	304 142	0%	3.0%
Manufacturing	9 483 686	14%	0.8%
Electricity, gas and water	3 584 350	5%	-1.0%
Construction	2 727 726	4%	2.4%
Wholesale and retail trade, catering and accommodation	10 077 798	15%	1.8%
Transport, storage and communication	7 919 575	11%	2.5%
Finance, insurance, real estate and business services	10 623 028	15%	2.3%
General government	4 515 754	7%	3.6%
Community, social and personal services	14 733 112	21%	2.0%

Source: Human Settlements Sector Plan (HSSP) for the Msunduzi Local Municipality, 2019

Table 3-4 overleaf shows the number of formally and informally employed persons in the Umgungundlovu District Municipality and its local municipalities, along with the percentage contribution of each. It also indicates the total number of employed persons, the percentage contribution of uMgungundlovu to KZN's employment and each local municipality to Umgungundlovu's employment as well as the CAAGR of employment from 2012-2017. UMDM contributes 10% to KZN's GVA but 12% to KZN's employment. The latter confirms the the importance of the district to KZN.

Furthermore, employment in Msunduzi has been growing at a rate of 2.8% since 2012, that is a percent higher than growth in KZN as a whole. uMgungundlovu's unemployment rate is 1% less than that of the province, however, Impendle LM exhibits a very high unemployment rate of 37%.

Table 3-4: Employment Levels per Local Municipality

AREA	UNEMPLOYMENT RATE	FORMAL EMPLOYMENT	% FORMAL OF TOTAL	INFORMAL EMPLOYMENT	% INFORMAL OF TOTAL	TOTAL EMPLOYMENT	% CONTRIBUTION	5 YR CAAGR
KwaZulu-Natal	24%	2 151 665	81%	493 468	19%	2 645 133	-	1.8%
uMgungundlovu	23%	261 616	82%	56 561	18%	318 176	12%	2.8%
uMshwathi	19%	20 762	76%	6 496	24%	27 258	9%	3.0%
uMngeni	17%	30 218	85%	5 540	15%	35 758	11%	3.0%
Mpofana	18%	9 564	74%	3 430	26%	12 995	4%	2.9%
Impendle	37%	3 108	79%	818	21%	3 925	1%	3.2%
Msunduzi	25%	175 239	84%	33 448	16%	208 687	66%	2.7%
Mkhambathini	20%	9 886	80%	2 395	20%	12 281	4%	2.3%
Richmond	20%	12 838	74%	4 434	26%	17 272	5%	3.1%

Source: Human Settlements Sector Plan (HSSP) for the Msunduzi Local Municipality, 2019

3.3 Population Growth Scenarios

Population and economic growth rates are used to determine future developmental requirements within the UMDM. This determines the required increase or decrease in water services. Non-domestic consumer unit growth, particularly commercial, industrial and agricultural growth, also gives an indication of the expected increase in water demand and associated wastewater flow discharges. Factors that affect population growth rate include:

- ✓ Immigration due to displaced farm labour, land restitution and declining job opportunities in neighbouring provinces;
- ✓ Emigration to urban centres or outward migration from the region in search of job opportunities; and
- ✓ The HIV/AIDS epidemic that is predicted to seriously affect economically active persons (18-45 years). Full-blown AIDS sufferers who are unable to continue working may return home to the

rural areas. This may be an internal urban/rural shift, or migration from urban areas outside the DM. With the prevalence of HIV/AIDS, especially in KZN, it is important to ensure adequate water services provision in the rural areas.

There is currently 1 142 862 people within 315 383 households residing within 258 communities within UMDM. As mentioned earlier in Section 3.1, the Community Survey 2016 yielded a growth rate of 1.9% for the UMDM from 2011 to 2016 and reports an annual average household growth of 2.1% from 2011 - 2016. There seems to be some migration from the rural areas to the various urban centres in the district as well as where infrastructure is provided.

Growth trends per local municipality can be summarised as follows:

- ✓ **uMshwathi** is predominantly rural, and slight positive growth is experienced mainly around urban towns.
- ✓ **uMngeni** experienced the highest growth rate in the DM. Migration towards the LM possibly due to the strategic location of the LM for better opportunities and the possibility of new human settlements.
- ✓ **Impendle** is predominantly rural that, experienced a negative growth rate due to migration to seek better opportunities in urban centres.
- ✓ **Msunduzi** experiences a strong positive growth rate particularly in the capital, Pietermaritzburg.
- ✓ **Mkhambathini** is predominantly rural that experienced a slight positive growth rate mainly around urban towns. Migration is evident.
- ✓ **Richmond** is predominantly rural that experienced a slight positive growth rate mainly around urban towns.
- ✓ **Mpofana** has **e**xperienced a positive growth rate mainly around urban towns.

3.4 Main Development Nodes[2]

The importance of development nodes is a reflection of an area's economic development potential and the range of service that should be provided.

The following **primary** nodes have been identified in the District:

- ✓ **The City (Pietermaritzburg/Ashburton/Edendale)** - The most strategic economic development node in the District with potential for growth and expansion.
- ✓ **Edendale** - Edendale has for most of its existence been a dormitory township only offering some regional services in terms of health and education. Industrial development occurred but had

[2] Sourced from the UMDM 2019-2020 IDP Review

limited impact on establishing a sustainable economic base. Over the past 5 years there has, for the first time, been substantial investment in the retail sector and this presents a basis for Edendale to not only be viewed as a dormitory township, but presents the opportunity for it to develop into a fully-fledged town with a stable economic base.

- ✓ **Howick/Hilton and Camperdown** - The City core is strengthened by the fast-developing Howick/Hilton complex and the Camperdown/Cato Ridge area. These towns are expected to grow and form an integral part of the urban core.
- ✓ **Mpophomeni** - In the long term it is envisaged that Mpophomeni will merge with Howick/Hilton. In the short-term Mpophomeni is, however, classified as a town and, as is the case with Edendale, the area presents the opportunity into a fully-fledged town with a stable economic base.
- ✓ **Mooi River/Bruntville and Richmond** - Both towns have well-developed urban infrastructure and an established economic base. Both the nodes fulfil administrative and commercial functions in the local municipality context. It is noted that the character and focus of each of these towns differ significantly and this must be acknowledged in regional and local spatial planning.
- ✓ **New Hanover** - New Hanover is recognized as the Municipal Service Centre for the uMshwathi LM. The future development of New Hanover will be dependent on significant investment by both the private and public sectors. Its location on a major regional transport link in relative close proximity to the urban core suggests that it may in future develop an economic base and it is thus categorized as an emerging town.
- ✓ **Impendle** - Impendle also serves as a Municipal Service Centre and is thus categorized as a town. However, the town has a limited population and the potential for establishing an economic base is limited. The status of Impendle as a town is thus to be reviewed in the short to medium term.

These nodes are mainly centres which should provide service to the sub-regional economy and community needs.

The following **secondary** order nodes have been identified:

- ✓ **Vulindlela** - Although forming an extension of the City and Edendale, the area is underdeveloped and it is suggested that allocating this to be established Service Centre New Town status will further support the spatial transformation of the City.
- ✓ **Wartburg, Dalton/Cool Air and Eston** - These Service Centres have formal housing and some retail and service centre activities. The populations of these urban areas are, however, small and if traditional areas in the municipality are adequately catered for in terms of development it is not anticipated that there will be much opportunity for growth.

- ✓ **Ndaleni, KwaSwayimani, Opokweni, Appelsbosch -** These potential nodes all have substantial opportunities for establishing vibrant service and economic nodes in these areas should be considered.

These nodal areas do not provide services or economic advantages significant on Provincial Level but fulfil very important service delivery functions within the local economies of the municipalities and are the only areas providing commercial choice to the residents of the respective municipalities.

4. WATER REQUIREMENTS

This section provides an overview of the water requirements as calculated using the demand model developed for the purpose of this study. A summary is provided firstly for the District and then for each of the Local Municipalities. The total number of households (HH) as obtained from the 2011 Census and the number of households below RDP standards are also provided. (Households below RDP standards include all households having water supply – any form – further than 200m from the household).

4.1 WATER SUPPLY SERVICE LEVEL

Service levels currently differ across the UMDM, predominantly based on a rural/urban split. In general urban areas have water services equal to or higher than, and many rural areas have either no water services or these services do not meet, the compulsory national standards determined by the Minister of Water Affairs and Forestry in terms of Section 9(1)(a) of the Water Services Act, 1997 (Table 4a).

The Municipality is a Water Services Authority and provides free basic services, that are part of the municipality's mandate, to its registered Indigents. The indigent register is continually updated and the municipality receives applications.

The municipality aims to annually review and adopt its indigent policy together with budget related policies. This assists in ensuring that the municipality provides basic services to those residents who cannot afford, provided they apply to be part of the Indigent Register. (UMDM IDP, 2019)

The UMDM WSDP 2018/2019 reports that the current water backlog for the District is as follows:

Table 4-1: Water Backlogs within Umgungundlovu District Municipality

Direct Backlogs	Totals
Direct settlement backlog water households. Total household of settlement with a water need (irrelevant the type of need)	19 691
Direct settlement backlog water population. Total population of settlement with a water need (irrelevant the type of need)	80 781

Source: UMDM WSDP, 2018-2019

According to the DWS reference framework database, the main source for the majority of households within UMDM is piped (tap) water inside the yard of households and piped (tap) water inside the dwelling/house (approximately 45% and 36% respectively). (DWS, 2019)

Table 4-2 overleaf presents the distribution of households by main source of water for drinking.

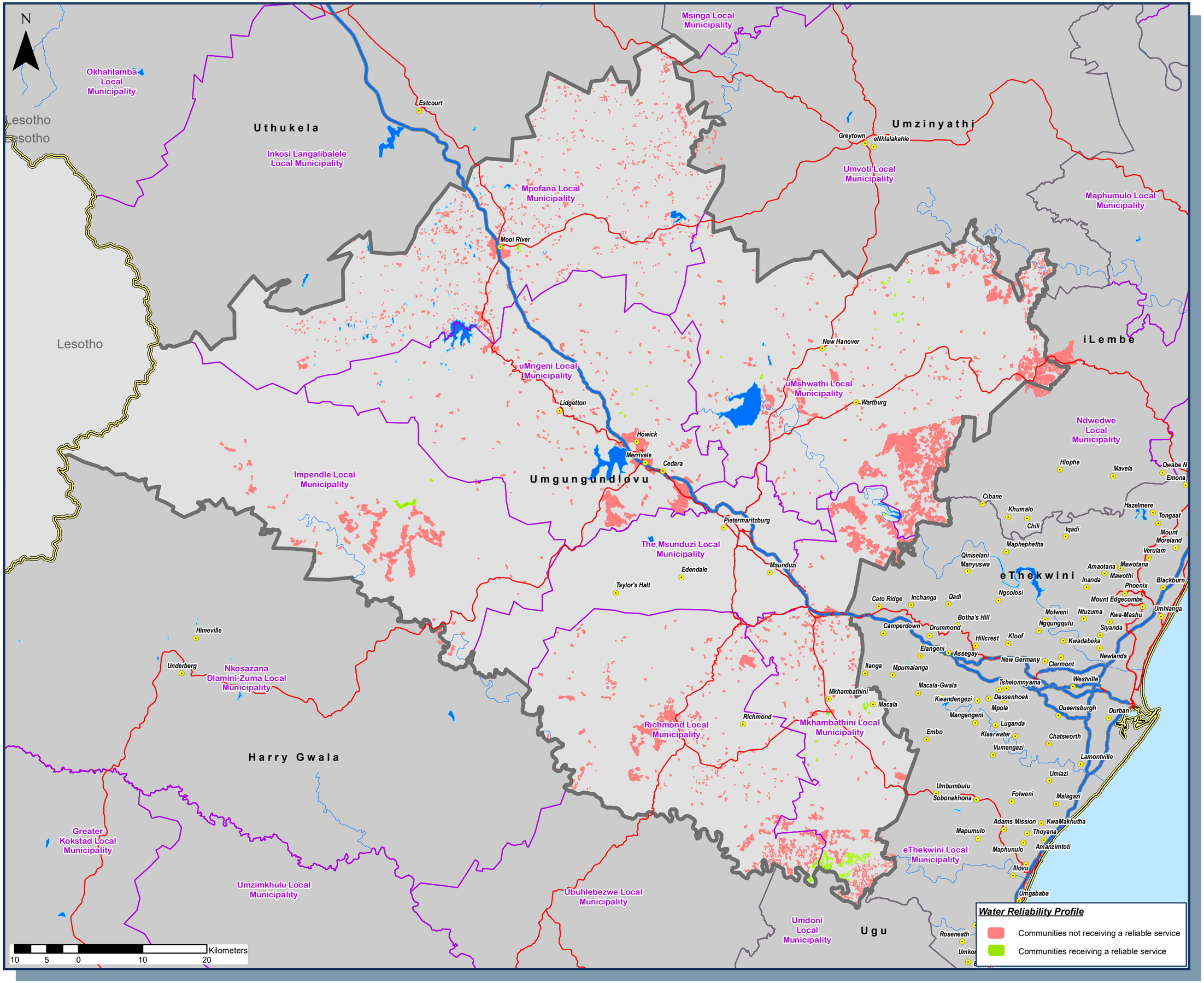
Table 4-2: Distribution of households by main source of water for drinking, DWS RF 2019

LM Name	Piped (tap) water inside the dwelling/house	Piped (tap) water inside yard	Distance below 200m	Distance greater than 200m	Borehole	Spring	Rain-water tank	Dam/pool/stagnant water	River/stream	Water vendor	Other	Total
Msunduzi *	75 346	102 884	8 029	2 673	178	0	202	569	139	857	179	**191 056**
uMshwathi	3 445	13 078	5 165	758	328	708	441	0	4 828	1 901	0	**30 652**
uMngeni	24 441	10 146	2 166	326	518	29	253	146	617	1 194	279	**40 115**
Richmond	2 050	4 459	8 087	2 577	316	0	0	0	477	445	15	**18 426**
Mkhambathini	1 292	6 437	3 614	2 584	103	0	0	16	1 691	597	7	**16 341**
Mpofana	5 675	2 636	825	0	25	41	0	0	697	1 373	161	**11 433**
Impendle	155	3 248	2 450	604	282	118	0	36	354	144	41	**7 432**
Total	**112 404**	**142 888**	**30 336**	**9 522**	**1 750**	**896**	**896**	**767**	**8 803**	**6 511**	**682**	**315 455**

Source: DWS Reference Framework, April 2019

* Note: The Msunduzi LM is its own WSA and is discussed in a separate study.

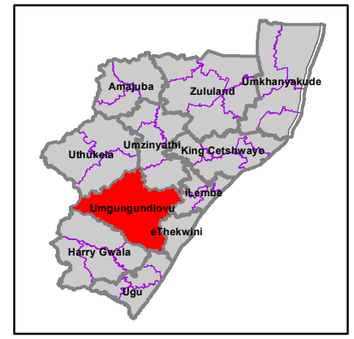
The service levels for UMDM is depicted in **Figure 4-1** overleaf.



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- National Roads
- Main Roads
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns (Hilton)

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

UMGUNGUNDLOVU DISTRICT MUNICIPALITY

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PROJECT TITLE

Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Water Levels of Service

Umgungundlovu District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 22 Figure 4-1

4.2 Water Losses and Demand Management[3]

Umgungundlovu District Municipality (UMDM) has increased its drive to accelerate the delivery of water services in its area of jurisdiction. UMDM is partnering with the DBSA which has provided the Municipality with lending and non-lending (technical) support to address critical water services infrastructure requirements. The lending support from the Development Bank of Southern Africa (DBSA) has been applied by UMDM to improve access to water and sanitation services. Key projects being implemented by the Municipality includes the replacement of asbestos cement pipes to reduce non-revenue water (NRW) and improve access to water supply.

It is noted that while UMDM is accelerating the delivery of water services, it is also facing the challenge of significant non-revenue water. If not addressed, the significant non-revenue water will jeopardize the financial viability of UMDM and undermine the sustainability of its service delivery.

Regular reporting in the form of water balances had been a standing requirement from all WSA's, as well as the recording of the volume of water saved on a quarterly basis from WC/WDM initiatives; however, the frequency and quality of the reporting from the Province has been and remains poor. Some of the reasons advanced from the WSA's for this were lack of human resources, appropriate skills and lack of necessary information. The objectives of the DWS's No Drop assessments and the KZN WC/WDM Forum are to:

- ✓ Provide hands-on technical support with specific emphasis on support to ensure that all WSA's can comply with No Drop reporting requirements;
- ✓ Ensure that water balances (to the IWA modified standard and with 95% confidence limits) can be produced on a regular basis on a WSA, town, and water supply system basis;
- ✓ Ensure that each WSA has sufficient bulk metering in place to accurately record System Input Volume (specifically that necessary to determine volumes on a water supply system basis);
- ✓ Identify areas of possible NRW reduction, by water balance component and per supply system, prioritise these in order of impact and prepare a consolidated NRW Reduction Intervention programme;
- ✓ Establish targets in terms of NRW by volume, supported by Key Performance Indicators and budget/funding requirements;
- ✓ Address the internal requirements necessary for the successful implementation of a NRW reduction programme in terms of resources, systems and critical success factors;
- ✓ Identify short-term problems that are being experienced with the Municipality's billing database and determine any necessary corrective actions;

[3] Sourced from the UMDM Management Plan to Reduce Non-Revenue Water, 2016

- ✓ Improve monitoring and reporting on WC/WDM activities and quantification of water demand reduction across all WSA's; and
- ✓ Commence projects focusing on system stabilisation, with the intention to move away from intermittent supply and thereby improve service delivery levels.

4.3 WATER BALANCE

The WSA prepares monthly water balances, in the IWA format, on a local municipality level, for submission to the DWS. These water balances help provide a greater understanding of each of the supply systems/waterworks and also assist in the preparation of specific intervention strategies and cost/benefit calculations.

The latest available water balance for the WSA is presented in **Table 4-3** below for the month of December 2018.

Table 4-3: UMDM Water Balance, December 2018

Total System Input Volume 1 874 826 m³/month 62.49 Mℓ/d	Authorised Consumption 1 020 158 m³/month Percentage of SIV = 54.4% 34.01 Mℓ/d	Billed Authorised Consumption 748 341 m³/month Percentage of SIV = 39.9% 24.94 Mℓ/d	Billed Metered Consumption-Domestic 663 873 m³/month Percentage of SIV = 35.4%	Revenue Water 748 341 m³/month Percentage of SIV = 39.9% 24.94 Mℓ/d
			Billed Metered Consumption-Commercial - m³/month Percentage of SIV = 0.0%	
			Export Volume - m³/month Percentage of SIV = 0.0%	
			Billed Unmetered Consumption 84 468 m³/month Percentage of SIV = 4.5%	
		Unbilled Authorised Consumption 271 817 m³/month Percentage of SIV = 14.5% 9.06 Mℓ/d	Unbilled Metered Consumption - m³/month Percentage of SIV = 0.0%	Non-Revenue Water 1 126 485 m³/month Percentage of SIV = 60.1% 37.55 Mℓ/d
			Unbilled Unmetered Consumption 271 817 m³/month Percentage of SIV = 14.5%	
	Water Losses 854 668 m³/month Percentage of SIV = 45.6% 28.49 Mℓ/d	Apparent Losses 153 840 m³/month Percentage of SIV = 8.2% 5.13 Mℓ/d	Unauthorised Consumption - m³/month Percentage of SIV = 0.0%	
			Metering Inaccuracies - m³/month Percentage of SIV = 0.0%	
		Real Losses 700 828 m³/month Percentage of SIV = 37% 23.36 Mℓ/d	Mains and Dsitribution Leaks - m³/month Percentage of SIV = 0.0%	
			Reservoir Overflows - m³/month Percentage of SIV = 0.0%	
			Service Connection Leaks - m³/month Percentage of SIV = 0.0%	

Source: KZN IWA Water Balances, 2018

The non-revenue water for the DM in 2018 was at 37.55 Mℓ/d. If using a rate of R6.00/kℓ, this amounts to a loss of R225 300 per day. Only 24.94 Mℓ/d of the SIV of 62.49 Mℓ/d can be billed and accounted for.

Table 4-4 provides detail on a first order water balance with figures from data that was available at the time. A spreadsheet reflecting the average daily meter reading volumes for UMDM was sourced from Umgeni Water and using the estimated losses as per Section 1 along with DWS WWTP influent figures, there is a water shortage of approximately 57,37Mℓ/day as illustrated within **Table 4-4**.

Table 4-4: First Order Water Balance for UMDM

Description	% Losses	Mℓday	Mℓ/year
Estimated bulk water abstracted		63.21	23 071.65
Estimated bulk water purchased from others		-	-
Estimated bulk water treated		**63.21**	**23 071.65**
Estimated losses during treatment	10%	6.32	2 307.17
Estimated physical water losses during distribution	15%	9.48	3 460.75
Estimated volume of water supplied to consumers	75%	**47.41**	**17 303.74**
Estimated influent at wastewater works		11.68	4 263.20
Estimated losses during treatment	10%	1.17	426.32
Estimated effluent discharged to source		**5.84**	**2 131.60**
Balance (discharge - abstraction)		**-57.37**	**-20 940.05**

4.4 Water Demand Model

This section provides an overview of the water requirements as calculated using the demand model developed for the purpose of this study. As mentioned in Section 1.5 of this report, the water demand model, approved by Umgeni Water, for this study was applied to determine the demands for all areas included in the study, at least at a town level. The water demands were modelled in five year increments up to 2050, with the minimum level of service as yard connections at 100ℓ capita per day. The base data used for the modelling is explained in Section 1.6.

The water demands for UMDM is presented below per LM and per supply scheme area. It must be noted that the Water Supply Scheme (WSS) boundaries do not necessarily coincide with municipal boundaries. There are supply areas that traverse more than one LM. The water requirements reported on are per LM and if a WSS is split by a LM, the water requirements are reported based on this split.

Within the UAP Phase II study, the Msunduzi LM was included in the planning for the UMDM. It is noted that the UAP Phase III water requirements excludes the water demands of the Msunduzi LM as it is its own WSA and a separate UAP Phase III will be undertaken for Msunduzi.

4.4.1 Water Demand for Umgungundlovu District Municipality

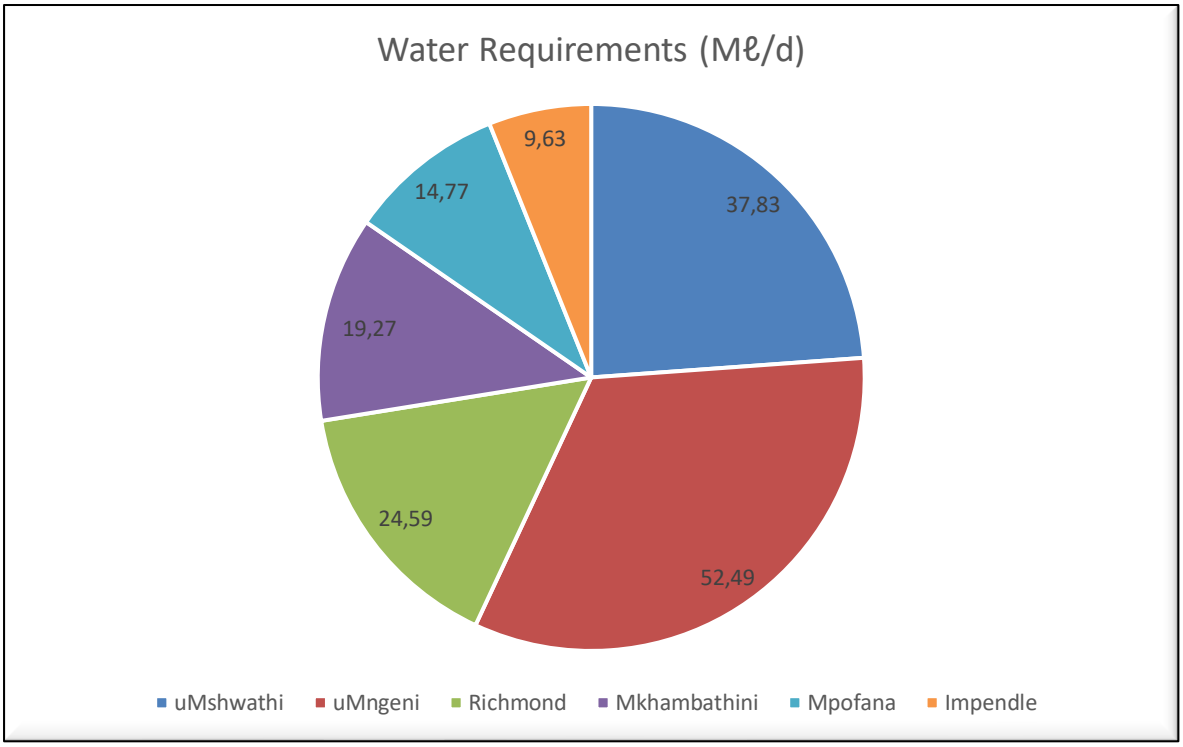
The water requirements (in Mℓ/d) for UMDM are presented per Local Municipality within **Table 4-5**. These water requirements were calculated for consumers having formal water supply schemes and for consumers not yet supplied from a formal water supply scheme. Section 1.5 Water Demand Methodology in this report explains the approach for the calculations to determine the theoretical water requirements and adjusted for water losses. The UMDM (excluding the requirements of Msunduzi LM) would require 158.57 Mℓ/day by the year 2050.

The 2050 water requirements per LM are presented overleaf in **Figure 4-2** in the form of a pie chart, illustrating that the uMngeni LM will be the largest water consumer in the UMDM requiring 33% of all water followed by the uMshwathi LM with 24%.

Table 4-5: Water Requirements (Mℓ/d), per Local Municipality

LM	2050 Population	2020 (Mℓ/d)	2025 (Mℓ/d)	2030 (Mℓ/d)	2035 (Mℓ/d)	2040 (Mℓ/d)	2045 (Mℓ/d)	2050 (Mℓ/d)
uMshwathi	190 329	25.09	26.72	28.67	30.70	32.89	35.26	37.83
uMngeni	165 085	35.12	37.37	40.06	42.85	45.84	49.05	52.49
Richmond	117 930	16.23	17.30	18.58	19.91	21.35	22.91	24.59
Mkhambathini	97 023	12.77	13.60	14.60	15.63	16.75	17.96	19.27
Mpofana	61 495	9.83	10.46	11.22	12.01	12.86	13.78	14.77
Impendle	52 144	6.35	6.77	7.27	7.79	8.35	8.97	9.63
Umgungundlovu DM	**684 005**	**105.39**	**112.22**	**120.40**	**128.89**	**138.05**	**147.92**	**158.57**

Figure 4-2: 2050 Water Demand in Mℓ/day per LM



4.4.2 *Demand per Water Scheme*

The water demands for the Water Supply Schemes (WSS) within UMDM is presented below and overleaf in **Table 4-6.**

Table 4-6: UMDM Water supply scheme demands

LM	WSS	2050 Population	2020 (Mℓ/d)	2025 (Mℓ/d)	2030 (Mℓ/d)	2035 (Mℓ/d)	2040 (Mℓ/d)	2045 (Mℓ/d)	2050 (Mℓ/d)
uMshwathi	Swayimane	59 426	7.07	7.53	8.07	8.64	9.26	9.92	10.65
	Appelsbosch (Hlatikhulu)	26 529	3.10	3.30	3.55	3.81	4.10	4.40	4.73
	Masihambisane	14 646	1.79	1.90	2.05	2.20	2.36	2.53	2.72
	uMshwathi Rural 3	13 715	1.79	1.91	2.05	2.19	2.34	2.51	2.69
	Mpolweni	11 407	1.52	1.61	1.73	1.85	1.98	2.12	2.28
	Albert Falls	10 100	1.44	1.53	1.64	1.75	1.88	2.01	2.16
	uMshwathi Rural 4	9 847	1.42	1.51	1.62	1.74	1.86	1.99	2.13
	Trust Feed	10 326	1.39	1.48	1.59	1.70	1.82	1.95	2.09
	Cool Air	4 606	1.01	1.08	1.16	1.24	1.32	1.42	1.52
	New Hanover	5 689	0.93	0.99	1.06	1.13	1.21	1.30	1.39
	uMshwathi Rural 2	6 877	0.88	0.94	1.01	1.08	1.16	1.24	1.34
	uMshwathi Rural 1	5 476	0.78	0.83	0.89	0.95	1.01	1.09	1.16
	Masihambisane - Ntanzi	6 397	0.75	0.80	0.86	0.92	0.99	1.07	1.14
	Dalton	2 678	0.58	0.62	0.66	0.71	0.76	0.81	0.87
	Wartburg	1 624	0.41	0.44	0.47	0.50	0.54	0.57	0.61
	Claridge	627	0.13	0.14	0.15	0.16	0.17	0.18	0.19
	Jaagbaan	358	0.11	0.11	0.12	0.13	0.14	0.15	0.16
uMngeni	Howick West	84 500	17.33	18.46	19.81	21.21	22.72	24.33	26.07
	Howick North	24 846	5.82	6.19	6.63	7.09	7.58	8.10	8.67
	Hilton	13 412	4.36	4.63	4.95	5.28	5.64	6.02	6.42
	uMgeni Rural 4	10 120	1.61	1.71	1.84	1.96	2.10	2.25	2.41
	uMgeni Rural 2	6 781	1.55	1.65	1.77	1.89	2.02	2.16	2.30
	Lidgetton	8 102	1.33	1.42	1.52	1.63	1.74	1.87	2.00
	uMgeni Rural 3	6 490	1.09	1.16	1.24	1.32	1.42	1.51	1.62
	uMgeni Rural 1	5 809	0.88	0.94	1.00	1.07	1.15	1.23	1.32
	Nottingham Road	3 201	0.69	0.73	0.78	0.84	0.90	0.96	1.02
	Balgowan	1 757	0.44	0.47	0.50	0.53	0.57	0.61	0.65
	Fort Nottingham	68	0.01	0.01	0.01	0.01	0.01	0.01	0.01

LM	WSS	2050 Population	2020 (Mℓ/d)	2025 (Mℓ/d)	2030 (Mℓ/d)	2035 (Mℓ/d)	2040 (Mℓ/d)	2045 (Mℓ/d)	2050 (Mℓ/d)
Richmond	Richmond	58 919	8.20	8.75	9.40	10.08	10.82	11.62	12.48
	Richmond Rural	21 023	3.13	3.33	3.57	3.82	4.09	4.39	4.70
	Hopewell	19 933	2.65	2.82	3.03	3.24	3.47	3.72	3.99
	Greater Eston 1	16 429	1.95	2.08	2.24	2.40	2.58	2.77	2.98
	Baynesfield	740	0.16	0.17	0.18	0.20	0.21	0.22	0.24
	Thornville	885	0.14	0.15	0.16	0.17	0.18	0.19	0.21
Mkhambathini	Table Mountain	45 546	5.42	5.77	6.19	6.63	7.10	7.62	8.18
	Greater Eston 2	20 136	2.47	2.64	2.84	3.05	3.27	3.52	3.78
	Mkhambathini Rural 1	12 808	1.99	2.12	2.27	2.42	2.59	2.77	2.97
	Mkhambathini Rural 3	7 951	0.97	1.03	1.11	1.18	1.27	1.36	1.46
	Umlaas Road and Camperdown	3 766	0.93	0.99	1.06	1.13	1.21	1.29	1.38
	Mkhambathini Rural 2	4 856	0.62	0.66	0.71	0.76	0.81	0.87	0.93
	Lion Park & Manyavu	1 961	4.74	4.76	4.79	4.82	4.85	4.89	4.92
Mpofana	Mooi River	32 508	5.95	6.34	6.79	7.27	7.78	8.33	8.92
	Mpofana Rural 3	7 533	1.06	1.13	1.21	1.30	1.39	1.49	1.60
	Mpofana Rural 2	7 073	0.98	1.04	1.12	1.19	1.28	1.36	1.46
	Mpofana Rural 6	4 488	0.54	0.57	0.62	0.66	0.71	0.76	0.82
	Mpofana Rural 7	4 009	0.50	0.53	0.57	0.61	0.66	0.71	0.76
	Tendele	2 004	0.24	0.26	0.28	0.30	0.32	0.34	0.37
	Rosetta	998	0.21	0.22	0.24	0.25	0.27	0.29	0.31
	Mpofana Rural 5	1 525	0.19	0.21	0.22	0.24	0.25	0.27	0.29
	Mpofana Rural 8	1 285	0.15	0.16	0.17	0.18	0.19	0.21	0.22
	Mpofana Rural 1	70	0.01	0.01	0.01	0.01	0.01	0.02	0.02
Impendle	Greater Impendle 1b	42 415	5.16	5.49	5.90	6.32	6.78	7.27	7.81
	Greater Impendle 1a	3 737	0.44	0.47	0.50	0.54	0.58	0.62	0.67
	Greater Impendle 2	3 655	0.42	0.45	0.48	0.52	0.55	0.60	0.64
	Impendle Rural 1	1 357	0.20	0.21	0.23	0.24	0.26	0.28	0.30
	Impendle Rural 2	532	0.08	0.09	0.09	0.10	0.11	0.12	0.12
	Impendle Rural 3	448	0.06	0.06	0.07	0.07	0.08	0.08	0.09

5. EXISTING WATER SUPPLY INFRASTRUCTURE

This section provides an overview of the available water resources as well as the current surface water supplied schemes. The Umgungundlovu DM water supply services are a mixture of individual schemes owned and operated by the DM and areas served via the Upper Mgeni System owned and operated by Umgeni Water.

- ✓ **Msunduzi** includes the urban areas of Pietermaritzburg and surrounds, and the rural area of Vulindlela. The entire municipality is supplied from the Upper Mgeni System.
- ✓ **Impendle** is categorised as mainly a rural area. Much of the local municipal land is dedicated to forestry and agriculture. The municipality is supplied via stand-alone groundwater and surface water systems at present. The remainder of the LM is private farmland.
- ✓ **Mkhambathini** is a largely rural area with Camperdown being the most urbanised area associated with light industries and distribution warehousing. Water is supplied to Mkhambathini by both UMDM stand-alone schemes, and the Upper Mgeni System.
- ✓ **Mpofana** is a rural area with Mooi River Town as the major town and a few smaller towns. These urban areas have all historically been provided via stand-alone surface and ground water systems owned and operated by Umgeni Water. However, increasing demand raised concerns over sustainability and the Greater Mpofana Water Supply Scheme is being built in a phased approach from the Spring Grove Dam Water Treatment Works.
- ✓ **Richmond** is a mixture of urban and rural areas. Richmond Town/eNdaleni, located in central Richmond is the most densely populated region. This is followed by Hopewell, located in the North-East part of Richmond. The greater Richmond urban area has recently been connected to the Upper Mgeni System via the Richmond pipeline. This pipeline also now supplies water to Hopewell, Thornville and Baynesfield. The rest of Richmond is served by boreholes and springs maintained by UMDM. The area is sparsely populated and the cost of supplying a Bulk Water Supply Scheme is high and renders a Regional Bulk Supply to the area not economically feasible.
- ✓ **uMshwathi** is a combination of rural and urban areas. Water is currently supplied to uMshwathi by UMDM stand-alone schemes and the Upper Mgeni System, but extensions are underway to cover the parts of the LM that are not private farmlands. No further bulk supply projects are required in this LM.
- ✓ **uMngeni** consists of the urban areas of Howick, Hilton, Merrivale and Mpophomeni and are supplied from the Upper Mgeni System. The remaining areas are primarily farmlands and are supplied by boreholes, and no further bulk supply projects are required.

For remote communities where no bulk services are feasible or possible (cannot be served by the Regional Scheme or Intermediate Schemes), a rudimentary water level of service is implemented in

the form of boreholes with handpumps, or spring protections. In some areas a small reticulation scheme with RDP level of services will be constructed where possible.

5.1 Water Resource Availability

5.1.1 Surface Water

The UMDM area is served by many different water resources. The Mooi/Mngeni catchment (U20 and V20) is the most important resource for a large proportion of the population. The other catchments in the area are the uMkomazi (U10), Lovu (U60), and Mvoti (U5). Groundwater also plays an important role in the district, with rural villages and large tracts of farmland being served via boreholes.

There are four major dams on the uMngeni River, namely Midmar, Albert Falls, Nagle and Inanda dams. These dams are all used as part of the water supply system and are supported by the Spring Grove Dam and Mearns Weir in the Mooi River catchment.

The major urban centres of Durban and Pietermaritzburg are situated within the Mgeni catchment. There are several other urban and peri-urban centres within this region including Mooi River, Rosetta, Nottingham Road, Howick, Wartburg, Cato Ridge and the greater surrounds of both Durban and Pietermaritzburg. The urban centres from Howick towards the coast receive their water from the Mgeni system. (UW IMP, 2020)

5.1.1.1 Mooi-Mgeni Transfer Scheme

A Mooi-Mgeni Transfer system was initially set up during the 1983 drought to provide additional water into the Mgeni System. The scheme consisted of a 3m high weir and pumpstation at Mearns, just downstream of the confluence of the Mooi and Little Mooi Rivers, a 13.3km long 1400mm diameter rising main to a break pressure tank situated at Nottingham Road and an 8.3km long 900mm diameter gravity main to an outfall structure on the Mpofana River. From here the water flows via the Mpofana, Lions and Mgeni rivers to Midmar Dam. The scheme has a maximum transfer capacity of 3.2m^3/s and was operated on a run-off-river basis due to the insignificant storage capacity. In 2002, the Mearns Weir was raised to 8m, increasing the storage to 5.116 Mm^3 and the Midmar Dam wall was raised an additional 3.5m. This was referred to as the Mooi-Mgeni Transfer Scheme 1 (MMTS-1) and was viewed as an interim solution whilst the feasibility of a dam on the Mooi was investigated.

In 2004 the demand in the Mgeni System first exceeded the system yield. With further growth in demand placing the system at a risk of failure, the DWS planned and constructed the Mooi/Mgeni Transfer Scheme - Phase 2A (Spring Grove Dam) and Phase 2B (Pump station and raw water pipeline) to mitigate this risk of non-supply. With Spring Grove Dam now fully impounded, the risk of water restrictions within the next few years is expected to be minimised. In the Mooi River catchment,

the only domestic and industrial water demands are associated with the town of Mooi River and Rosetta village. Numerous groundwater schemes feed many of the rural and outlying peri-urban centres in the region. (UW IMP, 2020)

The Mooi-Mgeni Transfer Scheme 2 (MMTS-2) involved the construction of a dam, a 4.5 m^3/s pump station and bulk raw water infrastructure for inter-basin transfer. The Spring Grove Dam is located on the Mooi River approximately 2km South West of Rosetta, and 8km upstream of the Mearns Weir. It drains an area of 339km^2 and has a gross storage volume of 139.5 Mm^3. Water is released from Spring Grove Dam and is abstracted at the Mearns Weir on the Mooi River and transferred into Midmar Dam to support supply in this system. In addition, a new raw water pipeline from Spring Grove Dam to the Mgeni catchment has been completed, enabling a continuous transfer of water at a higher rate and increasing the yield of the greater Mgeni System. In addition, a water treatment plant is being built at the dam to supply the Greater Mpofana Water Supply Scheme, with the ultimate capacity of 60 Mℓ/day. Both the Mooi and the Mgeni catchments are now fully utilised and no additional water use can be licensed. (UW IMP, 2020)

Water is abstracted from Midmar Dam, treated and distributed via the Upper Mngeni Water Supply System. The current demand off the Upper Mgeni System is approximately 304.56 Mℓ/day (14% for uMgungundlovu DM, 58% for Msunduzi, and 28% for eThekwini). (UW IMP, 2020)

The water resources of UMDM is illustrated in **Figure 5-1** overleaf.

Figure 5-2 overleaf presents a network chart of the Mngeni system and **Table 5-1** presents the yield information for the existing water resource infrastructure in the Mooi/Mgeni Region including transfers from the MMTS.

N

Pongola Mtamvuna

Mpofana Local Municipality

uMngeni Local Municipality

uMshwathi Local Municipality

Impendle Local Municipality

The Msunduzi Local Municipality

Mkhambathini Local Municipality

Richmond Local Municipality

Uthukela

Umzinyathi

eThekwini

iLembe

Harry Gwala

Ugu

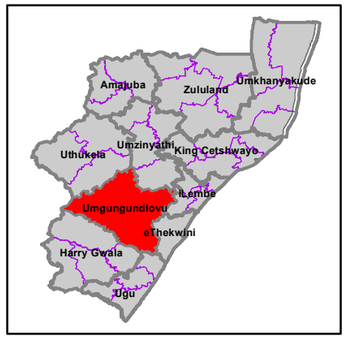
Lesotho

Kilometers
10 5 0 10 20

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Water Management Area
- Quaternary Boundaries & Numbers (W13A)

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

UMGUNGUNDLOVU DISTRICT MUNICIPALITY

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PROJECT TITLE

Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Water Resources

Umgungundlovu District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 22 Figure 5-1

Figure 5-2: Network chart of the uMgeni Water Supply System (UW IMP, 2020)

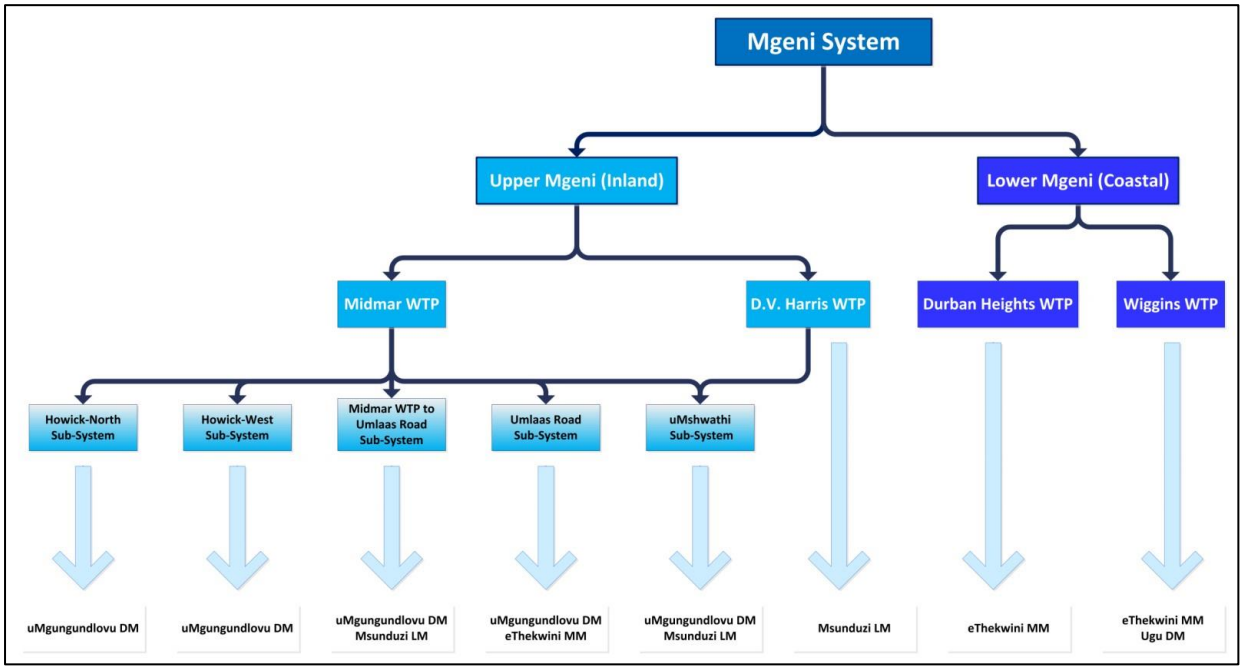


Table 5-1: Yield Information for the existing water resource infrastructure in the Mooi/Mgeni Region including transfers from the MMTS

Phase	Position in System	Historic Firm Yield	Stochastic Yield (1 in 50 years risk of failure)		Stochastic Yield (1 in 100 years risk of failure)	
		Mm^3/a	Mm^3/a	Mℓ/day	Mm^3/a	Mℓ/day
MMTS	Midmar Dam	177.3	192.0	526.0	173.8	476.2
	Nagle Dam	283.5	329.0	901.4	302.0	827.4
	Inanda Dam	384.0	428.0	1 172.6	400.0	1 095.9

Source: Umgeni Water, 2020

With the completion of the second phase of the MMTS, the 99% assured yield of the Mgeni System, at Midmar Dam, has increased from 322.5 Mℓ/day (117.7 Mm^3/a) to 476.2 Mℓ/day (173.8 Mm^3/a). (UW IMP, 2020)

The groundwater has a low to medium potential in the UMDM area. The quality of the groundwater is generally excellent. Groundwater is used by many private landowners for potable use. Groundwater is also used to supplement irrigation and for stock watering. Nottingham Road and Rosetta are supplied by very high yielding boreholes.

5.2 PHYSICAL INFRASTRUCTURE

Most of the existing water supply systems within UMDM is owned and operated by Umgeni Water as part of the Upper Mgeni Supply System. UMDM however is responsible for the internal bulks and reticulation from the bulk infrastructure.

The bulk systems/supply schemes in the UMDM is as follows:

- ✓ Upper Mgeni System;
  - Howick-North Sub-System;
  - Howick-West Sub-System;
    - Mill Falls Pump Station to Howick-West Reservoir;
    - Howick-West Reservoir to Groenekloof Reservoir;
    - Groenekloof Reservoir Supply;
    - Blackridge Reservoir Supply; and
    - Vulindlela Water Supply Scheme.
  - Umlaas Road Sub-System.
    - '57 Pipeline Supply System.
    - Eston/Umbumbulu Pipeline. and
    - Lion Park/Manyavu Pipeline.
  - uMshwathi Sub-System (via Umshwathi Regional Scheme/Augmentation and Extension of the Wartburg Supply System); and
    - Msunduzi Bulk Water Supply;
    - '69 Pipeline: to Wartburg Reservoir (Augmented by the Umshwathi Regional Scheme);
    - Wartburg Reservoir to Bruyns Hill Reservoir (Augmented by the Umshwathi Regional Scheme);
    - uMshwathi Bulk Water Supply System Upgrade;
    - Dalton to Ozwathini Supply System (Umshwathi Regional Scheme); and
    - Swayimana Water Supply Scheme.
- ✓ Greater Mpofana Water Supply Scheme Phase 1.

Figure 5-3 presents the existing infrastructure of the DM and then per LM within **Figures 5-4** to **5-9.**

N

Kilometers
10 5 0 10 20

Masongwane
Mlambonja
Mhlwazini
Ndedema
Mooi

Estcourt
Weenen
Uthukela
Umzinyathi
Greytown
eNhlalakahle
iLembe
Lesotho

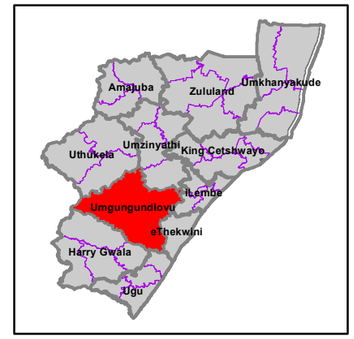
Mpofana Rural 5
Mpofana Rural 6
Mpofana Rural 8
Mpofana Local Municipality
Mpofana Rural 7
Mpofana Rural 3
Mooi River
Mpofana Rural 2
Mpofana Rural 1
Rosetta
Tendele
Nottingham Road
uMgeni Rural 4
uMgeni Rural 3
Fort Nottingham
Balgowan
Lidgetton
uMgeni Rural 2
uMgeni Local Municipality
uMgeni Rural 1
Howick
Howick North
Howick West
Merrivale
Cedara
Hilton
Claridge
Albert Falls
Mpolweni
Wartburg
New Hanover
uMshwathi Local Municipality
uMshwathi Rural 3
uMshwathi Rural 2
uMshwathi Rural 4
uMshwathi Rural 1
Dalton
Cool Air
Jaagbaan
Trust Feed
Masihambisane
Masihambisane Ntanzi
Appelsbosch (Hlatikhulu)
Swayimane
Table Mountain
Umgungundlovu
Impendle Rural 3
Impendle Rural 2
Impendle Local Municipality
Greater Impendle 1a
Greater Impendle 1b
Greater Impendle 2
Impendle Rural 1
Impendle Rural 4
Himeville
Underberg
Pietermaritzburg
The Msunduzi Local Municipality
Msunduzi
Edendale
Taylor's Halt
Lion Park & Manyavu
Umlaas Road and Camperdown
Thornville
Hopewell
Mkhambathini Rural 1
Mkhambathini Rural 2
Mkhambathini Rural 3
Mkhambathini Local Municipality
Richmond Local Municipality
Richmond
Richmond Rural
Harry Gwala
eThekwini
iLembe
Ugu
Lesotho
Hlophe
Cibane
Khumalo
Chili
Iqadi
Maphephetha
Qinisela Manyuswa
Mawothi
Inanda
Ngcolosi
Molweni
Ntuzuma
Ngungqulu
Siyanda
Kwadabeka
Newlands
Clermont
New Germany
Kloof
Hillcrest
Botha's Hill
Drummond
Camperdown
Cato Ridge
Inchanga
Qadi
Elangeni
Assegay
Ilanga
Mpumalanga
Tshelomnyama
Pinetown
Mpola
Dassenhoek
Kwandengezi
Ntshongweni
Macala-Gwala
Mangangeni
Luganda
Embo
Klaarwater
Vumengazi
Chatsworth
Queensburgh
Durban
Westville
Lamontville
Umlazi
Folweni
Malagazi
Umbumbulu
Sobonakhona
Adams Mission
KwaMakhutha
Mapumulo
Maphunulo
Thoyana
Amanzimtoti
Kingsburgh
Illovu
Umgababa
Luthuli
Mlazi
Lovu
Mzimkhulu
Ngwangwane

Water Infrastructure
- Existing Reservoirs
- Existing Water Pumpstations
- Existing Water Treatment Plants
- Surface Water Abstraction Works
- Existing Regional Bulk Pipelines
- Water Scheme Areas & Names

Howick

Legend
- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- National Roads
- Main Roads
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns (Hilton)

LOCALITY:



CLIENT:
UMGENI WATER • AMANZI

MUNICIPALITY:
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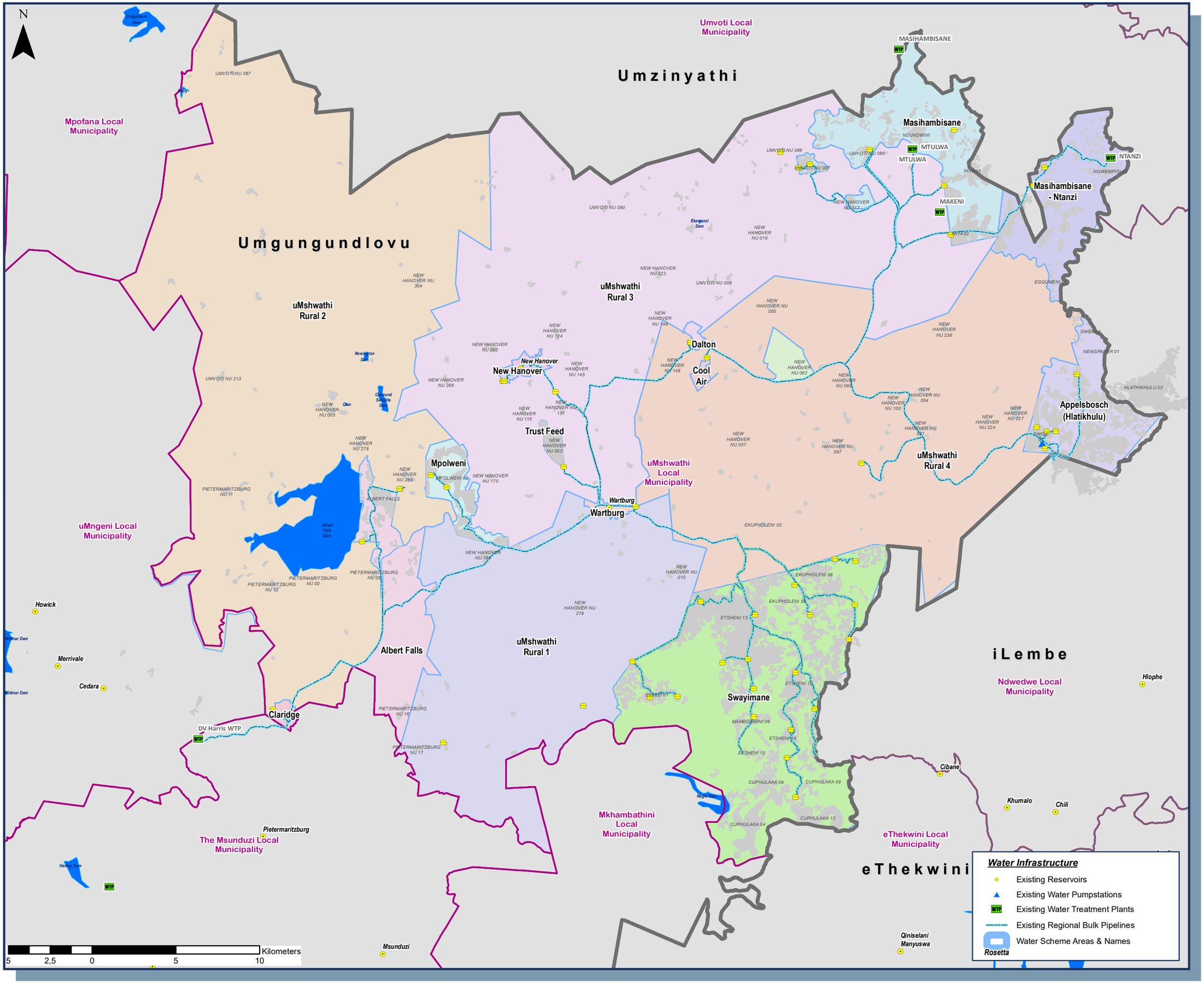
PROJECT TITLE
Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:
Existing Scheme Areas & Infrastructure Components Umgungundlovu District Municipality

DATE COMPLETED:
January 2021

MAP NO.:
DC 22 Figure 5-3



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PROJECT TITLE

Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - uMshwathi
Umgungundlovu District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 22 Figure 5-4

N

Inkosi Langalibalele Local Municipality

Uthukela

Mooi River

Mpofana Local Municipality

uMshwathi Local Municipality

Nottingham Road

uMgeni Rural 4

Balgowan

uMngeni Local Municipality

Fort Nottingham

uMgeni Rural 3

LIGETTON WEST

Lidgetton

Lidgetton

Umgungundlovu

uMgeni Rural 2

Howick

MIDMAR

WTP

Howick North

Merrivale

Cedara

uMgeni Rural 1

Howick West

Hilton

Impendle Local Municipality

Pietermaritzburg

The Msunduzi Local Municipality

Water Infrastructure

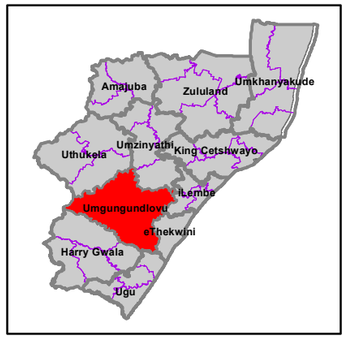
- Existing Reservoirs
- Existing Water Pumpstations
- WTP Existing Water Treatment Plants
- Existing Regional Bulk Pipelines
- Rosetta Water Scheme Areas & Names

5 2,5 0 5 10 Kilometers

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- N1 National Roads
- Main Roads
- Dried Dam Dams & Dam Names
- Rivers
- Settlements
- Hilton Major Towns

LOCALITY:



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PROJECT TITLE

Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

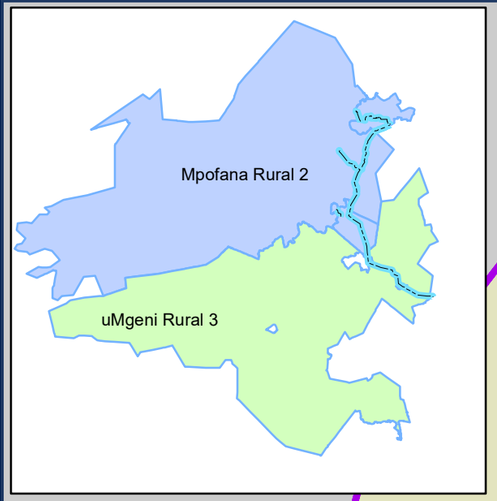
Existing Scheme Areas & Infrastructure Components - uMngeni
Umgungundlovu District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 22 Figure 5-5



N

Mpofana Rural 5

MOOI RIVER - MPOFANA

Mooi River

Mooi River

Mpofana Rural 3

Umgungundlovu

Mpofana Rural 2

Mpofana Local Municipality

ROSETTA

WTP

Rosetta

uMngeni Local Municipality

Spring Grove Dam

Kilometers

2 1 0 2 4

Water Infrastructure

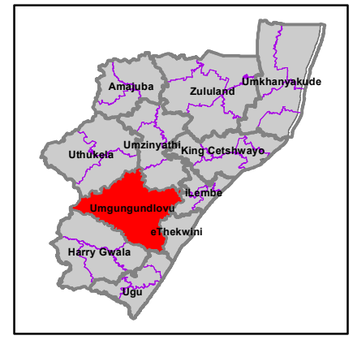
- Existing Reservoirs
- Existing Water Pumpstations
- Existing Water Treatment Plants
- Existing Regional Bulk Pipelines
- Water Scheme Areas & Names

Rosetta

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- National Roads
- Main Roads
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns

LOCALITY:



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PROJECT TITLE

Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Mpofana
Umgungundlovu District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 22 Figure 5-6

N

Kilometers
5 2,5 0 5 10

Inkosi Langalibalele Local Municipality

Uthukela

Mpofana Local Municipality

Lesotho

uMngeni Local Municipality

Lidgetton

Impendle Rural 3

Umgungundlovu

Impendle Rural 2

Impendle Local Municipality

Greater Impendle 1a

NZINGA

IMPENDLE SPRING PACKAGE PLANT

Greater Impendle 1b

GOMANE - PACKAGE PLANT

KWAKHETHA WTW

Greater Impendle 2

MAKHUZENI

Impendle Rural 1

Impendle Rural 4

Harry Gwala

Nkosazana Dlamini-Zuma Local Municipality

Himeville

Underberg

The Msunduzi Local Municipality

Richmond Local Municipality

Water Infrastructure

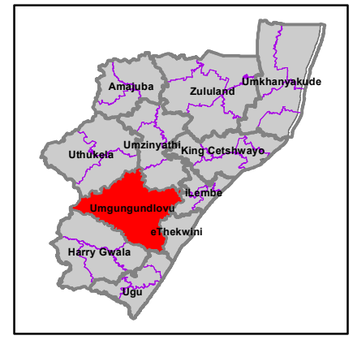
- Existing Reservoirs
- Existing Water Pumpstations
- Existing Water Treatment Plants
- Existing Regional Bulk Pipelines
- Water Scheme Areas & Names

Rosetta

Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- National Roads
- Main Roads
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns (Hilton)

LOCALITY:



CLIENT:

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PROJECT TITLE

Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Impendle
Umgungundlovu District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 22 Figure 5-7

N

uMshwathi Local Municipality

Table Mountain

Pietermaritzburg

The Msunduzi Local Municipality

Msunduzi

Lion Park & Manyavu

Cato Ridge

Inchanga

Qadi

Umlaas Road and Camperdown

Camperdown

Drummond

Mkhambathini Rural 1

eThekwini

Elangeni

Assegay

Ilanga

Mpumalanga

Mkhambathini Local Municipality

Macala-Gwala

Mkhambathini

Macala

Ntshongweni

Umgungundlovu

eThekwini Local Municipality

Mkhambathini Rural 2

Richmond

Embo

Richmond Local Municipality

Mkhambathini Rural 3

Umbumbulu

OLD WTW - ABANDONED

WTP

Greater Eston 2

Ubuhlebezwe Local

Ugu

Umdoni Local Municipality

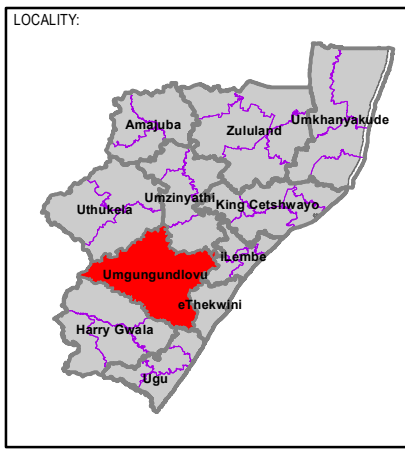
Kilometers

3 1,5 0 3 6

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- National Roads (N1)
- Main Roads
- Dams & Dam Names (Driel Dam)
- Rivers
- Settlements
- Major Towns (Hilton)

LOCALITY:



CLIENT:

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PROJECT TITLE

Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Mkhambathini Umgungundlovu District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 22 Figure 5-8

Water Infrastructure

- Existing Reservoirs
- Existing Water Pumpstations
- Existing Water Treatment Plants (WTP)
- Existing Regional Bulk Pipelines
- Water Scheme Areas & Names (Rosetta)

N

The Msunduzi Local Municipality

Thornville

Baynesfield

Hopewell

Richmond Local Municipality

Mkhambathini Local Municipality

Mkhambathini

RICHMOND

Umgungundlovu

Richmond

Richmond

Richmond Rural

Nkosazana Dlamini-Zuma Local Municipality

Harry Gwala

Ubuhlebezwe Local Municipality

Greater Eston 1

Ugu

Umdoni Local

Water Infrastructure

- Existing Reservoirs
- Existing Water Pumpstations
- Existing Water Treatment Plants
- Existing Regional Bulk Pipelines
- Water Scheme Areas & Names

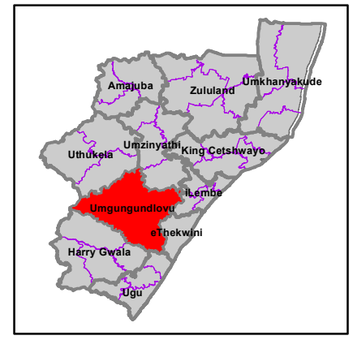
Rosetta

5 2,5 0 5 10 Kilometers

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- National Roads
- Main Roads
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns (Hilton)

LOCALITY:



CLIENT:

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Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Richmond
Umgungundlovu District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 22 Figure 5-9

5.2.1 Upper Mgeni System

The existing infrastructure of various sub-systems of the Upper Mgeni system is summarised below.

5.2.2 Howick-North Sub-System

The Howick-North Sub-System serves the Howick CBD and surrounding suburbs via the Howick-North Reservoir Complex (6.6 Mℓ) which functions as a terminal reservoir under the current operating conditions. With the current average demand at 5.2 Mℓ/day, the reservoir does not have enough storage to meet its 48hour storage requirement. A new reservoir, at a higher level, is proposed, to supply future developments. This reservoir, which needs to be constructed by uMgungundlovu District Municipality, will be supplied from the Howick-North Reservoir Complex. The Howick-North Reservoir Complex will thereafter become a distribution reservoir. The pumps at Mill Falls and the pipeline to the reservoir were recently upgraded and hence there is sufficient capacity in this infrastructure for the foreseeable future. (UW IMP, 2020)

5.2.3 Howick-West Sub-System

The Howick-West Sub-System serves the communities of Howick-West, Merrivale, Mpophomeni, Cedara and Hilton in the uMngeni LM; and Vulindlela, Sweetwaters and Blackridge in Msunduzi LM.

5.2.3.1 Mill Falls Pump Station to Howick-West Reservoir

Water from the Mill Falls Pump Station is pumped to the Howick-West Reservoir Complex through a 700 mm diameter steel pipeline. The original 375 mm diameter asbestos cement pipe from Midmar WTP to Howick-West Reservoir is now utilised as a back-feed pipeline. This back-feed pipeline supplies potable water to Merrivale, a lowcost housing scheme at Howick West, online consumers and the Midmar WTP.

The pump station (25.1 Mℓ/day) and pipeline (66.6 Mℓ/day) to the Howick-West Reservoir have adequate capacity to serve the long-term demands on the Howick-West Reservoir.

5.2.3.2 Howick-West Reservoir to Groenekloof Reservoir

The Howick-West Reservoir (16.5 Mℓ) serves as a distribution reservoir with bulk supply lines to Groenekloof and Mpophomeni Reservoirs with direct supply into the Howick-West reticulation network. An additional 16 Mℓ Reservoir is currently being constructed to ensure adequate storage to meet the current and projected demand of the supply area.

Water is pumped from the Howick-West Reservoir to Mpophomeni Reservoir (an Umgungundlovu District Municipality reservoir). Off-takes from this pumping main have the effect of continuously changing the system curve which affects the duty point of the pumps.

uMngeni Local Municipality has planned a 1 500-unit low cost housing development adjacent to Mpophomeni. Phase 1 will result in a 300 kℓ/day increase in demand which will cause the current demand to exceed the capacity of the Mpophomeni pipeline. New infrastructure will be required to meet the future demands.

5.2.3.3 Groenekloof Reservoir Supply

The 17.3 Mℓ Groenekloof Reservoir Complex serves as a balancing reservoir for Vulindlela, Sweetwaters and Blackridge.

5.2.3.3.1 Secondary bulk component

The Groenekloof Reservoir Complex has a 300 mm diameter back-feed pipeline (old '67 Pipeline) that supplies consumers in Hilton and Cedara. The current demand out of Groenekloof Reservoir is 33.43 Mℓ/day. This demand is expected to increase to 45 Mℓ/day by 2030 when 24 Mℓ of storage will be required. The high lift pumps to Vulindlela Reservoirs 2-5 have a capacity of approximately 22 Mℓ/day which is adequate to meet the current demand of 17.8 Mℓ/day. The high lift pump impellers were upgraded and this has increased the pumping capacity to accommodate the current demand. The high lift pumps are planned to be upgraded to 45 Mℓ/day to match the ultimate capacity of the pipeline.

The augmentation and upgrade of the Vulindlela Supply system is at detailed design stage. The upgrade will comprise of Reservoir 1 being the only reservoir in the system that will receive water from Groenekloof whereas Reservoir 2 will be supplied from the Howick-West Reservoir Complex.

5.2.3.4 Blackridge Reservoir Supply

Groenekloof Reservoir also supplies Blackridge Reservoir, through a 250 mm diameter pipeline ('56 Pipeline). There is a 160 mm diameter off-take along this pipeline supplying Sweetwaters Reservoir. The current demand from the Blackridge Reservoir is approximately 1.44 Mℓ/day. The capacity of the reservoir is 2.2 Mℓ. The reservoir functions as a terminal reservoir that should ideally have 48 hours of storage (2.88Mℓ). This is a reticulation requirement and the responsibility for the upgrade, therefore lies with the Municipality. (UW IMP, 2020)

5.2.4 Midmar WTW to Umlaas Reservoir Sub-System (Msunduzi LM)

The Midmar WTW to Umlaas Reservoir Sub-System serves the Msunduzi LM and will be covered in detail within the Msunduzi UAP Phase III study.

5.2.5 Umlaas Road Sub-System

The Umlaas Road Sub-System feeds the Greater Eston Water Supply Area, Camperdown, eThekwini, Lion Park, Manyavu and areas of Mkhambathini.

The Umlaas Road Reservoir Complex consists of a 9 Mℓ reservoir and a 45 Mℓ reservoir, which is interlinked. The reservoir complex has two (2) off-takes, one feeds the '57 Pipeline and the other the Lion Park Pipeline.

5.2.5.1 '57 Pipeline

The existing 800mm diameter pipeline serves a minimal demand in Camperdown. The combined capacity of the 1 000mm diameter and the new 1 600 mm diameter pipeline is 485 Mℓ/day which is sufficient to satisfy the future demands of the eThekwini Metropolitan Municipality's Western Aqueduct (WA).

5.2.5.2 Eston/Umbumbulu Pipeline

The capacity of this pipeline is restricted to 15 Mℓ/day due to the ground level profile along the pipeline route. The flow is restricted to ensure that the hydraulic grade line is at least 20m above a high point at Stoney Ridge. The current flow in this pipeline is 15.52 Mℓ/day. Umgungundlovu District Municipality supplies the Greater Eston area with potable water from this pipeline.

Ethekwini Water Services (EWS) have requested that Umgeni Water provide additional water to Umbumbulu to satisfy future demand growth in the area. This demand growth will be as a result of planned commercial and residential developments at Umbumbulu as well as a load shed of a portion of Adams Mission onto the Umbumbulu Reservoir. This means that the capacity of this pipeline is insufficient to meet the current demands. Umgeni Water is in the process of implementing the Umbumbulu Booster Pump Station as a short-term solution to meet the rapid growth in demand.

5.2.5.3 Lion Park/Manyavu Pipeline

The current demand on this pipeline is approximately 4.7 Mℓ/day. Umgeni Water constructed a pipeline from an off-take on the Lion Park Pipeline to serve the Manyavu community. The Manyavu demand is expected to grow to about 6 Mℓ/day by 2040. Umgeni Water has recently augmented the Lion Park

Pipeline by constructing a new 350mm diameter steel pipeline to ensure the sustainability of the supply to this area.

5.2.6 uMshwathi Sub-System

The D.V. Harris WTP supplies the uMshwathi BWSS, which is explained further in Section 9. This includes supply to the Wartburg and Table Mountain areas. Water is sold to Msunduzi LM at the WTP and is then conveyed to the 50 Mℓ Claridge Reservoir. At this point, the water is bought back from Msunduzi LM to supply Greater Wartburg. Another buy back point further downstream of Msunduzi LM's infrastructure at Lower Glen Lyn supplies Table Mountain.

The uMshwathi Sub-System supplies Table Mountain, Albert Falls, Mpolweni, Wartburg, New Hanover, Swayimane, individual households en route, Trustfeeds, Cool Air, Dalton, Efaye, Nadi and Ekhamanzi.

5.2.6.1 Table Mountain Supply

Umgeni Water purchases water from Msunduzi LM at the municipality's Lower Glen-Lyn Break Pressure Tank (BPT). An off-take from the BPT supplies the Table Mountain Pipeline, which feeds the Table Mountain Reservoir. From the Table Mountain Reservoir, potable water is supplied to the rural communities in Table Mountain within the UMDM.

5.2.6.2 '69 Pipeline: Claridge Reservoir to Wartburg Reservoir

The '69 Pipeline supplies potable water to the Albert Falls, Wartburg, Cool Air, New Hanover, Dalton and Swayimane areas as well as individual households en-route. Water is currently conveyed between D.V. Harris WTP and Claridge Reservoir along a 6.7 km long 1 000 mm diameter steel pipeline, which is owned by Msunduzi LM. Umgeni Water buys water back from Msunduzi LM at Claridge Reservoir. Potable water from the Claridge Reservoir flows under gravity through the '69 Pipeline to the Mpolweni Pump Station. There are off-takes to Albert Falls, Mpolweni as well as private connections en-route. From the Mpolweni pump station, the '69 Pipeline continues as a rising main to the Wartburg Reservoir.

5.2.6.3 Wartburg Reservoir to Bruyns Hill Reservoir

Bruyns Hill Reservoir is supplied via a 250 mm diameter steel pipeline from the Wartburg Reservoir. The pipeline is initially a gravity line to the Bruyns Hill Pump Station and then pumped via a 250 mm diameter rising main to the Bruyns Hill Reservoir. A new pump station at Wartburg Reservoir and 450 m diameter steel rising main has been constructed to supply the Bruynshill Supply System.

5.2.6.4 uMshwathi Bulk Water Supply System Upgrade

Wartburg Reservoir supplies Cool Air Reservoir via the Dingle Pump Station. En-route it supplies Trustfeeds and New Hanover. A further pump station at Cool Air Reservoir pumps water to Dalton Reservoir.

5.2.7 Greater Mpofana Water Supply Scheme Phase 1

A regional bulk water supply scheme referred to as the Greater Mpofana Bulk Water Supply Scheme (GMBWSS) is being implemented to ensure that the area has a reliable water supply that will sustain this growth into the future.

Phase 1 of the project is currently under construction and will provide a sustainable bulk water supply to the towns of Mooi River, Rosetta and Nottingham Road. Phase 2 of the project is in the initial feasibility stage and will provide a sustainable bulk water supply to the towns of Lidgetton and Lions River including the rural hinterland surrounding the abovementioned towns in KwaZulu-Natal.

The GMBWSS will obtain raw water from Spring Grove Dam on the Mooi River to a WTP to be situated adjacent to the dam. From here potable water will be pumped to two (2) command reservoirs. The first reservoir is located at Bruntville in Mooi River. This reservoir will serve the greater Mooi River area and will have the potential to supply the Muden/Rocky Drift area. The Mooi River WTP and Rosetta WTP can then be decommissioned. The second reservoir is at Nottingham Road which will then supply Balgowan, Lidgetton and Lions River. There is also a link pipeline to Mount West. The scheme is to be built in phases to gradually increase the supply area. (UW IMP, 2020)

The Greater Mpofana Phase 1 consists of a 20Mℓ/day Water Treatment Plant, pump stations, a 400mm diameter pipeline to Nottingham Road along with a 10Mℓ reservoir and a 500mm diameter pipeline to Rosetta and Bruntville in Mooi River with a 12Mℓ reservoir at Bruntville.

6. EXISTING SANITATION BULK INFRASTRUCTURE

6.1 SANITATION SERVICE LEVEL

The National Water and Sanitation Master Plan (NW&SMP), prepared in 2018 for South Africa, puts an emphasis on the reliability of water services (water and sanitation). The NW&SMP reported that "In the 27 priority district municipalities the water reliability is only 42%, with the worst 10 WSA's below 30% reliability" and that "Approximately 56% of the over 1 150 WWTP and approximately 44% of the 962 WTWs are in poor or critical condition and in need of urgent rehabilitation."

Reliability of services are affected by aging infrastructure, operation and maintenance, reliability of electricity supply, stormwater ingress into sewer systems, vandalism and theft, or extreme weather events. All these then affect sanitation security to consumers and may have negative impacts on the environment.

The DWS Reference Framework database yields that majority of households within UMDM use a pit latrine/toilet with ventilation pipe (approximately 35%).

Table 6-1 below presents the distribution of households by type of toilet facility.

Table 6-1: Distribution of households by type of toilet facility, DWS RF 2019

LM Name	Flush toilet connected to a public sewerage system	Flush toilet connected to a septic tank or conservancy tank	Chemical toilet	Pit latrine/toilet with ventilation pipe	Pit latrine/toilet without ventilation pipe	None	Bucket toilet (collected by municipality) – Bucket toilet (emptied by household)	Total
uMshwathi	3 865	1 115	4 572	9 757	5 957	4 956	395	**30 617**
uMngeni	21 108	8 475	5 339	3 696	0	1 456	66	**40 140**
Richmond	1 647	735	1 297	14 521	0	219	0	**18 419**
Mkhambathini	462	746	6	7 029	4 554	3 535	16	**16 348**
Mpofana	6 887	692	0	2 746	412	508	0	**11 245**
Impendle	70	55	784	5 820	0	695	0	**7 424**
Total	**34 039**	**11 818**	**11 998**	**43 569**	**10 923**	**11 369**	**477**	**124 193**

Source: DWS Reference Framework, April 2019

The current sanitation backlog is at 23.97% as illustrated in the UMDM WSDP 2018/2019 and in **Table 6-2** below. However, settlements are continuously expanding, and household growth will maintain an increase in the future.

The UMDM WSDP 2018/2019 reports that the current sanitation backlog for the District is as follows:

Table 6-2: Sanitation Backlogs within Umgungundlovu District Municipality

Direct Backlogs	Totals
Direct settlement backlog sanitation households. Total household of settlement with a sanitation need (irrelevant the type of need)	29 519
Direct settlement backlog sanitation population. Total population of settlement with a sanitation need (irrelevant the type of need)	97 715

Source: UMDM WSDP, 2018-2019

6.2 Existing Sanitation Bulk Infrastructure

Planning is required in the urban areas to confirm the suitability of the bulk infrastructure, especially with regards to increased pressures on the infrastructure due to an increasing urbanisation trend that has been occurring and also to allow for future growth in population.

According to the DWS Reference Framework, the following eight (8) sanitation schemes are currently operating within UMDM:

- ✓ New Hanover;
- ✓ Umshwathi Ridge;
- ✓ Mooi River;
- ✓ Appelsbosch Hospital;
- ✓ Camperdown;
- ✓ Coolair;
- ✓ Howick; and
- ✓ Richmond.

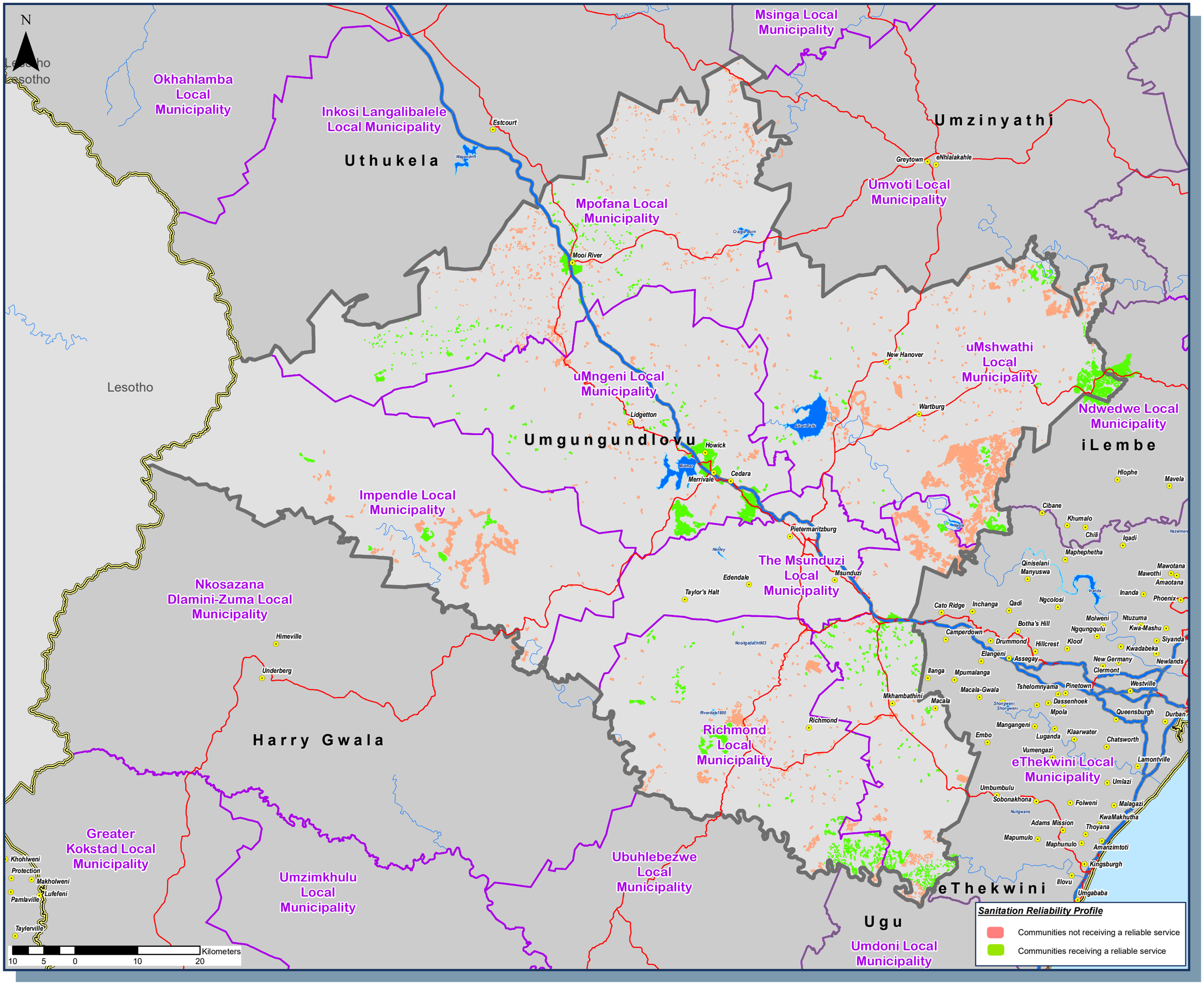
Nine (9) wastewater treatment plants are reflected within the Umgeni Water IMP and are listed in **Table 6-3** overleaf.

Table 6-3: List of Wastewater Treatment Plants

WWTP Name	Capacity Mℓ/day
Albert Falls North WWTP	0.055
Albert Falls South WWTP	0.055
Appelsbosch Hospital WWTP	0.5
Camperdown WWTP	0.5
Coolair WWTP	1.5
Howick WWTP	6.8
Mpofana WWTP	3.5
Mphophomeni WWTP	3.5
Richmond WWTW	2.9

Source: DWS Reference Framework

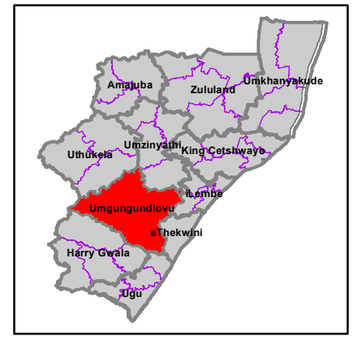
The sanitation reliability profile and existing infrastructure are presented in **Figure 6-1** and **Figure 6-2** overleaf.



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- National Roads
- Main Roads
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

UMGUNGUNDLOVU DISTRICT MUNICIPALITY

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PROJECT TITLE

Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Sanitation Reliability Profile

Umgungundlovu District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 22 Figure 6-1

N

Lesotho

Okhahlamba Local Municipality

Inkosi Langalibalele Local Municipality

Estcourt

Uthukela

Msinga Local Municipality

iLembe

Umvoti Local Municipality

Umzinyathi

Greytown

eNhlalakahle

Maphumulo Local Municipality

Mpofana Local Municipality

Mooi River

MOOI RIVER

uMshwathi Local Municipality

New Hanover

NEW HANOVER

NEW HANOVER TREATMENT PONDS

COOLAIR

COOLAIR

APPELSBOSCH HOSPITAL

APPELSBOSCH HOSPITAL

UMSHWATI RIDGE

Wartburg

iLembe

Ndwedwe Local Municipality

uMngeni Local Municipality

Umgungundlovu

Lidgetton

MIDMAR SEWAGE TREATMENT PLANT

HOWICK

Howick

Merrivale

HOWICK

Cedara

MPOPHOMENI

Impendle Local Municipality

Pietermaritzburg

The Msunduzi Local Municipality

Msunduzi

Edendale

Taylor's Halt

CAMPERDOWN

CAMPERDOWN

Cato Ridge

Inchanga

Qadi

Ngcolosi

Botha's Hill

Camperdown

Drummond

Hillcrest

Kloof

Elangeni

Assegay

Ilanga

Mpumalanga

eThekwini

Mkhambathini

Macala

Macala-Gwala

Pinetown

Tshelomnyama

Ntshongweni

Dassenhoek

Mpola

Kwandengezi

Mangangeni

Embo

Luganda

Klaarwater

Chatsworth

Vumengazi

Queensburgh

Durban

Lamontville

Umlazi

Umbumbulu

Sobonakhona

Folweni

Malagazi

KwaMakhutha

Thoyana

Adams Mission

Mapumulo

Maphunulo

Amanzimtoti

Kingsburgh

Hlophe

Mavela

Cibane

Khumalo

Chili

Iqadi

Maphephetha

Qiniselani

Manyuswa

Mawotana

Mawothi

Amaotana

Inanda

Phoenix

Molweni

Ntuzuma

Ngqungqulu

Kwa-Mashu

Siyanda

Kwadabeka

New Germany

Clermont

Newlands

Westville

Himeville

Underberg

Richmond Local Municipality

RICHMOND

RICHMOND

Richmond

Mkhambathini Local Municipality

Harry Gwala

Nkosazana Dlamini-Zuma Local Municipality

Greater Kokstad Local Municipality

Khohlweni

Protection

Makholweni

Lufefeni

Pamlaville

Taylerville

Umzimkhulu Local Municipality

Ubuhlebezwe Local Municipality

Ugu

Umd... Loc... Municip...

eThekwini Local...

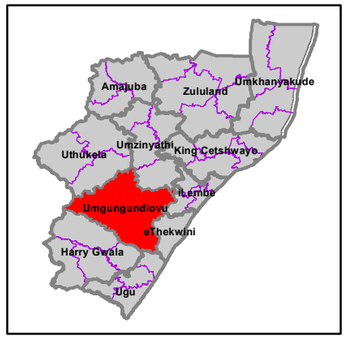
Kilometers

10 5 0 10 20

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- National Roads
- Main Roads
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns (Hilton)

LOCALITY:



CLIENT:

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PROJECT TITLE

Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Sanitation Infrastructure

Umgungundlovu District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 22 Figure 6-2

Sanitation Infrastructure

- Existing Sewer Pumpstations
- Existing Wastewater Treatment Works
- Sanitation Scheme Areas & Names (Howick)

7. BULK WATER SUPPLY PROJECTS CURRENTLY IN PLANNING

The existing funding grants for the municipal capital projects and operating subsidies for water services are mainly funded by the Municipal Infrastructure Grant (MIG) followed by the Regional Bulk Infrastructure Grant (RBIG) and the Water Services infrastructure Grant (WSIG). The main objective of MIG is to assist WSAs by providing grant funding in removing the backlog concerning basic municipal services to poor households. RBIG focusses on the infrastructure required to connect or augment the water resource on a macro[4] or sub regional [5]scale (over vast distances[6]), with internal bulk and reticulation systems or any bulk supply infrastructure that may have a significant impact on water resources in terms of quantity and quality. The bulk infrastructure that would have a "significant impact on water resources" includes:

- ✓ Any bulk scheme that is designed for maximum demand of 5Mℓ/day or more;
- ✓ Any wastewater treatment plant that discharges into a freshwater resource system; and
- ✓ Any water treatment plant that is designed for a maximum demand of more than 2Mℓ/day.

For the purpose of this study, the existing regional bulk projects were considered and evaluated to identify potential gaps within the existing project footprints to the extent that a total "wall-to-wall" bulk water services needs perspective is visualised and realised. This must be done in the context to improve access to basic services but at the same time support economic growth and development and ensure sustainable services.

This Chapter provides a brief overview of recently implemented and planned bulk water infrastructure projects sourced from the UMDM 2018/2019 WSDP and the Umgeni Water IMP, 2019.

[4] "Macro" is defined as infrastructure serving extensive areas across multi-municipal boundaries

[5] "Sub-regional" is defined as large regional bulk infrastructure serving numerous communities over a large area normally within a specific district or local municipal area

[6] Over "vast distances" is considered as any distances greater than 5km

7.1 Regional Bulk Water Projects in Planning

The UMDM mainly receives their funding from MIG and WSIG. No regional bulk infrastructure projects within UMDM receive funding from RBIG according to the Division of Revenue Bill Schedule.

The funding streams for infrastructure development over the next three years are tabled in **Table 7-1** below.

Table 7-1: Grant Funding Streams

Grant Funding Programme	2019/2020 (R '000)	2020/2021 (R '000)	2021/2022 (R '000)	Total Funding over Next 3 Financial Years
Municipal Infrastructure Grant (MIG)	R101 944	R107 795	R116 212	**R325 951**
Water Services Infrastructure Grant (WSIG)	R80 000	R90 000	R95 000	**R265 000**
Regional Bulk Infrastructure Grant (RBIG)	-	-	-	**-**
Total: Umgungundlovu District Municipality	**R181 944**	**R197 795**	**R211 212**	**R590 951**

Source: Division of Revenue Bill Schedule (DORA), 2019/2020

The funding allocations per Local Municipality as presented in DORA, is presented in **Table 7-2** below.

Table 7-2: Three-Year Medium-Term Expenditure Framework (MTEF) per Local Municipality in UMDM

LM Name	Municipal Infrastructure Grant (MIG)			Water Services Infrastructure Grant (WSIG)		
	2019/2020 (R '000)	2020/2021 (R '000)	2021/2022 (R '000)	2019/2020 (R '000)	2020/2021 (R '000)	2021/2022 (R '000)
Umgungundlovu District Municipality	R101 944	R107 795	R116 212	R80 000	R90 000	R95 000

Source: Division of Revenue Bill Schedule (DORA), 2019/2020

7.2 UMGENI WATER PROJECTS IN IMPLEMENTATION/PLANNING

Umgungundlovu District Municipality is a Water Services Authority (WSA) and Umgeni Water is the Water Services Provider. **Table 7-3** below outlines the projects planned by Umgeni Water in the UMDM municipal area.

Table 7-3: Umgeni Water Projects for UMDM (2019)

Project Name	Beneficiary LM	Project Cost	Project Status	Implementation Timeframe	Project Components
Greater Mpofana BWSS	Mpofana & uMngeni	R 757 342 112.27	Construction	2013-2021	Reservoirs & Pipelines
Midmar WTP Upgrade	uMngeni, Msunduzi, Richmond, Mkhambathini & eThekwini	R 280 775 350.70	Complete	2012-2019	Upgrade of WTP
uMkhomazi Water Project Phase 1	eThekwini	R 6 132 242 171.00	Detailed Feasibility	2012-2031	WTP, Pipelines, Tunnel, Langa Dam & Smithfield Dam
Wartburg to Bruyns Hill Pipeline	uMshwathi & Ndwedwe	R 104 770 470.71	Complete	2014-2019	Pipelines
Howick-West Reservoir Upgrade	Msunduzi	R 108 431 277.16	Construction	2014-2022	Reservoir Upgrade
Impendle BWSS	Impendle	R 411 422 448.80	Preliminary Design	2016-2025	WTP, Weirs, Reservoirs & Pipelines
Vulindlela Upgrade	Msunduzi	R 330 057 203.05	Detailed Design	2015-2021	Reservoir, Pump station and Pipeline Upgrades
Table Mountain Upgrade	Mkhambathini	R 138 520 000.00	Detailed Feasibility	2016-2026	Reservoir, Pump station and Pipeline Upgrades
Umbumbulu Pump Station	Mkhambathini & eThekwini	R 35 547 642.23	Ready for construction	2015-2022	Pump station

Source: UMDM IDP, 2019

8. SYNOPSIS OF EXISTING AND COMMITTED SCHEMES

A gap analysis has been undertaken for the water schemes in the Umgungundlovu DM. The purpose of the gap analysis is to check the adequacy of infrastructure to allow the 2050 water demand to be supplied, and where necessary identify upgrades to infrastructure.

The gap analysis has taken into account current planning interventions by the WSA. The interventions required to meet the 2050 water demand inclusive of infrastructure planning and recommended water resource investigations is discussed in Chapter 9 of this study.

The entire UMDM has been demarcated into regional water schemes in line with short and long-term plans by the WSA. gap analysis has been undertaken for the water schemes in the UMDM. The gap analysis has taken into account current planning interventions by the WSA. Sixteen (16) regional schemes have been identified and are as follows:

uMngeni LM

- ✓ UM001 WSIA: Howick North Scheme Area;
- ✓ UM002 WSIA: Howick West Scheme Area;
- ✓ UM003 WSIA: Groenekloof Reservoir Scheme Area;

uMshwathi LM

- ✓ UM006 WSIA: Claridge Reservoir Scheme Area;
- ✓ UM007 WSIA: uMshwathi RBWSS: Pipeline to Wartburg;
- ✓ UM008 WSIA: uMshwathi RBWSS: Pipeline to Bruyns Hill Reservoir;
- ✓ UM009 WSIA: uMshwathi RBWSS: Dalton Reservoir Scheme Area;
- ✓ UM010 WSIA: uMshwathi RBWSS: Ozwathini Supply Scheme Area;

Mkhambathini LM

- ✓ UM011 WSIA: Umlaas Road Water Supply Scheme;
- ✓ UM012 WSIA: Lion Park / Manyavu Water Supply Scheme;
- ✓ UM013 WSIA: Table Mountain Reservoir Scheme Area;

Mpofana LM

- ✓ UM014 WSIA: Mpofana Bulk Water Supply Scheme;

Richmond LM

- ✓ UM016 WSIA: Thornville / Hopewell Water Supply Scheme;
- ✓ UM017 WSIA: Liliefontein Water Supply Scheme;
- ✓ UM018 WSIA: Richmond Water Supply Scheme; and

Impendle LM

- ✓ UM019 WSIA: Impendle Bulk Water Supply Scheme.

The gap analysis for the sixteen (16) regional schemes is discussed under this section.

Note: For all the WSIA's hereunder raw water is conveyed to the Midmar Dam via the Mgeni River, with augmentation from the Mooi-Mgeni Transfer Scheme (MMTS), via a pumping scheme from Spring Grove Dam and Mearns Weir respectively. The firm yield of Midmar Dam, including the raw water augmentations, is 476.2 Mℓ/day. Raw water is pumped via two (2) steel pipelines (1 500mm ø and 1 600mm ø) to the Midmar WTP. Water is then treated at the 395 Mℓ/day Midmar WTP, which is located in Howick West. Raw water is also gravity fed via a 1 500mm ø steel pipeline to the 110 Mℓ/day D.V Harris WTP, located in Pietermaritzburg, where the water is then treated. UM014 WSIA and UM019 WSIA are supplied via different sources which are highlighted in its respective section.

The capacities of 395 Mℓ/day Midmar and 110 Mℓ/day D.V Harris Water Treatment Plants, are insufficient for all downstream demands. Based on the 2050 demands, the Midmar WTP and D.V Harris WTP will have to be upgraded from 395 Mℓ/day to 421 Mℓ/day and 110 Mℓ/day to 174 Mℓ/day respectively. The cost of the Midmar WTP upgrade is included under the UM002 WSIA: Howick West Scheme Area.

From the demand analysis carried out in this UAP Phase III study, the water demand on the Upper Mgeni System in 2050 will be 595 Mℓ/day. This is after the implementation of the Umkhomazi Water Project that will have capacity to supply 602 Mℓ/day to Ethekwini Municipality and thus shed the current Ethekwini Municipality load on the Upper Mgeni System. The Mgeni Water Supply system is fully developed and the only other infrastructure option available to increase the system yield would be an inter catchment raw water transfer. This is discussed further in Section 9.

8.1 UZ001 WSIA: Howick North Scheme Area

Potable water is pumped from the Midmar WTP via a 400mm ø steel pipeline to Reservoir 3 (4.5Mℓ) and a 300mm ø AC pipeline to Reservoir 1 (1.2Mℓ) and Reservoir 4 (6.5Mℓ). Reservoir 2 (0.9Mℓ) has been decommissioned. (UW IMP, 2020)

The 0.2Mℓ Greendale Reservoir is gravity fed via a 150mm ø pipeline from the Howick North Reservoir Complex.

No further upgrades to the Howick North Scheme Area was proposed within the UAP Phase II study.

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-1**.

Table 8-1: Howick North Scheme Area Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	-	-	-	-
Storage (Mℓ)	12.4	-	12.4	9.2	N/A
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	-	-
Bulk conveyance - Clear Water (Mℓ/d)	12.4	-	12.4	9.2	N/A

Based on the capacities of existing and planned infrastructure, there are no gaps within the water supply requirements for the projected 2050 demand.

8.2 UM002 WSIA: Howick West Scheme Area

Potable water is pumped from the Midmar WTP via a 700mm ø steel pipeline to Howick West Reservoir 1 (8.3Mℓ) and Howick West Reservoir 2 (8.3Mℓ). The Mpophomeni Reservoir is fed via a rising main via a 250mm ø pipe from the Howick West Reservoir Complex. (UW IMP, 2020)

An upgrade of the existing storage capacity from 16.6Mℓ to 32.5Mℓ was proposed within the UAP Phase II study. Additional demands will need to be catered for the planned Vulindlela BWSS upgrade which will be supplied from the Howick West Reservoir Complex via a proposed 800 mm ø rising main.

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-2** below.

Table 8-2: Howick West Scheme Area Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	395	-	395	421	26
Storage (Mℓ)	20.6	-	20.6	67.9	47.3
Bulk conveyance - Raw Water (Mℓ/d)	395	-	395	421	26
Bulk conveyance - Clear Water (Mℓ/d)	20.6	-	20.6	67.9	47.3

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the WTP, the capacity of existing reservoir and the bulk secondary pipelines would need to be increased to meet the demand of 2050.

8.3 UM003 WSIA: Groenekloof Reservoir Scheme Area

Note: This scheme supplies both the UMDM & Msunduzi LM

Water is pumped via a 600mm ø steel pipeline from the Howick West Reservoir Complex to the Groenekloof Reservoir Complex consisting of three reservoirs; Groenekloof Reservoir 1 (2.3Mℓ), Groenekloof Reservoir 2 (5Mℓ) and Groenekloof Reservoir 3 (10Mℓ), with a combined total capacity of 17.3Mℓ.

The 1.2Mℓ Merrivale Reservoir is gravity fed via a 200mm ø pipeline from the Groenekloof Reservoir Complex. The 3Mℓ Hilton Reservoir is also gravity fed via a 355mm ø pipeline from the Groenekloof Reservoir Complex.

There is no need for further upgrade to the Groenekloof system, as the planned Vulindlela Bulk Water Supply Scheme Upgrade (45Mℓ) will now be supplied by the Howick West Reservoir Complex. (UW IMP, 2020)

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-3** below.

Table 8-3: Groenekloof Reservoir Scheme Area Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	-	-	-	-

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Storage (Mℓ)	21.5	-	21.5	11.4	N/A
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	-	-
Bulk conveyance - Clear Water (Mℓ/d)	21.5	-	21.5	11.4	N/A

Based on the capacities of existing and planned infrastructure, there are no gaps within the water supply requirements for the projected 2050 demand.

8.4 UM006 WSIA: Claridge Reservoir Scheme Area

Potable water is gravity fed from the D.V Harris WTP via a 1 000mm ø steel pipeline to the Claridge Reservoir (50Mℓ). The Claridge Reservoir is the command reservoir for the uMshwathi Regional Bulk Supply Scheme.

The 2Mℓ Thokozani/Albert Falls Reservoir is gravity fed from the Claridge Reservoir via a 200mm ø offtake. The 4Mℓ Mpolweni Reservoir is also gravity fed from the Claridge Reservoir via a 315mm ø offtake.

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-4** below.

Table 8-4: Claridge Reservoir Scheme Area Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	130	-	130	174	44
Storage (Mℓ)	56	-	56	94.5	38.5
Bulk conveyance - Raw Water (Mℓ/d)	130	-	130	174	44
Bulk conveyance - Clear Water (Mℓ/d)	56	-	56	94.5	38.5

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the capacity of existing WTP, the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.5 UM007 WSIA: uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Wartburg

Water is pumped from the Claridge Reservoir via an 800mm ø pipeline to the Wartburg Reservoir (8Mℓ). The 1.4Mℓ Trust Feeds Reservoir is gravity fed via a 315mm ø pipeline from the Wartburg Reservoir. The 1Mℓ New Hanover/Schroeders Reservoir is also gravity fed via a 200mm ø pipeline from the Wartburg Reservoir.

The uMshwathi Regional Bulk Supply Scheme has been completed and fully commissioned. A new pump station has been constructed to boost pressure in this line. (UW IMP, 2020)

The existing infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-5** overleaf.

Table 8-5: uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Wartburg Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	-	-	-	-
Storage (Mℓ)	10.4	-	10.4	19.9	9.5
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	-	-
Bulk conveyance - Clear Water (Mℓ/d)	10.4	-	10.4	19.9	9.5

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the bulk pipelines, secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.6 UM008 WSIA: uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Bruyns Hill Reservoir

Water is supplied via a 250mm ø steel pipeline from the Wartburg Reservoir. The pipeline is initially a gravity line to the Bruyns Hill Pump Station and then a 250mm ø rising main to the Bruyns Hill Reservoir. The Mbhava and Mpethu-Swayimane Water Supply Scheme is fed via a 315mm ø gravity pipeline from the Bruyns Hill Reservoir.

The new pump station at Wartburg Reservoir and a 450mm ø steel rising main have been commissioned and will meet the current and projected demands of the Bruyns Hill Supply System. (UW IMP, 2020)

The existing infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-6**.

Table 8-6: uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Bruyns Hill Reservoir Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	-	-	-	-
Storage (Mℓ)	14.1	-	14.1	21.6	7.5
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	-	-
Bulk conveyance - Clear Water (Mℓ/d)	14.1	-	14.1	21.6	7.5

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the bulk pipelines, secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.7 UM009 WSIA: uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Dalton Reservoir

Water is supplied via a newly constructed 700mm ø steel pipeline from the Wartburg Reservoir and pumped at Cool Air pump station to the 10 Mℓ/day Dalton Reservoir.

The 0.5Mℓ Cool Air Reservoir is gravity fed via a 315mm ø pipeline from the Dalton Reservoir. The 4Mℓ Nadi Reservoir Supply Scheme (currently in construction) is supplied via a 350mm ø rising main from the Dalton Reservoir.

The existing infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-7** below.

Table 8-7: uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Dalton Reservoir Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	-	-	-	-
Storage (Mℓ)	10.5	4	14.5	18.8	4.3
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	-	-
Bulk conveyance - Clear Water (Mℓ/d)	10.5	-	10.5	18.8	8.3

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the bulk pipelines, secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.8 UM010 WSIA: uMshwathi Regional Bulk Water Supply Scheme: Ozwathini Supply Scheme Area

Water is pumped via the recently constructed 700mm ø steel pipeline from the Dalton Reservoir to the 12 Mℓ Ozwathini Reservoir. This reservoir was completed at the end of August 2019.

The existing infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-8** below.

Table 8-8: uMshwathi Regional Bulk Water Supply Scheme: Ozwathini Supply Scheme Area Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	-	-	-	-
Storage (Mℓ)	12	-	12	14	2
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	-	-
Bulk conveyance - Clear Water (Mℓ/d)	12	-	12	14	2

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the bulk pipelines, secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.9 UM011 WSIA: Umlaas Road Reservoir Scheme Area

Water is gravity fed from the Midmar WTP, through Worlds View Reservoir (80Mℓ), via two (2) steel pipelines (1 100mm ø and 1 000mm ø) to the Umlaas Road Reservoir Complex. Water is also supplied directly from the D V Harris WTP via a 900mm ø concrete pipeline. The total capacity of the Umlaas Road Reservoir Complex is 54Mℓ; Umlaas Road Reservoir 1 (9Mℓ) and Umlaas Road Reservoir (45Mℓ).

Water is gravity fed from the Umlaas Road Reservoir Complex (54Mℓ), via a 1 000mm/600mm ø steel pipeline to the Eston Reservoir Complex; Eston Reservoir 1 (2.5Mℓ) and Eston Reservoir 2 (2.5Mℓ). The Eston Reservoir Complex feeds the 0.4Mℓ Maqalagwala Reservoir via a 150mm ø gravity main as well as the 0.5Mℓ Ismont Reservoir via a 450mm ø, 300mm ø and 150mm ø gravity main. A 300mm ø offtake on the 450mm ø pipeline will feed the Jabula Store Reservoir that will in turn feed the Ukalo and Mbuthisweni Reservoirs.

Note: Water is also supplied to the Ethekwini Municipality from Umlaas Road. The Ethekwini supply area is not included in this report.

The existing infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-9** overleaf.

Table 8-9: Umlaas Road Reservoir Scheme Area Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	-	-	-	-
Storage (Mℓ)	59.4	-	59.4	56.4	N/A
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	-	-
Bulk conveyance - Clear Water (Mℓ/d)	59.4	-	59.4	56.4	N/A

Based on the capacities of existing and planned infrastructure, there are no gaps within the water supply requirements for the projected 2050 demand.

8.10 UM012 WSIA: Lion Park/Manyavu Water Supply Scheme

Water is gravity fed from Worlds View Reservoir (80Mℓ), via a 150mm ø Klambon pipeline and a newly constructed 350mm ø steel offtake from the '61 pipeline, to the 4Mℓ Lion Park/Manyavu Reservoir.

The existing infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-10** below.

Table 8-10: Lion Park/Manyavu Water Supply Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	-	-	-	-
Storage (Mℓ)	4	-	4	4	N/A
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	-	-
Bulk conveyance - Clear Water (Mℓ/d)	4	-	4	4	N/A

Based on the capacities of existing and planned infrastructure, there are no gaps within the water supply requirements for the projected 2050 demand.

8.11 UM013 WSIA: Table Mountain Reservoir Scheme Area

The Table Mountain Reservoir is fed via a 150mm ø rising main from the Lower Glen-Lyn Reservoir. A pre-feasibility study identified two (2) possible scenarios to augment the supply to the Greater Table Mountain area.

Scenario 1 entails the upgrade of the Lower Glen Lyn Break Pressure Tank to a 2 Mℓ storage facility, replacing the existing Table Mountain pump sets with three (3) new pump sets to meet the current and projected demand and to construct a new 4 Mℓ reservoir at Table Mountain.

Scenario 2 entails a direct feed off the proposed new 23 Mℓ Msunduzi Municipality Whispers Reservoir thus eliminating the need of augmenting the Glen Lyn Break Pressure Tank. The other components, i.e., the pump station and Table Mountain Reservoir would be as per Scenario 1.

Umgeni Water together with uMgungundlovu District Municipality and Msunduzi Municipality agreed to implement some of the recommendations as per Option 1 for the upgrade of the Table Mountain Bulk Water Supply Scheme to meet a demand of 3.0 Mℓ /day. This entails the construction of a 300 mm ø, 500 m long suction pipeline, the installation of 2 x 3.2 Mℓ /day pump sets and the upgrade of the existing switchgear. The cost for the partial upgrade will be attached to the asset management maintenance budget. This project is in the implementation phase with the final commissioning of the electrical system planned for end of February 2020. (UW IMP, 2020)

The existing infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-11** below.

Table 8-11: Table Mountain Reservoir Scheme Area Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	-	-	-	-
Storage (Mℓ)	0.5	-	0.5	1.7	1.2
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	-	-
Bulk conveyance - Clear Water (Mℓ/d)	0.5	-	0.5	1.7	1.2

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the bulk pipelines, secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.12 UM014 WSIA: MPOFANA BULK WATER SUPPLY SCHEME

The primary water source for the Mpofana LM is the Mooi River from where raw water is pumped to three different water treatment plants, namely the Lidgetton WTP (0.5Mℓ), Mpofana WTP (6Mℓ) and Rosetta WTP (265 m^3/day). The Lidgetton WTP supplies the town of Lidgetton via the 200mm ø pipeline to the Lidgetton Reservoir (0.575Mℓ). The Mpofana WTP supplies the towns of Mooi River and Bruntville. The Rosetta WTP supplies the village of Rosetta via the 0.85Mℓ Rosetta Reservoir. The rest of the scheme area is being supplied via stand-alone surface water and groundwater systems, owned and operated by Umgeni Water. These WTP's will be decommissioned when the planned Mpofana BWSS is completed.

The UAP Phase II study further mentions that the planned Mpofana BWSS will increase the level of assurance of supply to the Mpofana LM. The phases of the Mpofana BWSS are as follows:

- ✓ Phase 1 comprises of the construction of a 20Mℓ/day WTP, associated pumpstations, a 400mm ø pipeline to Nottingham Road and 10Mℓ Reservoir along with a 500mm ø pipeline to Rosetta and Bruntville in Mooi River with a 12Mℓ Reservoir at Bruntville. Construction is nearly complete;
- ✓ Phase 2 comprises of the construction of a pipeline from Nottingham Road Reservoir to Balgowan and then to Lidgetton including the Lidgetton and Lions River Reservoirs;
- ✓ Phase 3 comprises of the construction of a pipeline from Nottingham Road to Mount West including a reservoir at Mount West. A pipeline will also be constructed from Mount West to Lion's River including a reservoir at the termination point; and
- ✓ Phase 4 would include a possible extension to Msinga.

The existing infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-12**.

Table 8-12: Mpofana BWSS Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	20	-	20	27.76	7.76
Storage (Mℓ)	24	-	24	27.76	3.76
Bulk conveyance - Raw Water (Mℓ/d)	20	-	20	27.76	7.76
Bulk conveyance - Clear Water (Mℓ/d)	24	-	24	27.76	3.76

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the capacity of existing WTP, the bulk pipeline, secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.13 UM016 WSIA: Thornville/Hopewell Water Supply Scheme

The 2Mℓ Thornville Reservoir is supplied under gravity through a 350mm ø pipeline from the Liliefontein Reservoir. The reservoir serves the Thornville and Baynesfield area. An off-take on the pipeline to Baynesfield supplies water to the 0.5Mℓ Hopewell Reservoir via a 200mm ø pipeline which serves as reticulation for the Hopewell community.

No further upgrades to the Thornville/Hopewell Scheme Area was proposed within the UAP Phase II study.

The existing infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-13** below.

Table 8-13: Thornville / Hopewell Water Supply Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	-	-	-	-
Storage (Mℓ)	2.5	-	2.5	5.1	2.6
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	-	-
Bulk conveyance - Clear Water (Mℓ/d)	2.5	-	2.5	5.1	2.6

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the bulk pipelines, secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.14 UM017 WSIA: Liliefontein Water Supply Scheme

A 600mm ø off-take from the '61 pipeline supplies the Liliefontein Reservoir via the Richmond pump station. No further upgrades to the Liliefontein Scheme Area was proposed within the UAP Phase II study.

The existing infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-14** overleaf.

Table 8-14: Liliefontein Water Supply Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	-	-	-	-
Storage (Mℓ)	5	-	5	11.79	6.79
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	-	-
Bulk conveyance - Clear Water (Mℓ/d)	5	-	5	11.79	6.79

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the bulk pipelines, secondary and tertiary reservoirs would need to be increased to meet the demand of 2050

8.15 UM018 WSIA: Richmond Water Supply Scheme

The 1.8 Mℓ/day Richmond reservoir is gravity fed via a 450mm ø pipeline from the Liliefontein Reservoir.

No further upgrades to the Richmond Scheme Area was proposed within the UAP Phase II study.

The existing infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-15.**

Table 8-15: Richmond Water Supply Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	-	-	-	-
Storage (Mℓ)	1.8	-	1.8	9.24	7.44
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	-	-
Bulk conveyance - Clear Water (Mℓ/d)	1.8	-	1.8	9.24	7.44

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the bulk pipelines, secondary and tertiary reservoirs would need to be increased to meet the demand of 2050

8.16 UM019 WSIA: IMPENDLE WATER SUPPLY SCHEME

Raw water is abstracted from both the Mkhomazi and Nzinga Rivers. The Mkhomazi Scheme has a WTP with 1.6 Mℓ/day on the Mkhomazi River, while the Nzinga Scheme involves a WTP with a 6.3 Mℓ/day capacity on the Nzinga River. From these treatment plants, potable water is supplied via pump stations, bulk reticulation pipelines and reservoirs to communal standpipes.

The area of Impendle has unreliable sources of water and many small run-off-river abstraction and borehole schemes. The planned Impendle BWSS will increase the level of assurance of supply to the community of Impendle.

The planned Impendle BWSS will consists of two (2) bulk schemes, namely, the Stepmore scheme and the Nzinga scheme. The Stepmore scheme will supply the northwestern part of the LM from the Stepmore to the Lotheni area. The Nzinga scheme will provide water to the communities to the east of the LM. The proposed source is a new river intake to be constructed on the Mkhomazi River from where water will be treated at the proposed Stepmore WTP and at Nzinga, the proposed raw water pump station located approximately 190m from the intake station.

The Nzinga WTP has a proposed capacity of 13 Mℓ/day with an abstraction capacity of 18 Mℓ/day along with a 355 mm ø, 7.6 km long rising main as well as a 1 Mℓ Nzinga Reservoir.

The Stepmore WTP has a proposed capacity of 1.6 Mℓ/day upgradable to 3.0 Mℓ/day with an abstraction capacity of 4.0 Mℓ/day along with the 1 Mℓ/day Lotheni 1 Reservoir and 0.650 Mℓ/day

Lotheni 2 Reservoir as well as construction of approximately 11.5 km of 100 mm ø to 200 mm ø pipelines.

The duration of construction for this project is anticipated to be six years and the cost is estimated to be R 386 million at 2019 prices. (UW IMP, 2020)

The existing infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-16**.

Table 8-16: Impendle Water Supply Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	7.9	14.6	22.5	10	N/A
Storage (Mℓ)	-	2.65	2.65	-	N/A
Bulk conveyance - Raw Water (Mℓ/d)	7.9	14.6	22.5	10	N/A
Bulk conveyance - Clear Water (Mℓ/d)	7.9	14.6	22.5	10	N/A

Based on the capacities of existing and planned infrastructure, there are no gaps within the water supply requirements for the projected 2050 demand.

9. PROPOSED BULK WATER SUPPLY INTERVENTIONS

This section details the water supply reconciliation options for bulk water services within the Umgungundlovu DM – considering existing use and future supplies and water sources, per scheme area. It must be noted that the Water Supply Intervention Areas (WSIA's) were demarcated based on all the existing planning initiatives that are currently underway within the WSA. However, the demand model that was proposed to be used within this project will be used to determine the proposed bulk infrastructure requirements and would be sized accordingly to meet the demand of 2050.

It is recommended that the predominantly farmland, stand-alone areas not covered by schemes, be supplied by localised schemes (boreholes etc.) due to the sparse population and the proximity of the area in relation to the other regional schemes.

The details of each proposed upgrade and future additional requirements/interventions are provided per WSIA within the sections and paragraphs hereafter and illustrated for the entire WSA within **Figure 9-1**.

The following WSIA's receive their raw water supply via the Upper Mgeni System:

- ✓ UM001 WSIA: Howick North Scheme Area
- ✓ UM002 WSIA: Howick West Scheme Area
- ✓ UM003 WSIA: Groenekloof Reservoir Scheme Area
- ✓ UM005 WSIA: kwaMavena
- ✓ UM006 WSIA: Claridge Reservoir Scheme Area
- ✓ UM007 WSIA: uMshwathi RBWSS: Pipeline to Wartburg
- ✓ UM008 WSIA: uMshwathi RBWSS: Pipeline to Bruyns Hill Reservoir
- ✓ UM009 WSIA: uMshwathi RBWSS: Dalton Reservoir Scheme Area
- ✓ UM010 WSIA: uMshwathi RBWSS: Ozwathini Supply Scheme Area
- ✓ UM011 WSIA: Umlaas Road Water Supply Scheme
- ✓ UM012 WSIA: Lion Park/Manyavu Water Supply Scheme
- ✓ UM013 WSIA: Table Mountain Reservoir Scheme Area
- ✓ UM016 WSIA: Thornville / Hopewell Water Supply Scheme
- ✓ UM017 WSIA: Liliefontein Water Supply Scheme
- ✓ UM018 WSIA: Richmond Water Supply Scheme
- ✓ UM020 WSIA: Vulindlela Reservoir 5 to Impendle

For all the above WSIA's, raw water is conveyed to the Midmar Dam via the Mgeni River, with augmentation from the Mooi-Mgeni Transfer Scheme (MMTS), via a pumping scheme from Spring

Grove Dam and Mearns Weir respectively. The firm yield of Midmar Dam, including the raw water augmentations, is 476.2 Mℓ/day. Raw water is pumped via two (2) steel pipelines (1 500mm ø and 1 600mm ø) to the Midmar WTP. Water is then treated at the 395 Mℓ/day Midmar WTP, which is located in Howick West. Raw water is also gravity fed via a 1 500mm ø steel pipeline to the 110 Mℓ/day D.V Harris WTP, located in Pietermaritzburg, where the water is then treated.

As highlighted at the beginning of Chapter 8, the projected demand on the Upper Mgeni System after the implementation of the Umkhomazi Water Project will be 596.72 Mℓ/day. As the Mgeni Water supply system is fully developed (476.2 Mℓ/day), there will be a shortfall of 120.52 Mℓ/day in the system.

The UW 30-year demand on the Mgeni system is as follows:

- ✓ Msunduzi LM – 334.36 Mℓ/day
- ✓ Umgungundlovu - DM 194.36 Mℓ/day
- ✓ Ilembe - DM 28 Mℓ/day
- ✓ Ethekwini - 40 Mℓ/day (Umbumbulu pipeline only)

It is recommended that a detailed feasibility be undertaken to investigate the possibility of an inter-catchment raw water transfer from the Mkhomazi catchment to the Mgeni catchment to address the projected 2050 water deficit. Possible options to be investigated would include:-

- ✓ The Smithfield Dam to Midmar Dam raw water transfer;
- ✓ Timing of the implementation of the Impendle Dam; and
- ✓ Development of a water source on the upper Mzimkhulu River catchment (New Biggen Dam) for an inter-catchment transfer to the Mkhomazi System to augment this as well as the Upper Mgeni system. The three (3) sites for the proposed New Biggen Dam will require environmental, social and land investigations. As this dam is a long-term option to augment the raw water resources of the Mkhomazi and Upper Mgeni system, Umgeni Water should start the process of addressing the environmental, social and land issues now.

Only then, can the capacities of the Midmar and the D.V Harris Water Treatment Plants as well as infrastructure detailed in this section be upgraded to supply the projected 2050 demands on the Upper Mgeni System.

The Midmar WTP and DV Harris WTP will have to be upgraded from 395 Mℓ/day to 421 Mℓ/day and 110 Mℓ/day to 174 Mℓ/day respectively. The cost of the Midmar WTP upgrade is included under the UM002 WSIA: Howick West Scheme Area.

N

Bell Park Dam
Estcourt
Wagendrift
Wagendriftdam
Mtshezana
Uthukela
Lesotho
Grinacres
Warley
Oaklands
Common Dam
New Dell No.1
Devon No.1
Sharow
Brayhill
Oak
Zonk Laake
Forest Lodge
Trent Lodge
Brakvlei No.2
Redcliffe
Defence
Rey
Solitude
Sherwood No.1
Broedershoek
Shermilk
Spring Grove Dam
Inchbrakie
Drayton
Dalcrue
Invermooi Lower
Mpofana Rural 1
Mpofana Rural 2
Mpofana Rural 5
Mpofana Rural 6
Mpofana Rural 8
Mpofana Rural 7
Mpofana Rural 3
Mpofana Local Municipality
Hat
Summer Hill
Mooi River
Hainault No.1
Rosetta
Nottingham Road
Tendele
Fort Nottingham
uMgeni Rural 3
uMgeni Rural 4
Umgungundlovu
Balgowan
Lidgetton
Impendle Rural 3
Impendle Rural 2
Greater Impendle 1a
Greater Impendle 2
Impendle Local Municipality
Greater Impendle 1b
Impendle Rural 1
Impendle Rural 4
uMgeni Local Municipality
uMgeni Rural 1
uMgeni Rural 2
Howick North
Howick West
Merrivale
Cedara
Midmar Dam
Hilton
WTP
Claridge
Albert Falls
Albert Falls Dam
Mpolweni
Wartburg
Trust Feed
Newington Dam
Cramond Satellite Dam
New Hanover
uMshwathi Local Municipality
uMshwathi Rural 2
uMshwathi Rural 3
uMshwathi Rural 1
uMshwathi Rural 4
Ekamanzi Dam
Dalton
Cool Air
Jaagbaan
Appelsbosch (Hlatikhulu)
Masihambisane
Masihambisane - Ntanzi
Merthley Dam
Greytown
eNhlalakahle
Umzinyathi
iLembe
Swayimane
Hlophe
Cibane
Khumalo
Chili
Iqadi
Maphephetha
Table Mountain
Nagle Dam
uMngeni
Qiniselani Manyuswa
Inanda Dam
Inanda
Ngcolosi
Cato Ridge
Inchanga
Qadi
Botha's Hill
Molweni
Ntuzuma
Ngqungqulu
Kwadabeka
Camperdown
Drummond
Hillcrest
Kloof
Elangeni
Assegay
New Germany
Clermont
eThekwini
Hammersdale Dam
Ilanga
Mpumalanga
Macala-Gwala
Pinetown
Westville
Ntshongweni
Kwandengezi
Dassenhoek
Mpola
Queensburgh
Mangangeni
Luganda
Embo
Klaarwater
Chatsworth
Vumengazi
Shongweni Dam
Lamontville
Umlazi
Umbumbulu
Sobonakhona
Folweni
Malagazi
Nungwane
KwaMakhutha
Adams Mission
Thoyana
Mapumulo
Maphunulo
Amanzimtoti
Kingsburgh
Illovu
Lovu
Umlazi
Pietermaritzburg
Henley Dam
The Msunduzi Local Municipality
Msunduzi
Edendale
Taylor's Halt
Lion Park & Manyavu
Umlaas Road and Camperdown
Thornville
Baynesfield
Hopewell
Mkhambathini Rural 1
Mkhambathini Rural 2
Mkhambathini Rural 3
Mkhambathini
Macala
Mkhambathini Local Municipality
Richmond Local Municipality
Richmond
Richmond Rural
Greater Eston 1
Greater Eston 2
Roy Aldous Dam
Vaughan's Dam
Himeville
Loch Mcvey
Underberg
Mingay's Dam
Minay's Dam
Comrie Dam
Harry Gwala
Ugu
Umkomaas
Kilometers
10 5 0 10 20

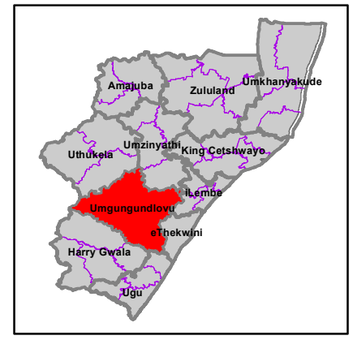
Proposed New / Upgrade Infrastructure

- Pata — Water Scheme Areas & Names
- WTP — Existing Water Treatment Plants
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- Pump Stations (Existing)
- 19Ml/d — Upgrade of WTW
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)
- Pump Stations (Future)

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Ncxola — Settlements
- Hilton — Major Towns

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

UMGUNGUNDLOVU DISTRICT MUNICIPALITY

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PROJECT TITLE

Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions

Umgungundlovu District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 22 Figure 9-1

9.1 UM001 WSIA: Howick North Scheme Area

9.1.1 Demand Model Intervention

9.1.1.1 Water Demand

The water demand for the Howick North Scheme Area was determined for 2020 and 2050 and included within **Table 9-1** below.

Table 9-1: Population and Water demand 2020 and 2050 for the Howick North Scheme Area

Population	**Population 2020**	**Population 2050**
	16 956	24 846
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	5.8	8.7

9.1.2 Water Supply Infrastructure

9.1.2.1 Proposed Interventions

The following infrastructure upgrades will be required in order to adequately supply the Howick North Scheme Area WSIA and is illustrated within **Figure 9-2** with the schematic layout of the WSIA depicted in **Figure 9-3.**

- ✓ The existing 2.5 km 300mm ø secondary bulk main which is supplying Reservoir 4 needs to be replaced as it is 48 years old and has surpassed its design life.

Design details of all the infrastructure components are provided within **Annexure B**.

9.1.3 Financial Requirements

The bulk cost requirement for the Howick North WSIA is summarised within **Table 9-2** below.

Table 9-2: UM001 Howick North Scheme Area Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	**-**	**-**	**-**
Secondary	R8 104 392.45	R810 439.25	R8 914 831.70
Tertiary	**-**	**-**	**-**
Total	**R8 104 392.45**	**R810 439.25**	**R8 914 831.70**

The total bulk cost requirement for the Howick North Scheme is R8 914 831.70 (excl VAT). The scheme development cost per household is approximately R 1 400.

9.2 UM002 WSIA: Howick West Scheme Area

9.2.1 Demand Model Intervention

9.2.1.1 Water Demand

The water demand for the Howick West Scheme Area was determined for 2020 and 2050 and included within **Table 9-3** below.

Table 9-3: Population and Water demand 2020 and 2050 for the Howick West Scheme Area

Population	**Population 2020**	**Population 2050**
	57 668	284 353
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	45.34	88.58

9.2.2 Water Supply Infrastructure

9.2.2.1 Proposed Interventions

The following infrastructure upgrades will be required in order to adequately supply the Howick West Scheme Area WSIA and is illustrated within **Figure 9-2** with the schematic layout of the WSIA depicted in **Figure 9-3.**

- ✓ The Midmar Water Treatment Plant will have to be upgraded from its current maximum design capacity of 395 Mℓ/day to 421 Mℓ/day in 2050.
- ✓ The existing 3.3 km, 700mm ø secondary bulk main which is supplying Reservoirs 1 and 2 needs to be upgraded to a 1 100mm ø pipeline in order to meet the 2050 demand.
- ✓ The current storage capacity of 32 Mℓ will have to be upgraded to 44 Mℓ in order to meet the 2050 demand.

Design details of all the infrastructure components are provided within **Annexure B**.

9.2.3 Financial Requirements

The bulk cost requirement for the Howick West WSIA is summarised within **Table 9-4** overleaf.

Table 9-4: UM002 Howick West Scheme Area Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R41 470 000.00	R414 700.00	R41 884 700.00
Secondary	R59 530 881.21	R595 308.81	R60 126 190.02
Tertiary	-	-	-
Total	**R101 000 881.21**	**R1 010 008.81**	**R102 010 890.02**

The total bulk cost requirement for the Howick West Scheme is R102 010 890.02 (excl VAT). The scheme development cost per household is approximately R 5 000.

9.3 UM003 WSIA: Groenekloof Reservoir Scheme Area

9.3.1 Demand Model Intervention

9.3.1.1 Water Demand

The water demand for the Groenekloof Reservoir Scheme Area was determined for 2020 and 2050 and included within **Table 9-5** below.

Table 9-5: Population and Water demand 2020 and 2050 for the Groenekloof Reservoir Scheme Area

Population	**Population 2020**	**Population 2050**
	142 033	8 267
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	26.1	11.0

9.3.2 Water Supply Infrastructure

9.3.2.1 Proposed Interventions

The Groenekloof Reservoir Scheme Area WSIA is illustrated within **Figure 9-2** with the schematic layout of the WSIA depicted in **Figure 9-3.**

No upgrades or interventions are proposed for the Groenekloof Reservoir Scheme Area. As per Section 8, there are no gaps in supply as the scheme area is adequately covered for the 2050 demand horizon by existing and planned infrastructure.

9.4.1 Demand Model Intervention

9.4.1.1 Water Demand

The water demand for the Howick North Scheme Area was determined for 2020 and 2050 and included within **Table 9-6** below

Table 9-6: Population and Water demand 2020 and 2050 for the Howick North Scheme Area

Population	**Population 2020**	**Population 2050**
	16 956	24 846
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	5.8	8.7

9.4.1.2 Water Resource Consideration

Water for the extension of the Mpofana Phase 2 Scheme from Lidgetton to Howick-North WSS will be sourced from the Spring Grove Dam. Water is treated at the 20 Mℓ/day Rosetta WTP. According to the 2020 Umgeni Water IMP, the Rosetta WTP will be upgraded to 60 Mℓ/day when the need arises.

Water will be pumped via a 600mm ø steel pipeline to the 5Mℓ Nottingham Road Reservoir. The Phase 2 of the Mpofana BWSS entails a proposed pipeline from Nottingham Road Reservoir to Balgowan which will then feed the Lidgetton Reservoir (including the Balgowan Reservoir). The anticipated construction commencement of this phase is early 2022. From this scheme an extension from the Lidgetton Reservoir to supply the Howick-North area, via a proposed secondary gravity main, was investigated as an intervention option.

The Howick-North command reservoir complex has capacity of 6.6 Mℓ/day. The current supply to these reservoirs is from the Upper Mgeni system and any additional supply from other sources will free up potable water capacity on the currently strained Upper Mgeni System.

9.4.2 Water Supply Infrastructure

The following infrastructure upgrades will be required in order to adequately supply the extension of Lidgetton to Howick North Scheme Area WSIA and is illustrated within **Figure 9-2** with the schematic layout of the WSIA depicted in **Figure 9-3.**

9.4.2.1 Proposed Interventions

In this option, an extension of the Mpofana Phase 2 BWSS is proposed (detailed further in Section 9.14). Water will be conveyed from the Lidgetton Command Reservoir (1 221 m) to the Howick-North (1 109 m) command reservoir. The length of the proposed 160mm ø pipeline from the Lidgetton

Reservoir to the Mandela Capture Site in the Midlands Meander is approximately 10km. From there, a 6 km, 160mm ø pipeline will feed the Howick-North reservoir.

The capacity of the Rosetta WTP and the existing Lidgetton Reservoir will have to be upgraded to cater for the projected demand of the Howick-North scheme. This option allows for augmentation of the Mgeni System from the Mooi System by means of potable water from the Rosetta WTP.

Design details of all the infrastructure components are provided within **Annexure B**.

9.4.3 Financial Requirements

The bulk cost requirement for the Extension of Lidgetton to Howick North WSIA is summarised within **Table 9-7** below.

Table 9-7: UM004 Lidgetton to Howick North Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	-	-	-
Secondary	R8 366 885.88	R836 688.59	R9 203 574.47
Tertiary	-	-	-
Total	**R8 366 885.88**	**R836 688.59**	**R9 203 574.47**

The total bulk cost requirement for the Extension (Lidgetton to Howick North) Scheme is R9 203 574.47 (excl VAT). The scheme development cost per household is approximately R 1 500.

9.5 UM005 WSIA: KwaMevana SP WSS

9.5.1 Demand Model Intervention

9.5.1.1 Water Demand

The water demand for the KwaMevana WSIA was determined for 2020 and 2050 and included within **Table 9-8** below.

Table 9-8: Population and Water demand 2020 and 2050 for the KwaMevana WSIA

Population	**Population 2020**	**Population 2050**
	4 739	6 549
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	0.98	1.49

9.5.1.2 Water Resource Consideration

Raw water is conveyed to Midmar Dam via the Mgeni River, with augmentation from the Mooi-Mgeni Transfer Scheme (MMTS), which is pumped from Spring Grove Dam and Mearns Weir respectively.

The firm yield of Midmar Dam is 476.2 Mℓ/day. Water is treated at the 395 Mℓ/day Midmar WTP, which is located in Howick West. Water is then pumped via a 400mm ø steel pipeline to Reservoir 3 (4.5Mℓ) and a 300mm ø AC pipeline to Reservoir 1 (1.2Mℓ) and Reservoir 4 (6.5Mℓ). Reservoir 2 (0.9Mℓ) has been decommissioned

9.5.2 Water Supply Infrastructure

The following infrastructure upgrades will be required to adequately supply the KwaMevana SP WSIA and is illustrated within **Figure 9-2** with the schematic layout of the WSIA depicted in **Figure 9-3.**

9.5.2.1 Bulk Conveyance and Storage

The proposed distribution reservoir for the KwaMevana SP rural settlement is proposed to be supplied from the existing 85 kℓ concrete reservoir in Howick. The existing concrete reservoir is fed from the Sozomeni South reservoir, which in turn is supplied by the Howick West Reservoir. The existing concrete reservoir will need to be upgraded to cater to meet the future demands of the proposed Howick North WSS. Storage at Howick-West Reservoir is currently being increased by 16 Mℓ to bring the total storage to 32.5 Mℓ. The upstream supply for the proposed KwaMevana SP rural settlement will thus be adequately catered for by the increased storage capacity.

9.5.2.2 Proposed Interventions

The existing 85 kℓ concrete reservoir will convey potable water to the proposed distribution reservoir within the KwaMevana SP rural settlement. To cater for the future demands of the scheme area, the existing reservoir would need to be upgraded to accommodate a total of 1.5 Mℓ of storage. A proposed 110 mm ø pipeline will then supply the proposed KwaMevana SP distribution reservoir (1 032 m).

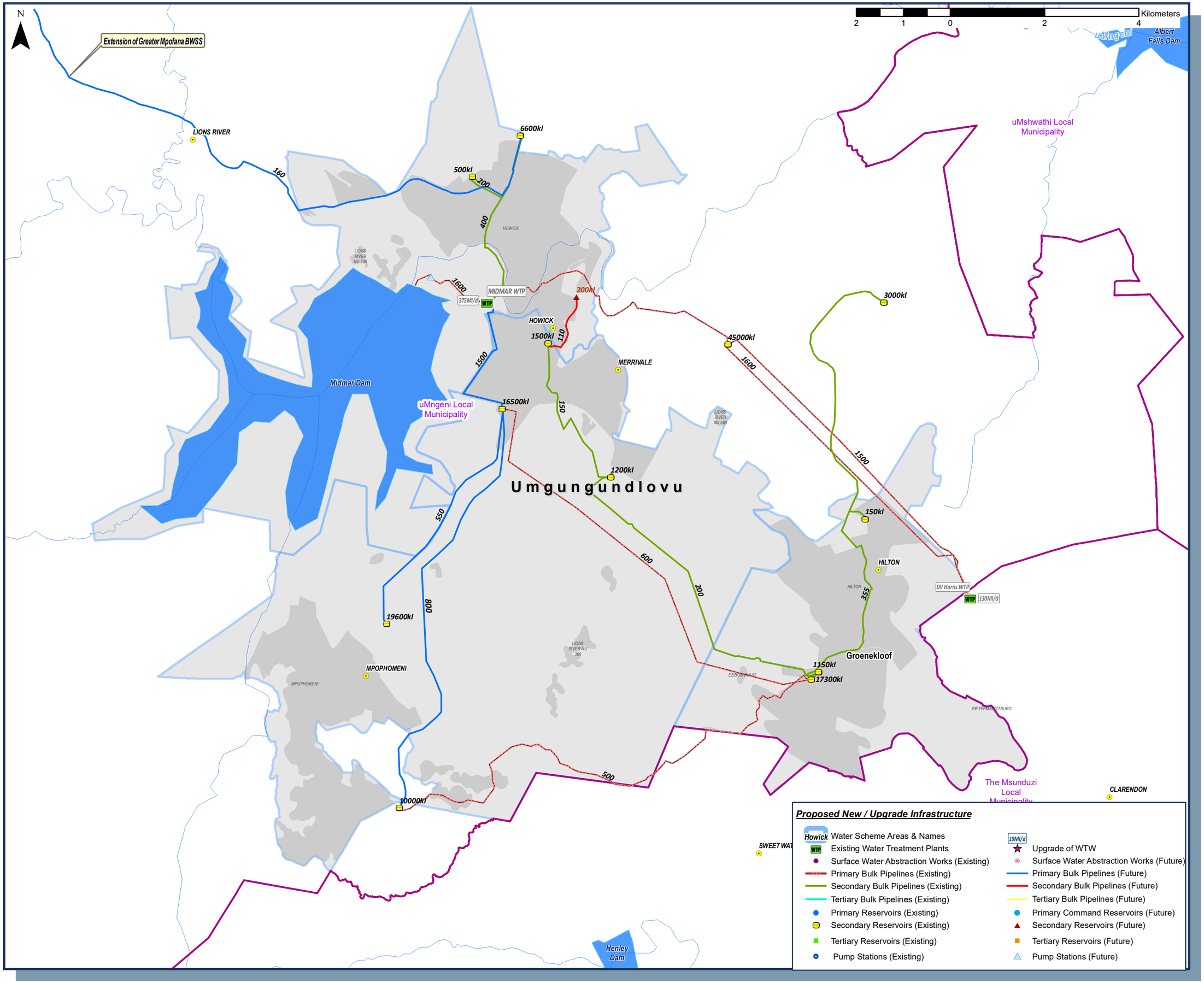
9.5.3 Financial Requirements

The bulk cost requirement for the KwaMevana SP WSIA is summarised within **Table 9-9** overleaf.

Table 9-9: UM005 KwaMevana SP Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	-	**-**	-
Secondary	R8 601 711.14	R860 171.11	R9 461 882.25
Tertiary	R445 825.44	R44 582.54	R490 407.98
Total	**R9 047 536.58**	**R904 753.66**	**R9 952 290.24**

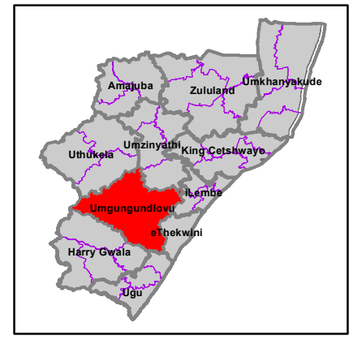
The total bulk cost requirement for the KwaMavena Scheme is R9 952 290.24 (excl VAT). The scheme development cost per household is approximately R 1 600.



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- National Roads
- Main Roads
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns (Hilton)

LOCALITY:



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Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - Umngeni LM: (UM001- UM005)

Umgungundlovu District Municipality

DATE COMPLETED:

January 2021

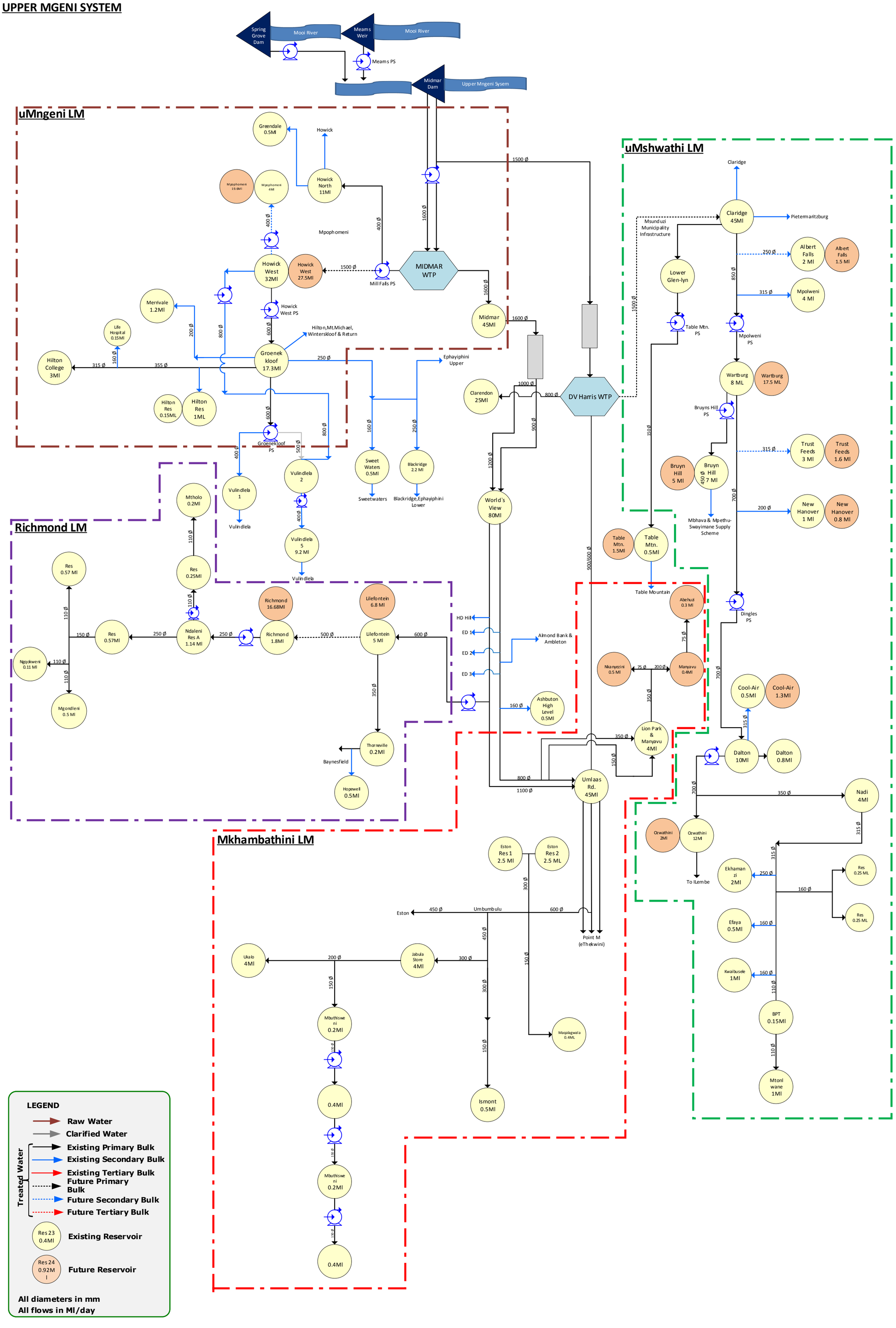
MAP NO.:

DC 22 Figure 9-2

Proposed New / Upgrade Infrastructure

Howick — Water Scheme Areas & Names	19Ml/d — Upgrade of WTW
WTP — Existing Water Treatment Plants	Surface Water Abstraction Works (Future)
Surface Water Abstraction Works (Existing)	Primary Bulk Pipelines (Future)
Primary Bulk Pipelines (Existing)	Secondary Bulk Pipelines (Future)
Secondary Bulk Pipelines (Existing)	Tertiary Bulk Pipelines (Future)
Tertiary Bulk Pipelines (Existing)	Primary Command Reservoirs (Future)
Primary Reservoirs (Existing)	Secondary Reservoirs (Future)
Secondary Reservoirs (Existing)	Tertiary Reservoirs (Future)
Tertiary Reservoirs (Existing)	Pump Stations (Future)
Pump Stations (Existing)	

Figure 9-3
UM001-UM013 & UM016-UM018 WSIA:
UPPER MGENI SYSTEM



9.6 UM006 WSIA: CLARIDGE RESERVOIR SCHEME AREA

9.6.1 Demand Model Intervention

9.6.1.1 Water Demand

The water demand for the Claridge Reservoir Scheme Area was determined for 2020 and 2050 and included within **Table 9-10** below.

Table 9-10: Population and Water demand 2020 and 2050 for the Claridge Reservoir Scheme Area

Population	**Population 2020**	**Population 2050**
	198 638	291 061
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	54.47	173.1

9.6.2 Water Supply Infrastructure

9.6.2.1 Proposed Interventions

The following infrastructure upgrades will be required in order to adequately supply the Claridge Reservoir Scheme Area WSIA and is illustrated within **Figure 9-4** with the schematic layout of the WSIA depicted in **Figure 9-3.**

- ✓ The D.V Harris Water Treatment Plant will have to be upgraded from its current maximum design capacity of 110 Mℓ/day to 174 Mℓ/day to meet the 2050 demand.
- ✓ The existing 6.7 km, 1 000mm ø secondary bulk main that is supplying Claridge Reservoir needs to be upgraded to a 1 500mm ø pipeline in order to meet the 2050 demand.
- ✓ The existing 9.8 km 200mm ø secondary bulk main that is supplying Albert Falls and Thokozani, needs to be upgraded to an 250mm ø pipeline in order to meet the 2050 demand.
- ✓ The current storage capacity of 2 Mℓ at Albert Falls and Thokozani will have to be upgraded to 3.5 Mℓ in order to meet the 2050 demand

Design details of all the infrastructure components are provided within **Annexure B**.

9.6.3 Financial Requirements

The bulk cost requirement for the Claridge Reservoir Scheme Area WSIA is summarised within **Table 9-11** below.

Table 9-11: UM006 Claridge Reservoir Scheme Area Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R177 860 000.00	R17 786 000.00	R195 646 000.00
Secondary	R22 267 004.54	R2 226 700.45	R24 493 705.00
Tertiary	R14 545 141.38	R1 454 514.14	R15 999 655.52
Total	**R214 672 145.92**	**R21 467 214.59**	**R236 139 360.52**

The total bulk cost requirement for the Claridge Reservoir Scheme is R236 139 360.52 (excl VAT). The scheme development cost per household is approximately R 1 500 000.

9.7 UM007 WSIA: uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Wartburg

9.7.1 Demand Model Intervention

9.7.1.1 Water Demand

The water demand for the uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Wartburg was determined for 2020 and 2050 and included within **Table 9-12** below.

Table 9-12: Population and Water demand 2020 and 2050 for the uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Wartburg

Population	**Population 2020**	**Population 2050**
	54 629	80 047
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	9.54	51

9.7.2 Water Supply Infrastructure

9.7.2.1 Proposed Interventions

The following infrastructure upgrades will be required in order to adequately supply the uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Wartburg WSIA and is illustrated within **Figure 9-4** with the schematic layout of the WSIA depicted in **Figure 9-3.**

- ✓ The current storage capacity of the 8 Mℓ Wartburg Reservoir will have to be upgraded to 25.5 Mℓ in order to meet the 2050 demand.
- ✓ The current storage capacity of the 1 Mℓ New Hanover Reservoir will have to be upgraded to 1.8 Mℓ in order to meet the 2050 demand.
- ✓ The current storage capacity of the 1.4 Mℓ Trust Feeds Reservoir will have to be upgraded to 3 Mℓ in order to meet the 2050 demand.

Design details of all the infrastructure components are provided within **Annexure B**.

9.7.3 Financial Requirements

The bulk cost requirement for the uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Wartburg WSIA is summarised within **Table 9-13** below.

Table 9-13: UM007 uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Wartburg Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	-	-	-
Secondary	R51 712 389.25	R5 171 238.92	R56 883 628.17
Tertiary	-	-	-
Total	**R51 712 389.25**	**R5 171 238.92**	**R56 883 628.17**

The total bulk cost requirement for the Pipeline to Wartburg Scheme is R56 883 628.17 (excl VAT). The scheme development cost per household is approximately R 140 000.

9.8 UM008 WSIA: uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Bruyns Hill Reservoir

9.8.1 Demand Model Intervention

9.8.1.1 Water Demand

The water demand for the uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Bruyns Hill Reservoir was determined for 2020 and 2050 and included within **Table 9-14** below.

Table 9-14: Population and Water demand 2020 and 2050 for the uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Bruyns Hill Reservoir

Population	**Population 2020**	**Population 2050**
	40 556	59 427
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	7.1	10.6

9.8.2 Water Supply Infrastructure

9.8.2.1 Proposed Interventions

The following infrastructure upgrades will be required in order to adequately supply the uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Bruyns Hill Reservoir WSIA and is illustrated within **Figure 9-4** and **Figure 9-5** with the schematic layout of the WSIA depicted in **Figure 9-3.**

- ✓ The current storage capacity of 6.4 Mℓ Bruyns Hill Reservoir will have to be upgraded to 11 Mℓ in order to meet the 2050 demand.
- ✓ The existing Swayimane Supply Scheme will need to be upgraded in order to meet the 2050 demand. The Swayimane Supply Scheme upgrades are shown in **Table 9-15** overleaf.

Table 9-15: Swayimane Supply Scheme upgrades

Reservoirs				
Proposed Reservoir	**Elevation (m)**	**Capacity (Mℓ)**		
Reservoir B	963	0.5		
Reservoir H	970	0.8		
Reservoir I	880	0.5		
Reservoir D	1 050	2.2		
Reservoir T	924	0.15		
Reservoir K1	976	0.7		
Reservoir M	927	0.6		
Reservoir L	951	1		
Reservoir P	987	0.5		
Reservoir W	823	0.7		
Reservoir A	828	0.6		
Reservoir F	874	0.25		
Reservoir V	733	0.3		
Pipelines				
Leg	**Ø (mm)**	**Material**	**Class**	**Length (km)**
1	250	uPVC	16	11
2	300	uPVC	16	16
3	140	uPVC	16	4
4	250	uPVC	16	11
5	300	uPVC	16	13
6	140	uPVC	16	5

Design details of all the infrastructure components are provided within **Annexure B**.

9.8.3 Financial Requirements

The bulk cost requirement for the uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Bruyns Hill Reservoir WSIA is summarised within **Table 9-16** overleaf.

Table 9-16: UM008 uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Bruyns Hill Reservoir Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	-	-	-
Secondary	R202 982 598.28	R20 298 259.83	R223 280 858.10
Tertiary	R36 927 603.41	R3 692 760.34	R40 620 363.75
Total	**R239 910 201.68**	**R23 991 020.17**	**R263 901 221.85**

The total bulk cost requirement for the Pipeline to Bruyns Hill Scheme is R263 901 221.85 (excl VAT). The scheme development cost per household is approximately R 17 800.

9.9 UM009 WSIA: uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Dalton Reservoir

9.9.1 Demand Model Intervention

9.9.1.1 Water Demand

The water demand for the uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Dalton Reservoir was determined for 2020 and 2050 and included within **Table 9-17** below.

Table 9-17: Population and Water demand 2020 and 2050 for the uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Dalton Reservoir

Population	**Population 2020**	**Population 2050**
	21 052	30 847
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	10	37.3

9.9.2 Water Supply Infrastructure

9.9.2.1 Proposed Interventions

The following infrastructure upgrades will be required in order to adequately supply the uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Dalton Reservoir WSIA and illustrated within **Figure 9-4** and **Figure 9-6** with the schematic layout of the WSIA depicted in **Figure 9-3.**

- ✓ The current storage capacity of 10 Mℓ Dalton Reservoir will have to be upgraded to 17 Mℓ in order to meet the 2050 demand.
- ✓ The current storage capacity of 0.5 Mℓ Cool Air will have to be upgraded to 1.8 Mℓ in order to meet the 2050 demand.

Design details of all the infrastructure components are provided within **Annexure B**.

9.9.3 Financial Requirements

The bulk cost requirement for the uMshwathi Regional Bulk Water Supply Scheme: Pipeline to Dalton Reservoir WSIA is summarised within **Table 9-18** below.

Table 9-18: UM009 Mshwathi Regional Bulk Water Supply Scheme: Pipeline to Dalton Reservoir Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	-	-	-
Secondary	R22 700 051.79	R2 270 005.18	R24 970 056.97
Tertiary	-	-	-
Total	**R22 700 051.79**	**R2 270 005.18**	**R24 970 056.97**

The total bulk cost requirement for the Dalton Reservoir Scheme is R24 970 056.97 (excl VAT). The scheme development cost per household is approximately R 37 300.

9.10 UM010 WSIA: uMshwathi Regional Bulk Water Supply Scheme: Ozwathini Supply Scheme Area

9.10.1 Demand Model Intervention

9.10.1.1 Water Demand

The water demand for the uMshwathi Regional Bulk Water Supply Scheme: Ozwathini Supply Scheme Area was determined for 2020 and 2050 and included within **Table 9-19** below.

Table 9-19: Population and Water demand 2020 and 2050 for the uMshwathi Regional Bulk Water Supply Scheme: Ozwathini Supply Scheme Area

Population	**Population 2020**	**Population 2050**
	21 052	30 847
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	6.3	28

9.10.2 Water Supply Infrastructure

9.10.2.1 Proposed Interventions

The following infrastructure upgrades will be required in order to adequately supply the uMshwathi Regional Bulk Water Supply Scheme: Ozwathini WSIA and is illustrated within **Figure 9-4** with the schematic layout of the WSIA depicted in **Figure 9-3.**

- ✓ The current storage capacity of 12 Mℓ Ozwathini Reservoir needs to be upgraded to 14 Mℓ in order to meet the 2050 demand.

Design details of all the infrastructure components are provided within **Annexure B**.

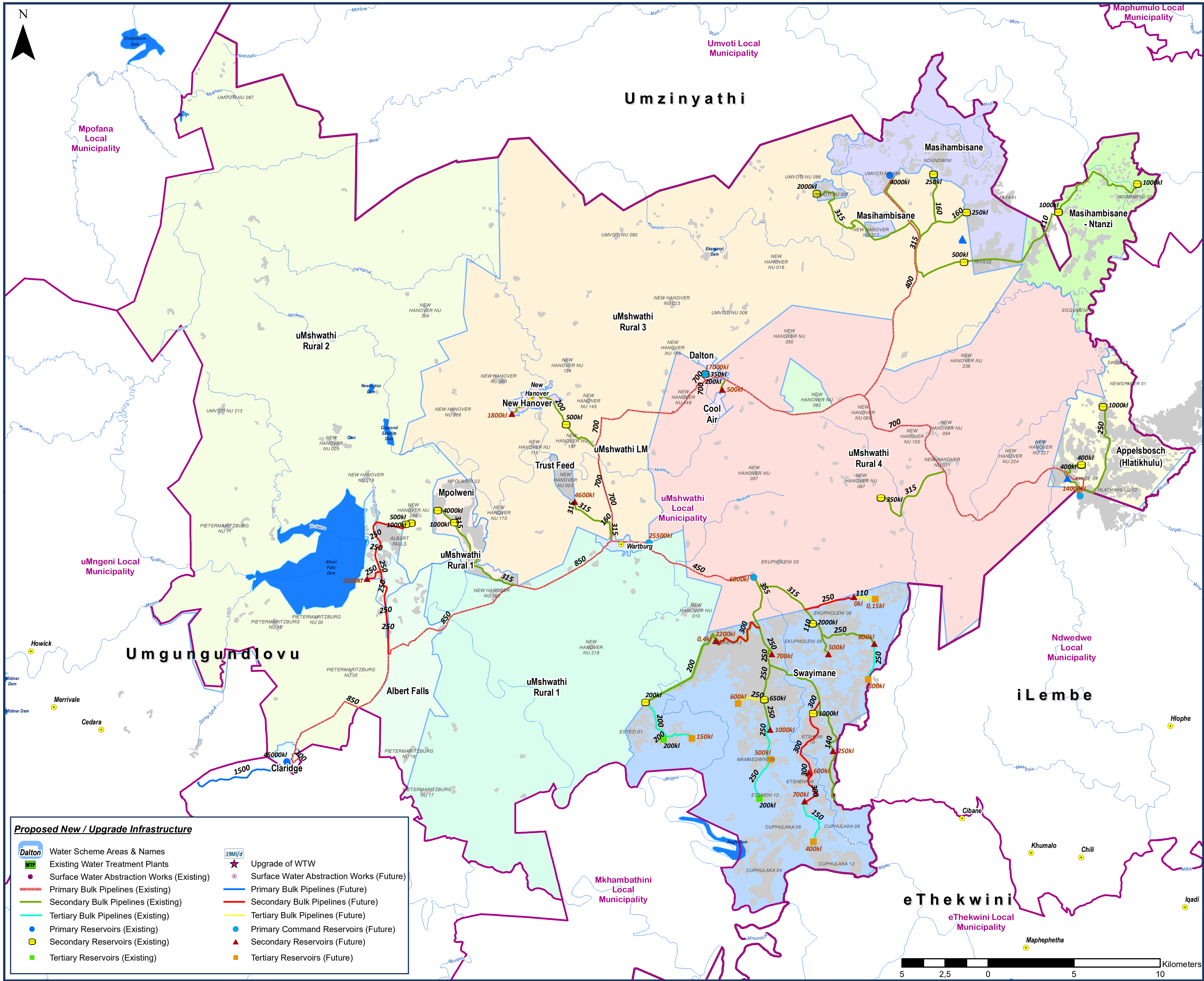
9.10.3 Financial Requirements

The bulk cost requirement for the uMshwathi Regional Bulk Water Supply Scheme: Ozwathini WSIA is summarised within **Table 9-20** below.

Table 9-20: UM010 uMshwathi Regional Bulk Water Supply Scheme: Oswathini Supply Scheme Area Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	-	-	-
Secondary	**R18 889 010.70**	**R1 888 901.07**	**R20 777 911.77**
Tertiary	-	-	-
Total	**R18 889 010.70**	**R1 888 901.07**	**R20 777 911.77**

The total bulk cost requirement for the Ozwathini Scheme is R20 777 911.77 (excl VAT). The scheme development cost per household is approximately R 3 100.



N
Umzinyathi
Umvoti Local Municipality
Maphumulo Local Municipality
Mpofana Local Municipality
uMngeni Local Municipality
Umgungundlovu
iLembe
eThekwini
Ndwedwe Local Municipality
Mkhambathini Local Municipality
eThekwini Local Municipality
uMshwathi Local Municipality
uMshwathi Rural 1
uMshwathi Rural 2
uMshwathi Rural 3
uMshwathi Rural 4
uMshwathi LM
Masihambisane
Masihambisane - Ntanzi
Appelsbosch (Hlatikhulu)
Dalton
Cool Air
New Hanover
Trust Feed
Mpolweni
Wartburg
Swayimane
Albert Falls
Claridge
Howick
Merrivale
Cedara
Hlophe
Cibane
Khumalo
Chili
Iqadi
Maphephetha
Kilometers
5 2,5 0 5 10
Proposed New / Upgrade Infrastructure
Water Scheme Areas & Names
Existing Water Treatment Plants
Surface Water Abstraction Works (Existing)
Primary Bulk Pipelines (Existing)
Secondary Bulk Pipelines (Existing)
Tertiary Bulk Pipelines (Existing)
Primary Reservoirs (Existing)
Secondary Reservoirs (Existing)
Tertiary Reservoirs (Existing)
Upgrade of WTW
Surface Water Abstraction Works (Future)
Primary Bulk Pipelines (Future)
Secondary Bulk Pipelines (Future)
Tertiary Bulk Pipelines (Future)
Primary Command Reservoirs (Future)
Secondary Reservoirs (Future)
Tertiary Reservoirs (Future)

Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns

LOCALITY:

Amajuba, Zululand, Umkhanyakude, Uthukela, Umzinyathi, King Cetshwayo, iLembe, Umgungundlovu, eThekwini, Harry Gwala, Ugu

CLIENT:

UMGENI WATER • AMANZI

MUNICIPALITY:

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PROJECT TITLE

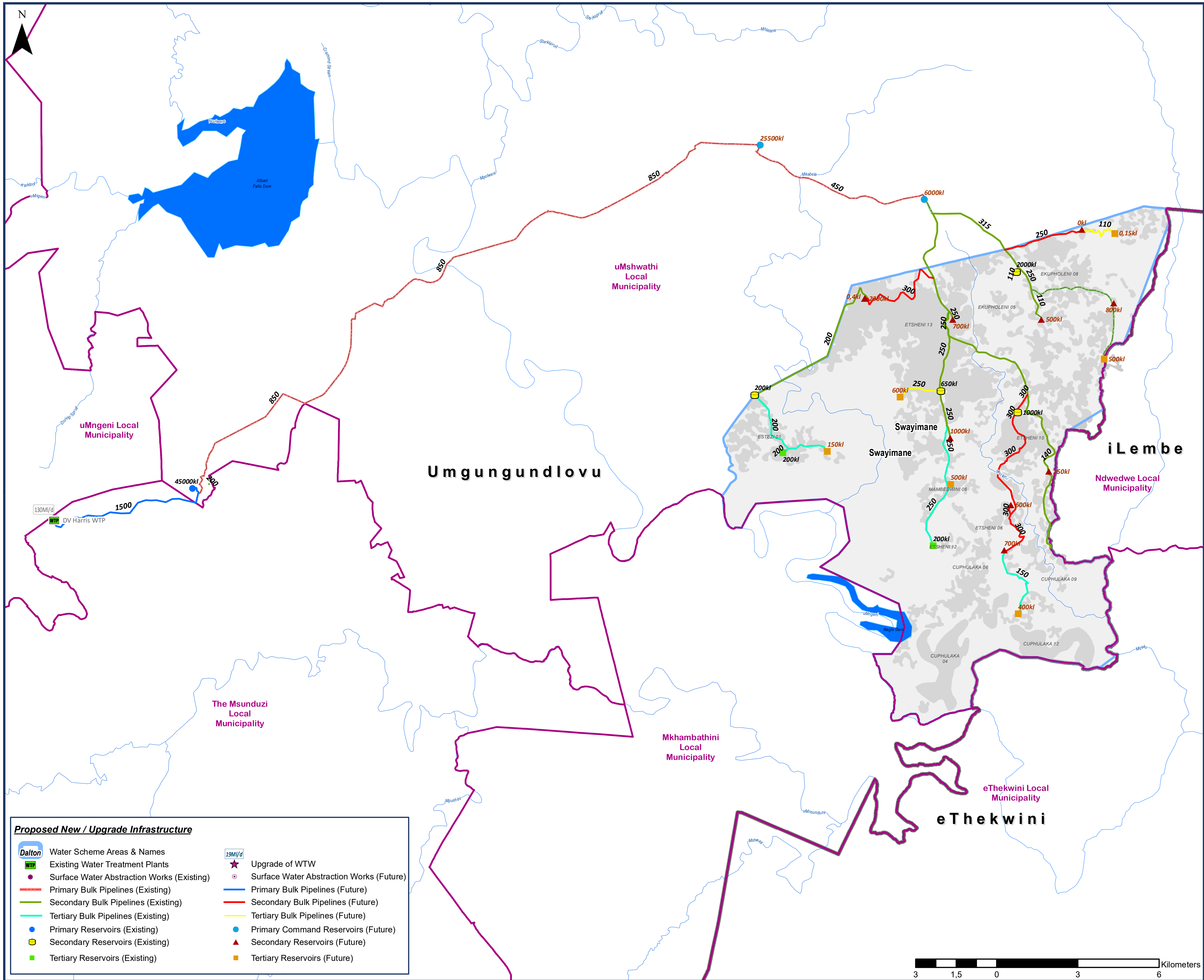
Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - UM006 - UM010: Umshwathi
Umgungundlovu District Municipality

DATE COMPLETED: January 2021

MAP NO.: DC 22 Figure 9-4



N
Albert Falls Dam
25500kl
6000kl
850
450
315
250
110
0kl
0,15kl
2000kl
uMshwathi Local Municipality
uMngeni Local Municipality
Umgungundlovu
45000kl
200
1500
130Ml/d
DV Harris WTP
Swayimane
iLembe
Ndwedwe Local Municipality
The Msunduzi Local Municipality
Mkhambathini Local Municipality
eThekwini Local Municipality
eThekwini
200kl
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650kl
1000kl
500kl
700kl
800kl
400kl
Proposed New / Upgrade Infrastructure
Dalton Water Scheme Areas & Names
WTP Existing Water Treatment Plants
Surface Water Abstraction Works (Existing)
Primary Bulk Pipelines (Existing)
Secondary Bulk Pipelines (Existing)
Tertiary Bulk Pipelines (Existing)
Primary Reservoirs (Existing)
Secondary Reservoirs (Existing)
Tertiary Reservoirs (Existing)
19Ml/d Upgrade of WTW
Surface Water Abstraction Works (Future)
Primary Bulk Pipelines (Future)
Secondary Bulk Pipelines (Future)
Tertiary Bulk Pipelines (Future)
Primary Command Reservoirs (Future)
Secondary Reservoirs (Future)
Tertiary Reservoirs (Future)
3 1,5 0 3 6 Kilometers

Legend

- Provincial Boundaries
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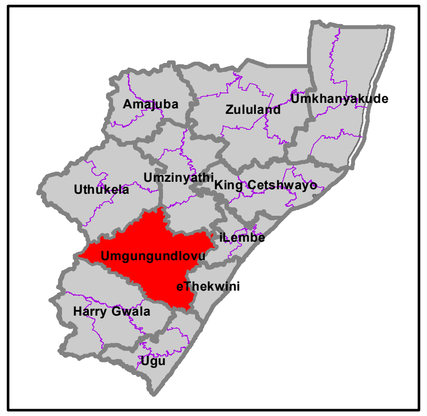
LOCALITY:



CLIENT: UMGENI WATER•AMANZI

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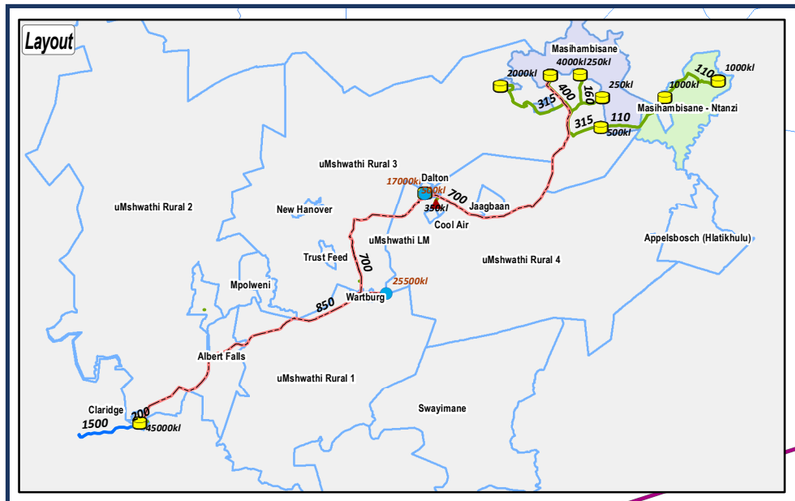
PROJECT TITLE

Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE: **Total Bulk Water Supply Interventions - UM008: Swayimane**
Umgungundlovu District Municipality

DATE COMPLETED: January 2021

MAP NO.: DC 22 Figure 9-5



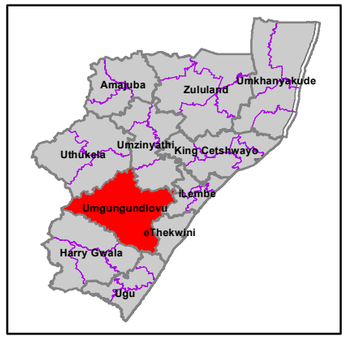
Proposed New / Upgrade Infrastructure

- Water Scheme Areas & Names
- Existing Water Treatment Plants
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- Upgrade of WTW
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns

LOCALITY:



CLIENT:

UMGENI WATER • AMANZI

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PROJECT TITLE

Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - UM009: Nadi Umgungundlovu District Municipality

DATE COMPLETED:

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MAP NO.:

DC 22 Figure 9-6

9.11 UM011 WSIA: Umlaas Road Reservoir Scheme Area

9.11.1 Demand Model Intervention

9.11.1.1 Water Demand

The water demand for the Umlaas Road Reservoir Scheme Area was determined for 2020 and 2050 and included within **Table 9-21** below.

Table 9-21: Population and Water demand 2020 and 2050 for the Umlaas Road Reservoir Scheme Area

Population	Population 2020	Population 2050
	66 214	97 023
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	115.18	56.4

9.11.2 Water Supply Infrastructure

9.11.2.1 Proposed Interventions

No upgrades or interventions are proposed for the Umlaas Road Reservoir Scheme Area. As per Section 8, there are no gaps in supply as the scheme area is adequately covered for the 2050 demand horizon by existing and planned infrastructure.

The Umlaas Road Reservoir Scheme Area WSIA is illustrated within **Figure 9-7** with the schematic layout of the WSIA depicted in **Figure 9-3.**

9.12 UM012 WSIA: Lion Park/Manyavu Water Supply System

9.12.1 Demand Model Intervention

9.12.1.1 Water Demand

The water demand for the Lion Park/Manyavu Water Supply System was determined for 2020 and 2050 and included within **Table 9-22** overleaf.

Table 9-22: Population and Water demand 2020 and 2050 for the Lion Park/Manyavu Water Supply System

Population	Population 2020	Population 2050
	24 954	36 565
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	4.4	7.5

9.12.2 Water Supply Infrastructure

9.12.2.1 Proposed Interventions

The following infrastructure upgrades will be required in order to adequately supply Table Mountain Reservoir Scheme Area WSIA and is illustrated within **Figure 9-7** with the schematic layout of the WSIA depicted in **Figure 9-3.**

- ✓ The tertiary bulk mains supplied by the Lion Park/Manyavu Reservoir need to be upgraded to range between 75mm ø and 200mm ø to meet the 2050 demand.
- ✓ The three (3) tertiary storage reservoirs will need to be upgraded to 0.3 Mℓ, 0.4 Mℓ and 0.5 Mℓ to meet the 2050 demand.

Design details of all the infrastructure components are provided within **Annexure B**.

9.12.3 Financial Requirements

The bulk cost requirement for the Lion Park/Manyavu WSIA is summarised within **Table 9-23** below.

Table 9-23: UM012 Lion Park/Manyavu Water Supply Scheme Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	-	-	-
Secondary	R19 176 954.04	R1 917 695.40	R21 094 649.45
Tertiary	R9 623 724.96	R962 372.50	R10 586 097.45
Total	**R28 800 679.00**	**R2 880 067.90**	**R31 680 746.90**

The total bulk cost requirement for the Lion Park/Manyavu Scheme is R31 680 746.90 (excl VAT). The scheme development cost per household is approximately R 65 000.

9.13 UM013 WSIA: Table Mountain Reservoir Scheme Area

9.13.1 Demand Model Intervention

9.13.1.1 Water Demand

The water demand for the Table Mountain Reservoir Scheme Area was determined for 2020 and 2050 and included within **Table 9-24** below.

Table 9-24: Population and Water demand 2020 and 2050 for the Table Mountain Reservoir Scheme Area

Population	**Population 2020**	**Population 2050**
	24 954	36 565
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	1.73	2.7

9.13.2 Water Supply Infrastructure

9.13.2.1 Proposed Interventions

The following infrastructure upgrades will be required in order to adequately supply Table Mountain Reservoir Scheme Area WSIA and is illustrated within **Figure 9-7** with the schematic layout of the WSIA depicted in **Figure 9-3.**

Option 1

- ✓ The current storage capacity of 0.5 Mℓ Table Mountain will have to be upgraded to 5.4 Mℓ in order to meet the 2050 demand.

Option 2

The Ezinketheni area is currently being supplied by the existing 20 Mℓ Copesville Reservoir, via the 12 Mℓ Ezinketheni Reservoir that is currently under construction by the Msunduzi LM. The following alternative is proposed for the supply of the Table Mountain Reservoir Scheme Area:

- ✓ A proposed 150mm ø secondary bulk pipeline to supply the Table Mountain Reservoir; and
- ✓ The current storage capacity of 0.5 Mℓ Table Mountain need to be upgraded to 5.4 Mℓ in order to meet the 2050 demand.

Design details of all the infrastructure components are provided within **Annexure B.**

9.13.3 Financial Requirements

The bulk cost requirement for both options of the Table Mountain Reservoir Scheme Area WSIA is summarised within **Table 9-25** and **Table 9-26**.

Table 9-25: UM013 Table Mountain Reservoir WSIA Cost Requirement (Option 1)

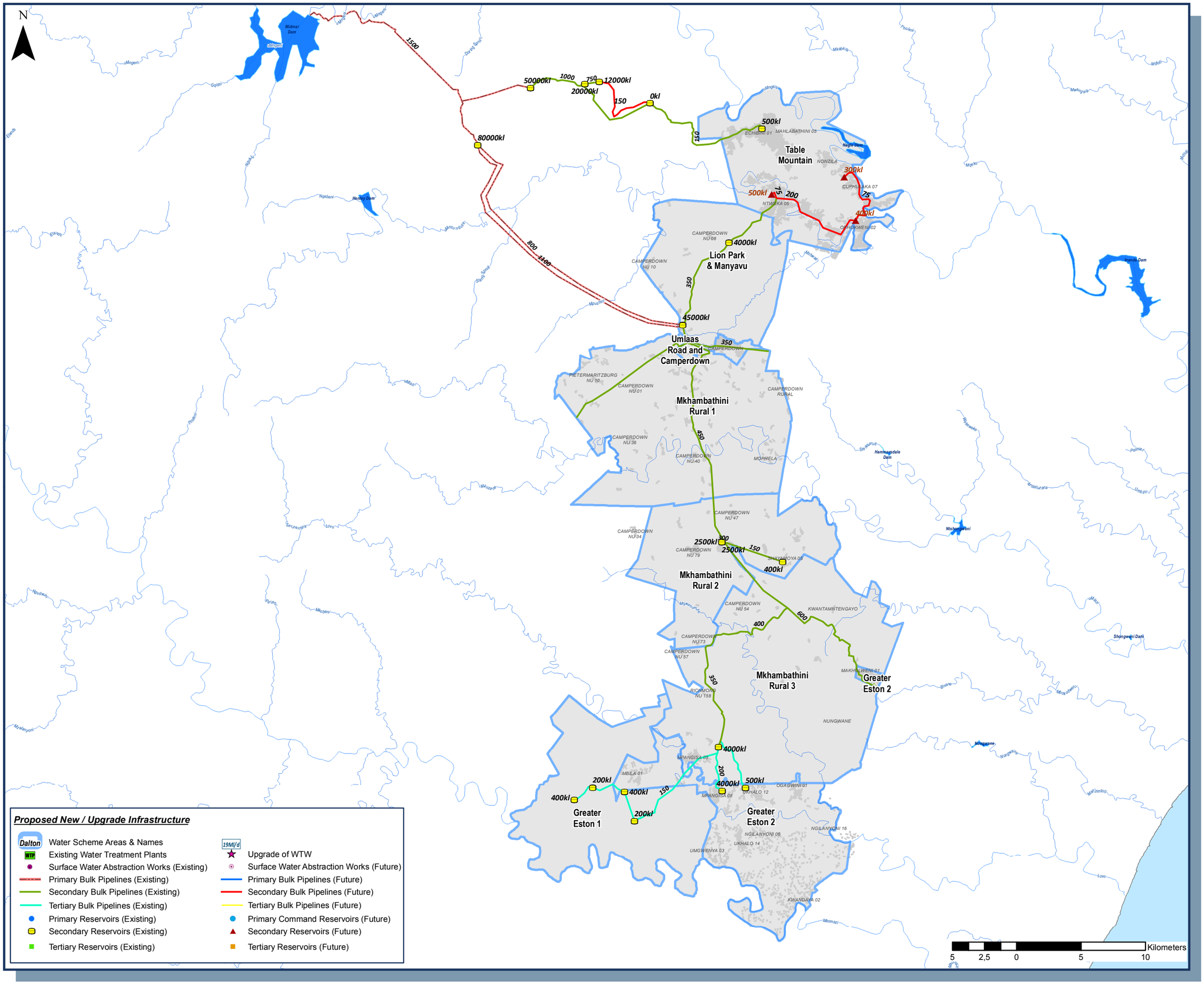
	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	-	-	-
Secondary	R16 661 226.93	R1 666 122.69	R18 327 349.63
Tertiary	-	-	-
Total	**R16 661 226.93**	**R1 666 122.69**	**R18 327 349.63**

The total bulk cost requirement for the Table Mountain Reservoir (Option 1) is R18 327 349.63 (excl VAT). The scheme development cost per household is approximately R 1 600.

Table 9-26: UM013 Table Mountain Reservoir WSIA Cost Requirement (Option 2)

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	-	-	-
Secondary	R21 080 783.15	R2 108 078.32	R23 188 861.47
Tertiary	R4 419 556.22	R441 955.62	R4 861 511.84
Total	**R25 500 339.37**	**R2 550 033.94**	**R28 050 373.31**

The total bulk cost requirement for the Table Mountain Reservoir (Option 2) is R28 050 373.31 (excl VAT). The scheme development cost per household is approximately R 2 500.



Proposed New / Upgrade Infrastructure

Water Scheme Areas & Names	
Existing Water Treatment Plants	Upgrade of WTW
Surface Water Abstraction Works (Existing)	Surface Water Abstraction Works (Future)
Primary Bulk Pipelines (Existing)	Primary Bulk Pipelines (Future)
Secondary Bulk Pipelines (Existing)	Secondary Bulk Pipelines (Future)
Tertiary Bulk Pipelines (Existing)	Tertiary Bulk Pipelines (Future)
Primary Reservoirs (Existing)	Primary Command Reservoirs (Future)
Secondary Reservoirs (Existing)	Secondary Reservoirs (Future)
Tertiary Reservoirs (Existing)	Tertiary Reservoirs (Future)

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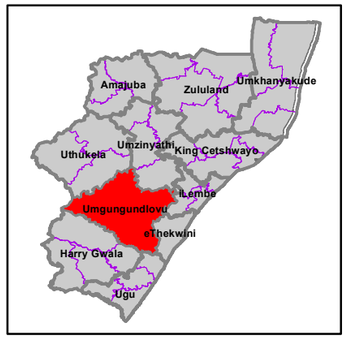

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PROJECT TITLE

Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - UM011 - UM013: Mkhambathini Umgungundlovu District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 22 Figure 9-7

9.14.1 Demand Model Intervention

9.14.1.1 Water Demand

The water demand for the Mpofana Bulk Water Supply Scheme was determined for 2020 and 2050 and included within **Table 9-27** below.

Table 9-27: Population and Water demand 2020 and 2050 for the Mpofana Bulk Water Supply Scheme

Population	**Population 2020**	**Population 2050**
	41 968	61 495
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	9.8	14.8

9.14.1.2 Water Resource Consideration

The Rosetta WTP at Spring Grove Dam will be commissioned in 2020. This WTP has a capacity of 20Mℓ/d and has been planned to be extended to 60Mℓ/d. Currently the intention is to supply the Mpofana Regional Scheme from the Rosetta WTP

The Rosetta WTP, however, has the potential to supply beyond the Mpofana LM into the Umvoti LM in the Umzinyathi DM. The 12Mℓ Bruntville Reservoir will be completed in 2020 as part of Phase 1 of the Mpofana Regional Scheme.

The 12Mℓ Bruntville terminal bulk reservoir on the Mpofana Bulk Water Supply Scheme Phase 1will be completed in 2020 as part of Phase 1 of the Mpofana Regional Scheme. The bulk reservoir is strategically positioned to have the potential (with eventual storage upgrades) to be a Primary Bulk Reservoir that will supply water to regional schemes in the uMgungundlovu, uMzinyathi and possibly even the iLembe District Municipalities. This will address existing backlogs and augment bulk water supply to the following existing water schemes:

- ✓ Mpofana Rural 6 WSS (Section 9.15);
- ✓ Remainder of Mpofana LM around Craigieburn Dam, Ward 4 as well as KwaMathwanya;
- ✓ Muden, including augmentation of the Muden Regional Scheme (Umzinyathi DM);
- ✓ Greytown Regional Scheme (Umzinyathi DM);
- ✓ Mvoti Regional Scheme (Umzinyathi DM); and
- ✓ Augmentation of Ngcebo Scheme (iLembe DM).

9.14.2 Water Supply Infrastructure

9.14.2.1 Proposed Interventions

No upgrades or interventions are proposed for the Mpofana Bulk Water Supply Scheme. As per Section 8, there are no gaps in supply as the scheme area is adequately covered for the 2050 demand horizon by existing and planned infrastructure.

The Mpofana Bulk Water Supply Scheme WSIA and is illustrated within **Figure 9-8** with the schematic layout of the WSIA depicted in **Figure 9-9.**

9.15 UM015 WSIA: Mpofana Rural 6 WSS.

9.15.1 Demand Model Intervention

9.15.1.1 Water Demand

The water demand for the Mpofana Rural 6 WSIA was determined for 2020 and 2050 and included within **Table 9-28** below.

Table 9-28: Population and Water demand 2020 and 2050 for the Mpofana Rural 6 WSIA

Population	Population 2020	Population 2050
	3063	4488
Water Demand	**Demand 2020**	**Demand 2050**
	0.54	0.82

9.15.1.2 Water Resource Consideration

The Mpofana Rural 6 WSS could be supplied from the Spring Grove Regional Bulk Water Supply Scheme highlighted in Section 9.14.

9.15.2 Water Supply Infrastructure

The following infrastructure proposal will be required in order to adequately supply the Mpofana Rural 6 WSIA and is illustrated within **Figure 9-8** with the schematic layout of the WSIA depicted in **Figure 9-9.**

9.15.2.1 Bulk Conveyance and Storage

The Spring Grove Regional Bulk Water Supply Scheme will obtain raw water from Spring Grove Dam on the Mooi River to a WTP to be situated adjacent to the dam. Potable water will be pumped from the WTP to the two (2) command reservoirs. The first reservoir is located at Bruntville in Mooi River. This reservoir will serve the greater Mooi River area and will have the potential to supply the Muden/Rocky Drift area. The Mooi River WTP and Rosetta WTP can then be decommissioned. The

second reservoir is at Nottingham Road that will then supply Balgowan, Lidgetton and Lions River. There is also a link pipeline to Mount West. The scheme will be built in phases to gradually increase the supply area. (UW IMP, 2020)

The Greater Mpofana Phase 1 consists of a 20Mℓ/day Water Treatment Works, pump stations, a 400mm ø pipeline to Nottingham Road along with a 10Mℓ reservoir and a 500mm ø pipeline to Rosetta and Bruntville in Mooi River with a 12Mℓ reservoir at Bruntville.

9.15.2.2 Proposed Interventions

The Spring Grove Regional Bulk Water Supply Scheme could be implemented in two (2) main phases that will allow connection to existing infrastructure and either augment existing schemes or provide water supply to current backlog areas.

Phase 1: Muden Bulk Water Supply

A 47.6km pipeline (14.5 km 900mm ø and 33.1 km 500mm ø) from the Bruntville Command reservoir will allow water supply under gravity to Muden to augment the Muden and Keates Drift Regional Schemes.

The Mpofana Rural 6 scheme area can be supplied en route. This area is currently being supplied by borehole/rudimentary schemes without an existing formal water supply. The projected demand for 2050 for the Mpofana Rural 6 scheme area is 0.82 Mℓ/day.

In this option, water will be supplied via a 160mm ø, 7.2km long pipeline via an off take from the Bruntville-Muden gravity main to a proposed distribution reservoir (1 306 m).

Phase 2: Off-take to Greytown

An off take at approximately 15km on the Muden Bulk Pipeline will allow bulk water supply to Greytown. This will be possible by connecting into the already constructed Craigie Burn to Greytown Raw Water Pipeline thereby converting this pipeline to a potable water pipeline.

The remainder of Mpofana Ward 4 including the KwaMathwanya area can be supplied en route.

Design details of all the infrastructure components are provided within **Annexure B.**

9.15.3 Financial Requirements

The bulk cost requirement for the Mpofana Rural 6 WSIA is summarised within **Table 9-29** below.

Table 9-29: UM015 Mpofana Rural 6 WSIA Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	-	-	-
Secondary	R12 960 725.49	R1 296 072.55	R14 256 798.04
Tertiary	R4 359 014.35	R435 901.44	R4 794 915.79
Total	**R17 319 739.84**	**R1 731 973.98**	**R19 051 713.83**

The total bulk cost requirement for the Mpofana Rural 6 Scheme is R19 051 713.83 (excl VAT). The scheme development cost per household is approximately R 17 000.

Kilometers
5 2,5 0 5 10

N

Okhahlamba Local Municipality

Msinga Local Municipality

Inkosi Langalibalele Local Municipality

Mpofana Local Municipality

Umvoti Local Municipality

uMshwathi Local Municipality

uMngeni Local Municipality

Impendle Local Municipality

Mpofana Rural 1

Mpofana Rural 2

Mpofana Rural 3

Mpofana Rural 5

Mpofana Rural 6

Mpofana Rural 7

Mpofana Rural 8

Tendele

Rosetta

STAND ALONE SCHEMES

Supplies Muden WTP Reservoir

Supplies Howick North

MOOI RIVER - MPOFANA WTP 7Ml/d

ROSETTA WTP 0,32Ml/d

1700kl 160

5000kl 200

1000kl 500

12000kl 500

500kl 110

5000kl 400

5000kl 160

500 145

500 900

MOOIRIVIER NU 115

MOOIRIVIER NU 044

MOOIRIVIER NU 059

MOOIRIVIER NU 037

MOOIRIVIER NU 061

MOOIRIVIER NU 152

MOOIRIVIER NU 002

SINYAMA 05

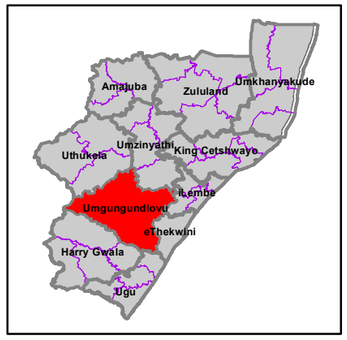
UMVOTI NU 179

UMVOTI NU 204

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- National Roads (N1)
- Main Roads
- Dams & Dam Names (Driel Dam)
- Rivers
- Settlements
- Major Towns (Hilton)

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

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PROJECT TITLE

Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - UM014 & UM015: Mpofana BWSS Umgungundlovu District Municipality

DATE COMPLETED:

January 2021

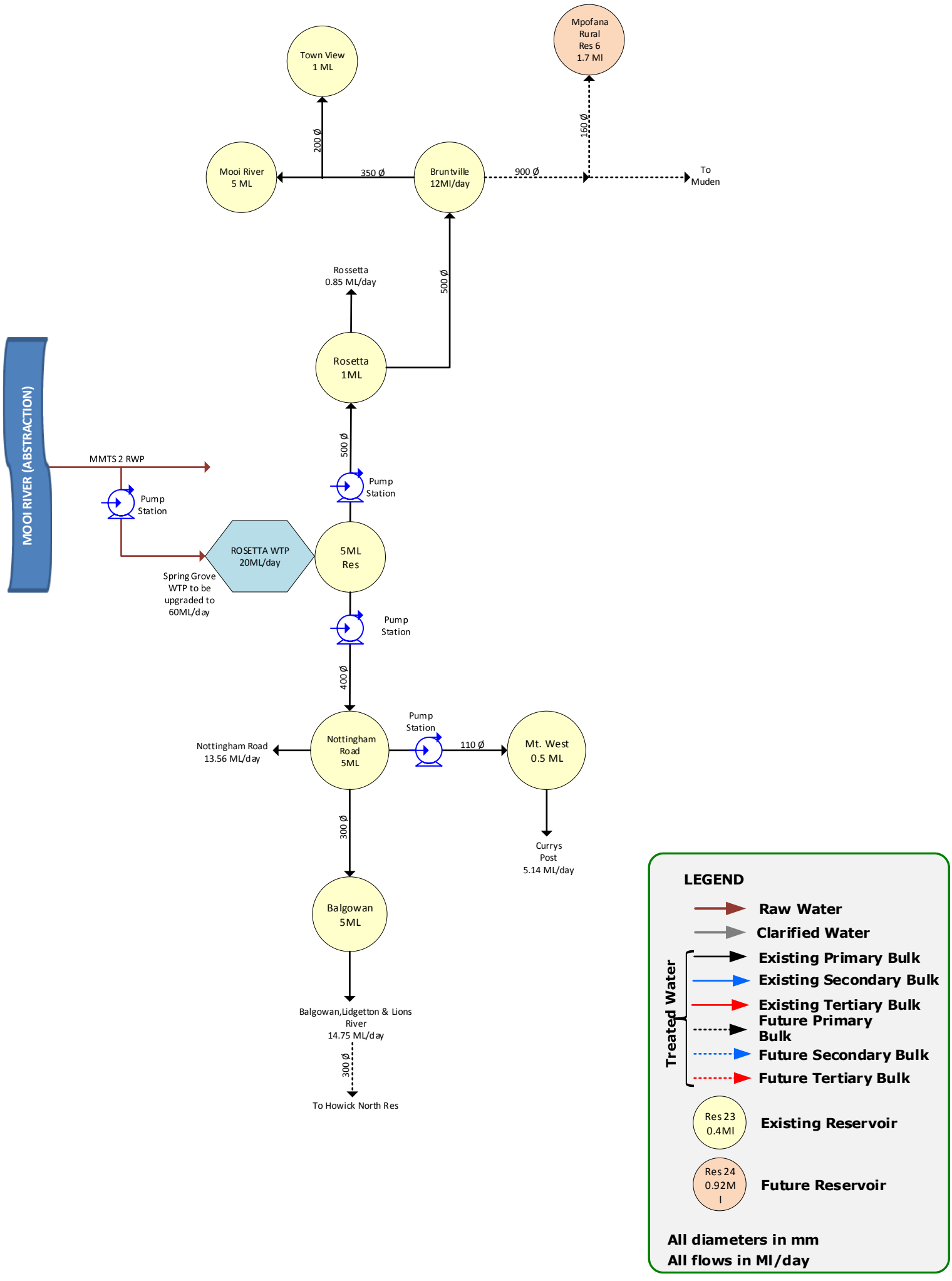
MAP NO.:

DC 22 Figure 9-8

Proposed New / Upgrade Infrastructure

- Howick — Water Scheme Areas & Names
- Existing Water Treatment Plants
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- Pump Stations (Existing)
- 19Ml/d — Upgrade of WTW
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)
- Pump Stations (Future)

Figure 9-9
UM014 WSIA: GREATER MPOFANA



9.16.1 Demand Model Intervention

9.16.1.1 Water Demand

The water demand for the Thornville/Hopewell Water Supply Scheme was determined for 2020 and 2050 and included within **Table 9-30** below.

Table 9-30: Population and Water demand 2020 and 2050 for the Thornville/Hopewell Water Supply Scheme

Population	**Population 2020**	**Population 2050**
	14 712	21 023
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	3.0	5.1

9.16.2 Water Supply Infrastructure

9.16.2.1 Proposed Interventions

The following infrastructure upgrades will be required in order to adequately supply the Thornville/Hopewell Water Supply Scheme WSIA and is illustrated within **Figure 9-10** with the schematic layout of the WSIA depicted in **Figure 9-3.**

- ✓ The current storage capacity of the 2 Mℓ Thornville Reservoir will have to be upgraded to 2.6 Mℓ in order to meet the 2050 demand.

Design details of all the infrastructure components are provided within **Annexure B**.

9.16.3 Financial Requirements

The bulk cost requirement for the Thornville/Hopewell WSIA is summarised within **Table 9-31** below.

Table 9-31: UM016 Thornville/Hopewell Water Supply Scheme Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	-	-	-
Secondary	R750 000.00	R75 000.00	R825 000.00
Tertiary	-	-	-
Total	**R750 000.00**	**R75 000.00**	**R825 000.00**

The total bulk cost requirement for the Thornville/Hopewell Scheme is R825 000.00 (excl VAT). The scheme development cost per household is approximately R 160.

9.17 UM017 WSIA: LILIEFONTEIN WATER SUPPLY SCHEME

9.17.1 Demand Model Intervention

9.17.1.1 Water Demand

The water demand for the Liliefontein Water Supply Scheme was determined for 2020 and 2050 and included within **Table 9-32** below.

Table 9-32: Population and Water demand 2020 and 2050 for the Liliefontein Water Supply Scheme

Population	**Population 2020**	**Population 2050**
	14 347	21 023
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	5.27	23.58

9.17.2 Water Supply Infrastructure

9.17.2.1 Proposed Interventions

The following infrastructure upgrades will be required in order to adequately supply the Liliefontein Water Supply Scheme WSIA and is illustrated within **Figure 9-10** with the schematic layout of the WSIA depicted in **Figure 9-3.**

- ✓ The current storage capacity of the 5 Mℓ Liliefontein Reservoir will have to be upgraded to 11.8 Mℓ in order to meet the 2050 demand.

Design details of all the infrastructure components are provided within **Annexure B**.

9.17.3 Financial Requirements

The bulk cost requirement for the Liliefontein WSIA is summarised within **Table 9-33** below.

Table 9-33: UM017 Liliefontein Water Supply Scheme Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	**-**	**-**	**-**
Secondary	R22 700 051.79	R2 270 005.18	R24 970 056.97
Tertiary	**-**	**-**	**-**
Total	**R22 700 051.79**	**R2 270 005.18**	**R24 970 056.97**

The total bulk cost requirement for the Liliefontein Scheme is R24 970 056.97 (excl VAT). The scheme development cost per household is approximately R 135 000.

9.18 UM018 WSIA: Richmond Water Supply Scheme

9.18.1 Demand Model Intervention

9.18.1.1 Water Demand

The water demand for the Richmond Water Supply Scheme was determined for 2020 and 2050 and included within **Table 9-34** below.

Table 9-34: Population and Water demand 2020 and 2050 for the Richmond Water Supply Scheme

Population	**Population 2020**	**Population 2050**
	40 209	58 919
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	3.47	18.48

9.18.2 Water Supply Infrastructure

9.18.2.1 Proposed Interventions

The following infrastructure upgrades will be required in order to adequately supply the Richmond Water Supply Scheme WSIA and is illustrated within **Figure 9-10** with the schematic layout of the WSIA depicted in **Figure 9-3.**

- ✓ The existing 22.6 km, 450mm ø secondary bulk main which is supplying the Richmond Reservoir needs to be upgraded to a 500mm ø in order to meet the 2050 demand.
- ✓ The current storage capacity of 1.8 Mℓ will have to be increased to 9.5 Mℓ in order to meet the 2050 demand.

Design details of all the infrastructure components are provided within **Annexure B**.

9.18.3 Financial Requirements

The bulk cost requirement for the Richmond Water Supply Scheme WSIA is summarised within **Table 9-35**.

Table 9-35: UM018 Richmond Water Supply Scheme Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R141 560 465.81	R14 156 046.58	R155 716 512.39
Secondary	R41 371 091.68	R4 137 109.17	R45 508 200.85
Tertiary	-	-	-
Total	**R182 931 557.49**	**R18 293 155.75**	**R201 224 713.23**

The total bulk cost requirement for the Richmond Scheme is R201 224 713.23 (excl VAT). The scheme development cost per household is approximately R 13 700.

N

Umgungundlovu

Harry Gwala

eThekwini

Ugu

Richmond Local Municipality

MIDMAR WTP

DV Harris WTP

375Ml/d

130Ml/d

1600

1500

800

80000kl

1100

600

6800kl

5000kl

350

200kl

200

500kl

500

250

16680

200kl

250kl

110

1140kl

570kl

150

110kl

uMngeni

uMlazi

Mkomazi

Lovu

Kilometers

3 1,5 0 3 6

Legend

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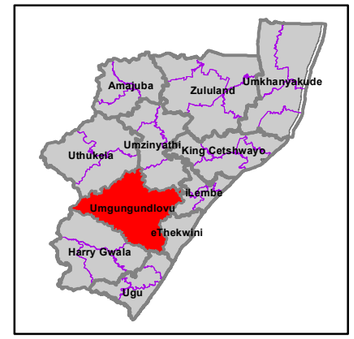

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PROJECT TITLE

Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE: **Total Bulk Water Supply Interventions - UM016 - UM018: Richmond Umgungundlovu District Municipality**

DATE COMPLETED: January 2021

MAP NO.: **DC 22 Figure 9-10**

Proposed New / Upgrade Infrastructure

- Water Scheme Areas & Names (Dalton)
- Existing Water Treatment Plants (WTP)
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- Upgrade of WTW (19Ml/d)
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)

9.19 UM019 WSIA: IMPENDLE WATER SUPPLY SCHEME

9.19.1 Demand Model Intervention

9.19.1.1 Water Demand

The water demand for the Impendle Water Supply Scheme was determined for 2020 and 2050 and included within **Table 9-36** below.

Table 9-36: Population and Water demand 2020 and 2050 for the Impendle Water Supply Scheme

Population	**Population 2020**	**Population 2050**
	35 586	52 144
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	6.4	9.6

9.19.1.2 Water Resource Consideration

Raw water for the Impendle Water Supply Scheme is sourced from both the Mkhomazi and Nzinga Rivers.

9.19.2 Water Supply Infrastructure

9.19.2.1 Proposed Interventions

The following infrastructure upgrades will be required to adequately supply the Impendle Water Supply Scheme WSIA and is illustrated within **Figure 9-11** with the schematic layout of the WSIA depicted in **Figure 9-12.**

- ✓ The existing secondary bulk main, which is supplying Impendle, needs to be upgraded to various pipeline diameters ranging from 75mm ø to 250mm ø in order to meet the 2050 demand.
- ✓ The current storage capacity will have to be increased to 16.11 Mℓ in order to meet the 2050 demand.

Design details of all the infrastructure components are provided within **Annexure B**.

9.19.3 Financial Requirements

The bulk cost requirement for the Impendle Water Supply Scheme WSIA is summarised within **Table 9-37**.

Table 9-37: UM019 Impendle Water Supply Scheme Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	**-**	**-**	**-**
Secondary	R97 888 566.17	R9 788 856.62	R107 677 422.78
Tertiary	R19 082 288.85	R1 908 228.89	R20 990 517.74
Total	**R116 970 855.02**	**R11 697 085.50**	**R128 667 940.52**

The total bulk cost requirement for the Impendle Scheme is R128 667 940.52 (excl VAT). The scheme development cost per household is approximately R 12 200.

9.20 UM020 WSIA: Vulindlela Reservoir 5 to Impendle

9.20.1 Demand Model Intervention

9.20.1.1 Water Demand

The water demand for the Impendle WSIA was determined for 2020 and 2050 and included within **Table 9-38** below.

Table 9-38: Population and Water demand 2020 and 2050 for the Vulindlela Reservoir 5 to Impendle WSIA

Population	**Population 2020**	**Population 2050**
	35 586	52 144
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	6.4	9.6

9.20.1.2 Water Resource Consideration

A project is currently underway (in design phase) to supply water to areas in the Impendle LM.

According to the Vulindlela Bulk Water Supply System Upgrade (VBWSSU) that is currently in detailed design and procurement phase, the 2050 demand at the existing Reservoir 5 will be 18.01 Mℓ/day primarily for the existing Vulindlela Secondary System that this reservoir supplies. As the capacity of this upgrade is designed for the long term water demand in the Vulindlela sub-system, it was decided to investigate whether the use of some of the spare capacity that would be available immediately upon commissioning of the upgrade of the VBWSS, to supply and augment the Impendle LM.

9.20.2 Water Supply Infrastructure

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Vulindlela Reservoir 5 to Impendle WSIA is illustrated within **Figure 9-11** with the schematic layout of the WSIA depicted in **Figure 9-12.**

9.20.2.1 Bulk Conveyance and Storage

The Vulindlela system receives potable water from the Groenekloof Reservoir Complex (23 Mℓ/d) through two pumping systems via two bulk supply systems. The high-level pumping system feeds two command reservoirs namely, Reservoir 2 (10.6 Mℓ/d) at KwaDulela and Reservoir 5 (9.2Mℓ/d) at Kanzakana as well as two additional reservoirs, Reservoir 3 (0.6 Mℓ/d) and Reservoir 4 (0.2 Mℓ/d). The low-level pumping system only feeds command Reservoir 1 (10.6 Mℓ/d). Potable water is then gravity fed from Reservoir 2 to Reservoirs 13 to 19, whilst potable water is gravity fed from Reservoir 5 to Reservoirs 6 to 12.

9.20.2.2 Proposed Interventions

In this proposed option, water will be conveyed from Vulindlela Reservoir 5 (1 489 m) to the proposed Impendle Command Reservoir (1 673 m) via a 350mm ø, 33km long pipeline. Flow under gravity will be possible for 18km and thereafter a pump station together with a rising main will be necessary to get water to the Impendle Command Reservoir. A static head of 184m will be required. The proposed pipeline will follow the existing R617 road from Reservoir 5 towards Boston until the Impendle Road intersection and then along the Impendle Road to the Impendle Command Reservoir.

This proposed pipeline from Reservoir 5 will terminate at the proposed Impendle Command Reservoir and will then supply the Impendle area via secondary bulk mains.

NOTE: *There is a possibility of supplying Impendle as well as augmenting the supply to Vulindlela Reservoir 5 from a proposed dam on the Mzimkhulu River. This could result in reducing the strain on the existing supply from the d Upper Mgeni System.but will depend on the feasibility of the proposal and the time it will take to implement.The proposed project named the New Biggen Regional Bulk Water Supply Scheme (NBRBWSS) is discussed in Section 10.6 of this report.*
Design details of all the infrastructure components are provided within **Annexure B**.

9.20.3 Financial Requirements

The bulk cost requirement for the Vulindlela Reservoir 5 to Impendle WSIA is summarised within **Table 9-39** below.

Table 9-39: UM020 Vulindlela Reservoir 5 to Impendle WSIA Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R216 286 853.29	R21 628 685.33	R237 915 538.61
Secondary	R97 888 566.17	R9 788 856.62	R107 677 422.78
Tertiary	R19 082 288.85	R1 908 228.89	R20 990 517.74
Total	**R333 257 708.30**	**R33 325 770.83**	**R366 583 479.13**

The total bulk cost requirement for the Vulindlela Reservoir 5 to Impendle Scheme is R366 583 479.13 (excl VAT). The scheme development cost per household is approximately R 35 000.

9.21 UM021 WSIA: Stephen Dlamini Command Reservoir to Impendle & Vulindlela Reservoir 5 (New Biggen Regional Bulk Water Supply Scheme)

9.21.1 Demand Model Intervention

9.21.1.1 Water Demand

The water demand for the Stephen Dlamini Command Reservoir to Impendle & Vulindlela Reservoir 5 WSIA was determined for 2020 and 2050 and included within **Table 9-40** and **Table 9-41** below.

Table 9-40: Population and Water demand 2020 and 2050 for the Impendle WSIA

Population	**Population 2020**	**Population 2050**
	35 586	52 144
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	6.4	9.6

Table 9-41: Population and Water demand 2020 and 2050 for the Vulindlela Reservoir 5 WSIA

Population	**Population 2020**	**Population 2050**
	8 542	13 782
Water Demand	**Demand 2020**	**Demand 2050**
	1.55	2.33

9.21.1.2 Water Resource Consideration

As per the EVN Africa report, the dam was sized to have a capacity of 8.206 Mm^3 and a yield of 95.23 Mℓ/day that co-incided with the project water demand for HGDM within UAP Phase II The proposed WTP approximately 350m downstream of the dam wall, will have a treatment capacity of 52 Mℓ/day, and a network of pipelines, pump stations and reservoirs that would essentially supply the Umzimkhulu Local Municipality. (EVN Africa, 2018)

Should there be limitations on raising the dam wall, other options that could be investigated to improve the yield of the dam include the following:

- A smaller downstream impoundment at the original dam position that would not inundate any existing infrastructure together with a raw water pipeline to the main dam, or
- An upstream impoundment at a proposed dam site close to Underberg town for conjunctive use with the proposed New Biggen Dam.

The 2050 demand on the New Biggen Dam for the proposed NBBRWSS is estimated at 133 Mℓ/day. Originally, the dam was sized to yield 95.23 Mℓ/day. However, to ensure that the proposal is feasible, the possibility of increasing the yield of the New Biggen Dam to 133 Mℓ/d will have to be investigated.

9.21.2 Water Supply Infrastructure

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Stephen Dlamini Command Reservoir to Impendle & Vulindlela Reservoir 5 WSIA and is illustrated within **Figure 9-11** with the schematic layout of the WSIA depicted in **Figure 9-12.**

9.21.2.1 Bulk Conveyance and Storage

A proposed 1 200 mm ø pipeline currently in the implementation phase, will supply water from a proposed New Biggen WTP to the Proposed Steven Dlamini Command Reservoir (1 665 m).

The Stephen Dlamini Dam, water treatment plant and command reservoir form part of the Greater Bulwer/Donnybrook Regional Water Supply Scheme which is currently under implementation and is planned to be fully completed by the year 2021.

It is proposed that the water supply for this scheme will be supplied from three (3) dams; the existing Comrie as well as the proposed Bulwer Dam that is currently under construction. A water treatment works at each of these dams will allow for treatment and distribution of water to consumers within the project footprint. The domestic water demand in the year 2045 for the Greater Bulwer Donnybrook Regional Bulk Water Supply Scheme is estimated at 12.31 Mℓ/day. An additional 3.75 Mℓ/day will be required for livestock and irrigation purposes as per the UAP Phase II study for the Harry Gwala DM.

The proposed New Biggen Regional Bulk Water Supply Scheme will augment water supply to the Greater Bulwer/Donnybrook Regional Bulk Water Supply Scheme as well as allowing supply to other areas in Ugu DM and UMDM, using the Stephen Dlamini Command Reservoir.

(Other phases of the New Biggen Regional Bulk Water Supply Scheme are discussed in the Harry Gwala and Ugu DM UAP Phase III Studies)

9.21.2.2 Proposed Interventions

From the Steven Dlamini Command Reservoir, the following infrastructure is proposed to augment supply to Impendle and the Vulindlela Reservoir 5:

- ✓ A proposed 700 mm ø pipeline from the Stephen Dlamini Command Reservoir to Reservoir 5 (1489 m) at Kanzakana/Mphophomeni; and

- ✓ A proposed 500 mm ø offtake off the 450 mm ø pipeline to the proposed Impendle Command Reservoir at elevation 1 672 m.

While the Vulindlela Reservoir 5 currently supplies the Msunduzi LM, it is strategically positioned to be used as a command reservoir for possible supply back into UMDM. The upgrades of infrastructure to supply Reservoir 5 from the Upper Mgeni System (detailed in Section 9.1.2) will allow supply via reverse flow to all of its current upstream reservoirs as far back as the Groenekloof Reservoir and even the Howick-West Reservoirs (Potential Mzimkhulu – Mgeni Water Transfer).

Note: Should the above option be considered for a detailed feasibility study, the possibility of supply from the New Biggen Regional Water Supply Scheme to Reservoir 5 can be viewed as a future possibility as an Umzimhkulu to Umgeni Catchment Water Transfer. The option of reverse flow on the Reservoir 5 to Impendle Pipeline could be considered to allow supply from the Stephen Dlamini Command Reservoir to Reservoir 5.

9.21.3 Financial Requirements

The bulk cost requirement for the Stephen Dlamini Command Reservoir to Impendle & Vulindlela Reservoir 5 WSIA is summarised within **Table 9-42** below.

Table 9-42: UM021 Stephen Dlamini Command Reservoir to Impendle & Vulindlela Reservoir 5 WSIA Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R1 020 935 626.53	R102 093 562.65	R1 123 029 189.18
Secondary	R97 888 566.17	R9 788 856.62	R107 677 422.78
Tertiary	R19 082 288.85	R1 908 228.89	R20 990 517.74
Total	**R1 137 906 481.54**	**R113 790 648.15**	**R1 251 697 129.70**

The total bulk cost requirement for the Stephen Dlamini to Impendle & Vulindlela Reservoir 5 Scheme is R1 251 697 129.70 (excl VAT). The scheme development cost per household is approximately R 118 000.

N

Proposed New / Upgrade Infrastructure

- Water Scheme Areas & Names
- Existing Water Treatment Plants
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- Upgrade of WTW
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns

STAND ALONE SCHEMES

Impendle Local Municipality

LOWER LOTENI

Umgungundlovu

Greater Impendle 2

Greater Impendle 1b

IMPENDLE

POLELA

Harry Gwala

Nkosazana Dlamini-Zuma Local Municipality

The Msunduzi Local Municipality

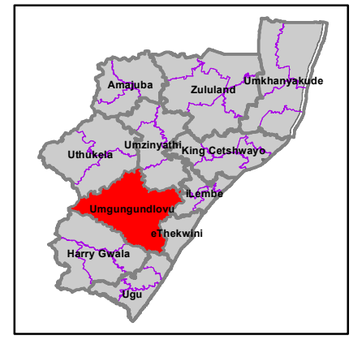
Nzinga WTP

650kl
1600kl
Greater Impendle 2
Greater Impendle 2
150kl
200kl
500kl
250kl
700kl
450kl
750kl
450kl
750kl
200kl
16000kl
850kl
500kl
650kl
200kl
750kl
Supplied By Vulindlela Reservoir 5
Supplied by New Biggen Scheme

NHLAMBAMASOKA 02
LOTHENI 11
LOTHENI 06
MAHLUTSHINI 02
LOTHENI 08
ISUPANENG 06
ISUPANENG 01
ANGLEHEST 03
MZUMBE
ENGUGA 08
ENGUGA 02
KWANOVUKA 02
KWANOVUKA 01
GOMANE 11
GOMANE 02
ENTSHABANKU 04
COMPENSATION 03
FIKESUTHI 01
GOMANE 09
MACKSAM 03
MACKSAM 04

Kilometers
4 2 0 4 8

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

UMGUNGUNDLOVU DISTRICT MUNICIPALITY

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PROJECT TITLE

Umgungundlovu DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - UM019 - UM021: Impendle Umgungundlovu District Municipality

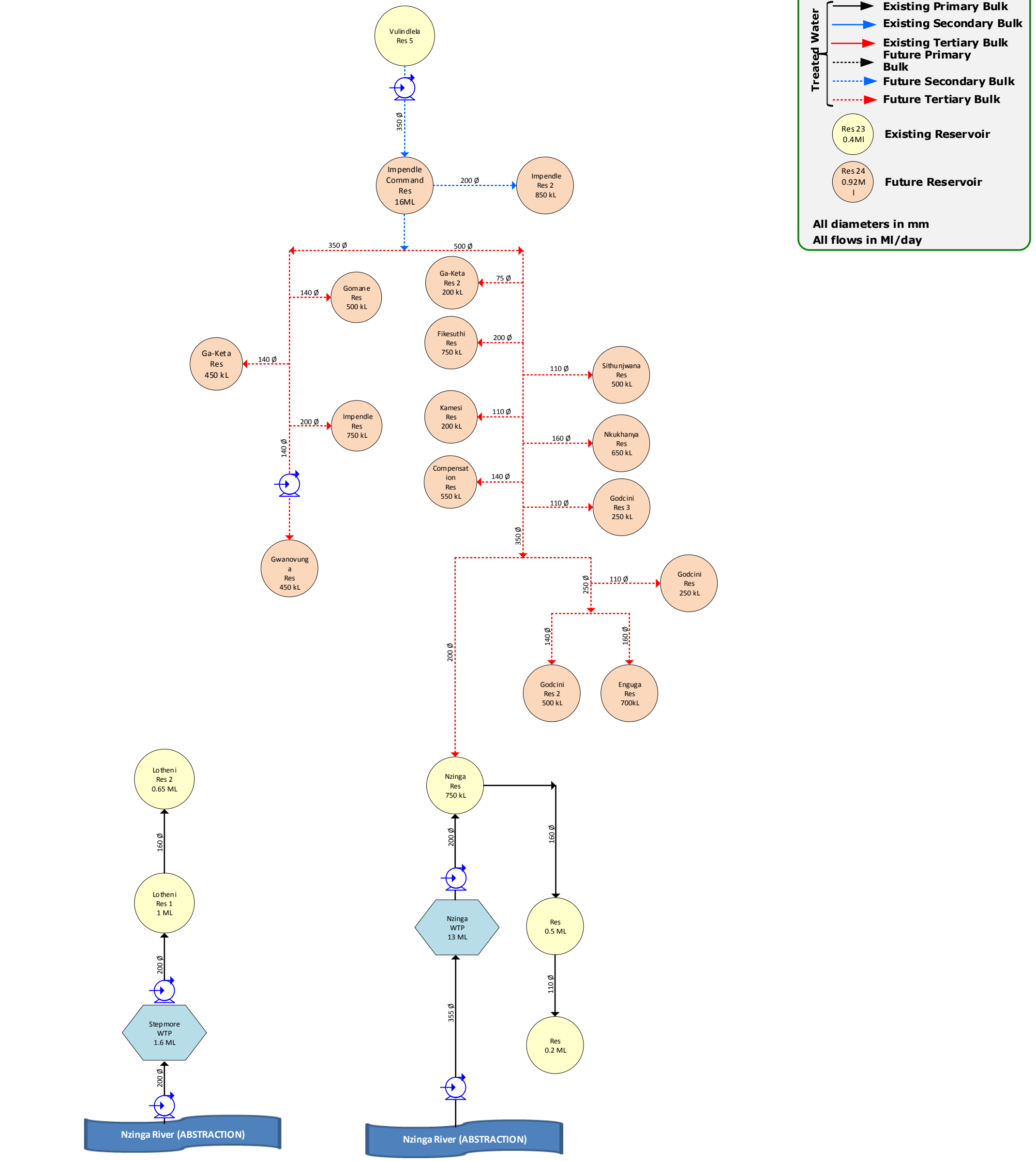
DATE COMPLETED:

January 2021

MAP NO.:

DC 22 Figure 9-11

Figure 9-12
UM021 WSIA: Proposed Greater Impendle



10. CONCLUSIONS

10.1 Total Water Demand per Water Supply Intervention Area (WSIA)

The total water demand per WSIA is detailed within **Table 10-1** below.

Table 10-1: Total Water Demand 2050 per WSIA

WSIA	Population 2020	Population 2050	Water Demand 2020 (Mℓ/d)	Water Demand 2050 (Mℓ/d)
Howick North	16 956	24 846	5.80	8.70
Howick West	57 668	284 353	45.34	88.58
Groenekloof Reservoir	142 033	8 267	26.10	11.00
Extension (Lidgetton to Howick North)	16 956	24 846	5.80	8.70
kwaMavena	4 739	6 549	0.98	1.49
Claridge Reservoir	198 638	291 061	54.47	173.10
Pipeline to Wartburg	54 629	80 047	9.54	51.00
Pipeline to Bruyns Hill Reservoir	40 556	59 427	7.10	10.60
Dalton Reservoir	21 052	30 847	10.00	37.30
Ozwathini	21 052	30 847	6.30	28.00
Umlaas Road	66 214	97 023	115.18	56.40
Lion Park/Manyavu	24 954	36 565	4.40	7.50
Table Mountain Reservoir	24 954	36 565	1.73	2.70
Mpofana Bulk	41 968	61 495	9.80	14.80
Mpofana Rural 6	3 063	4 488	0.54	0.82
Thornville/Hopewell	14 712	21 023	3.00	5.10
Liliefontein	14 347	21 023	5.27	23.58
Richmond	40 209	58 919	3.47	18.48
Impendle	35 586	52 144	6.40	9.60
Reservoir 5 to Impendle	8 542	13 782	1.55	2.33
Stephen Dlamini to Impendle & Res 5	**44 128**	65 926	7.95	11.93

10.2 Total Water Resources Required vs Proposed Water Supply Interventions (WSI)

The total volume of water required is compared to the existing proposed water supply interventions are tabled within **Table 10-2** below:

Table 10-2: Water Resources Required vs proposed WSI

WSIA	WSIA Name	Population (2050)	2050 Demand (Mℓ/day)	2050 Demand (Mm^3/a)	Existing Resources (Mm^3/a)	Proposed Additional under UAP Phase 3 (Mm^3/a)	Total (Mm^3/a)	Balance (Mm^3/a)
UM001	Howick North	24 846	8.7	3.18	-	-	-	-3.18
UM002	Howick West	284 353	88.58	32.33	144.18	9.49	153.67	121.33
UM003	Groenekloof Reservoir	8 267	11	4.02	-	-	-	-4.02
UM004	Extension (Lidgetton to Howick North)	24 846	8.7	3.18	-	-	-	-3.18
UM005	kwaMavena	6 549	1.49	0.54	-	-	-	-0.54
UM006	Claridge Reservoir	291 061	173.1	63.18	47.45	16.06	63.51	0.33
UM007	Pipeline to Wartburg	80 047	51	18.62	-	-	-	-18.62
UM008	Pipeline to Bruyns Hill Reservoir	59 427	10.6	3.87	-	-	-	-3.87
UM009	Dalton Reservoir	30 847	37.3	13.61	-	-	-	-13.61
UM010	Ozwathini	30 847	28	10.22	-	-	-	-10.22
UM011	Umlaas Road	97 023	56.4	20.59	-	-	-	-20.59
UM012	Lion Park/Manyavu	36 565	7.5	2.74	-	-	-	-2.74
UM013	Table Mountain Reservoir	36 565	2.7	0.99	-	-	-	-0.99
UM014	Mpofana BWSS	61 495	14.8	5.40	7.30	2.83	10.13	4.73
UM015	Mpofana Rural 6	4 488	0.82	0.30	-	-	-	-0.30
UM016	Thornville/Hopewell	21 023	5.1	1.86	-	-	-	-1.86
UM017	Liliefontein	21 023	23.58	8.61	-	-	-	-8.61
UM018	Richmond	58 919	18.48	6.75	-	-	-	-6.75
UM019	Impendle	52 144	9.6	3.50	-	-	-	-3.50
UM020	Reservoir 5 to Impendle	13 782	2.33	0.85	-	-	-	-
UM021	Stephen Dlamini to Impendle & Res 5	65 926	11.93	4.35	-	-	-	-
TOTAL		**1 310 043**	**571.71**	**208.67**	**198.93**	**28.38**	**227.31**	**23.84**

From **Table 10-2** above, it is noted that some of the schemes will not have adequate raw water resources after upgrades/interventions to meet the 2050 demand requirements. The feasibility studies for the proposed resources and, in addition, the implementation of the Reservoir 5 to Impendle Scheme should be prioritised.

10.3 Summary of Total Bulk Water Infrastructure Requirements per WSIA

A summary of the total bulk water infrastructure requirements per proposed WSIA is provided within the tables and pages hereafter.

10.3.1 UM001: Howick North WSIA

Table 10-3: WSIA Summary for the UM001: Howick North WSIA

Howick North Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTW	Various	Regional Bulk	1	375
		WTW	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	3.70
				Secondary Bulk	160 ø mm - 300 ømm	0.70
				Tertiary Bulk	50 ø mm - 110 ømm	19.46
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	0	-
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	2.5
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	0	-
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	-	-	-	-

10.3.2 UM002: Howick West WSIA

Table 10-4: WSIA Summary for the UM002: Howick West WSIA

Howick West Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTW	Various	Regional Bulk	0	0
		WTW	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	1	0
		Pump Stations	Various	Internal Bulk	1	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	2.99
				Secondary Bulk	160 ø mm - 300 ømm	0.19
				Tertiary Bulk	50 ø mm - 110 ømm	19.75
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	3	0.25 kl to 0.721 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	WTW	MIDMAR WTP	Regional Bulk	UMG017	26
		Bulk Pipelines		Primary Bulk	>350	3.3
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	1	27700 kl to 27700 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	-	-	-	-

10.3.3 UM004: Extension (Lidgetton to Howick North) WSIA

Table 10-5: WSIA Summary for the UM004: Extension (Lidgetton to Howick North) WSIA

Lidgetton to Howick North						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTW	Various	Regional Bulk	1	375
		WTW	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	3.70
				Secondary Bulk	160 ø mm - 300 ømm	0.70
				Tertiary Bulk	50 ø mm - 110 ømm	19.46
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	-	-
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	13.82
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	-	-
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	-	-	-	-

10.3.4 UM005: KwaMevana WSIA

Table 10-6: WSIA Summary for the UM005: KwaMevana WSIA

Kwa Mavena Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTW	Various	Regional Bulk	1	375
		WTW	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	3.70
				Secondary Bulk	160 ø mm - 300 ømm	0.70
				Tertiary Bulk	50 ø mm - 110 ømm	19.46
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	0	-
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	1.53
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	1	1700 kl to 1700 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	-	-	-	-

10.3.5 UM006: Claridge Reservoir WSIA

Table 10-7: WSIA Summary for the UM006: Claridge Reservoir WSIA

Claridge Reservoir Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTW	Various	Regional Bulk	0	0
		WTW	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	1.13
				Tertiary Bulk	50 ø mm - 110 ømm	0.00
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	1	0.8 kl to 0.8 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	WTW	D. V HARRIS WTP	Regional Bulk	1	46
		Bulk Pipelines		Primary Bulk	>350	6.73
				Secondary Bulk	160 ø mm - 300 ømm	9.8
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	1	1500 kl to 1500 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	-	-	-	-

10.3.6 UM007: Pipeline to Wartburg WSIA

Table 10-8: WSIA Summary for the UM007: Pipeline to Wartburg WSIA

Pipeline to Wartburg Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTW	Various	Regional Bulk	0	0
		WTW	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.00
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	1	2 kl to 2 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	2	1600 kl to 17500 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	-	-	-	-

10.3.7 UM008: Pipeline to Bruyns Hill Reservoir WSIA

Table 10-9: WSIA Summary for the UM008: Pipeline to Bruyns Hill Reservoir WSIA

Pipeline to Bruyns Hill Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTW	Various	Regional Bulk	0	0
		WTW	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	2.04
				Secondary Bulk	160 ø mm - 300 ømm	0.61
				Tertiary Bulk	50 ø mm - 110 ømm	67.44
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	3	0.013 kl to 0.24 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	60
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	14	150 kl to 4600 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	-	-	-	-

10.3.8 UM009: Dalton Reservoir WSIA

Table 10-10: WSIA Summary for the UM009: Dalton Reservoir WSIA

Dalton Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTW	Various	Regional Bulk	0	0
		WTW	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.00
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	1	0.035 kl to 0.035 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	1	7000 kl to 7000 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	-	-	-	-

10.3.9 UM010: Ozwathini WSIA

Table 10-11: WSIA Summary for the UM010: Ozwathini WSIA

Ozwathini Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTW	Various	Regional Bulk	1	0.79
		WTW	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	1	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	6.89
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	0	#NUM!
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	2	2000 kl to 2000 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	-	-	-	-

10.3.10 UM012: Lion Park/Manyavu WSIA

Table 10-12: WSIA Summary for the UM012: Lion Park/Manyavu WSIA

Lion Park/Manyavu Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTW	Various	Regional Bulk	0	0
		WTW	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.05
				Tertiary Bulk	50 ø mm - 110 ømm	5.79
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	1	0.3 kl to 0.3 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	8.9
				Tertiary Bulk	50 ø mm - 110 ømm	8.5
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	3	500 kl to 500 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	-	-	-	-

10.3.11 UM013: Table Mountain Reservoir WSIA

Table 10-13: WSIA Summary for the UM013: Table Mountain Reservoir WSIA (Option 1)

Table Mountain Scheme (Option 1)						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTW	Various	Regional Bulk	0	0
		WTW	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	1	0
		Pump Stations	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.05
				Secondary Bulk	160 ø mm - 300 ømm	0.01
				Tertiary Bulk	50 ø mm - 110 ømm	0.83
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	3	0.1 kl to 0.4 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	1	4500 kl to 4500 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	-	-	-	-

Table 10-14: WSIA Summary for the UM013: Table Mountain Reservoir WSIA (Option 2)

Table Mountain Scheme (Option 2)						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTW	Various	Regional Bulk	0	0
		WTW	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	1	0
		Pump Stations	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.05
				Secondary Bulk	160 ø mm - 300 ømm	0.01
				Tertiary Bulk	50 ø mm - 110 ømm	0.83
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	3	0.1 kl to 0.4 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	7.3
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	1	4500 kl to 4500 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	-	-	-	-

10.3.12 UM015: Mpofana Rural 6 WSIA

Table 10-15: WSIA Summary for the UM015: Mpofana Rural 6 WSIA

Mpofana Rural 6 Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTW	Various	Regional Bulk	0	0
		WTW	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.00
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	0	#NUM!
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	7.2
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	1	1700 kl to 1700 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	-	-	-	-

10.3.13 UM016: Thornville/Hopewell WSIA

Table 10-16: WSIA Summary for the UM016: Thornville/Hopewell WSIA

Thornville/Hopewell Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTW	Various	Regional Bulk	0	0
		WTW	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	3.02
				Tertiary Bulk	50 ø mm - 110 ømm	1.50
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	0	-
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	1	100 kl to 100 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	-	-	-	-

10.3.14 UM017: Liliefontein WSIA

Table 10-17: WSIA Summary for the UM017: Liliefontein WSIA

Liliefontein Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTW	Various	Regional Bulk	0	0
		WTW	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	1.26
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	0	-
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	1	6790 kl to 6790 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	-	-	-	-

10.3.15 UM018: Richmond WSIA

Table 10-18: WSIA Summary for the UM018: Richmond WSIA

Richmond Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTW	Various	Regional Bulk	1	6
		WTW	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	4	0
		Pump Stations	Various	Internal Bulk	1	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.06
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	1.65
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	2	0.04 kl to 0.98 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	22.6
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	1	16500 kl to 16500 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	-	-	-	-

10.3.16 UM020: Reservoir 5 to Impendle WSIA

Table 10-19: WSIA Summary for the UM020: Reservoir 5 to Impendle WSIA

Impendle Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTW	Various	Regional Bulk	0	0
		WTW	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	7	0
		Pump Stations	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.05
				Secondary Bulk	160 ø mm - 300 ømm	0.04
				Tertiary Bulk	50 ø mm - 110 ømm	3.09
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	11	0.1 kl to 0.4 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0.31
				Secondary Bulk	160 ø mm - 300 ømm	26.77
				Tertiary Bulk	50 ø mm - 110 ømm	1.4
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	17	200 kl to 7810 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	-	-	-	-

10.3.17 UM021: Stephen Dlamini to Impendle & Res 5 WSIA

Table 10-20: WSIA Summary for the UM021: Stephen Dlamini to Impendle & Res 5 WSIA

Reservoir 5 to Impendle						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTW	Various	Regional Bulk	0	0
		WTW	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	7	0
		Pump Stations	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.05
				Secondary Bulk	160 ø mm - 300 ømm	0.04
				Tertiary Bulk	50 ø mm - 110 ømm	3.09
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	11	0.1 kl to 0.4 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	34.84
				Secondary Bulk	160 ø mm - 300 ømm	26.77
				Tertiary Bulk	50 ø mm - 110 ømm	1.4
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	17	200 kl to 7810 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	-	-	-	-

10.4 Financial Requirements

The financial requirements for the provision of bulk infrastructure per WSIA based on the demand model intervention by 2050 is summarised in the **Table 10-21** below. A total estimate of approximately R 3.2 billion is required to address the total bulk water supply requirement by 2050.

Table 10-21: Financial requirements

WSIA	WSIA Name	Total Cost Requirement				
		Primary	Secondary	Tertiary	10% Contingencies	Total Cost (excl VAT)
UM001	Howick North	-	R8 104 392.45	-	R810 439.25	R8 914 831.70
UM002	Howick West	R41 470 000.00	R59 530 881.21	-	R1 010 008.81	R102 010 890.02
UM003	Groenekloof Reservoir	-	-	-	-	-
UM004	Extension (Lidgetton to Howick North)	-	R8 366 885.88	-	R836 688.59	R9 203 574.47
UM005	kwaMavena	-	R8 601 711.14	R445 825.44	R904 753.66	R9 952 290.24
UM006	Claridge Reservoir	R177 860 000.00	R22 267 004.54	R14 545 141.38	R21 467 214.59	R236 139 360.52
UM007	Pipeline to Wartburg	-	R51 712 389.25	-	R5 171 238.92	R56 883 628.17
UM008	Pipeline to Bruyns Hill Reservoir	-	R202 982 598.28	R36 927 603.41	R23 991 020.17	R263 901 221.85
UM009	Dalton Reservoir	-	R22 700 051.79	-	R2 270 005.18	R24 970 056.97
UM010	Ozwathini	-	R18 889 010.70	-	R1 888 901.07	R20 777 911.77
UM011	Umlaas Road	-	-	-	-	-
UM012	Lion Park/Manyavu	-	R19 176 954.04	R9 623 724.96	R2 880 067.90	R31 680 746.90
UM013	Table Mountain Reservoir 1	-	R16 661 226.93		R1 666 122.69	R18 327 349.63
	Table Mountain Reservoir 2	-	R21 080 783.15	R4 419 556.22	R2 550 033.94	R28 050 373.31
UM014	Mpofana BWSS	-	-	-	-	-
UM015	Mpofana Rural 6	-	R12 960 725.49	R4 359 014.35	R1 731 973.98	R19 051 713.83
UM016	Thornville/Hopewell	-	R750 000.00	-	R75 000.00	R825 000.00
UM017	Liliefontein	-	R22 700 051.79	-	R2 270 005.18	R24 970 056.97
UM018	Richmond	R141 560 465.81	R41 371 091.68	-	R18 293 155.75	R201 224 713.23
UM019	Impendle	-	R97 888 566.17	R19 082 288.85	R11 697 085.50	R128 667 940.52
UM020	Reservoir 5 to Impendle	R216 286 853.29	R97 888 566.17	R19 082 288.85	R33 325 770.83	R366 583 479.13
UM021	Stephen Dlamini to Impendle & Res 5	R1 020 935 626.53	R97 888 566.17	R19 082 288.85	R113 790 648.15	R1 251 697 129.70
Total		**R1 598 112 945.63**	**R831 521 456.83**	**R127 567 732.31**	**R246 630 134.16**	**R2 803 832 268.93**

10.5 Funding Options

The UMDM relies mainly on grant funding programmes to fund their water supply projects. These funding programmes are mainly MIG and WSIG. Based on all the current funding streams available to the District Municipality over the MTEF period, it will take a minimum of 30 years for the WSA to address their water supply requirements. Another funding option that the UMDM could consider is loan funding through the Development Bank of Southern Africa (DBSA). Special submissions to National Treasury could also be considered to create an awareness of the DM's planning and implementation readiness.

10.6 Implementation Programme

The implementation programme will depend on the availability of funds from National Treasury as well as the capacity of the Municipality to implement projects. Although all twenty-one (21) area interventions would be an implementation priority for the DM, it is proposed to consider the following three (3) priorities detailed within **Table 10-22**. It is also proposed to follow a phased approach for implementation for e.g. initiate only the upgrade to the WTP at first and then when funding permits, can the bulk conveyance and storage be extended, upgraded or constructed.

However, the order would most likely be determined by the availability of funds or intervention programmes and should be confirmed with the WSA.

Table 10-22: Proposed Implementation Order (Phased Approach)

Proposed Priorities (Phased Approach)	WSIA No and Name		Proposed Project Name	Proposed Estimated Project Value
1	Detailed feasibility study of the Mkhomazi to Mgeni inter-catchment raw water transfer as well as the Mzimkhulu to Mkhomazi inter-catchment transfer to augment the 2050 raw water deficit in the Upper Mgeni System.			
2	UM002	Howick West	Howick West scheme upgrade	R102 010 890.02
3	UM020	Reservoir 5 to Impendle	Augmentation of supply to the Impendle LM from the Vulindlela system	R366 583 479.13
4	UM006	Claridge Reservoir	Claridge scheme upgrade	R236 139 360.52

11. RECOMMENDATIONS

11.1 Responsibilities

The provision of water services remains the responsibility of the UMDM as the WSA. The UMDM should ensure that they meet all the requirements to take these interventions to implementation readiness.

These planning studies are in various stages of readiness to lobby for grant funding and Umgeni Water could consider this as a Regional Utility to assist the UMDM to take this process further.

11.2 Selection of Solutions

The twenty-one (21) proposed water supply intervention areas (WSIA's) are the appropriate solutions for bulk water supply development within UMDM and are as follows:

- ✓ UM001 WSIA: Howick North Scheme Area
- ✓ UM002 WSIA: Howick West Scheme Area
- ✓ UM003 WSIA: Groenekloof Reservoir Scheme Area
- ✓ UM004 WSIA: Extension (Lidgetton to Howick North)
- ✓ UM005 WSIA: kwaMavena
- ✓ UM006 WSIA: Claridge Reservoir Scheme Area
- ✓ UM007 WSIA: uMshwathi RBWSS: Pipeline to Wartburg
- ✓ UM008 WSIA: uMshwathi RBWSS: Pipeline to Bruyns Hill Reservoir
- ✓ UM009 WSIA: uMshwathi RBWSS: Dalton Reservoir Scheme Area
- ✓ UM010 WSIA: uMshwathi RBWSS: Ozwathini Supply Scheme Area
- ✓ UM011 WSIA: Umlaas Road Water Supply Scheme
- ✓ UM012 WSIA: Lion Park / Manyavu Water Supply Scheme
- ✓ UM013 WSIA: Table Mountain Reservoir Scheme Area
- ✓ UM014 WSIA: Mpofana Bulk Water Supply Scheme
- ✓ UM015 WSIA: Mpofana Rural 6 Scheme
- ✓ UM016 WSIA: Thornville / Hopewell Water Supply Scheme
- ✓ UM017 WSIA: Liliefontein Water Supply Scheme
- ✓ UM018 WSIA: Richmond Water Supply Scheme
- ✓ UM019 WSIA: Impendle Bulk Water Supply Scheme
- ✓ UM020 WSIA: Vulindlela Reservoir 5 to Impendle
- ✓ UM021 WSIA: Stephen Dlamini to Impendle & Vulindlela Reservoir 5

11.3 Pertinent Legislation

Various Acts of Parliament make provision for existing or planned institutional structures for management of water resources and water and sanitation services. These are:

- ✓ Current Acts of Parliament: National Water, Water Services, Municipal Structures, Municipal Systems, Division of Revenue Acts; and
- ✓ Existing and proposed policy documents such as The White Paper on Water Services, the Local Government White Paper and the White Paper on Municipal Service Partnerships.

These Acts deal with the management of water resources and the provision of water services. Provision for the bodies listed below is made in these acts:

- ✓ The Catchment Management Agencies (CMA's) which will be established throughout South Africa over the next three years;
- ✓ Water User Associations comprising co-operative associations of individual water users at a restricted local level;
- ✓ National Government;
- ✓ Water Service Authorities comprising District Municipalities or Local Municipalities;
- ✓ Water Boards;
- ✓ Water Service Providers;
- ✓ Provincial Government; and
- ✓ Advisory Committees.

11.3.1 Municipal Structures Act

The Municipal Structures Act (117 of 1997), which was subsequently amended by the Municipal Structure Amendment Act (33 of 2000), addresses the basis for establishing municipalities (Category A,B & C) and stipulates that Category A and C (Metropolitan and District) municipalities are WSA's and the Category B (local) municipalities can only be WSA's if authorised by the Minister of DPLG.

11.3.2 Municipal Systems Act

The Municipal Systems Act (32 of 2000) legislates internal systems and addresses the differences between the authority and the provider functions as well as alternative mechanisms for providing municipal services.

11.3.3 Water Services Act

The Water Services Act (Act 108 of 1997) states that each WSA must for its area of jurisdiction, prepare a Water Services Development Plan (WSDP). Whilst the WSDP is a legal requirement, the real value in preparing the WSDP lies in the need to plan for Water Services (Water Supply and

Sanitation Provision) whereby key targets are set over the next five years. At least six WSDP key focus areas need to be addressed during the planning process. These are:

- ✓ Basic Service: Water supply, sanitation, free basic water supply and free basic sanitation;
- ✓ Higher Levels of Service: Water supply, sanitation, associated needs and economic development;
- ✓ Water Resources: Appropriate choice, demand and water conservation management, water resource protection and integrated water resource management;
- ✓ Environmental Issues: Health, natural and social environment;
- ✓ Effective Management: planning, organisational or institutional aspects, management, financial and regulatory aspects; and
- ✓ Transfers: Infrastructure related transfers.

Water services development planning must also be done as part of the IDP process (section 12 (1) (a)) and the WSDP must be incorporated into the IDP (section 15 (5)).

Water Services Authorities must report on the implementation of its WSDP every year i.e. annual performance reporting (section 18).

Water Services Authorities must also comply with applicable regulations including Regulation No. R. 509, Government Gazette No. 22355, 8 June 2001 which requires the inclusion of a Water Services Audit as part of the annual performance report.

The Department must monitor the performance of every water services authority to ensure its compliance with every applicable water services development plan…section 62 (1) (c).

The Minister may- issue guidelines to water services institutions on performing their functions in terms of this Act section 73 (1) (h).

The Minister must ensure that there is a national information system on water services….to monitor the performance of water services institutions. section 68 (b) (i).

The Minister may require any…water services institution…to furnish information to be included in the national information system. section 68 (a).

Based on the above, the preparation of a WSDP is a legal requirement.

ANNEXURE A – REFERENCES

- ✓ Bigen Africa, 2016. Universal Access Plan Phase 2 – Progressive Development of a Regional Concept Plan for uMgungundlovu District Municipality, s.l.: s.n.
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- ✓ DBSA, 2020. Umgungundlovu District Municipality Water and Sanitation Programme. [Online].
- ✓ DWS, 2019. Data List. [Online] Available at: https://www.dwa.gov.za/wsks/DefaultList.aspx?SubjectAreaID=2&DataTopicDetailID=42&DisplayTypeId=1&PerspectiveID=0&LvlID=72&DataTopicID=35
- ✓ Ezemvelo KZN Wildlife, 2017. uMgungundlovu Biodiversity Sector Plan, V1.0, Pietermaritzburg: s.n.
- ✓ Institute of Natural Resource, 2017. Environmental Management Framework for the Umgungundlovu District Municipality: Environmental Management Framework Report , s.l.: s.n.
- ✓ Naidu Consulting, 2016. Vulindlela Bulk Water Supply System Upgrade – Preliminary Design Report, s.l.: s.n.
- ✓ NEMAI, 2018. Environmental Management Framework for the Harry Gwala District Municipality: Draft Status Quo Report, s.l.: s.n.
- ✓ UMDM IDP, 2019. Integrated Development Plan for Umgungundlovu District Municipality, 2019/2020 Review, s.l.: s.n.
- ✓ UMDM/Cogta, 2014. UMDM District Growth and Development Plan, s.l.: s.n.
- ✓ UW IMP, 2020. Umgeni Water Infrastructure Master Plan Volume 2: Mgeni System, s.l.: s.n.

ANNEXURE B – DETAILED PROPOSED WSI INFRASTRUCTURE COMPONENT DETAIL

UM001 WSIA: Howick North Scheme Area

The total bulk cost requirement for the Howick North Scheme is R8 914 831.70 (excl VAT). The scheme development cost per household is approximately R 1 400.

Howick North Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Howick North Scheme	UMG016	16 956	24 846	
		Total		**16 956**	**24 846**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Howick North Scheme	UMG016	5.82	8.67	
		Total		**5.82**	**8.67**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Midmar Dam	173.38	475	Water is sourced from the Midmar Dam	
4	**Infrastructure**		**WTW Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTW**	MIDMAR	Regional Bulk	UMG016	375
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	3.70
				Secondary Bulk	160 ø mm - 300 ømm	0.70
				Tertiary Bulk	50 ø mm - 110 ømm	19.46
		Pump stations	-	-	-	-
		Reservoirs	NHLATHIMBE RES 2	-	-	-
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	2.5
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	-	-	-	-
		Pump stations	-	-	-	-

5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Secondary Bulk	R8 104 392.45	**R810 439.25**	**R8 914 831.70**	
		Tertiary Bulk	R0.00	**R0.00**	**R0.00**	
		Total	**R8 104 392.45**	**R810 439.25**	**R8 914 831.70**	

UM002 WSIA: Howick West Scheme Area

The total bulk cost requirement for the Howick West Scheme is R102 010 890.02 (excl VAT). The scheme development cost per household is approximately R 5 000.

Howick West Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Howick West Scheme	UMG017	57 668	84 500	
		Total		**57 668**	**84 500**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Howick West Scheme	UMG017	17.33	26.07	
		Total		**17.33**	**26.07**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Midmar Dam	173.38	475	Water is sourced from the Midmar Dam	
4	**Infrastructure**		**WTW Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTW**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	2.99
				Secondary Bulk	160 ø mm - 300 ømm	0.19
				Tertiary Bulk	50 ø mm - 110 ømm	19.75
		Pump stations	Unknown	Regional Bulk	UMG017	0
			Unknown	Internal Bulk	UMG017	0
		Reservoirs	GREATER ESTON BWSS PHASE 3 RESERVOIR	Secondary Bulk	UMG017	0.00
			IMPENDLE VILLAGE RES 2	Secondary Bulk	UMG017	0.72
			RESERVOIR NO. 3 - ST BARNARDS	Secondary Bulk	UMG017	0.25
			KWANOVUKA RES 2	Secondary Bulk	UMG017	0.30
4.2	**Future**	**WTW**	MIDMAR WTP	Regional Bulk	UMG017	26
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	3.3
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Reservoir	Secondary Bulk	1	27700
		Pump stations	-	-	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R41 470 000.00**	**R414 700.00**	**R41 884 700.00**	

		Secondary Bulk	**R59 530 881.21**	**R595 308.81**	**R60 126 190.02**	
		Tertiary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Total	**R101 000 881.21**	**R1 010 008.81**	**R102 010 890.02**	

UM004 WSIA: Extension (Lidgetton to Howick North)

The total bulk cost requirement for the Extension (Lidgetton to Howick North) Scheme is R9 203 574.47 (excl VAT). The scheme development cost per household is approximately R 1 500.

Lidgeton to Howick North						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Lidgeton to Howick North	UMG016	16 956	24 846	
		Total		**16 956**	**24 846**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Lidgeton to Howick North	UMG016	5.82	8.67	
		Total		**5.82**	**8.67**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Spring Grove Dam	76.6	209.86	Water is sourced from the Spring Grove Dam	
4	**Infrastructure**		**WTW Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTW**	MIDMAR	Regional Bulk	UMG016	375
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	3.70
				Secondary Bulk	160 ø mm - 300 ømm	0.70
				Tertiary Bulk	50 ø mm - 110 ømm	19.46
		Pump stations	-	-	-	-
		Reservoirs	NHLATHIMBE RES 2	Secondary Bulk	0	0.00
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	13.82
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	-	-	-	-
		Pump stations	-	-	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Secondary Bulk	**R8 366 885.88**	**R836 688.59**	**R9 203 574.47**	
		Tertiary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Total	**R8 366 885.88**	**R836 688.59**	**R9 203 574.47**	

UM005 WSIA: KwaMavena

The total bulk cost requirement for the KwaMavena Scheme is R9 952 290.24 (excl VAT). The scheme development cost per household is approximately R 1 600.

KwaMavena Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Kwa Mavena Scheme	UMG016	16 956	24 846	
		Total		**16 956**	**24 846**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Kwa Mavena Scheme	UMG016	5.82	8.67	
		Total		**5.82**	**8.67**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Midmar Dam	173.38	475	Water is sourced from the Midmar Dam	
4	**Infrastructure**		**WTW Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTW**	MIDMAR	Regional Bulk	UMG016	375
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	3.70
				Secondary Bulk	160 ø mm - 300 ømm	0.70
				Tertiary Bulk	50 ø mm - 110 ømm	19.46
		Pump stations	-	-	-	-
		Reservoirs	NHLATHIMBE RES 2	-	0	0.00
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	1.53
		Reservoirs	Reservoir	Secondary Bulk	1	1700
		Pump stations	-	-	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Secondary Bulk	**R8 601 711.14**	**R860 171.11**	**R9 461 882.25**	
		Tertiary Bulk	**R445 825.44**	**R44 582.54**	**R490 407.98**	
		Total	**R9 047 536.58**	**R904 753.66**	**R9 952 290.24**	

UM006 WSIA: Claridge Reservoir Scheme Area

The total bulk cost requirement for the Claridge Reservoir Scheme is R236 139 360.52 (excl VAT). The scheme development cost per household is approximately R 1 500 000.

Claridge Reservoir Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Claridge Reservoir Scheme	UMG005	428	627	
		Total		**428**	**627**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Claridge Reservoir Scheme	UMG005	0.13	0.19	
		Total		**0.13**	**0.19**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Midmar Dam	173.38	475	Water is sourced from the Midmar Dam	
4	**Infrastructure**		**WTW Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTW**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	1.13
				Tertiary Bulk	50 ø mm - 110 ømm	0.00
		Pump stations	-	-	-	-
		Reservoirs	THOKOZANI RES 1	Secondary Bulk	0	0.00
			RESERVOIR 9	Secondary Bulk	1	0.80
4.2	**Future**	**WTW**	D. V HARRIS WTP	Regional Bulk	1	46
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	6.73
				Secondary Bulk	160 ø mm - 300 ømm	9.8
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Reservoir	Secondary Bulk	1	1500
		Pump stations	-	-	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R177 860 000.00**	**R17 786 000.00**	**R195 646 000.00**	
		Secondary Bulk	**R22 267 004.54**	**R2 226 700.45**	**R24 493 705.00**	
		Tertiary Bulk	**R14 545 141.38**	**R1 454 514.14**	**R15 999 655.52**	
		Total	**R214 672 145.92**	**R21 467 214.59**	**R236 139 360.52**	

UM007 WSIA: uMshwathi RBWSS: Pipeline to Wartburg

The total bulk cost requirement for the Pipeline to Wartburg Scheme is R56 883 628.17 (excl VAT). The scheme development cost per household is approximately R 140 000.

Pipeline to Wartburg Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Pipeline to Wartburg Scheme	UMG058	1 108	1 624	
		Total		**1 108**	**1 624**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Pipeline to Wartburg Scheme	UMG058	0.41	0.61	
		Total		**0.41**	**0.61**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Midmar Dam	173.38	475	Water is sourced from the Midmar Dam	
4	**Infrastructure**		**WTW Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTW**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.00
		Pump stations	-	-	-	-
		Reservoirs	WARTBURG RESERVOIR	Secondary Bulk	1	2.00
			RESERVOIR E - MACKSAM	-	0	0.00
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Reservoir	Secondary Bulk	1	17500
			Reservoir	Secondary Bulk	1	1600
		Pump stations	-	-	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Secondary Bulk	**R51 712 389.25**	**R5 171 238.92**	**R56 883 628.17**	
		Tertiary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Total	**R51 712 389.25**	**R5 171 238.92**	**R56 883 628.17**	

UM008 WSIA: uMshwathi RBWSS: Pipeline to Bruyns Hill Reservoir

The total bulk cost requirement for the Pipeline to Bruyns Hill Scheme is R263 901 221.85 (excl VAT). The scheme development cost per household is approximately R 17 800.

Pipeline to Bruyns Hill Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Pipeline to Bruyns Hill Scheme	UMG044	40 556	59 426	
		Total		**40 556**	**59 426**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Pipeline to Bruyns Hill Scheme	UMG044	7.07	10.65	
		Total		**7.07**	**10.65**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Midmar Dam	173.38	475	Water is sourced from the Midmar Dam	
4	**Infrastructure**		**WTW Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTW**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	2.04
				Secondary Bulk	160 ø mm - 300 ømm	0.61
				Tertiary Bulk	50 ø mm - 110 ømm	67.44
		Pump stations	-	-	-	-
		Reservoirs	GOLUBE RESERVOIR R1	Secondary Bulk	1	0.24
			ENGUGA - RESERVOIR D	-	0	0.00
			EMASHWAZINI RESERVOIR (STEEL TANK)	Secondary Bulk	1	0.01
			NDALENI RESERVOIR	Secondary Bulk	1	0.06
			APPELSBOSCH WTW RES 1	-	0	0.00
			CLARIDGE RES 1	-	0	0.00
			UNKNOWN	-	0	0.00
			UNKNOWN	-	0	0.00
			GENGESHE RES 3	-	0	0.00
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	60
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Reservoir	Secondary Bulk	1	4600

			Reservoir	Secondary Bulk	1	2200
			Reservoir	Secondary Bulk	1	1000
			Reservoir	Secondary Bulk	1	800
			Reservoir	Secondary Bulk	2	700
			Reservoir	Secondary Bulk	2	600
			Reservoir	Secondary Bulk	3	500
			Reservoir	Secondary Bulk	1	300
			Reservoir	Secondary Bulk	1	250
			Reservoir	Secondary Bulk	1	150
		Pump stations	-	-	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Secondary Bulk	**R202 982 598.28**	**R20 298 259.83**	**R223 280 858.10**	
		Tertiary Bulk	**R36 927 603.41**	**R3 692 760.34**	**R40 620 363.75**	
		Total	**R239 910 201.68**	**R23 991 020.17**	**R263 901 221.85**	

UM009 WSIA: uMshwathi RBWSS: Dalton Reservoir Scheme Area

The total bulk cost requirement for the Dalton Reservoir Scheme is R24 970 056.97 (excl VAT). The scheme development cost per household is approximately R 37 300.

Dalton Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Dalton Scheme	UMG007	1 827	2 678	
		Total		**1 827**	**2 678**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Dalton Scheme	UMG007	0.58	0.87	
		Total		**0.58**	**0.87**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Midmar Dam	173.38	475	Water is sourced from the Midmar Dam	
4	**Infrastructure**		**WTW Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTW**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.00
		Pump stations	-	-	-	-
		Reservoirs	DALTON RESERVOIR	Secondary Bulk	1	0.04
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Reservoir	Secondary Bulk	1	7000
		Pump stations	-	-	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Secondary Bulk	**R22 700 051.79**	**R2 270 005.18**	**R24 970 056.97**	
		Tertiary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Total	**R22 700 051.79**	**R2 270 005.18**	**R24 970 056.97**	

UM010 WSIA: uMshwathi RBWSS: Ozwathini Supply Scheme Area

The total bulk cost requirement for the Ozwathini Scheme is R20 777 911.77 (excl VAT). The scheme development cost per household is approximately R 3 100.

Ozwathini Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Ozwathini Scheme	UMG002	18 105	26 529	
		Total		**18 105**	**26 529**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Ozwathini Scheme	UMG002	3.10	4.73	
		Total		**3.10**	**4.73**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Midmar Dam	173.38	475	Water is sourced from the Midmar Dam	
4	**Infrastructure**		**WTW Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTW**	APPELSBOSCH	Regional Bulk	UMG002	0.79
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	6.89
		Pump stations	Unknown	Internal Bulk	UMG002	0
		Reservoirs	COOL AIR RES		0	0.00
			BRUNTVILLE RES 2		0	0.00
			THENDELE RESERVOIR		0	0.00
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Reservoir	Secondary Bulk	1	2000
		Pump stations	-	-	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Secondary Bulk	**R18 889 010.70**	**R1 888 901.07**	**R20 777 911.77**	
		Tertiary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Total	**R18 889 010.70**	**R1 888 901.07**	**R20 777 911.77**	

UM012 WSIA: Lion Park/Manyavu Water Supply Scheme

The total bulk cost requirement for the Lion Park/Manyavu Scheme is R31 680 746.90 (excl VAT). The scheme development cost per household is approximately R 65 000.

Lion Park/Manyavu Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Lion Park / Manyavu Scheme	UMG024	1 338	1 961	
		Total		**1 338**	**1 961**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Lion Park / Manyavu Scheme	UMG024	0.38	0.56	
		Total		**0.38**	**0.56**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Midmar Dam	173.38	475	Water is sourced from the Midmar Dam	
4	**Infrastructure**		**WTW Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTW**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.05
				Tertiary Bulk	50 ø mm - 110 ømm	5.79
		Pump stations	-	-	-	-
		Reservoirs	NEW HANOVER - 300KL CONCRETE RESERVOIR	Secondary Bulk	1	0.30
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	8.9
				Tertiary Bulk	50 ø mm - 110 ømm	8.5
		Reservoirs	Reservoir	Secondary Bulk	1	500
			Reservoir	Secondary Bulk	1	400
			Reservoir	Secondary Bulk	1	300
		Pump stations	-	-	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Secondary Bulk	**R19 176 954.04**	**R1 917 695.40**	**R21 094 649.45**	
		Tertiary Bulk	**R9 623 724.96**	**R962 372.50**	**R10 586 097.45**	
		Total	**R28 800 679.00**	**R2 880 067.90**	**R31 680 746.90**	

UM013 WSIA: Table Mountain Reservoir Scheme Area

The total bulk cost requirement for the Table Mountain Reservoir (Option 1) is R18 327 349.63 (excl VAT). The scheme development cost per household is approximately R 1 600.

Table Mountain Scheme (Option 1)						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Table Mountain Scheme (Option 1)	UMG045	31 083	45 546	
		Total		**31 083**	**45 546**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Table Mountain Scheme (Option 1)	UMG045	5.42	8.18	
		Total		**5.42**	**8.18**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Midmar Dam	173.38	475	Water is sourced from the Midmar Dam	
4	**Infrastructure**		**WTW Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTW**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.05
				Secondary Bulk	160 ø mm - 300 ømm	0.01
				Tertiary Bulk	50 ø mm - 110 ømm	0.83
		Pump stations	Unknown	Regional Bulk	UMG045	0
		Reservoirs	MANYAVU RES	Secondary Bulk	1	0.10
			APPELS BOSCH WTW RES	Secondary Bulk	1	0.40
			APPELS BOSCH HOSPITAL RES 1	Secondary Bulk	1	0.40
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Reservoir	Secondary Bulk	1	4500
			Reservoir	Secondary Bulk	0	200
		Pump stations	-	-	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Secondary Bulk	**R16 661 226.93**	**R1 666 122.69**	**R18 327 349.63**	

		Tertiary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Total	**R16 661 226.93**	**R1 666 122.69**	**R18 327 349.63**	

The total bulk cost requirement for the Table Mountain Reservoir (Option 2) is R28 050 373.31 (excl VAT). The scheme development cost per household is approximately R 2 500.

Table Mountain Scheme (Option 2)						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Table Mountain Scheme (Option 2)	UMG045	31 083	45 546	
		Total		**31 083**	**45 546**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Table Mountain Scheme (Option 2)	UMG045	5.42	8.18	
		Total		**5.42**	**8.18**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Midmar Dam	173.38	475	Water is sourced from the Midmar Dam	
4	**Infrastructure**		**WTW Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTW**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.05
				Secondary Bulk	160 ø mm - 300 ømm	0.01
				Tertiary Bulk	50 ø mm - 110 ømm	0.83
		Pump stations	Unknown	Regional Bulk	UMG045	0
		Reservoirs	MANYAVU RES	Secondary Bulk	1	0.10
			APPELS BOSCH WTW RES	Secondary Bulk	1	0.40
			APPELS BOSCH HOSPITAL RES 1	Secondary Bulk	1	0.40
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	7.3
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Reservoir	Secondary Bulk	1	4500
		Pump stations	-	-	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Secondary Bulk	**R21 080 783.15**	**R2 108 078.32**	**R23 188 861.47**	
		Tertiary Bulk	**R4 419 556.22**	**R441 955.62**	**R4 861 511.84**	
		Total	**R25 500 339.37**	**R2 550 033.94**	**R28 050 373.31**	

UM015 WSIA: Mpofana Rural 6 Scheme

The total bulk cost requirement for the Mpofana Rural 6 Scheme is R19 051 713.83 (excl VAT). The scheme development cost per household is approximately R 17 000.

Mpofana Rural 6 Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Springrove Regional Bulk Scheme	UMG035	3 063	4 488	
		Total		**3 063**	**4 488**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Springrove Regional Bulk Scheme	UMG035	0.54	0.82	
		Total		**0.54**	**0.82**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Spring Grove Dam	76.6	209.86	Water is sourced from the Spring Grove Dam	
4	**Infrastructure**		**WTW Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTW**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.00
		Pump stations	-	-	-	-
		Reservoirs	-	-	-	-
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	7.2
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Reservoir	Secondary Bulk	1	1700
		Pump stations	-	-	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Secondary Bulk	**R12 960 725.49**	**R1 296 072.55**	**R14 256 798.04**	
		Tertiary Bulk	**R4 359 014.35**	**R435 901.44**	**R4 794 915.79**	
		Total	**R17 319 739.84**	**R1 731 973.98**	**R19 051 713.83**	

UM016 WSIA: Thornville/Hopewell Water Supply Scheme

The total bulk cost requirement for the Thornville/Hopewell Scheme is R825 000.00 (excl VAT). The scheme development cost per household is approximately R 160.

Thornville/Hopewell Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Thornville / Hopewell Scheme	UMG015	13 603	19 933	
			UMG047	604	885	
		Total		**14 208**	**20 818**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Thornville / Hopewell Scheme	UMG015	2.65	3.99	
			UMG047	0.14	0.21	
		Total		**2.79**	**4.19**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Midmar Dam	173.38	475	Water is sourced from the Midmar Dam	
4	**Infrastructure**		**WTW Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTW**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	3.02
				Tertiary Bulk	50 ø mm - 110 ømm	1.50
		Pump stations	-	-	-	-
		Reservoirs	-	-	-	-
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Reservoir	Secondary Bulk	1	100
		Pump stations	-	-	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Secondary Bulk	**R750 000.00**	**R75 000.00**	**R825 000.00**	
		Tertiary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Total	**R750 000.00**	**R75 000.00**	**R825 000.00**	

UM017 WSIA: Liliefontein Water Supply Scheme

The total bulk cost requirement for the Liliefontein Scheme is R24 970 056.97 (excl VAT). The scheme development cost per household is approximately R 135 000.

Liliefontein Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Liliefontein Scheme	UMG004	505	740	
		Total		**505**	**740**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Liliefontein Scheme	UMG004	0.16	0.24	
		Total		**0.16**	**0.24**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Midmar Dam	173.38	475	Water is sourced from the Midmar Dam	
4	**Infrastructure**		**WTW Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTW**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	1.26
		Pump stations	-	-	-	-
		Reservoirs	-	-	-	-
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Reservoir	Secondary Bulk	1	6790
		Pump stations	-	-	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Secondary Bulk	**R22 700 051.79**	**R2 270 005.18**	**R24 970 056.97**	
		Tertiary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Total	**R22 700 051.79**	**R2 270 005.18**	**R24 970 056.97**	

UM018 WSIA: Richmond Water Supply Scheme

The total bulk cost requirement for the Richmond Scheme is R201 224 713.23 (excl VAT). The scheme development cost per household is approximately R 13 700.

Richmond Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Richmond Scheme	UMG041	40 210	58 919	
		Total		**40 210**	**58 919**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Richmond Scheme	UMG041	8.20	12.48	
		Total		**8.20**	**12.48**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Midmar Dam	173.38	475	Water is sourced from the Midmar Dam	
4	**Infrastructure**		**WTW Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTW**	RICHMOND	Regional Bulk	UMG041	6
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.06
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	1.65
		Pump stations	Unknown	Internal Bulk	UMG041	0
			Unknown	Regional Bulk	UMG041	0
			Unknown	Regional Bulk	UMG041	0
			Unknown	Regional Bulk	UMG041	0
			Unknown	Regional Bulk	UMG041	0
		Reservoirs	EMAKHOLWENI	Secondary Bulk	UMG041	0.0
			LINCOLNVILLE RES 1	Secondary Bulk	UMG041	0.0
			MERRIVALE HEIGHTS TOWER	Secondary Bulk	UMG041	0.0
			UNKNOWN	Secondary Bulk	UMG041	0.0
			HILTON SERVICE RESERVOIR	Secondary Bulk	UMG041	1.0
			LIONS RIVER RES	Secondary Bulk	UMG041	0.0
			RICHMOND WTW RES 1	Secondary Bulk	UMG041	0.0
			MASANGAZANE RES 2	Secondary Bulk	UMG041	0.0
			MASANGAZANE RES 1	Secondary Bulk	UMG041	0.0
4.2	**Future**		uPVC, Steel, HDPE, AC	Primary Bulk	>350	22.6

		Bulk Pipelines		Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Reservoir	Secondary Bulk	1	16500
		Pump stations	-	-	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R141 560 465.81**	**R14 156 046.58**	**R155 716 512.39**	
		Secondary Bulk	**R41 371 091.68**	**R4 137 109.17**	**R45 508 200.85**	
		Tertiary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Total	**R182 931 557.49**	**R18 293 155.75**	**R201 224 713.23**	

UM019 WSIA: Impendle Bulk Water Supply Scheme

The total bulk cost requirement for the Impendle Scheme is R128 667 940.52 (excl VAT). The scheme development cost per household is approximately R 12 200.

Impendle Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Impendle Scheme	UMG012	28 946	42 415	
		Total		**28 946**	**42 415**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Impendle Scheme	UMG012	5.16	7.81	
		Total		**5.16**	**7.81**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Midmar Dam	173.38	475	Water is sourced from the Midmar Dam	
4	**Infrastructure**		**WTW Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTW**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.05
				Secondary Bulk	160 ø mm - 300 ømm	0.04
				Tertiary Bulk	50 ø mm - 110 ømm	3.09
		Pump stations	UNKNOWN	Regional Bulk	UMG012	0
			UNKNOWN	Regional Bulk	UMG012	0
			UNKNOWN	Regional Bulk	UMG012	0
			UNKNOWN	Regional Bulk	UMG012	0
			UNKNOWN	Regional Bulk	UMG012	0
			UNKNOWN	Regional Bulk	UMG012	0
			UNKNOWN	Regional Bulk	UMG012	0
		Reservoirs	UNKNOWN	Secondary Bulk	0	0.00
			IMBOYI RES (reservoir 4)	Secondary Bulk	0	0.00
			RESERVOIR W - RESERVOIR STEEL 8,6M X 9,6M X 4,8M	Secondary Bulk	0	0.00
			RESERVOIR V - 390 KL STEEL RESERVOIR	Secondary Bulk	1	0.39
			UNKNOWN	Secondary Bulk	1	0.10
			UNKNOWN	Secondary Bulk	1	0.15
			NZINGA RESERVOIR 8	Secondary Bulk	1	0.15
			UNKNOWN	Secondary Bulk	1	0.15

			UNKNOWN	Secondary Bulk	1	0.20
			UNKNOWN	Secondary Bulk	1	0.40
			UNKNOWN	Secondary Bulk	1	0.40
			UNKNOWN	Secondary Bulk	1	0.15
			UNKNOWN	Secondary Bulk	1	0.10
			UNKNOWN	Secondary Bulk	1	0.15
			UNKNOWN	Secondary Bulk	0	0.00
			UNKNOWN	Secondary Bulk	0	0.00
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.31
				Secondary Bulk	160 ø mm - 300 ømm	26.77
				Tertiary Bulk	50 ø mm - 110 ømm	1.4
		Reservoirs	Reservoir	Secondary Bulk	1	7810
			Reservoir	Secondary Bulk	1	850
			Reservoir	Secondary Bulk	3	750
			Reservoir	Secondary Bulk	1	700
			Reservoir	Secondary Bulk	1	650
			Reservoir	Secondary Bulk	1	550
			Reservoir	Secondary Bulk	3	500
			Reservoir	Secondary Bulk	2	450
			Reservoir	Secondary Bulk	2	250
			Reservoir	Secondary Bulk	2	200
		Pump stations	-	-	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Secondary Bulk	**R97 888 566.17**	**R9 788 856.62**	**R107 677 422.78**	
		Tertiary Bulk	**R19 082 288.85**	**R1 908 228.89**	**R20 990 517.74**	
		Total	**R116 970 855.02**	**R11 697 085.50**	**R128 667 940.52**	

UM020 WSIA: Vulindlela Reservoir 5 to Impendle

The total bulk cost requirement for the Vulindlela Reservoir 5 to Impendle Scheme is R366 583 479.13 (excl VAT). The scheme development cost per household is approximately R 35 000.

Reservoir 5 to Impendle						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Reservoir 5 to Impendle	UMG012	28 946	42 415	
		Total		**28 946**	**42 415**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Reservoir 5 to Impendle	UMG012	5.16	7.81	
		Total		**5.16**	**7.81**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Midmar Dam	173.38	475	Water is sourced from the Midmar Dam	
4	**Infrastructure**		**WTW Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTW**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.05
				Secondary Bulk	160 ø mm - 300 ømm	0.04
				Tertiary Bulk	50 ø mm - 110 ømm	3.09
		Pump stations	UNKNOWN	Regional Bulk	UMG012	0
			UNKNOWN	Regional Bulk	UMG012	0
			UNKNOWN	Regional Bulk	UMG012	0
			UNKNOWN	Regional Bulk	UMG012	0
			UNKNOWN	Regional Bulk	UMG012	0
			UNKNOWN	Regional Bulk	UMG012	0
			UNKNOWN	Regional Bulk	UMG012	0
		Reservoirs	UNKNOWN	Secondary Bulk	0	0.00
			IMBOYI RES (reservoir 4)	Secondary Bulk	0	0.00
			RESERVOIR W - RESERVOIR STEEL 8,6M X 9,6M X 4,8M	Secondary Bulk	0	0.00
			RESERVOIR V - 390 KL STEEL RESERVOIR	Secondary Bulk	1	0.39
			UNKNOWN	Secondary Bulk	1	0.10
			UNKNOWN	Secondary Bulk	1	0.15
			NZINGA RESERVOIR 8	Secondary Bulk	1	0.15

			UNKNOWN	Secondary Bulk	1	0.15
			UNKNOWN	Secondary Bulk	1	0.20
			UNKNOWN	Secondary Bulk	1	0.40
			UNKNOWN	Secondary Bulk	1	0.40
			UNKNOWN	Secondary Bulk	1	0.15
			UNKNOWN	Secondary Bulk	1	0.10
			UNKNOWN	Secondary Bulk	1	0.15
			UNKNOWN	Secondary Bulk	0	0.00
			UNKNOWN	Secondary Bulk	0	0.00
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	34.84
				Secondary Bulk	160 ø mm - 300 ømm	26.77
				Tertiary Bulk	50 ø mm - 110 ømm	1.4
		Reservoirs	Reservoir	Secondary Bulk	1	7810
			Reservoir	Secondary Bulk	1	850
			Reservoir	Secondary Bulk	3	750
			Reservoir	Secondary Bulk	1	700
			Reservoir	Secondary Bulk	1	650
			Reservoir	Secondary Bulk	1	550
			Reservoir	Secondary Bulk	3	500
			Reservoir	Secondary Bulk	2	450
			Reservoir	Secondary Bulk	2	250
			Reservoir	Secondary Bulk	2	200
		Pump stations	-	-	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R216 286 853.29**	**R21 628 685.33**	**R237 915 538.61**	
		Secondary Bulk	**R97 888 566.17**	**R9 788 856.62**	**R107 677 422.78**	
		Tertiary Bulk	**R19 082 288.85**	**R1 908 228.89**	**R20 990 517.74**	
		Total	**R333 257 708.30**	**R33 325 770.83**	**R366 583 479.13**	

UM021 WSIA: Stephen Dlamini to Impendle & Vulindlela Reservoir 5

The total bulk cost requirement for the Stephen Dlamini to Impendle & Vulindlela Reservoir 5 Scheme is R1 251 697 129.70 (excl VAT). The scheme development cost per household is approximately R 118 000.

Stephen Dlamini To Impendle & Reservoir 5						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Stephen Dlamini To Impendle & Reservoir 5	UMG012	28 946	42 415	
		Total		**28 946**	**42 415**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Stephen Dlamini To Impendle & Reservoir 5	UMG012	5.16	7.81	
		Total		**5.16**	**7.81**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		New Biggen	34.675	95	Water is sourced from the proposed New Biggen Dam	
4	**Infrastructure**		**WTW Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTW**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.05
				Secondary Bulk	160 ø mm - 300 ømm	0.04
				Tertiary Bulk	50 ø mm - 110 ømm	3.09
		Pump stations	UNKNOWN	Regional Bulk	UMG012	0
			UNKNOWN	Regional Bulk	UMG012	0
			UNKNOWN	Regional Bulk	UMG012	0
			UNKNOWN	Regional Bulk	UMG012	0
			UNKNOWN	Regional Bulk	UMG012	0
			UNKNOWN	Regional Bulk	UMG012	0
			UNKNOWN	Regional Bulk	UMG012	0
		Reservoirs	UNKNOWN	Secondary Bulk	0	0.00
			IMBOYI RES (reservoir 4)	Secondary Bulk	0	0.00
			RESERVOIR W - RESERVOIR STEEL 8,6M X 9,6M X 4,8M	Secondary Bulk	0	0.00
			RESERVOIR V - 390 KL STEEL RESERVOIR	Secondary Bulk	1	0.39
			UNKNOWN	Secondary Bulk	1	0.10
			UNKNOWN	Secondary Bulk	1	0.15

			NZINGA RESERVOIR 8	Secondary Bulk	1	0.15
			UNKNOWN	Secondary Bulk	1	0.15
			UNKNOWN	Secondary Bulk	1	0.20
			UNKNOWN	Secondary Bulk	1	0.40
			UNKNOWN	Secondary Bulk	1	0.40
			UNKNOWN	Secondary Bulk	1	0.15
			UNKNOWN	Secondary Bulk	1	0.10
			UNKNOWN	Secondary Bulk	1	0.15
			UNKNOWN	Secondary Bulk	0	0.00
			UNKNOWN	Secondary Bulk	0	0.00
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	77.71
				Secondary Bulk	160 ø mm - 300 ømm	26.77
				Tertiary Bulk	50 ø mm - 110 ømm	1.4
		Reservoirs	Reservoir	Secondary Bulk	1	7810
			Reservoir	Secondary Bulk	1	850
			Reservoir	Secondary Bulk	3	750
			Reservoir	Secondary Bulk	1	700
			Reservoir	Secondary Bulk	1	650
			Reservoir	Secondary Bulk	1	550
			Reservoir	Secondary Bulk	3	500
			Reservoir	Secondary Bulk	2	450
			Reservoir	Secondary Bulk	2	250
			Reservoir	Secondary Bulk	2	200
		Pump stations	Primary PS	Primary Bulk	-	471
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R1 020 935 626.53**	**R102 093 562.65**	**R1 123 029 189.18**	
		Secondary Bulk	**R97 888 566.17**	**R9 788 856.62**	**R107 677 422.78**	
		Tertiary Bulk	**R19 082 288.85**	**R1 908 228.89**	**R20 990 517.74**	
		Total	**R1 137 906 481.54**	**R113 790 648.15**	**R1 251 697 129.70**	