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

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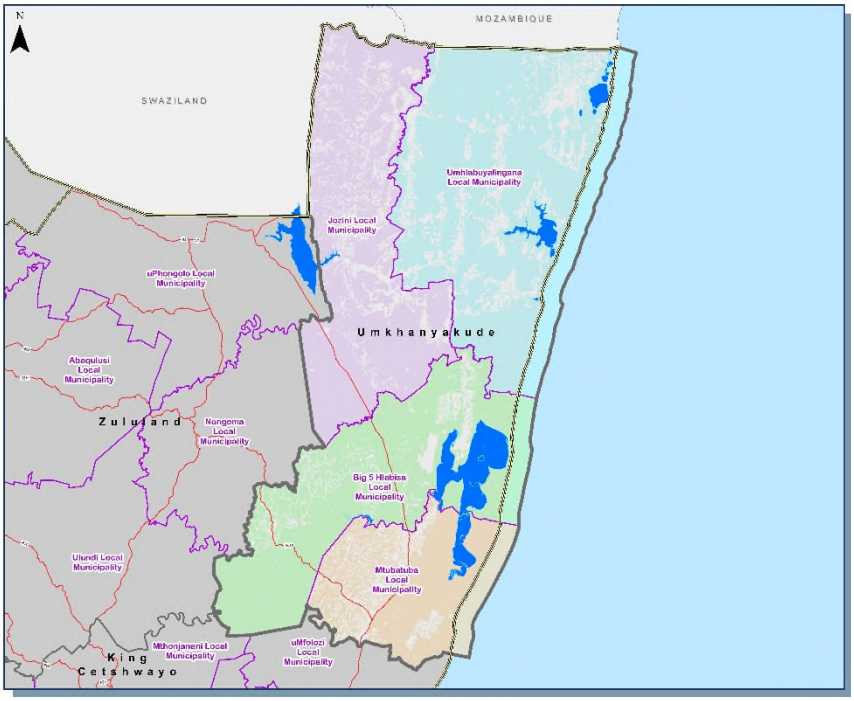

Reconnaissance Report

January 2021

Prepared for:

UMGENI WATER•AMANZI

Name : Umgeni Water
Phone : 033-341 1232 / 082 852 9308
Email : vernon.perumal@umgeni.co.za
Contact Person: Vernon Perumal
Address: 310 Burger Street
Pietermaritzburg
3201

Prepared by:

MARISWE JTN

Name : Mariswe (Pty) Ltd
Phone : +27 (0)12-424-9707
Email : sandram@mariswe.com
Contact Person: Sandra Munnik
Address: P O Box 25549
Monument Park
0181

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Prepared for:	**Client's Name:** Umgeni Water		**Contact Person:** Vernon Perumal **Tel No.:** 033-341 1232 **Email Address:** vernon.perumal@umgeni.co.za	
Prepared at / by:	**Office:** Pretoria		**Division:** Infrastructure Planning	
Verification Process:	**Name:**	**Capacity:**	**Signature:**	**Date:**
Verification by Author:	S Munnik	Planning specialist		January 2021
Checked by:	L Wise	Lead Planner		January 2021
Authorised by:	S Munnik	Project Director		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.

This report is prepared for the Umkhanyakude District Municipality.

B. Demographics

Umkhanyakude District Municipality (UKDM) is located in the far Northern region of Kwazulu-Natal Province in South Africa. The District Municipality consists of the following Local Municipalities:

- ✓ uMhlabuyalingana Municipality (KZ 271);
- ✓ Jozini Municipality (KZ 272);
- ✓ Mtubatuba Municipality (KZ 275); and
- ✓ The Big 5 Hlabisa Municipality (KZ 276).

There is currently 751 531 people within 149 197 households residing within 319 communities within UKDM. The average household size is 5 persons per household.

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

LM Name	No of Communities	No of Households	No of Population	People per Household
Umhlabuyalingana Local Municipality	117	36 650	174 113	4.8
Jozini Local Municipality	103	41 567	211 519	5.1
Mtubatuba Local Municipality	41	41 669	209 949	5.0
Big 5 Hlabisa Local Municipality	58	29 311	155 950	5.3

LM Name	No of Communities	No of Households	No of Population	People per Household
Umkhanyakude	**319**	**149 197**	**751 531**	**5.0**

Source: Umkhanyakude WSDP 2020

Population growth was determined until 2050 that resulted in the projected number of people residing within Umkhanyakude will be approximately 923 000 people. The projected population per Municipality is tabled within Table B-2 below.

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

Municipality	WSDP Pop 2020	Population						
		2020	2025	2030	2035	2040	2045	2050
Umhlabuyalingana	174 113	186 924	193 163	199 835	207 465	215 387	223 611	232 149
Jozini	211 519	221 466	228 859	236 764	245 804	255 190	264 934	275 050
Mtubatuba	209 949	208 319	215 273	222 708	231 212	240 041	249 206	258 722
Big 5 Hlabisa	155 950	126 461	130 682	135 196	140 358	145 717	151 281	157 058
Total	**751 531**	**743 170**	**767 977**	**794 503**	**824 840**	**856 335**	**889 032**	**922 979**

Source: Umkhanyakude WSDP 2020

The majority of the population will continue to reside within the Jozini Municipality that can be ascribed to the inclusion of Mkhuze Town, home to the District Municipal offices as well as being identified as a primary development node. There has been an influx of major services such as offices, residential development and commercial uses that has led to Mkuze being the major investment node within the area of Jozini Municipality. Mtubatuba has the second highest number of people that can also be ascribed to the Mtubatuba town also being a primary development node and offers the highest agricultural development potential.

C. Service Levels

C.1 Water

The water supply reliability index within Umkhanyakude is overall 40.5% and detailed per Local Municipality within Table C-1 below. Dysfunctional schemes, insufficient water resource and a lack of appropriate WC&DM measures are the major contributors to households not receiving reliable water supply. The highest % of households with no access to reliable water supply are experienced within Mtubatuba and Jozini Local Municipalities and are confirmed when the current water supply infrastructure, the available water resources and the lack of water conservation measures are discussed later in this document.

Table C-1: Water Supply Reliability Profile

Local Municipality	Umhlabuyalingana Local Municipality	Jozini Local Municipality	Mtubatuba Local Municipality	Big 5 Hlabisa Local Municipality	Umkhanyakude
No of HH	36 650	41 567	41 669	29 311	149 197

Local Municipality		Umhlabuyalingana Local Municipality	Jozini Local Municipality	Mtubatuba Local Municipality	Big 5 Hlabisa Local Municipality	Umkhanyakude
Total No of HH not receiving reliable water supply		10 397	18 140	17 031	14 819	60 387
No of HH receiving No Reliable Water Supply due to:	Dysfunctional Schemes	3 637	6 346	5 963	5 188	21 134
	Insufficient Water Resource	5 200	9 068	8 518	7 409	30 195
	No infrastructure	1 559	2 727	2 555	2 221	9 062
	No WC&DM measures	4 160	7 257	6 813	5 929	24 159
	New Scheme Required	1 038	1 812	1 703	1 479	6 032
	Infrastructure Upgrade	1 091	1 902	1 792	1 552	6 337
	infrastructure Extension	310	542	512	446	1 810
	Internal Bulk Infrastructure Required	91	155	153	137	536
	Infrastructure Replacement	55	105	105	86	351
	% Reliability	**28.4%**	**43.6%**	**40.9%**	**50.6%**	**40.5%**

Source: Umkhanyakude WSDP 2020

C.2 Sanitation

16.8% of the households within UKDM do not have access to basic sanitation and is illustrated within Table C-2 below. The majority of the backlogs are concentrated within the rural areas with the 27% of the households in the Umhlabuyalingana Local Municipality do not have access to basic sanitation.

Table C-2: Sanitation Service

Local Municipality	No of HH	No of HH			
		Pit Latrines to Waterborne	Pit Latrines to VIP	Total Sanitation Need	% HH with no access to basic sanitation
Umhlabuyalingana Local Municipality	29 311	238	7 773	8 011	27.3%
Jozini Local Municipality	41 567	6	7 439	7 445	17.9%
Mtubatuba Local Municipality	41 669	239	2 733	2 972	7.1%
Big 5 Hlabisa Local Municipality	36 650	184	6 522	6706	18.3%
Umkhanyakude	**149 197**	**667**	**24 467**	**25 134**	**16.8%**

Source: Umkhanyakude WSDP 2020

D. Water Resources

The Umkhanyakude WSA falls within the Pongola-Mtamvuna Water Management Area). Major rivers affecting the WSA include the Pongola, Mhlatuze, Mfolozi and the Mkuze rivers. The tertiary drainage regions are W11 to W13, W31 to W32, W41, W45, and the portions of W42, W43, W44 and W57 falling within the boundary of the RSA as well as T40, T51 and T52 Mkuze/Hluhluwe, and the Mfolozi catchments. The area has a wide diversity of aquatic and wetland habitats, and supports many faunal and floral species, due to the area having both subtropical and temperate features, and mountainous and flat areas.

D-1 Pongola & Mkuze river systems

The Pongola River system is major river in the Umkhanyakude District Municipality, which is part of the shared watercourse of the Rio-Maputo River system. The Pongola River is well regulated with the Pongolapoort Dam being one of the largest dams in the country with a storage capacity of 2 445 million m^3. The Pongolapoort Dam is the main source of domestic water supply for the downstream water users up to the border with Mozambique. Water is also transferred from the Dam to the Mkuze River where it supplies the Mkuze town as well as Zululand District Municipality. The other surface water resource is Lake Sibaya, a freshwater source, which is currently supplying the Mseleni and Mbazwana water supply systems. The water balance assessment indicates that there is surplus water available in the Pongola River system to meet the future water requirements of the domestic sector in the supply areas that can be supplied from or supported by the Pongolapoort Dam.

D-2 Mfolozi Hluhluwe River Systems

The Mfolozi River system is major river which forms the border between the Umkhanyakude and uThungulu District. The Mfolozi River is a very sandy river system and is regulated above the confluence of the White Mfolozi and the Black Mfolozi River. The total water available from the two river systems was determined to be 7.96 million m^3/a. The allocation from the Hluhluwe Dam to domestic use is 2.81 million m^3/a with the remainder being allocated for the commercial irrigation downstream of the Hluhluwe Dam for pineapple farming.

The low flow runoff of the Mfolozi River is important for Mtubatuba particularly with the increasing demands upstream of the abstraction works. The major water user downstream of the dam is irrigation agriculture which has a registered water use of 11.54 million m^3/a and water use for the domestic sector which is 3.63 million m^3/a.

Groundwater is currently being used conjunctively with the surface water supplies as well as supplying stand-alone schemes in the outer lying areas of the formal water supply systems. The groundwater development potential of the area around Mtubatuba is very high. The utilisable groundwater exploitation potential for quaternary catchment W23D during the dry season was estimated to be 18 Ml/d (6.59 million m^3/a), while the annual utilisable groundwater exploitation potential based on GRDM evaluations for this catchment, was estimated at 17.78 million m^3/a.

The Mfolozi River run-of-river is limited to approximately 3.69 million m^3/a. This is not sufficient to meet the current water requirements of the scheme area. With the high MAR of the Mfolozi River there is potential to develop an off-channel storage in the supply area. Lake Ntweni is situated about 15 km upstream of the N2 Bridge on the Northern side of the Mfolozi River. One of the options being investigated by UKDM is the raising of Lake Ntweni in order to meet the current and future water requirements of Mtubatuba and surrounding areas. The proposed scheme will include the construction of a dam wall on the lake and a bulk water supply pipeline from the intake works to Mtubatuba WTP. The capacity of the proposed Lake Ntweni

Dam as an off-channel storage dam is approximately 6 million m^3. This will be sufficient to meet the demand during the low flow period. It is envisaged that the dam will have a yield of 5.85 million m^3/a.

E. Existing Water Supply Schemes and Water Requirements

The six (6) major schemes are:

- ✓ Shemula: covering the northern region;
- ✓ Jozini: covering the major portion of Jozini LM to Mkuze, Mseleni and Mbazwana in uMhlabuyalingana LM;
- ✓ Hluhluwe: This covers the local municipality of The Big 5 False Bay;
- ✓ Hlabisa: Covering the area of Hlabisa LM that falls outside of the Hluhluwe Game Reserve;
- ✓ Mtubatuba; and
- ✓ Mpukunyoni.

The water requirements (Mℓ/d) for the UKDM are presented per Local Municipality within Table E-1. These water requirements were calculated for consumers having formal water supply schemes and for consumers not yet supplied from a formal water supply scheme. The UKDM would require by the year 2050, 177.18 Mℓ/day.

All of the LMs in the District, are classified as Category B-Municipalities, signifying a combination of market and business activities and opportunities, surrounded by a reasonably productive agricultural area as well as a rural, mainly subsistence economy. The settlements are generally small and the incomes of their inhabitants low, which means very few opportunities for markets, SMME formation and LED initiatives. The Mtubatuba LM will be the largest water consumer in the UKDM requiring 30% of all water followed by the Jozini LM with 29%. The aforementioned can be ascribed to the fact that the majority of the secondary economy and agricultural activities are located within these two (2) Municipalities.

Table E-1: Water Requirements (Mℓ/d), Per Local Municipality

Local Municipality	Population 2020	Water Requirements (Mℓ/d)						
		2020	2025	2030	2035	2040	2045	2050
Umhlabuyalingana	186 924	32.68	33.93	35.29	36.84	38.49	40.24	42.10
Jozini	221 466	40.12	41.67	43.36	45.28	47.32	49.48	51.77
Mtubatuba	208 319	41.46	43.02	44.71	46.65	48.70	50.87	53.17
Big 5 Hlabisa	126 461	23.40	24.29	25.27	26.38	27.56	28.81	30.13
TOTAL	**743 170**	**137.65**	**142.91**	**148.63**	**155.14**	**162.06**	**169.39**	**177.18**

F. Existing Sanitation Supply Schemes

There are 11 Wastewater Treatment Works within the UKDM that serves the major towns but all of them are in need of refurbishment and improved operations and maintenance. None of these works has achieved Green Drop status.

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 UKDM amount to approximately R 946,42 million. However, the proposed cost requirement for bulk water supply services within UKDM is R 4,7 billion and would represent a wall to wall coverage of the total need. UKDM currently has only one existing bulk interventions currently in planning under the Regional Bulk Infrastructure Grant earmarked for 2021.

H. Bulk Water Supply Interventions Considered

This study aims to ensure that the UKDM 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 (WSIAs) 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 WSIAs, number of applicable households, population and their water requirements are illustrated within **Table H-1.**

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

WSIA No	WSIA Name	Population 2020	Population 2050	Water Demand 2020	Water Demand 2050
UK001	Hlabisa	62 370	77 460	11.2	14.4
UK002	Shemula	220 211	273 491	38.7	50.0
UK003	Mpukunyoni	61 178	75 980	10.6	13.7
UK004	Jozini	172 100	213 739	30.5	39.3
UK005	Hluhluwe	145 171	180 295	25.8	33.2
UK006	Mtubatuba	64 142	79 661	16.8	21.5
UK007	Mkuze	15 020	18 654	3.4	4.3

WSIA No	WSIA Name	Population 2020	Population 2050	Water Demand 2020	Water Demand 2050
Farm Land and Conservation Areas		2 978	3 699	0.7	0.8
Umkhanyakude		**743 170**	**922 979**	**137.6**	**177.2**

The Shemula WSIA and the Jozini WSIA has the highest water demand of approximately 18% and 14% respectively. These WSIAs are also the biggest two (2) supply areas within the UKDM and would be serving close to 53% of the UKDM 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)
UK001	Hlabisa	77 460	14.4	5.25	7.3	5.48	12.78	7.53
UK002	Shemula	273 491	50.0	18.24	13.5	6.57	20.07	1.83
UK003	Mpukunyoni *	75 980	13.7	4.99	3.65	56.5	60.15	47.32
UK004	Jozini	213 739	39.3	14.36	20.82	0	20.82	6.46
UK005	Hluhluwe *	180 295	33.2	12.11	3.59	56.5	60.09	35.21
UK006	Mtubatuba *	79 661	21.5	7.84	3.65	56.5	60.15	52.31
UK007	Mkuze	18 654	4.3	1.57	1.57	1.83	3.4	1.83
Con001	Conservation Areas and Farm land	3 699	0.8	0.19	-	-	-	-
TOTAL			919 280	176.34	64.36			
*** The current source is the Mfolozi River of which the existing yield is insufficient and should be augmented by the off-channel storage dam on the Mfolozi River that would yield 56,57Mm^3/annum.**								

From the table above, it is noted all the schemes will have adequate raw water resources to meet the 2050 demand requirements. The investigation to augment the water shortage within three WSIAs, Mtubatuba, Mpukunyoni and Hlabisa, by constructing the off-channel storage dam at the Mfolozi River should be prioritised.

A total estimate of approximately R 7.021 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)
UK001	Hlabisa	R0,00	R197 121 000	R56 520 000	R25 364 100	R279 005 100
UK002	Shemula	R222 052 000	R732 895 000	R353 717 000	R130 875 400	R1 439 629 400
UK003	Mpukunyoni	R67 227 000,00	R106 085 000,00	R121 060 000,00	R29 437 200	R323 809 200
UK004	Jozini	R0,00	R757 796 000,00	R454 459 000,00	R121 225 500	R1 333 480 500
UK005	Hluhluwe	R57 880 500	R268 711 000	R338 996 000	R66 558 750	R732 146 250
UK006	Mtubatuba	R2 350 917 156.26	R101 328 000.00	R116 587 000.00	R256 883 216	R2 825 715 372
UK007	Mkuze	R0,00	R30 410 000,00	R48 979 000,00	R7 938 900	R87 327 900
TOTAL		**R2 698 076 656**	**R2 194 346 000**	**R1 490 318 000**	**R638 274 066**	**R7 021 014 722**

I. Conclusions and Recommendations

The UKDM 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. 40,5% of the consumers within UKDM do not have access to reliable water supply across the whole of the UKDM's geographic extent. 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 UKDM relies mainly on grant funding programmes to fund their water supply projects. These funding programmes are mainly MIG, WSIG and RBIG. 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 UKDM 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 seven 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 UKDM as the WSA. The UKDM 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 UKDM to take this process further.

The seven (7) proposed water supply intervention areas (WSIAs) are the appropriate solutions for bulk water supply development within UKDM and are as follows:

- ✓ UK001 WSIA: Hlabisa;

- ✓ UK002 WSIA: Shemula;
- ✓ UK003 WSIA: Mpukunyoni;
- ✓ UK004 WSIA: Jozini;
- ✓ UK005 WSIA: Hluhluwe;
- ✓ UK006 WSIA: Mtubatuba; and
- ✓ UK007 WSIA: Mkuze (part of Jozini)

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 seven (7) area interventions would be an implementation priority for the DM, it is proposed to consider the following three (3) priorities detailed within **Table H-4**. 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.

H-4: Proposed Implementation Order (Phased Approach)

Proposed Priorities (Phased Approach)	WSIA No and Name		Proposed Project Name	Proposed Estimated Project Value
1	UK003	Mpukunyoni	Mfolozi Off Channel Storage Dam Feasibility Study and Dam Development:	
	UK005	Hluhluwe	1. Initiate Feasibility Study	R5 000 000
	UK006	Mtubatuba	2. Off-channel storage dam development	R2 077 643 156
2	UK007	Mkuze	Augment the supply to the Mkuze supply area from the Jozini WTP	R87 327 900
3	UK002	Shemula	Upgrade the existing Shemula WTP to 45 Ml/day inclusive of an 195kW pump station at the WTP as well as increasing the storage capacity of the Command Reservoir to 6.74Mℓ.	R103 927 000

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LIST OF ABBREVIATIONS

CoGTA	Department of Cooperative Governance and Traditional Affairs
CR	Command Reservoir
CoU	City of uMhlathuze
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
LTBWSS	Lower Thukela Bulk Water Supply Scheme
m^3	Cubic meter
Mm^3	Million 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
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
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 Umkhanyakude District Municipality (UKDM) – 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 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:

- ✓ Umkhanyakude District Integrated Development Plan 4th Generation, 2018/2019
- ✓ Umkhanyakude District Municipality Water Services Master Plan, 2016;
- ✓ StatsSA Community Survey, 2016;
- ✓ Monthly water balance reports as submitted by DWS (KZN) for each WSA;
- ✓ Universal Access Plan Phase II – Umkhanyakude Water Infrastructure Master Plan 2015;
- ✓ Umkhanyakude Asset Register 2018/19;
- ✓ Draft Water Services Development Plan (WSDP) 2019; and

- ✓ DWS WSDP Reference Framework.

Meetings were held with managers and technical staff of the KCDM 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 Overall Master Plan for Water Supply for Umkhanyakude. 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 was 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.

1.6 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:

    - o Category 1 (Very High Income): Households with a house connection and an income more than R 1 228 000 per year;
    - o Category 2 (Upper Middle Income): Households with a house connection and an income between R 153 601 and R 1 228 000 per year;
    - o Category 3 (Average Middle Income): Households with a house connection and an income of between R 38 401 and R 153 600 per year;
    - o Category 4 (Low Middle Income): Households with a house connection and an income of between R 9 601 and R 38 400 per year;
    - o Category 5 (Low Income): Households with a house connection and an income between R1 and R 9 600 per year;
    - o Category 6 (Yard Connections): all Households with a Yard Connection;
    - o Category 7 Households with access to interim services and
    - o 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:

    - o Category 1: Long Established Metropolitan Centers (M): Large conurbation of a number of largely independent local authorities generally functioning as an entity;
    - o Category 2: City (c): Substantial authority functioning as a single entity isolated or part of a regional conurbation;
    - o Category 3: Town: Industrial (Ti): A town serving as a center for predominantly industrial activities;
    - o 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:

- AtBelow: 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.

1.6.1 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 Assumed average AADD per person per combined income and LoS category. 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 Indirect demands, as a ratio of direct demands per Centre classification 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				

				Indirect demands as a ratio of direct demands			
Classification	**Type of Centre**	**Description**	**Typical CSIR / SACN Settlement Typology**	**Commercial**	**Industrial**	**Institutional**	**Municipal**
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 Level of Service Upgrade.

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

Dwelling Type	LOS Upgrade
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.

1.6.2 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.

1.7 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.

1.8 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

Umkhanyakude District Municipality (UKDM) is located in the far Northern region of KwaZulu-Natal Province in South Africa. At 12 818 km² and according to the IDP of 2018/19, the District Municipality has a population totalling 751 531. The District is the second largest District in KwaZulu-Natal, in terms of size, behind its neighbouring District, Zululand District Municipality. Umkhanyakude District also has the World Heritage Site known as Isimangaliso Wetland Park which encompasses the entire coastline of more than 200 km. The District Municipality consists of the following Local Municipalities:

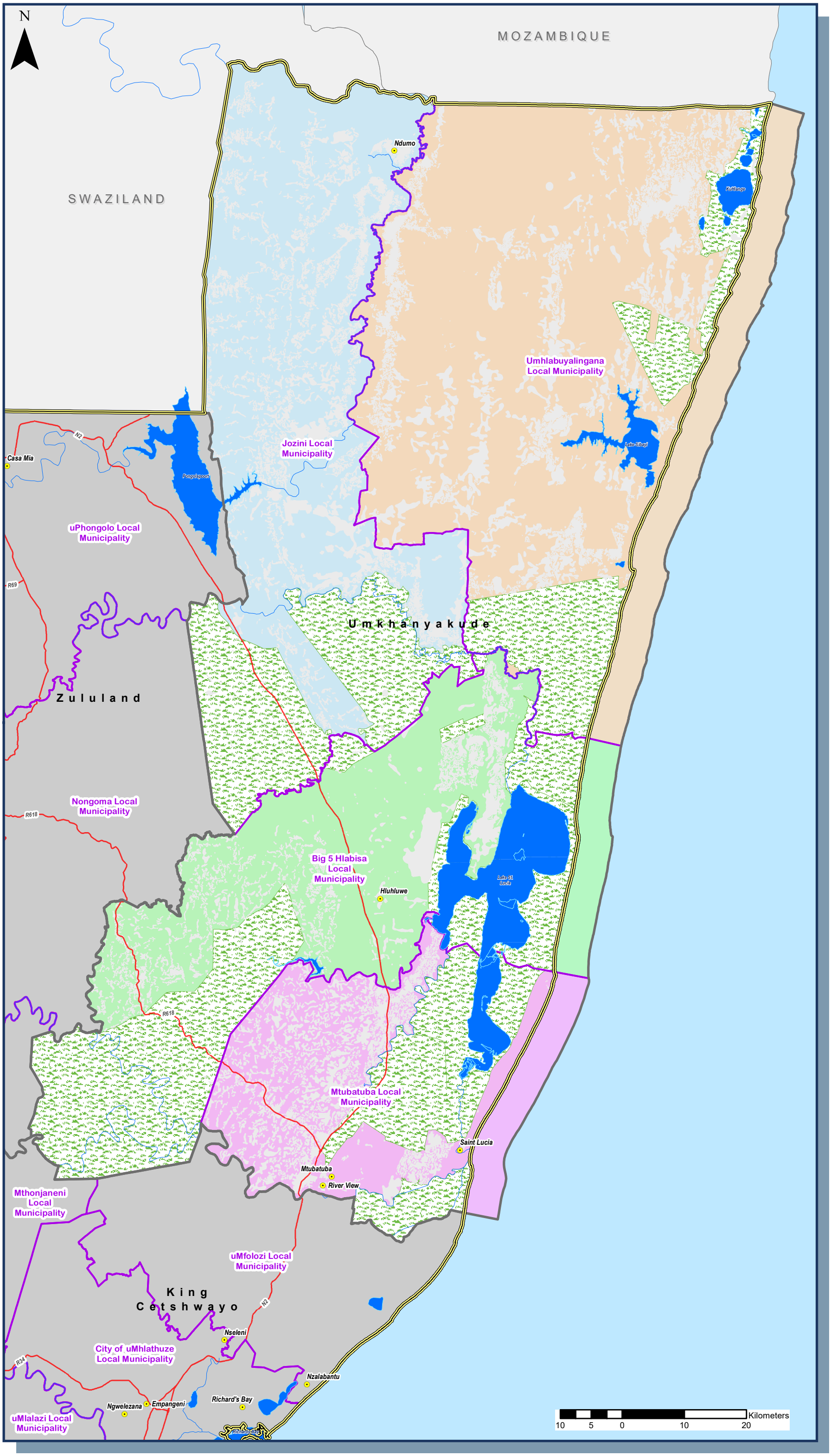
- ✓ uMhlabuyalingana Municipality (KZ 271);
- ✓ Jozini Municipality (KZ 272);
- ✓ Mtubatuba Municipality (KZ 275); and
- ✓ The Big 5 Hlabisa Municipality (KZ 276.

The DM is surrounded by the Republic of Mozambique to the North, the Indian Ocean to the East, King Cetshwayo District Municipality to the South (DC28), Zululand District Municipality to the West (DC26) and the Kingdom of Swaziland to the North- West (see Figure 2-1: Study Area overleaf). The District Municipal office is located in within the town of Mkhuze. The N2, Lubombo Mountain, Mfolozi River and Indian Ocean, border this unique, natural resources rich district. Economically, this district is the second least contributor to the provincial GGP after Sisonke District, standing at 1%.

Umkhanyakude district is also known as the Elephant Coast for its rich and wild natural tourism resources. The district's most natural resource attractions include game reserves and parks, beaches, cultural & adventure tourism and also birding watching destinations (avi - tourism). The district has identified main tourism activity hubs to include Hluhluwe, St. Lucia, Mtubatuba, Sodwana / Kosi bay and Lake Sibaya and Mkuze. As this district is more rural than any district in KZN, its sectors are mainly in agriculture, tourism and government services.

The UKDM has large tracts of land that are conservation areas, including:

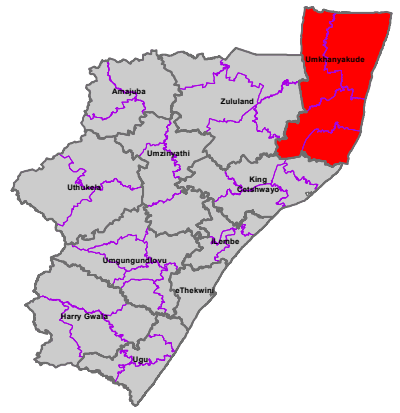
- ✓ Isimangaliso Wetland Park encompassing the entire coastline;
- ✓ Hluhluwe-Umfolozi Game Reserve in Hlabisa LM;
- ✓ Mkuze and Ndumo Game Reserves in Jozini LM; and
- ✓ Tembe Elephant Park in uMhlabuyalingana LM.



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Farm Land & Conservation Areas
- National Roads (N1)
- Main Roads
- Dams & Dam Names (Dried Dam)
- Rivers
- Settlements
- Major Towns (Eshowe)

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

UMKHANYAKUDE DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
Fax: + 27 (0) 12 460 4071
Email: pretoria@mariswe.com

PROJECT TITLE

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

MAP TITLE:

Study Area

Umkhanyakude District Municipality

DATE COMPLETED: 30 September 2020

MAP NO.: **DC27: Figure 2.1**

2.2 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

Land use comprises of agricultural land, a high level of subsistence farming, small areas of high-density settlements and natural areas. The majority of agricultural land is under sugarcane to the south of Mtubatuba and commercial forestry along the coastal low-lying plains from Mtubatuba up to Kosi Bay. Natural areas are mostly located within the various protected areas, conservation areas and wetlands in the District, with the majority of land outside having a high level of modification.

The majority of the population resides in tribal or traditional areas and all major towns ((Mbazwana, Jozini, Hluhluwe, Mtubatuba, Hlabisa &Manguze) have been identified as Quaternary Development Nodes. The two (2) dominant local economies within the district are the Mtubatuba and Jozini LMs with the dominant economic sectors being retail, catering and accommodation sector as well as the general government services sector. General government sector and the community, social and personal services sector remained the main sources of formal sector employment in the district. The unemployment rate of 31% in UKDM is slightly higher than the provincial rate of 28.5%; The majority of the employed population in the district is active in the formal sector (71.8%), with a further 18.8% involved in the informal sector.

2.2.1 uMhlabuyalingana Local Municipality (KZ 271)

The Umhlabuyalingana is one of the four local municipalities that comprises Umkhanyakude District. Umhlabuyalingana is located in Northern KwaZulu-Natal along the border with Mozambique to the north, the Indian Ocean to the east, Jozini Municipality to the west and the Big Five False Bay Municipality to the south. The municipality is generally rural, with the population being spread among the 18 municipal wards and four (4) traditional council areas (Tembe, Mashabane, Mabaso and Zikhali). These areas cover a total municipal area of 3 621 km^2.

The Umhlabuyalingana Municipality has a rural character with 99% of the municipality classified as rural and consists of 18 wards. Nearly 60 % of the municipal area falls under traditional authority ownership, with the remaining 40% consisting of commercial farms and conservation areas.

2.2.2 Jozini Local Municipality (KZ 272)

The Jozini Local Municipality is one of the four (4) municipalities within the uMkhanyakude District Municipality. It is located in the northern region of KwaZulu–Natal, and is bordered by Mozambique to the north, Swaziland to the west, uMhlabuyalingana to the east, Big Five/Hlabisa to the south and Nongoma and Uphongolo to the west. It consists of six (6) semi formalized towns viz. Jozini, Mkhuze, Ingwavuma, UBombo, Bhambanana and Ndumo. The remaining parts of the municipality are characterized as being rural. Jozini Municipality covers 24% (3 057 km^2) of the total area of 12 818 km^2 of the uMkhanyakude District Municipality.

The primary investment points are Mkhuze and Jozini. Secondary investment points have been identified at Ingwavuma, UBombo, Ndumo and Bhambanana and tertiary investment points have been identified at

Ophansi, Manyiseni, MakWakWa, Emabhanoyini, Makhonyeni. These investment points are seen as the existing and future growth points in the municipal area and serve as the basis for the clustering of activities and services such as schools, shops, community halls, etc.

The municipal area is well served by major movement routes, inter-alia national link (N2), R22 that links Jozini to Manguzi in the uMhlabuyalingana Municipality and the 522-1 that extends from uBombo in the south to Ingwavuma in the north.

2.2.3 Mtubatuba Local Municipality (KZ 275)

The Mtubatuba Local Municipality is a Category B municipality situated in the south-eastern corner of the uMkhanyakude District along the northern coastal belt of KwaZulu-Natal. Mtubatuba is located roughly 200km north of Durban and 55km north of the Richards Bay/Empangeni metropole along the N2 National Route.

Mtubatuba is the urban centre of the municipal area and serves as the administrative head office of the Mtubatuba Municipality. To the west of Mtubatuba town, are rural villages of Mpukunyoni Traditional Council (previously with Mtubatuba Municipality) administered by the Ingonyama Trust Board; to the south-west lies KwaMsane Township; to the north-east of the Mtubatuba Town lies iSimangaliso Wetland Park; and is bordered by Mfolozi River to the South. St Lucia town is a tourism and service centre for the surrounding rural area of Mpukunyoni and a scenery belt where the R618 links the Mtubatuba Town and St Lucia Town.

Mtubatuba has developed from a railway siding into a strong sub-regional commercial, service, transport and administrative centre for the entire north-eastern Zululand region. There has been substantial commercial growth in Mtubatuba, lending it the status of being an economic hub of northern KwaZulu-Natal. The town is ideally located as a base from which to explore the rich culture of the Zulu Nation, the province's world-renowned game reserves, and the iSimangaliso Wetland Park.

2.2.4 The Big 5 Hlabisa Local Municipality (KZ 276)

The Big 5 Hlabisa Local Municipality was established by the amalgamation of The Big 5 False Bay Local Municipality and Hlabisa Local Municipality on 3 August 2016 and covers a total Area of 3 466km². The Big 5 Hlabisa Local Municipality is a Category B municipality situated within the uMkhanyakude District in northern KwaZulu-Natal. It is one of four (4) municipalities in the district, making up a quarter of its geographical area (3 466km²). It hosts the towns of Hluhluwe and Hlabisa.

It is easily accessible off the N2 National Route, it incorporates part of the iSimangaliso Wetland Park (previously known as the Greater St Lucia Wetlands Park) and is the starting point of the MR4 (LSDI Corridor), which links Hluhluwe to Mozambique. The town of Hluhluwe hosts major shopping and light servicing facilities, as well as the municipal offices of the municipality.

A large proportion of the land is used for agriculture and game lodge activities and is sparsely settled. The north-eastern parts of the municipality are occupied by fairly densely settled rural traditional communities (Makhasa, Mnqobokasi and Nibela).

A major drawcard is the tourism industry centred on the Hluhluwe-uMfolozi Game Reserve, located 280km north of Durban and is the oldest proclaimed park in Africa. It consists of 960km² of hilly topography in central Zululand, KwaZulu-Natal, and is known for its rich wildlife and conservation efforts. The park is the only state-run park in KwaZulu-Natal where all the Big Five game occur. Due to conservation efforts, the park now has the largest population of white rhinos in the world.

2.3 Climate and Climate Change[1]

[2]The uMkhanyakude District is characterized by a temperate climate with warm to hot summers and mild winters. The mild winter temperatures are due to the oceanic climate (warm Agulhas current), with the lowest temperatures, which are experienced between March and July, being on average 10 ºC. Average summer maximum temperatures vary between 29 ºC and 32 ºC. The southern and eastern parts of uMkhanyakude District fall predominantly within the humid subtropical region of South Africa, with the western region being a more semi-arid region. The highest rainfall months are typically January and March, with the highest mean annual rainfall (> 1000 mm) occurring in the southern part of the District.

[3]A number of general conclusions about the future climate (2070–2100) are relevant to the Umkhanyakude district and climate modelling is constantly being refined and according to the IDP of 2019/2020, are as follows.

- ✓ lower rainfall lead to wetter summers, drier winters; and higher temperatures;
- ✓ increased hydrological risk and uncertainty;
- ✓ high incidence of extreme rainfall days;
- ✓ drying of topsoil;
- ✓ less water for drinking, sanitation and irrigation;
- ✓ less water in the soil for plants; and
- ✓ Increases in irrigation requirements for crops.

The above could lead to the following:

- ✓ Rain-fed agriculture in Umkhanyakude is likely to be negatively affected due to lower annual rainfall, higher temperatures, increased hydrological risk, increased rainfall variability, drying of topsoil, less

[1] Climate Change Vulnerability Assessment and Response Plan, March 2018, Version 2

[2] Umkhanyakude District Municipality Bio-Diversity Sector Plan, 2014

[3] UuMkhanyakude District Municipality Integrated Development Plan Review 4th Generation: 2018/2019

water in the soil for plants, and increased irrigation requirements. Such a change may have serious implications for food security and livelihoods and could lead to poor health and a state of malnutrition;

- ✓ A number of climate-mediated diseases exist, and climate has impacts on human health beyond affecting sanitation, drinking water and food. In general, warmer and more extreme climate shifts are likely to exacerbate disease and health risks. In general, Umkhanyakude might expect to see increases in illness or mortality related to higher temperatures, water-borne diseases, and malaria;
- ✓ Degradation of biodiversity could result in a change in ecosystems that plays a significant role in overall human wellbeing. The maintenance thereof also provides an important livelihood resource and food security for many communities; and
- ✓ Climate change also has an impact on sea level changes and erosion of the coastline, the availability of fresh water, fisheries, tourism and an increase in an increased risk of frequency and intensity of droughts and floods.

2.4 Topography, Geology and Soils

[4]The uMkhanyakude District Municipality is characterised by a diverse terrain consisting of coastal dunes and plains, mountain ranges and low-lying foothills, high hills and incised river valleys. Moving from east to west though the uMkhanyakude District Municipality there are the undulating dunes along the eastern shores which are regarded as the tallest dunes in the world and the adjacent coastal low-lying plains. Moving inland, in the north are the eastern foothills of the Lebombo Mountain range, extending from Ndumo south to Mkuze, the Lebombo Mountain range and the low lying western plains, and in the south the high hills around Hlabisa and the Hluhluwe-iMfolozi Park.

The altitude ranges from 10- 70 metres above sea level around Mtubatuba and St Lucia Town to 670 metres at the Lebombo Mountain range, with the highest point being on average just above 744 metres above sea level at Ingwavuma within the Lebombo Mountain range. The highly variable topography characteristic of KwaZulu-Natal and the District creates biophysical habitat and micro climatic conditions which support a range of biodiversity. North facing slopes are generally warmer and drier, supporting habitat types such as grasslands. South facing slopes, escarpments and sheltered kloofs on the other hand tends to be cooler and wetter, commonly providing conditions favourable for supporting indigenous forest.

The soil forms of uMkhanyakude District vary widely according to their geology and topographical location; however, sandy soils tend to dominate in this region. The district is characterised by soils of well to moderate drainage, black soils, duplex soils and alluvial soils. The soil depth and condition of the soils also vary widely, with areas of both deep and shallow soils present in the district.

[4] Umkhanyakude District Municipality Bio-Diversity Sector Plan, 2014

The diverse terrain and soil composition associated with the District would have an impact on not only on the availability and suitability of water resources but also the cost of the planned water supply infrastructure.

2.5 ENVIRONMENTAL

[2] The uMkhanyakude District traverses six biomes, the Azonal Forest, Forest, Indian Coastal Belt, Savanna, Grassland and Wetlands biomes and contains 45 vegetation types. The region, specifically the Maputaland region, is of great conservation and biodiversity importance and falls within the Maputaland Centre of Plant Endemism (Van Wyk & Smith, 2001), a globally recognized biodiversity hotspot. Of the plant species, most endemics are associated with three of the major plant communities, namely Sand forest, Tembe Sandy bushveld and the Maputaland Wooded grassland. This region thus warrants a high level of conservation protection.

2.5.1 Hydrology and Wetlands

[2] The hydrology of the uMkhanyakude District is strongly influenced by the high lying land to the west with its associated network of non-perennial rivers, the large areas of low lying plains which tend to form extensive wetland and pan areas and the major watercourses originating to the west of the District. These watercourses include the Pongola River, which drains the north-western area northwards toward the Great Usutu River and Mozambique, the Msunduzi River and Mkuze River which drain the central areas in a southerly direction toward the iSimangaliso Wetland Park system, and the Hluhluwe, Nyalazi River and Mfolozi Rivers which drain the southern areas towards the iSimangaliso Wetland Park system. Three of these major watercourses, the Nyalazi, Mkuze and Black Mfolozi are classified as being free flowing rivers, meaning that these rivers have no barriers that obstruct movement and migration of aquatic species

The hydrology of the uMkhanyakude District is further described within each of the five local municipalities:

- ✓ The Jozini Local Municipal: contains many non-perennial rivers and tributaries that have their source within the high-lying Lebombo/Ubombo Mountain Range (located along the western border), and which drain in an easterly direction toward the Pongola River. The Pongola and Nawavuma River which originate west of the District cut though this mountain range via gorges. The Mkuze and Msunduzi Rivers, which also originated to the west of the District, drain the southern areas of the municipality into the iSimangaliso Wetland Park and ultimately southwards toward the Indian Ocean. East of the mountain range the topography flattens substantially and develops into lowland undulating watercourses and the formation of floodplains and off-channel pan-type wetlands which are typical characteristic feature of the Pongola and Mkuze Rivers within this area.
- ✓ The uMhlabuyalingana Local Municipality: comprises of the low-lying eastern area that has a generally flat topography. The flattened, low lying area does not allow for channel formation which results in a lack of defined watercourses and hence larger wetland areas. The eastern portion of the area is drained by small rivers, of which the Swamanzi River is the only one classified as perennial.

- ✓ The Big 5 False Bay Local Municipality: as with the uMhlabuyalingana Local Municipality, is relatively flat and comprises of a number of non-perennial watercourses and is rich with wetland habitat including floodplain and pan-type wetland habitats. This municipality is drained by the Mzinene and Hluhluwe Rivers that flow into the iSimangaliso Wetland Park. The Hlabisa Local Municipality: also, has rather flat topography and is rich in floodplain wetland areas. The municipality also has several perennial river systems and is drained by the Mfolozi and Nyalazi River which forms the southern and eastern boundary respectively, as well as the Mfolozi and Msunduzi Rivers in the south.
- ✓ The Mtubatuba Local Municipality: which is also rich in floodplain wetland areas is drained by the Mfolozi, Msunduzi and Nyalazi Rivers.

2.6 Institutional Arrangements for Water Supply

The Umkhanyakude District Municipality is a Water Services Authority (WSA) and as such 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. The municipality is also a Water Services Provider (WSP) for the consumers within its area of jurisdiction.

The core functions associated with water services and provision resides within the Technical Services Department split into the following three (3) Units:

- ✓ Infrastructure Development;
- ✓ Operations and Maintenance; and
- ✓ Water Service Authority.

The Overall Objectives of the Department are:

- ✓ Provision of reliable, cost effective, efficient and sustainable water services;
- ✓ Research and development of new projects;
- ✓ Preparation of short, medium- and long-term water development plans and implementation strategies;
- ✓ Operation and maintenance of water and sanitation schemes;
- ✓ Planning and implementation of municipal capital infrastructure projects; and
- ✓ Management of electricity at Ingwavuma and KwaMsane

3. DEMOGRAPHICS

3.1 EXISTING POPULATION DISTRIBUTION

The UKDM has reviewed their WSDP in 2020 and has updated their demographics accordingly. As the UAP process also promotes the integration of related planning processes, the UAP III has therefore also adopted the WSDP demographics for UKDM.

There is currently 751 531 people within 149 197 households residing within 319 communities within UKDM. The average household size is 5 persons per household as indicated within Table 3-1. Both Jozini and Mtubatuba Local Municipalities host 28% of the population and illustrated within Figure 3-1 overleaf.

Table 3-1: UKDM Population and Households per Local Municipalities

LM Name	No of Communities	No of Households	No of Population	People per Household
Umhlabuyalingana Local Municipality	117	36 650	174 113	4.8
Jozini Local Municipality	103	41 567	211 519	5.1
Mtubatuba Local Municipality	41	41 669	209 949	5.0
Big 5 Hlabisa Local Municipality	58	29 311	155 950	5.3
Umkhanyakude	**319**	**149 197**	**751 531**	5.0

Source: UKDM WSDP 2020

The male female split within UKDM is 47:53 that illustrates that that more households are headed female headed as men might seek job opportunities elsewhere as illustrated within Table 3-2 below. The gender ratio is also slightly higher when compared with the entire province. Stats SA has defined since 2016 the youth population as people between the age of 15 and 34. 38% of the population within UKDM falls within this category and also reflects that 38% of the population is eligible to work and could contribute to the overall economic growth of the Municipality.

Table 3-2: Gender and Youth

Municipality	Male	Female	Youth		
			Male	Female	Youth Total
Umkhanyakude	47%	53%	49%	51%	38%
KZN	48%	52%	49%	51%	37%

Source: Stats SA Community Survey 2016

N

MOZAMBIQUE

SWAZILAND

Ndumo

Kutlange

Umhlabuyalingana Local Municipality

Jozini Local Municipality

Lake Sibayi

Casa Mia

N2

Pongolapoort

uPhongolo Local Municipality

R69

Umkhanyakude

Zululand

Nongoma Local Municipality

R618

Big 5 Hlabisa Local Municipality

Hluhluwe

Lake St Lucia

Mtubatuba Local Municipality

Saint Lucia

Mtubatuba

River View

Mthonjaneni Local Municipality

uMfolozi Local Municipality

King Cetshwayo

Nseleni

Nzalabantu

Richard's Bay

Municipality

Population Distribution

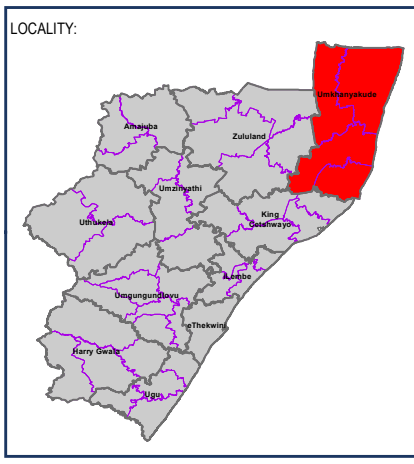
- 0 - 200 people
- 201 - 500 people
- 501 - 1 000 people
- 1 001 - 5 000 people
- 5 001- 10 000 people
- 10 001 and more people

10 5 0 10 20 Kilometers

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Farm Land & Conservation Areas
- National Roads (N1)
- Main Roads
- Dams & Dam Names (Dried Dam)
- Rivers
- Settlements
- Major Towns (Eshowe)

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

UMKHANYAKUDE DISTRICT MUNICIPALITY

CONSULTANTS:

Project No.: 27814

MARISWE

JTN CONSULTING

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
Fax: + 27 (0) 12 460 4071
Email: pretoria@mariswe.com

PROJECT TITLE

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

MAP TITLE:

Population Distribution

Umkhanyakude District Municipality

DATE COMPLETED:

30 September 2020

MAP NO.:

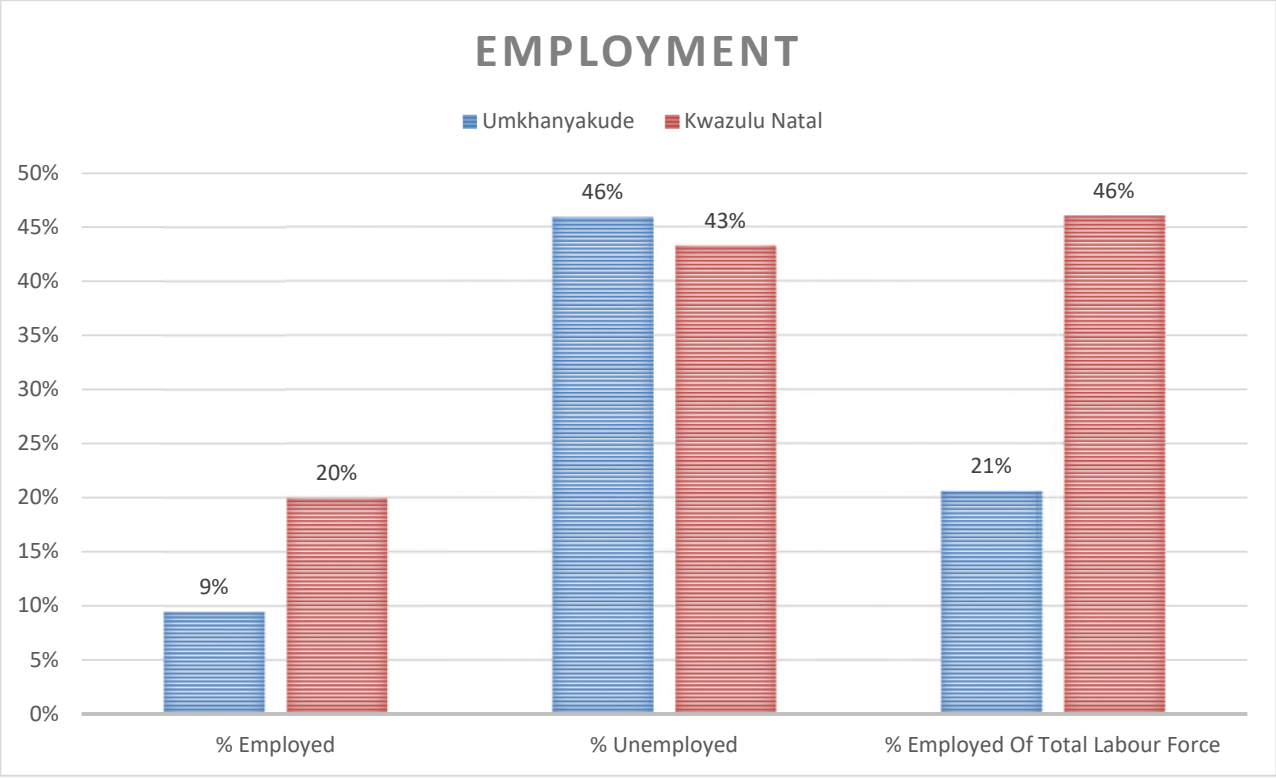
DC27: Figure 3.1

3.2 SOCIAL AND ECONOMIC INDICATORS

The District Growth and Development Plan[5] reported that the Umkhanyakude District is associated with a small district economy if compared to other districts within the province. It is less than 5% of the size of the eThekWini municipality's economy in 2011. However, the economy has grown significantly with more than 9% per annum since 2000 onwards but contributes only 2,4% to the provincial economy. The biggest contributors are the Mtubatuba and Jozini Local Municipalities. The dominant economic sectors are retail, tourism, manufacturing and the general government that also are the main sources of formal employment in the district. Retail and tourism are the biggest contributors to the economy and can be ascribed to the significant tourism trade that emanates from the large conservation areas. Approximately 17.9% of the District is being used for agricultural purposes, with the majority of agricultural land being focused within Mtubatuba.

According to Census 2011, the unemployment rate within the UKDM is 45,85% and slightly higher than the employment rate of 43,23% within the Province. Approximately 16% of the economically active population within the district is classified as discouraged work seekers and also higher than the provincial average of 12%.

Figure 3-2: Employment Levels within the provincial context



Source: Stats SA Census 2011

[5] Umkhanyakude District Growth and Development Plan, 2014

The employment levels per Local Municipality is illustrated within Table 3-3 below. The unemployed population reside within all four Local Municipalities with the highest number of the population that are employed reside within the Mtubatuba Local Municipality being a prime industrial zone due to the Umfolozi Sugar Mill.

Table 3-3: Employment Levels per Local Municipality.

Local Municipality	% Employed	% Unemployed	% Employed of the Total Labour Force
Jozini	8.55%	46.26%	18.49%
Mtubatuba	11.53%	44.66%	25.81%
The Big 5 False Bay	10.02%	45.22%	22.16%
Umhlabuyalingana	7.67%	47.12%	16.28%
Total	9.42%	45.85%	20.54%

Source: Stats SA Census 2011

The majority of the population is depending on grants and subsidies as their income source and is illustrated within Table 3-4 despite a drop in the number of poor households from 20% in 2011 to 16% in 2016. This will have a direct impact on households' ability to pay for services as well as their ability to contribute to grow the economy of the district. The education level of persons older than 20 years with at least a senior certificate is also much lower than the provincial average, 18% versus 26%.

Table 3-4: Socio-economic indicators

Municipality	Population 2016	2015 Grants and subsidies received as a % of the total income	Poverty Index (no of poor households)		Youth (15 – 34 age group)	Persons aged 20+ years who completed Grade 12	
			2011	2016		Number	%
Umhlabuyalingana Local Municipality	172 077	75%	30%	23%	36%	27 681	16%
Jozini Local Municipality	198 215	74%	22%	16%	39%	30 691	15%
Mtubatuba Local Municipality	202 176	71%	12%	10%	38%	42 344	21%
Big 5 Hlabisa Local Municipality	116622	81%	17%	13%	39%	21 188	18%
Umkhanyakude	689 090	91%	20%	16%	38%	121 904	18%
KwaZulu Natal	11 065 240		11%	8%	37%	2 830 345	26%

Source: Stats SA, Community Survey 2016

3.3 POPULATION GROWTH SCENARIOS

All the Municipalities within Umkhanyakude have experienced a population increase between 2001 and 2020 as illustrated within Table 3-5 below. The overall growth rate for the District Municipality is 3,2% that could be ascribed to a significant decrease in the District's mortality rate. The lowest population growth of 0,8% is experienced within the Jozini Local Municipality. Mtubatuba experienced substantial growth since 2001 until 2020 and can be ascribed to the job opportunities that are offered in this Local Municipality.

Table 3-5: Population Growth

Municipality	Population					% Growth Rate
	2001	2007	2011	2016	2020	
uMhlabuyalingana	140 958	163 694	156 736	172 077	174 113	1.2%
Jozini	184 052	207 250	186 502	198 215	211 519	0.8%
The Big 5	64 831	185 548	107 147	116 622	155 950	5.0%
Mtubatuba	40 150	57 554	175 425	202 176	209 949	9.6%
	429 991	**614 046**	**625 810**	**689 090**	**751 531**	**3.2%**

Source: StatsSA, Community Survey 2016 and UKDM WSDP 2020

3.3.1.1 Projected Population Growth until 2050

For the purpose of this study, the population growth was determined until 2050 that resulted in the projected number of people residing within Umkhanyakude will be approximately 923 000 people. The projected population per Municipality is tabled within Table 3-6 below.

Table 3-6: Project Population per Local Municipality until 2050

Municipality	WSDP Pop 2020	Population						
		2020	2025	2030	2035	2040	2045	2050
Umhlabuyalingana	174 113	186 924	193 163	199 835	207 465	215 387	223 611	232 149
Jozini	211 519	221 466	228 859	236 764	245 804	255 190	264 934	275 050
Mtubatuba	209 949	208 319	215 273	222 708	231 212	240 041	249 206	258 722
Big 5 Hlabisa	155 950	126 461	130 682	135 196	140 358	145 717	151 281	157 058
Total	**751 531**	**743 170**	**767 977**	**794 503**	**824 840**	**856 335**	**889 032**	**922 979**

The majority of the population will continue to reside within the Jozini Municipality that can be ascribed to the inclusion of Mkhuze Town, home to the District Municipal offices as well as being identified as a primary development node. There has been an influx of major services such as offices, residential development and commercial uses has led to Mkuze being the major investment node within the area of Jozini Municipality. Mtubatuba has the second highest number of people that can also be ascribed to the Mtubatuba town also being a primary development node and offers the highest agricultural development potential.

3.4 Main Development Nodes

[6]The uMkhanyakude District Master Plan is structured around the spatial concept of nodal and corridor development as adopted in the KwaZulu-Natal Provincial Spatial Development Framework. Some of the identified corridors from the Master Plan are the N2 Corridor, Jozini Aisle of Kings-Kosi Bay Corridor, Route 22 Zulu Ocean Corridor and the Cultural Heritage Corridor. There are 18 Traditional Council Areas which contribute 42% of total land.

The 12 Development Principles identified in the Master Plan are;

- ✓ Principle 1: To achieve a sustainable equilibrium between human settlement, conservation, tourism, commercial, and agricultural activities within the District, by way of proper land use management and in partnership with the private sector and local communities;
- ✓ Principle 2: To define and establish a functional hierarchy of nodal service centres in the District in order to consolidate human settlement, optimise the delivery of social and engineering services, and stimulate local economic development, while protecting valuable agricultural land;
- ✓ Principle 3: To provide a full range of social/ community services at all identified nodal points, in accordance with the nationally approved Thusong Centre concept;
- ✓ Principle 4: To optimally capitalise on the strategic location of the District through enhancing the N2 and R22 as development corridors, and to functionally link all nodal points and major destinations within and outside the District to one another, by way of an extensive movement network;
- ✓ Principle 5: To ensure that proper public transport infrastructure and services are provided along the priority movement network and at all nodal points;
- ✓ Principle 6: To establish the iSimangaliso Wetland Park as the international Tourism Anchor in the District, supplemented by the full variety of public and private reserves, and cultural heritage precincts within the District;
- ✓ Principle 7: To promote irrigated and cultivated farming activities on suitable land within the District; and to support small scale and/ or subsistence farming throughout the remainder of the area;
- ✓ Principle 8: To enhance business activities (formal and informal) at each of the identified nodal points in the District by consolidating these activities with the Thusong Centres and modal transfer facilities;
- ✓ Principle 9: To consolidate major industrial and manufacturing activities around three core areas, namely Mtubatuba, Hluhluwe and Mkuze; and to promote small-scale manufacturing/ light industrial activities, including agro-processing at all other nodal service centres;
- ✓ Principle 10: To direct the major infrastructure programmes towards the nodal and corridor network in the District, but to ensure that areas displaying little or no potential for growth (urban and rural) are at least provided with the constitutionally mandated minimum levels of services as prescribed by the NSDP and enshrined in the Constitution;

[6] UuMkhanyakude District Municipality Integrated Development Plan Review 4th Generation: 2018/2019

- ✓ Principle 11: To integrate and consolidate the fragmented human settlement structure of the UDM by way of delineating urban and rural development boundaries around nodal points and promoting infill development and densification within these Strategic Development Areas; and
- ✓ Principle 12: To compile Area Based Plans for Traditional Authority Areas and detailed Precinct Plans for each of the identified nodal points in the District.

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 UKDM WSDP of 2020 and the number of households that do not have access to reliable water supply are also provided.

4.1 WATER SUPPLY SERVICE LEVEL

The water supply reliability index within Umkhanyakude is overall 40,5% and detailed per Local Municipality within Table 4-1 below and illustrated within Figure 4-1 below. Dysfunctional schemes, insufficient water resource and a lack of appropriate WC&DM measures are the major contributors to households not receiving reliable water supply. The highest % of households with no access to reliable water supply are experienced within Mtubatuba and Jozini Local Municipalities and are confirmed when the current water supply infrastructure, the available water resources and the lack of water conservation measures are discussed later in this document.

Table 4-1: Water Supply Reliability Profile

Local Municipality		Umhlabuyalingana Local Municipality	Jozini Local Municipality	Mtubatuba Local Municipality	Big 5 Hlabisa Local Municipality	Umkhanyakude
No of HH		36 650	41 567	41 669	29 311	149 197
Total No of HH not receiving reliable water supply		10 397	18 140	17 031	14 819	60 387
No of HH receiving No Reliable Water Supply due to:	Dysfunctional Schemes	3 637	6 346	5 963	5 188	21 134
	Insufficient Water Resource	5 200	9 068	8 518	7 409	30 195
	No infrastructure	1 559	2 727	2 555	2 221	9 062
	No WC&DM measures	4 160	7 257	6 813	5 929	24 159
	New Scheme Required	1 038	1 812	1 703	1 479	6 032
	Infrastructure Upgrade	1 091	1 902	1 792	1 552	6 337
	infrastructure Extension	310	542	512	446	1 810
	Internal Bulk Infrastructure Required	91	155	153	137	536
	Infrastructure Replacement	55	105	105	86	351
	% Reliability	**28,4%**	**43,6%**	**40,9%**	**50,6%**	**40,5%**

Source: Umkhanyakude WSDP 2020

N

MOZAMBIQUE

SWAZILAND

Ndumo

Kutlange

Umhlabuyalingana Local Municipality

Jozini Local Municipality

Lake Sibayi

Pongolapoort

Casa Mia

N2

uPhongolo Local Municipality

R69

Umkhanyakude

Zululand

Nongoma Local Municipality

R618

Big 5 Hlabisa Local Municipality

Hluhluwe

Lake St Lucia

Mtubatuba Local Municipality

Saint Lucia

Mtubatuba

River View

Mthonjaneni Local Municipality

uMfolozi Local Municipality

King Cetshwayo

Nseleni

City of uMhlathuze Local Municipality

R34

Nzalabantu

Richard's Bay

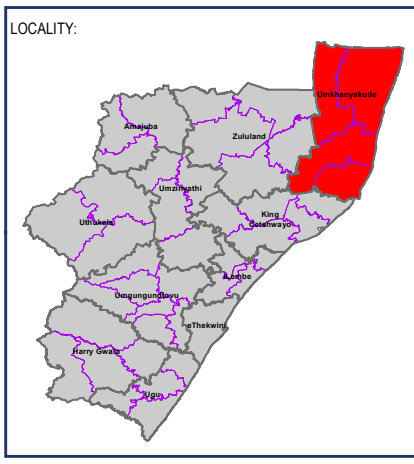
Municipality

10 5 0 10 20 Kilometers

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Farm Land & Conservation Areas
- National Roads (N1)
- Main Roads
- Dams & Dam Names (Dried Dam)
- Rivers
- Settlements
- Major Towns (Eshowe)

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

UMKHANYAKUDE DISTRICT MUNICIPALITY

CONSULTANTS:

Project No.: 27814

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
Fax: + 27 (0) 12 460 4071
Email: pretoria@mariswe.com

PROJECT TITLE

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

MAP TITLE:

Water Supply Reliability Profile

Umkhanyakude District Municipality

DATE COMPLETED:

30 September 2020

MAP NO.:

DC27: Figure 4.1

Water Reliability Profile

- Communities not receiving a reliable service
- Communities receiving a reliable service

4.2 WATER LOSSES AND DEMAND MANAGEMENT

Each WSA should prepare a Water Conservation and Water Demand Management (WC/WDM) Strategy in order to address water inefficiencies and ensure protection and conservation of water resources. It goes along with the financial sustainability of providing water services.

In terms of the National Water Act, 1998 (Act 36 of 1998) the Department of Water and Sanitation (DWS) carries the responsibility of ensuring that all water sources are properly protected, conserved, managed and developed. In light thereof, the DWS has increased its regulation of the Water Conservation/Water Demand Management (WC/WDM) affairs of Water Services Authorities across the country.

[7]The updated All Town Reconciliation Strategy reported in 2016 that the development of a comprehensive WC/WDM strategy and business plan for the water supply schemes within the UKDM in particular must be prepared for implementation in the next three to five years. The implementation plan should comprise of:

- ✓ An active leakage control programme;
- ✓ Refurbishment of old reticulation pipelines;
- ✓ Pressure management; as well as
- ✓ Consumer metering to manage consumer demand through a well-designed tariff structure, that encourages water use efficiency.

As part of the plan, annual water use efficiency and water saving targets should be set up, in order to monitor how successfully the WC/WDM intervention measures are being implemented

The UKDM IDP of 2018/2019 reported that the municipality does not have a formalised water conservation and water demand management strategy in place. The development and adoption of a formalised water conservation and water demand management strategy has been identified as one of the critical issues to address. The Non-Revenue water reduction programme whereby a number of bulk water meters were installed did not yield the intended results.

It also stated that the WSA need to improve their asset register to enable the WSA to perform water demand and loss studies of all the reticulations within its jurisdictional area and capture all the as built information for the entire water services infrastructure within the District. The WSA also undertook to proceed with the installation of a Management Information system (MIS) for the capturing of bulk water meter readings, reservoir levels and the recording of other critical operational information.

[7] Continuation of Reconciliation Strategies for All Towns (CRSAF) in the Eastern Region - Summary of the Water Reconciliation Strategy Options for the Schemes in the Umkhanyakude District Municipality for the Period - 2015 To 2045, September 2016

Not all the reduction in non-revenue water can be attributed to the programme as water restrictions were also imposed as well as industries reducing their usage to alleviate the effects of the drought.

The WSA prepares monthly water balances, in the IWA format, on a local municipality level, for submission to the DWS. The water balance for the WSA is presented in Table 4-2 for the month of December 2018.

Table 4-2: Umkhanyakude Water Balance, December 2018

<table>
<tr>
<td rowspan="10">Total System Input Volume
1 303 439 m³/month</td>
<td rowspan="5">Authorised Consumption
1 160 097 m³/month
Percentage of SIV = 89,0%</td>
<td rowspan="3">Billed Authorised Consumption
809 733 m³/month
Percentage of SIV = 62,1%</td>
<td>Billed Metered Consumption-Domestic
317 460 m³/month
Percentage of SIV = 24,4%</td>
<td rowspan="3">Revenue Water
809 733 m³/month
Percentage of SIV = 62,1%</td>
</tr>
<tr>
<td>Billed Metered Consumption-Commercial
470 785 m³/month
Percentage of SIV = 36,1%</td>
</tr>
<tr>
<td>Export Volume
21 488 m³/month
Percentage of SIV = 1,6%</td>
</tr>
<tr>
<td rowspan="2">Unbilled Authorised Consumption
350 364 m³/month
Percentage of SIV = 26,9%</td>
<td>Billed Unmetered Consumption
- m³/month
Percentage of SIV = 0,0%</td>
</tr>
<tr>
<td>Unbilled Metered Consumption
100 317 m³/month
Percentage of SIV = 7,7%</td>
<td rowspan="5">Non-Revenue Water
493 706 m³/month
Percentage of SIV = 37,9%</td>
</tr>
<tr>
<td rowspan="5">Water Losses
143 342 m³/month
Percentage of SIV = 11,0%</td>
<td rowspan="2">Apparent Losses
22 935 m³/month
Percentage of SIV = 1,8%</td>
<td>Unbilled Unmetered Consumption
250 047 m³/month
Percentage of SIV = 19,2%</td>
</tr>
<tr>
<td>Unauthorised Consumption
- m³/month
Percentage of SIV = 0,0%</td>
</tr>
<tr>
<td rowspan="3">Real Losses
120 407 m³/month
Percentage of SIV = 9%</td>
<td>Metering Inaccuracies
- m³/month
Percentage of SIV = 0,0%</td>
</tr>
<tr>
<td>Mains and Dsitribution Leaks
- m³/month
Percentage of SIV = 0,0%</td>
</tr>
<tr>
<td>Reservoir Overflows
- m³/month
Percentage of SIV = 0,0%</td>
</tr>
<tr>
<td>Service Connection Leaks
- m³/month
Percentage of SIV = 0,0%</td>
</tr>
</table>

Source: KZN IWA Water Balances, 2018

The non-revenue water for the WSA in December 2018 was at 16,5Mℓ/d. If using a rate of R6.00/kℓ, this amounts to a loss of R 99 000 per day. Only 27Mℓ/d of the SIV of 45Mℓ/d can be billed and is accounted for.

4.3 WATER DEMAND MODEL

The Water Demand Model as described within Section 1.5 was applied to the Umkhanyakude District Municipality and the population growth estimates utilising Census' Community Survey 2016 as base were used to determine the project population until 2050 of which the detailed are provided within the paragraphs hereafter.

4.3.1 *Water Demand for Umkhanyakude District Municipality*

The water requirements (in Mℓ/d) for the UKDM are presented per Local Municipality within Table 4-3. 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 UKDM would require by the year 2050, 177,18 Mℓ/day.

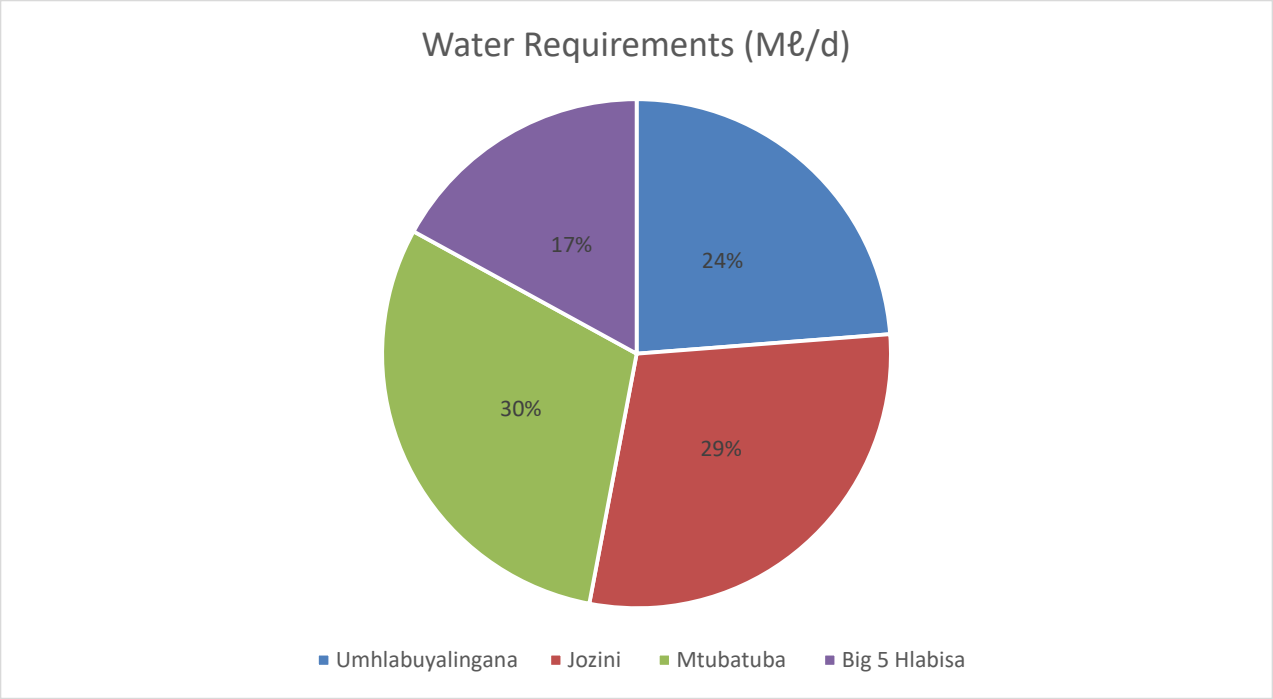
Table 4-3: Water Requirements (Mℓ/d), Per Local Municipality

Local Municipality	Population 2020	Water Requirements (Mℓ/d)						
		2020	2025	2030	2035	2040	2045	2050
Umhlabuyalingana	186 924	32.68	33.93	35.29	36.84	38.49	40.24	42.10
Jozini	221 466	40.12	41.67	43.36	45.28	47.32	49.48	51.77
Mtubatuba	208 319	41.46	43.02	44.71	46.65	48.70	50.87	53.17
Big 5 Hlabisa	126 461	23.40	24.29	25.27	26.38	27.56	28.81	30.13
TOTAL	**743 170**	**137.65**	**142.91**	**148.63**	**155.14**	**162.06**	**169.39**	**177.18**

All of the LMs in the District, are classified as Category B-Municipalities, signifying a combination of market and business activities and opportunities, surrounded by a reasonably productive agricultural area as well as a rural, mainly subsistence economy. The settlements are generally small and the incomes of their inhabitants low, which means very few opportunities for markets, SMME formation and LED initiatives.

The 2050 water requirements per LM are presented within Figure 4-2: 2050 Water Demand in Mℓ/day per LM in the form of a pie chart, illustrating that the Mtubatuba LM will be the largest water consumer in the UKDM requiring 30% of all water followed by the Jozini LM with 29%. The aforementioned can be ascribed to the fact that the majority of the secondary economy and agricultural activities are located within these two (2) Municipalities.

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



4.3.2 Demand per Regional Water Scheme

The water requirements for UKDM are presented in this section per existing Water Supply Scheme (WSS) area and potential future Water Supply Intervention Area (WSIA) area for the entire DM, thus covering all consumers in the municipality. Table 4-4: Water Demand per WSS/WSIA in Mℓ per day represents the water requirements in Mℓ/d.

The Shemula WSS/WSIA and the Jozini WSS/WSIA has the highest water demand of approximately 18% and 14% respectively. These WSS/WSIA are also the biggest two supply areas within the UKDM and would be serving close to 53% of the UKDM population.

Table 4-4: Water Demand per WSS/WSIA in Mℓ per day

Water Supply Scheme / WSIA		Population 2020	Water Requirements (Mℓ/d)						
			2020	2025	2030	2035	2040	2045	2050
Con001	Conservation	1 912	0.40	0.42	0.43	0.45	0.47	0.49	0.51
Farm001	Farmland	1 066	0.26	0.27	0.28	0.29	0.30	0.31	0.33
UK001	Hlabisa	62 370	11.16	11.59	12.05	12.59	13.15	13.75	14.39
UK002	Shemula	220 211	38.70	40.19	41.82	43.68	45.65	47.75	49.97
UK003	Mpukunyoni	61 178	10.57	10.98	11.42	11.93	12.48	13.05	13.66
UK004	Jozini	172 100	30.54	31.71	32.98	34.43	35.97	37.61	39.35
UK005	Hluhluwe	145 171	25.84	26.81	27.88	29.09	30.37	31.74	33.19
UK006	Mtubatuba	64 142	16.84	17.47	18.14	18.91	19.73	20.58	21.49
UK007	Mkuze	15 020	3.35	3.48	3.61	3.77	3.93	4.11	4.29
TOTAL		**743 170**	**137,65**	**142.91**	**148.63**	**155.14**	**162.06**	**169.39**	**177.18**

5. EXISTING WATER SUPPLY INFRASTRUCTURE

This section provides an overview of the available water resources as well as the current surface water supplied schemes and the larger groundwater schemes (not for individual consumption).

5.1 WATER RESOURCE AVAILABILITY

The Umkhanyakude WSA falls within the Pongola-Mtamvuna Water Management Area (See Figure 5-1 overleaf). Major rivers affecting the WSA include the Pongola, Mhlatuze, Mfolozi and the Mkuze rivers. The tertiary drainage regions are W11 to W13, W31 to W32, W41, W45, and the portions of W42, W43, W44 and W57 falling within the boundary of the RSA as well as T40, T51 and T52 Mkuze/Hluhluwe, and the Mfolozi catchments. The area has a wide diversity of aquatic and wetland habitats, and supports many faunal and floral species, due to the area having both subtropical and temperate features, and mountainous and flat areas.

5.1.1 Pongola & Mkuze river systems

[8]The Pongola River system is major river in the Umkhanyakude District Municipality, which is part of the shared watercourse of the Rio-Maputo River system. The Pongola River is well regulated with the Pongolapoort Dam being one of the largest dams in the country with a storage capacity of 2 445 million m^3.

The Pongolapoort Dam is the main source of domestic water supply for the downstream water users up to the border with Mozambique. Water is also transferred from the Dam to the Mkuze River where it supplies the Mkuze town as well as Zululand District Municipality. There is significant conjunctive use of the water resources of the Pongola River system. This includes the direct abstraction from the Pongolapoort Dam, the releases from the dam for downstream abstraction by existing water supply systems, the groundwater abstraction, particularly in the W70A coastal aquifer and abstraction from Lake Sibaya as well as a number of small rivers and streams in the north eastern parts of the Umkhanyakude District Municipality.

The dam has a storage capacity of 2 445 million m^3. This is equivalent to 2.97 times the Mean Annual Runoff of the upper catchments of the Pongola River system. The dam was developed mainly for irrigation purposes although it now also supplies the domestic water requirements.

The other surface water resource is Lake Sibaya, a freshwater source, which is currently supplying the Mseleni and Mbazwana water supply systems. It is estimated that the natural runoff into Lake Sibaya is 25Mm^3/a (ISP, 2004) with an estimated storage capacity of 700 Mm^3. Groundwater recharge is high, as is the groundwater potential. The Kwazulu-Natal coastal aquifer underlies much of this catchment

[8] Continuation of Reconciliation Strategies for All Towns (CRSAF) in the Eastern Region - Summary of the Water Reconciliation Strategy Options for the Schemes in the Umkhanyakude District Municipality for the Period - 2015 To 2045, September 2016

N

MOZAMBIQUE

SWAZILAND

Zululand

Pongola - Mtamvuna

W57E
W57H
W57J
W57K
W57G
W43F
W45B
W43E
W43D
W70A
W44E
W44C
W44D
W45A
W44B
W32A
W31J
W31G
W32B
W31H
W31L
W31F
W31K
W32C
W22K
W32D
W32F
W22J
W32E
W32H
W22L
W32G
W21L
W23A
W23D
W23B
W23C
W12G
W12J
W12H
W12D
W12E
W12F

Jozini Local Municipality
Umhlabuyalingana Local Municipality
uPhongolo Local Municipality
Nongoma Local Municipality
Big 5 Hlabisa Local Municipality
Mtubatuba Local Municipality
Mthonjaneni Local Municipality
uMfolozi Local Municipality
City of uMhlathuze Local Municipality
uMlalazi Local Municipality

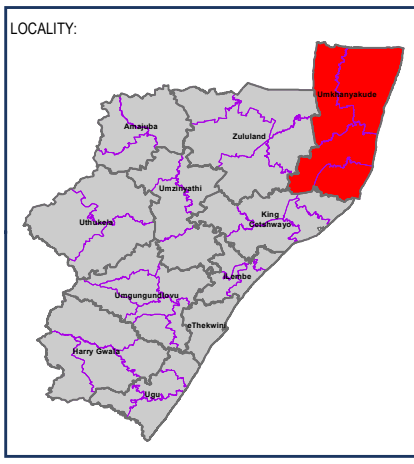
Pongolapoort
Kutlange
Lake Sibayi
Lake St Lucia
Richards Bay

10 5 0 10 20 Kilometers

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

DISTRICT MUNICIPALITY:

UMKHANYAKUDE DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

MARISWE
JTN CONSULTING

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
Fax: + 27 (0) 12 460 4071
Email: pretoria@mariswe.com

PROJECT TITLE

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

MAP TITLE:

Water Resources

Umkhanyakude District Municipality

DATE COMPLETED:
30 September 2020

MAP NO.:
DC27: Figure 5.1

and the potential for groundwater use is therefore high. The total water available for use was determined to be 16.44 million m^3/a

The natural MAR of the coastal catchment W70A, which is the source of supply for Mbazwana is $111Mm^3$. Although the rainfall in the catchment is relatively high (769 Mm^3/a), the surface runoff is limited due to the very flat terrain.

The water supply schemes (WSS) that are dependent on the Pongolapoort Dam or could potentially be supplied from the system include the following:

- ✓ *Shemula water supply scheme* – This is the largest WSS and the scheme may be extended to include Pelindaba and Kwangwanase WSS's in future as continued groundwater abstraction may negatively impact on the wetlands in these schemes. The Shemula WSS is dependent on releases from the Pongolapoort Dam some 46 km upstream of the scheme.
- ✓ *Jozini north and Nondabuya schemes* – These schemes are located on the left bank of Pongolapoort Dam and are supplied by an abstraction works on the left bank of the dam.
- ✓ *Jozini-Makhatini water supply scheme* – The town of Jozini is located on the right bank of Pongolapoort Dam and extends to the shores of the dam. It gets its water directly from the dam. The scheme extends into Makhatini flats up to a small river called Muzi and the Mkuze River in the south. Depending on the availability of the water resources of Lake Sibaya and groundwater, the scheme areas of Mbazwana and Mseleni may in the long term be supplied from the Pongola River system.
- ✓ *Mkuze-Ubombo water supply scheme* – the administrative centre of Umkhanyakude District Municipality gets its raw supply from the Mkuze River and is supplemented from the Pongola River.

There are five other water supply schemes that are currently not directly dependent on the Pongola River but on local resources such as groundwater and Lake Sibaya. These are likely to be supplied from the Pongola River system in the long term and include the Mbazwana, Mseleni, Kwangwanase, Pelindaba and Ekhanyezeni WSS's.

5.1.2 Water Resource Availability

In the short to medium term, there are sufficient local resources from groundwater and Lake Shengezi to meet the future water requirements of Kwanganase and Pelindaba water supply schemes. The water available for use based on the groundwater recharge potential of 5% of the MAP of quaternary catchment W70A is approximately 1.67 million m^3/a, or 4.5 Ml/d, based on the aquifer area of 18.85 km^2.

The water available for use based on the groundwater recharge potential of 5% of the MAP of quaternary catchment W70A is approximately 1.82 million m^3/a, or 4.98 Ml/d, based on the aquifer area of 47.285 km^2 for the areas of Mseleni and Mbazwana water supply schemes. This source together with the abstraction from Lake Sibaya will provide sufficient resource to meet the future water requirements of the two schemes

until 2040. However, there may be restrictions necessary on the level of groundwater abstraction in order not to negatively impact on levels of Lake Sibaya, which is fed from the groundwater.

The Pongolapoort Dam has a storage capacity of 2 445 million m^3/a, and a historical firm yield of 530 million m^3/a. However, some of the yield is released to maintain the Makhatini floodplain. The current operating rule for the floodplain results in a yield impact of 250 million m^3/a. Besides meeting the water requirements of South Africa, the Pongolo River is an international shared watercourse and some of the water is released to meet the international obligations in accordance with the Interim Inco-Maputo Agreement (IIMA). Besides the releases for the Makhatini Floodplains, and for international requirements, the major water user downstream of the dam is irrigation agriculture, which has a registered water use of 70.23 million m^3/a. The water use for the domestic sector is very small.

The water balance assessment indicates that there is surplus water available in the Pongola River system to meet the future water requirements of the domestic sector in the supply areas that can be supplied from or supported by the Pongolapoort Dam. It is estimated that the surplus water available as provided in the ISP of 2004 is 102 million m^3/a. There was an application for the development of cotton in the area, which would require 60 million m^3/a. Compared with the total water requirements of all the schemes in the area of 64,66 Million m^3/a in 2050, there will not be sufficient water available in the Pongolapoort Dam to meet the domestic water needs of the schemes. It is however important that local resources in the scheme areas are fully utilised before the resources of the Pongolapoort Dam are used, particularly in the case of Kwangwanase, Ekhanyezeni, Mseleni and Mbazwana WSS.

Although there are several boreholes that were drilled in the coastal area, there is no well-developed groundwater management plan to optimise on the available groundwater in the Kwangwanase, Mseleni and Mbazwana WSS's in particular. The safe yield of the boreholes in the area ranges between 0.5 l/s and 3 l/s on average. With a high groundwater recharge capacity for these scheme areas, there is potential to develop an optimal groundwater supply system which can supply a bulk water supply system.

The Mseleni and Mbazwana WSS obtain some of their water supply from Lake Sibaya. A recent hydrological assessment conducted by Terratest indicates that there is potential for domestic water to abstract 1.0 million m^3/a (3.0 Ml/d) from Lake Sibaya. This will require removal of the illegal forestry in the area. This will be sufficient to meet the water requirements of the area until 2040. However, cognisance must be taken of the ecological water requirements of the Lake, before further allocation is made from the Lake or from boreholes in the draw-down zone of the Lake.

An additional 11.7 million m^3/a will be required from the Pongola River system to address the current and the long-term water requirements of the schemes in the area. The reduction in the additional water requirements is because 4.49 million m^3/a can be locally developed in the Kwangwanase, Mseleni and Mbazwana water supply schemes.

5.1.3 Mfolozi Hluhluwe River Systems

The Mfolozi River system is major river which forms the border between the Umkhanyakude and uThungulu District. It has its headwaters in the Zululand District Municipality as the White Mfolozi River in the south and the Black Mfolozi River in the north. The two major tributaries then confluence at the border of Umkhanyakude District Municipality to form the Mfolozi River which then flows into Lake St Lucia and the Indian Ocean. The Mfolozi River is a very sandy river system and is regulated above the confluence of the White Mfolozi and the Black Mfolozi River.

The Hluhluwe River system flows into the Lake St Lucia and is very important from an ecological perspective. It is regulated with the Hluhluwe Dam, which has a storage capacity of 25.9 million m^3. The two river systems have been combined because of the potential of supplying Hluhluwe from the Mfolozi River. The water supply schemes that are dependent on the Mfolozi and Hluhluwe River systems or could potentially be supplied from the two systems include the following:

- ✓ *Mtubatuba water supply scheme* –It includes the town of St Lucia and Mtubatuba which is located along the N2 highway. This scheme is dependent on run-of-river abstraction from the Mfolozi River system.
- ✓ *Hluhluwe town water supply* – The town of Hluhluwe and neighbouring communities are located on the left bank of Hluhluwe River and are supplied by an abstraction works on the left bank of the Hluhluwe dam.
- ✓ *Hluhluwe rural water supply scheme* – This scheme covers the area to north and north east of Hluhluwe town, comprising mainly rural communities. The scheme is dependent on the water resources of the Hluhluwe River.
- ✓ *Mpukunyoni water supply scheme* – The scheme is located west of Mtubatuba and extends as far as the border with Zululand District Municipality. The Nyalazi River is a seasonal river that flows through the scheme area before it discharges into the Lake St Lucia.

5.1.3.1 Water Resource Availability

The main source of supply for the two schemes of Mtubatuba and Mpukunyoni, is the run-of-river abstraction from the Mfolozi River system. Water is abstracted directly from Hluhluwe Dam for supply to the Hluhluwe WSS. The total water available from the two river systems was determined to be 7.96 million m^3/a. The allocation from the Hluhluwe Dam to domestic use is 2.81 million m^3/a with the remainder being allocated for the commercial irrigation downstream of the Hluhluwe Dam for pineapple farming.

The main source of supply is the Mfolozi River which is unregulated with the schemes relying on run-of-river abstraction during the rainy season. During the dry winter periods the Mfolozi River in most cases, has only sub-surface flow. A sand abstraction system has to be developed to address the shortages that are experienced during the low flow periods.

The cumulative natural Mean Annual Runoff (MAR) of the Mfolozi River catchment system up to the abstraction point at Mtubatuba is 821.38 million m^3/a. The MAR determined does not take into account the uptake of water by alien vegetation as well as upstream abstraction by the agricultural sector. There is no irrigation agriculture, taking place in the Mfolozi River system, with the exception of opportunistic agriculture.

The low flow runoff of the Mfolozi River is important for Mtubatuba particularly with the increasing demands upstream of the abstraction works. From WR2005, it has been estimated that the natural flow with a 1:50 year recurrence interval being available at the Mtubatuba abstraction works will be approximately 5.26 million m^3 and 8.09 million m^3 for the 1-month and 3-month durations respectively. This translates to approximately 7.39 million m^3/a. However, because of the sandy nature of the Mfolozi River, only 50% of this low flow is available during the year.

The Hluhluwe Dam has a storage capacity of 25.89 million m^3 and a historical firm yield ranging from 8.5 million m^3/a to 23 million m^3/a, based on differing reports. The MAR at the Hluhluwe Dam outlet is 23.89 million m^3/a. Depending on the capacity of the dam it is unlikely that the yield of Hluhluwe Dam can be 23 million m^3/a and has therefore been assumed to be 8.5 million m^3/a. Besides meeting the downstream water requirements, the Hluhluwe Dam may be required to release the environmental water requirements (EWR) especially with iSimangaliso Wetland Park, being downstream of the dam. Currently there is very limited unutilised water from the dam which makes it unlikely to meet the EWR in the future. The major water user downstream of the dam is irrigation agriculture which has a registered water use of 11.54 million m^3/a and water use for the domestic sector which is 3.63 million m^3/a, which includes the Hluhluwe Water Supply Scheme.

Groundwater is currently being used conjunctively with the surface water supplies as well as supplying stand-alone schemes in the outer lying areas of the formal water supply systems. The geology of the Mtubatuba supply area is such that the groundwater recharge capacity is significant. The Mfolozi River is a groundwater dominated system in the lower sections of the system. The geology and the topography of the area are such that there is potential for significant groundwater development. Currently no significant groundwater use has been developed for the Mtubatuba WSS although there are a number of boreholes supplying the communities in the scheme area as stand-alone systems.

The groundwater development potential of the area around Mtubatuba is very high. The quaternary (Pleistocene and Holocene) inter-granular formations and late Miocene Uloa formations are potential productive aquifers which may alleviate the current and future water shortages if a sound groundwater assessment, exploration and development programme is implemented. Groundwater levels are generally shallow with 50 % of boreholes having a water level less than 25 m below ground level. The highest yielding borehole in the Maputaland Group is in the Uloa Formation, with yields of 15 l/s easily obtained. The potential for drilling a successful borehole in the region is 95% (King 2003). An additional target area may be the cluster of predominantly W-E striking faults located about 16 km north-west of the town of Mtubatuba, within quaternary sub-catchment W32G.

The utilisable groundwater exploitation potential for quaternary catchment W23D during the dry season was estimated to be 18 Ml/d (6.59 million m^3/a), while the annual utilisable groundwater exploitation potential based on GRDM evaluations for this catchment, was estimated at 17.78 million m^3/a. Therefore, a significant proportion of the current and future water requirements of the Mtubatuba WSS can be met through development of the groundwater resources.

In the Hluhuluwe Water Supply Scheme area, the geology and the topography of the area are such that there is limited potential for significant groundwater development. Currently four boreholes with a combined yield 115 000 m^3/a have been registered within a 5 km radius of the town Hluhluwe. However, there are unregistered boreholes that are supplying water to a number of the villages in the Hluhluwe WSS.

When comparing the current water requirements of the schemes in the Mfolozi and Hluhluwe catchments of 16.3 million m^3/a (or 44.7 Ml/d) to the bulk water supply capacity of 26.11 Ml/d (or 9.5 million m^3/a), the existing bulk water supply infrastructure, is not sufficient to meet the current water requirements at a higher level of service. In the short to medium term, there is a shortage of the raw water supplies to address the current water services backlogs, particularly in the Mtubatuba WSS, which includes Dukuduku forests and St Lucia. There is a very urgent need to address the current water supply shortages in all the scheme areas of the Mfolozi and Hluhluwe River systems.

The Mfolozi River run-of-river is limited to approximately 3.69 million m^3/a. This is not sufficient to meet the current water requirements of the scheme area. The Hluhluwe Dam can only supply approximately 3.63 million m3/a to Hluhluwe town and the surrounding areas because of the irrigation water requirements needs from the dam. With the high MAR of the Mfolozi River there is potential to develop an off-channel storage in the supply area. The off-channel storage dam can also be a source of supply for the Mpukunyoni WSS. Lake Ntweni is situated about 15 km upstream of the N2 Bridge on the Northern side of the Mfolozi River. One of the options being investigated by UKDM is the raising of Lake Ntweni in order to meet the current and future water requirements of Mtubatuba and surrounding areas. The proposed scheme will include the construction of a dam wall on the lake and a bulk water supply pipeline from the intake works to Mtubatuba WTP. The capacity of the proposed Lake Ntweni Dam as an off-channel storage dam is approximately 6 million m^3. This will be sufficient to meet the demand during the low flow period. It is envisaged that the dam will have a yield of 5.85 million m^3/a.

5.2 WATER SUPPLY SCHEMES

The six (6) major schemes are:

- ✓ Shemula: covering the northern region;
- ✓ Jozini: covering the major portion of Jozini LM to Mseleni and Mbazwana in uMhlabuyalingana LM;
- ✓ Hluhluwe: This covers the local municipality of The Big 5 False Bay;
- ✓ Hlabisa: Covering the area of Hlabisa LM that falls outside of the Hluhluwe Game Reserve;
- ✓ Mtubatuba; and

- ✓ Mpukunyoni.

The six water supply scheme areas are depicted in Figure 5-2 for the UKDM overleaf.

5.2.1 The Shemula Scheme

The Shemula Scheme as illustrated within Figure 5-3 overleaf abstracts water from the Pongola River and is treated at the Shemula WTP with a capacity of 27Mℓ/day. The scheme has 13.5 million m3/a (37 Mℓ/day) registered on WARMS (as at December 2015), which is significantly higher than the current use of 5.46 Mℓ per day, more than the capacity of the Shemula WTWs.

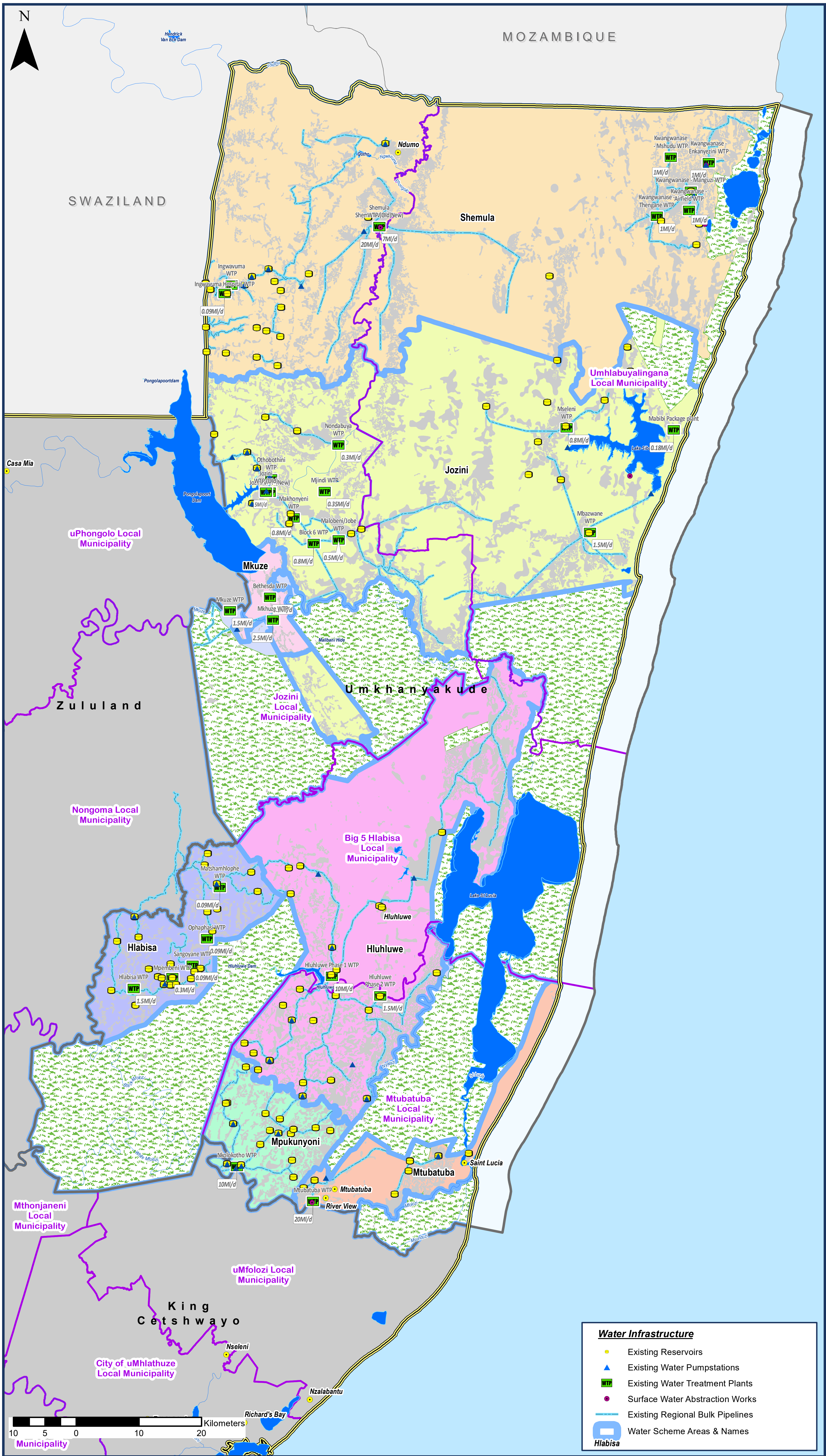
Table 5-1: Shemula Regional Bulk Water Treatment Plant Details

LM	Regional Scheme	Sub-Scheme	Source	Water Treatment Plant	Design Capacity	Current Operating Capacity	Works Classification
				Plant Names	(Ml/Day)	(Ml/Day)	
uMhlabuyalingana	**Shemula**	Shemula	Pongola	Shemula (old)	7	5.46	E
	Shemula	Shemula	Pongola River	Shemula (new)	20	20	C

Source: UKDM Water Services District Master Plan, 2016 2016 and updated with WSDP information received in 2020

Treated water is pumped from the Shemula works to the Shemula command/balancing reservoir. From here water flows North, towards Ndumo, West towards Ingwavuma and East towards Shongwe town and surrounding areas. East, again from the Shemula reservoir, water gravitates East along the existing 250mm ø main to the Shongwe Reservoir, with off-takes along the way feeding the area of Embonisweni. From the Shongwe reservoir, water gravitates further to the Phelandaba Booster pump Station where it is pumped North to Phelandaba North reservoir and also gravitates South to Phelandaba South. Despite the Shemula scheme's large extent, the scheme is augmented with five (5) stand-alone schemes that are supplied by boreholes. These schemes are Manyiseni, Manguzi, Thengane, Mshudu and Enkanyezini, each supplied by small WTWs of which the details are as follows:

- ✓ Manyiseni - There is no existing bulk supply in Manyiseni, however there is a proposed bulk supply line that is planned to branch from a bulk supply pipeline supplying water to Ingwavuma from the Shemula WTP. This proposed bulk pipeline will extend from Manyiseni Town and its ø ranges from 200mm to 300mm.
- ✓ Manguzi - This sub-scheme draws water from Gezisa stream, and several boreholes. The details of the airfield wellfield are: Airfield 1 and Airfield 1a with each yielding 10l/s that amounts to a daily delivery of 633m^3/day; Airfield 2 and Airfield 2a – each yielding 12l/s amounting to a daily delivery of


N
MOZAMBIQUE
SWAZILAND
Hendrick Van Eck Dam
uSuthu
Ndumo
Qotho
Ngwavuma
Phongolo
Shemula
Shemula
Shem WTP (Old) New)
7Ml/d
20Ml/d
Ingwavuma WTP
Ingwavuma Hospital WTP
0.09Ml/d
Kwangwanase - Mshudu WTP
Kwangwanase - Enkanyezini WTP
1Ml/d
1Ml/d
Kwangwanase - Manguzi WTP
Kwangwanase - Airfield WTP
Kwangwanase - Thengane WTP
1Ml/d
1Ml/d
Pongolapoortdam
Casa Mia
Pongolapoort Dam
uPhongolo Local Municipality
Umhlabuyalingana Local Municipality
Nondabuya WTP
0.3Ml/d
Othobothini WTP
Jozini WTP (Old) (New)
5Ml/d
Mjindi WTP
0.35Ml/d
Makhonyeni WTP
0.8Ml/d
Malobeni/Jobe WTP
Block 6 WTP
0.8Ml/d
0.5Ml/d
Jozini
Mseleni WTP
0.8Ml/d
Mabibi Package plant
Lake Sibaya
0.18Ml/d
Mbazwane WTP
1.5Ml/d
Mkuze
Bethesda WTP
Mkuze WTP
Mkhuze WTP
1.5Ml/d
2.5Ml/d
Malibani Hide
Zululand
Umkhanyakude
Jozini Local Municipality
Nongoma Local Municipality
Big 5 Hlabisa Local Municipality
Lake St Lucia
Matshamhlophe WTP
0.09Ml/d
Ophaphasi WTP
Hlabisa
Sangoyane WTP
0.09Ml/d
Mpembeni WTP
Hlabisa WTP
0.09Ml/d
0.3Ml/d
1.5Ml/d
Hluhluwe Dam
Hluhluwe
Hluhluwe
Hluhluwe Phase 1 WTP
10Ml/d
Hluhluwe Phase 2 WTP
1.5Ml/d
Black Mfolozi
White Mfolozi
Nyalazi
St Lucia
Mtubatuba Local Municipality
Mpukunyoni
Nkolokotho WTP
10Ml/d
Mtubatuba WTP
Mtubatuba
River View
20Ml/d
Mtubatuba
Saint Lucia
Mfolozi
Msunduzi
Mthonjaneni Local Municipality
uMfolozi Local Municipality
King Cetshwayo
Nseleni
City of uMhlathuze Local Municipality
Nzalabantu
Richard's Bay
Municipality
Kilometers
10 5 0 10 20
Water Infrastructure
Existing Reservoirs
Existing Water Pumpstations
Existing Water Treatment Plants
Surface Water Abstraction Works
Existing Regional Bulk Pipelines
Water Scheme Areas & Names
Hlabisa
Legend
Provinical Boundaries
District Municipality Boundaries
Local Municipality Boundaries
Farm Land & Conservation Areas
Driel Dam
Dams & Dam Names
Rivers
Settlements
Eshowe
Major Towns
Mshudu
UKDM Sub Scheme Areas & Names
LOCALITY:
Umkhanyakude
Amajuba
Zululand
Umzinyathi
Uthukela
King Cetshwayo
iLembe
Umgungundlovu
eThekwini
Harry Gwala
Ugu

CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

UMKHANYAKUDE DISTRICT MUNICIPALITY

CONSULTANTS:

Project No.: 27814

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
Fax: + 27 (0) 12 460 4071
Email: pretoria@mariswe.com

PROJECT TITLE

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

MAP TITLE:

Existing Scheme Areas & Infrastructure Components
Umkhanyakude District Municipality

DATE COMPLETED:
30 September 2020

MAP NO.:
DC27: Figure 5.2

SWAZILAND

MOZAMBIQUE

N

Ndumo

Manyiseni

Ingwavuma

Emboniseweni

Phelandaba North

Phelandaba South

Mshudu

Enkanyezini

Manguzi

Shemula

Thengane

Umhlabuyalingana Local Municipality

Jozini Local Municipality

U m k h a n y a k u d e

Jozini

Ndumo Game Reserve

Tembe Elephant Reserve

Lake Sibaya

Pongolapoort Dam

Pongola

Kilometers

5 2.5 0 5 10

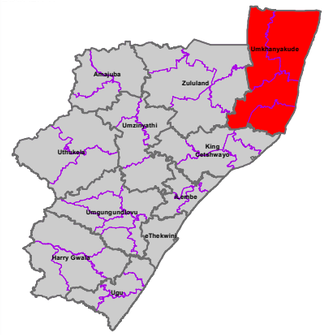
Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Farm Land & Conservation Areas
- Dams & Dam Names
- Rivers
- Settlements & Settlement Names
- Major Towns
- UKDM Sub Scheme Areas & Names

Water Infrastructure

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

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

UMKHANYAKUDE DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

MARISWE

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
Fax: + 27 (0) 12 460 4071
Email: pretoria@mariswe.com

PROJECT TITLE

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

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Shemula
Umkhanyakude District Municipality

DATE COMPLETED:
30 September 2020

MAP NO.:
DC27: Figure 5.3

- ✓ 875m^3/day; Airfield 3 – Airfield 3a each yielding 8l/s with a daily delivery amounting to 644m^3/day and eManguzi 1 – yielding 5l/s with a daily delivery of 454 m^3/day.
- ✓ Thengane - This sub-scheme draws water from a wellfield of five boreholes; and is treated at a package treatment plant. The details of the five boreholes as per the Water Project Feasibility report Shemula Water Supply Scheme-upgrade, February 2014 report are:
    - o Bom 12 -12ℓ/s,
    - o Libuyile – 5.3ℓ/s,
    - o Bom 10a – 3ℓ/s,
    - o Thengani- 5.4ℓ /s; and
    - o Thengani B- 2ℓ/s.
- ✓ Mshudu - scheme draws water from a Mshudu borehole of 3ℓ/s where it is treated at Mshudu WTP (1Mℓ/day). It is also supplied with treated water from Thengane Reservoir 6 located in Thandizwe. The reservoir is supplied with water drawn from the Thengane well field and treated at the Thengane WTP.
- ✓ Enkanyezini – The sub-scheme gets its water from Kanini Stream and Tshong 4 borehole. The Tshong 4 borehole yields 10.5ℓ/s amounting to a daily delivery of 781.92 m³/day. The raw water abstracted from the two sources is treated at the Enkanyezini WTP (1Mℓ/day). North, from the Shemula reservoir, water is pumped to the Ndumo reservoir and is distributed in the rural area of Ndumo. West, from the Shemula reservoir, water gravitates along the newly constructed ø 400mm bulk main to the Ingwavuma pump station in the Siweni Area. Water is then pumped mountain ridge to the Ingwavuma Reservoir where it is then distributed into Ingwavuma.

Table 5-2 below presents a summary of the existing small treatment plants within the Shemula Supply Area.

Table 5-2: Summary of existing small treatment plants within Shemula-Supply Area.

LM	Sub-Scheme	Source	Water Treatment Plant	Design Capacity	Current Operating Capacity	Works Classification
			Plant Names	(Ml/Day)	(Ml/Day)	
uMhlabuyalingana	Enkhanyezini	Borehole	Kwangwanase -Enkhanyezini	1	0.72	D
	Thengane	Boreholes x 5	Kwangwanase -Thengane	1	0.90	D
	Manguze	Borehole	Kwangwanase - Manguzi	1.5	1.57	D
	Manguzi	Boreholes x 4	Kwangwanase - Manguzi Airfield	1	0.39	D
	Mshudu	Borehole	Kwangwanase - Mshudu	1	0.00	D
	Manguzi	Kanini Stream	Kwangwanase - Kanini	0.3	0.05	
	Manguzi	Gezisa Stream	Kwangwanase - Gezisa	1	0.30	
				6.8	3.93	

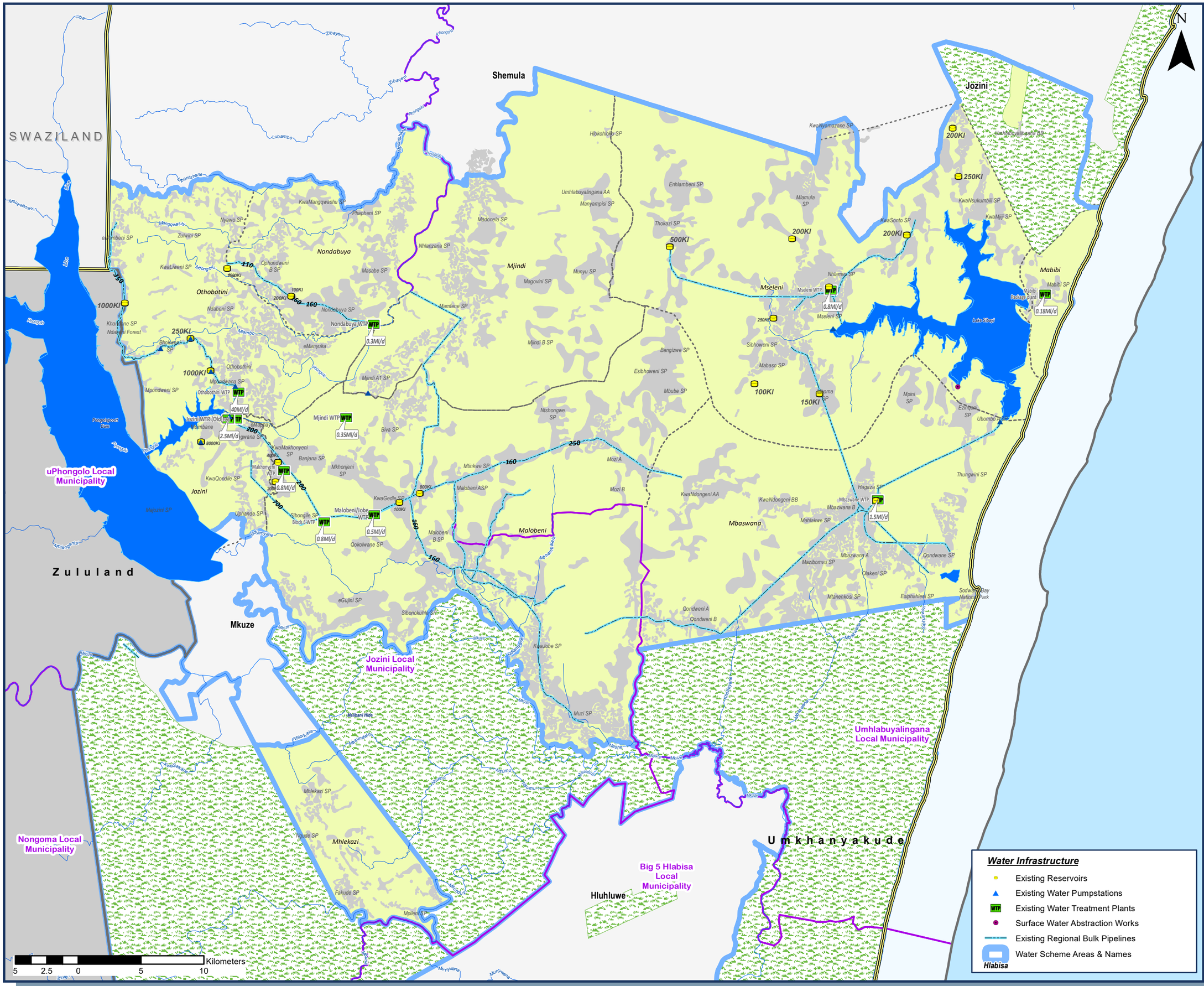
Source: UKDM Water Services District Master Plan, 2016 and updated with WSDP information received in 2020

5.2.2 The Jozini Supply Area

The Jozini Supply area is in the northern half of the UKDM, cutting across the southern parts of Jozini and uMhlabuyalinga LMs and illustrated within Figure 5-4 overleaf. The Jozini Supply Area comprises of a series of small scheme areas that are as follows:

- ✓ Tshongwe Malobeni;
- ✓ Othobothini;
- ✓ Nondabuya;
- ✓ Mjindini;
- ✓ Jozini;
- ✓ Mkuze;
- ✓ Mhlekazi;
- ✓ Mseleni; and
- ✓ Mbazwana.

The main source of supply of these sub-schemes (Jozini, Malobeni, Mjindi, Nondabuyo, Mkuze and Othobothini) currently is the Phongola River. The schemes are primarily supplied by small package treatment works. An allocation of 2.6 million m^3/a is registered on WARMS for the UKDM. The UKDM has registered a water allocation of 0.4 million m^3/a at the weir where the Jozini New WTP abstracts water. This is the equivalent of only 1.2Mℓ/day. The river's current water allocations and registered water users are discussed in 5.1 Water Resource Availability which shows that the Pongola catchment is significantly oversubscribed, and a solution needs to be found. Table 5-3 indicates a summary of the Water Treatment Plant in the Jozini Supply Area.



Legend

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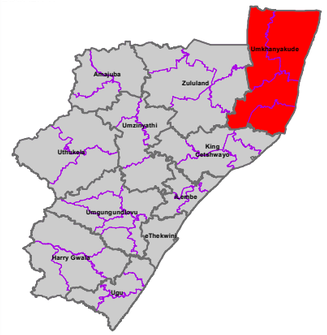

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MARISWE

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
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Email: pretoria@mariswe.com

PROJECT TITLE

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

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Jozini
Umkhanyakude District Municipality

DATE COMPLETED:

30 September 2020

MAP NO.:

DC27: Figure 5.4

Water Infrastructure

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

Table 5-3: Summary of Water Treatment Plant in the Jozini Supply Area

LM	Regional Scheme	Sub-Scheme	Source	Water Treatment Plant	Design Capacity	Current Operating Capacity	Works Classification
				Plant Names	(Ml/Day)	(Ml/Day)	
Jozini	Jozini	Jozini	Pongola River	Jozini Old	2.5	2.45	C
	Jozini	Jozini	Pongola River	Jozini New	5	4.99	
	Jozini	Malobeni	Pongola River	Malobeni old	0.5	0.31	D
	Jozini	Malobeni	Pongola River	Malobeni New			
	Jozini	Nondabuyo	Pongola River	Nondubuya	0.3	0.31	D
	Jozini	Mkuze	Pongolapoort Dam via Blackie Dam into Mkuze River	Mkuze	1.5	1.90	C
	Jozini		Not operational	Mkuze River	2.5	0.00	
	Jozini	Mkuze	Pongolapoort Dam via Blackie Dam into Mkuze River	Ubombo	0.3	0.55	
	Jozini	Othobothini	Pongola River	Block 6 Package	0.8	0.35	D
	Jozini	Mjindi	Pongola River	Mjindi	0.35	0.27	D
	?	?	Pongola River	Makhonyeni	0.8	0.58	D
	Jozini	Othobothini	Pongola River	Othobothini Old	0.5	0.44	D
	Jozini	Othobothini	Pongola River	Othobothini New	40		
	Shemula	Ingwavuma	Phophopho dam	Ingwavuma	0.5	0.00	
Total					**54.05**	**12.15**	

Source: UKDM Water Services District Master Plan, 2016 and updated with WSDP information received in 2020

The bulk distribution and reticulation of each scheme is summarized as follows:

- ✓ Jozini Old/New - The bulk pipeline extends from Mseleni Town to the north west towards KwaMlamula, to the north east towards KwaSonto and its ranges from ø 200 mm to ø 250 mm over some sections.
- ✓ Othobothini- The ø 800 mm bulk line is from a 40 Mℓ/day WTP in Othobothini to Mbazwana branching off towards KwaJobe and Mseleni. The bulk backbone extends from Othobothini rural area towards Hlatikula and Mombeni along road D 1837, north of Othobothini rural towards Ophondweni and its ø ranges from 250 to 320 mm for Hlatikhulu/ Mombeni section and ø 220 to ø 350 mm for Ophondweni.
  - ✓ Line to Kwajobe: The bulk line is a ø 250 mm pipe with an estimated length of 31.5 km. According to the demand model calculation, a ø 250 mm pipe is over design and instead the required is a ø 200mm pipe to cope with 3.48 Ml/day flow. Construction of the pipe is 80% complete.
  - ✓ Kwajobe branch to Mbazwana and Tshongwe: This section of the pipe begins at the branch to Kwajobe passing Tshongwe, then ending in Mbazwana supply area. The pipe ø is 250 mm of 18.5

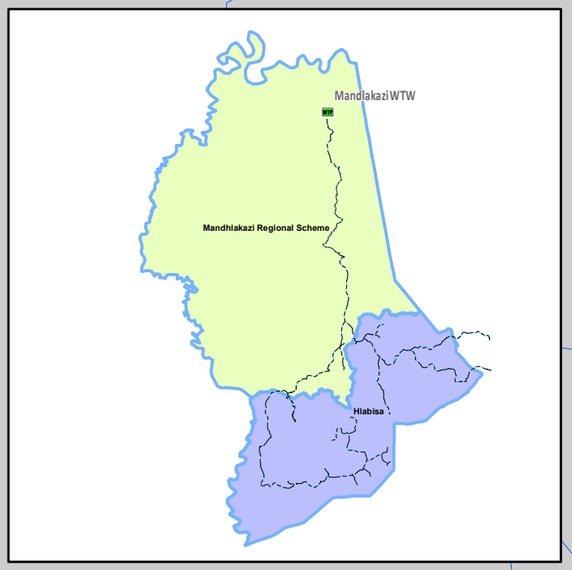
km length. This pipe won't be able to cope with the future demand flow since the recommended ø is 400 mm. It is recommended that the pipe must be revaluated.

- ✓ Nondabuyo - Reticulation extends from a water treatment plant towards Nondabuya rural, North towards Kwashukela and north west towards Ophondweni.
- ✓ Mjindi – The bulk pipeline extends from Mjindi WTP to the north towards Mafefe along road S 1 834 bulk pipeline branches to road D21 towards Biva community and also branches on A1188 road towards Maputuland.
- ✓ Mkhuze Ubombo– The bulk pipeline extends from outskirt of Mkuze towards Mkuze town. Potable is conveyed from the Mkuze WTP towards Ubombo reservoir crossing Mkuze River. Bulk line from Ubombo WTP extends to Town supplying the hospital and commercial/residence settlement and a limited supply is extended beyond the rural town.
- ✓ Mbazwana - The bulk backbone extends from Mbazwana Town towards Shazibe and Qondweni, to the west towards Monzi, south west towards KwaJozana and its ø ranges from 90mm to 200 over some sections. Because of the Ultimate demands for this sub-supply area exceeding the available yield from Lake Sibaya, it is recommended that Lake Sibaya be dedicated to the Mseleni Sub supply area only and Mbazwana be supplied from Pongolapoort Dam via the Jozini Regional bulk scheme.
- ✓ Mseleni - The bulk pipeline extends from Mseleni Town to the north west towards KwaMlamula, to the north east towards KwaSonto.
  - ✓ The ø 800 mm bulk line is from a 40 Mℓ/day WTP in Othobothini to Mbazwana branching off towards Kwajobe and Mseleni.

5.2.3 The Hlabisa Supply area

The Hlabisa Supply Area covers the Hlabisa Local Municipality. Hlabisa was also made up of eight (8) stand-alone small scheme areas provided by the WSA and is illustrated within Figure 5-5 overleaf. Currently the southern Hlabisa Scheme abstracts water from a small stream east of Hlabisa town as well a borehole with the premises of the Hlabisa WTP and the northern Hlabisa Scheme being served by the Mpembheni WTP which abstracts water from a single borehole. Hlabisa is further served by numerous stand-alone boreholes, some equipped with hand pumps with relatively low yield capacities.

The existing Hlabisa WTP has a capacity of 1,5Ml/day. The plant has been operating at very low flows with the earliest figures from the Operation and Maintenance Report from July 2014 indicating that the Plant has been unable to even produce 0.5 Mℓ/day (as slow as 0 flows for the month of February 2015). This is unfortunately due to existing source problems from the stream and borehole. The Mpembheni WTP has a capacity of 0.3Mℓ/day and is not operational with the last actual production figure of 0.2 Mℓ/d being in April 2015. These two works will be subsequently decommissioned upon the full operation of the new Hlabisa Water Scheme Infrastructure, and therefore treatment of water will be from the Mandlakazi WTP in Zululand District.



N

Zululand

Umkhanyakude

Big 5 Hlabisa Local Municipality

Mtubatuba Local Municipality

Ulundi Local Municipality

Mpukunyoni

Hlabisa

200KI
450
110
160
200KI
Mthwadlana SP
355
355
Dukumbane SP
200KI
200
250
500KI
355
MawuzaBB
500KI
200
100
Matshamnyama
Matshamlophe SP
200
500KI
500KI
KwaGula SP
Zibayeni SP
200
500KI
500KI
500KI
2000KI
Mgangado SP
KwaQunwane SP
315
Papasi SP
Mgovuzo SP
Nhlawathi SP
360
375
KwaThambeka SP
20KI
Sitezi SP
500KI
Hlabisa
Mpembeni SP
20KI
20KI
20KI
20KI
Madunjini SP
1000KI
1000KI
20KI
20KI
20KI
20KI
Amatshamnyama SP
280
500KI
20KI
20KI
Thandanini SP
KwaMkenkethe SP
80
20KI
20KI
Zidonini SP
2000KI
315
Bazaneni SP
150
Hlabisa SP
250
250
KwaSeme SP
Mabundeni SP
Mgwaqeni SP
Tanganeni SP
20KI
20KI
20KI
20KI
KwaQonsa SP
Nqotweni SP
Hlambanyathi SP
Mabhokisini SP
KwaHlabisa SP

5 2.5 0 5 10 Kilometers

Water Infrastructure

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

Hlabisa

Legend

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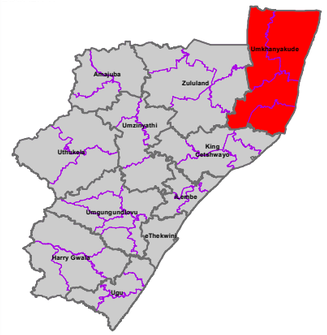

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CONSULTANTS: Project No.: 27814

MARISWE
JTN CONSULTING

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
Fax: + 27 (0) 12 460 4071
Email: pretoria@mariswe.com

PROJECT TITLE

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

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Hlabisa
Umkhanyakude District Municipality

DATE COMPLETED:

30 September 2020

MAP NO.:

DC27: Figure 5.5

This new Hlabisa scheme draws water via a cross-district agreement with Zululand District Municipality from the Mandlakazi Water Scheme. Raw Water from the Senekal Boerdery, who in turn source water via a license from the Pongola Poort Dam. The Charl Senekal is noted to have a license for abstraction of 32.6mil m^3/a, of which 2.6 million m^3/a (7.1Mℓ/day) is registered for domestic use to share between the Mkuze and Mandlakazi (and therefore Hlabisa) schemes. It should be noted that the Pongolapoort Dam is already over allocated, and an increase in the allocation from the Charl Senekal Trust should be confirmed. Table 5-4 presents the Water Treatment Plants within Hlabisa.

Table 5-4: Water Treatment Plants in Hlabisa

LM	Regional Scheme	Sub-Scheme	Source	Water Treatment Plant	Design Capacity	Current Operating Capacity	Works Classification
				Plant Names	(Ml/Day)	(Ml/Day)	
Hlabisa	Hlabisa	Hlabisa	Borehole	Mpembeni	0.3	no meters	D
	Hlabisa	Hlabisa	stream + 3 Boreholes	Hlabisa	1.5	0.05 No water	
					1.8	**0.05**	

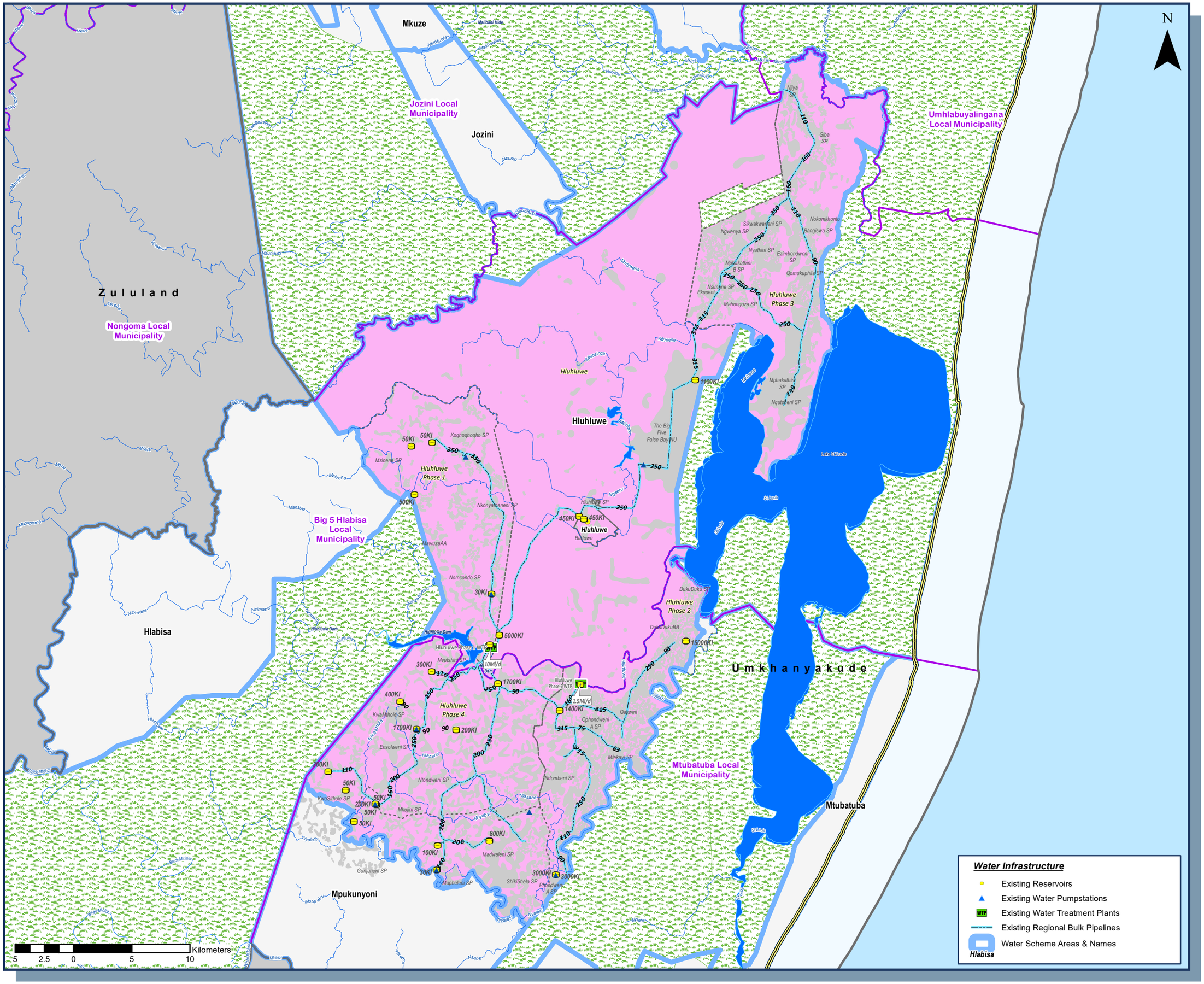
Source: UKDM Water Services District Master Plan, 2016 and updated with WSDP information received in 2020

The overall capacity of the new Mandlakazi WTP was upgraded to 20 Mℓ/d, which would comprise of 10.6 Mℓ/d for the Mandlakazi scheme area and 9.3 Mℓ/d would be reserved to be supplied to the Hlabisa Supply Area. It is noted that the raw water supply line has a capacity of only 10Mℓ/day.

After treatment at the Mandlakazi WTP, potable water "gravitates" into two (2) Hlabisa Scheme connection nodes H (Northern Area) and A (Southern Area) which comprise of two 55KVA pump stations. Water from each node is pumped via a 450mm ø rising mains into storage reservoirs and then into secondary distribution mains.

5.2.4 The Hluhluwe Supply Area

The Hluhluwe Supply Area covers The Big 5 False Bay Local Municipality. The entire Hluhluwe Supply area sources water from the Hluhluwe River, downstream of the Hluhluwe Dam and illustrated within Figure 5-6 overleaf. The Hluhluwe River is part of the Hluhluwe/Mkuze Catchment (W30) that is currently oversubscribed, primarily due to overuse in the Mkuze sub-catchment. The rivers flow into the Isimangaliso Wetland Park, and therefore protection of the Environmental Reserve is very important.



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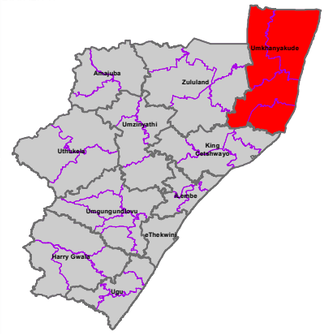

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Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

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Existing Scheme Areas & Infrastructure Components - Hluhluwe Umkhanyakude District Municipality

DATE COMPLETED: 30 September 2020

MAP NO.: **DC27: Figure 5.6**

Water Infrastructure

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

[9]The Hluhluwe Dam has a storage capacity of 25.89 million m^3 and estimates of the historical firm yield range from 8.5 million m^3/a to 23 million m^3/a based on differing reports. For this report, the yield of 13.5 million m^3/a is utilised as determined by the 2004 ISP study (Department of Water Affairs, 2004). UKDM has two water use registrations from W32F for the Hluhluwe Scheme totalling 9.8Ml/d. Hluhluwe 1 WTP has an allocation of 2.8 million m^3/a (7.6Mℓ/day) and Hluhluwe 2 WTP has an allocation of 0.79 million m^3/a (2.16 Mℓ/day).

There are two Water Treatment Plants supplying the area, the Hluhluwe 1 WTP is located at Hluhluwe Dam and currently supplies Hluhluwe Phase 1, Hluhluwe Farms, Hluhluwe Town, and Hluhluwe Phase 3 and Hluhluwe Phase 4. Potable water is pumped through a ø 300mm rising main to a 5000kℓ reservoir located in the Mdlesthe area. From Mdlesthe water is transferred to Hluhluwe town and Phase 3. Water is also being pumped South into Phase 4 via a ø 250mm rising main.

Bulk consumers include:

- ✓ Mdlesthe rural: ± 360kℓ/d
- ✓ Commercial farmers (19) and a game ranch: ± 130kℓ/d
- ✓ Hluhluwe town: ± 880kℓ/d

The Hluhluwe 2 WTP is located downstream of Hluhluwe Dam and supplies Hluhluwe Phase 2. From the treatment plant potable water is supplied to rural communities to the south (Ophondweni region) at approximately 650kℓ/d and communities towards False Bay in the north at approximately 650kℓ/d. Table 5-5 lists the Water Treatment Plant in the Hluhluwe Supply Area.

Table 5-5: Water Treatment Plant in the Hluhluwe Supply area

LM	Regional Scheme	Sub-Scheme	Source	Water Treatment Plant	Design Capacity	Current Operating Capacity	Works Classification
				Plant Names	(Ml/Day)	(Ml/Day)	
Hluhluwe	Hluhluwe	Hluhluwe	Hluhluwe River	Hluhluwe Phase1 (Dam)	10	6.3	B
	Hluhluwe	Hluhluwe	Hluhluwe	Hluhluwe Phase	1.5	1.46	B
Total					11.5	7.76	

Source: UKDM Water Services District Master Plan, 2016 and updated with WSDP information 2020

The bulk distribution and reticulation of each sub-scheme is summarised as follows:

- ✓ Hluhluwe Phase 1 – The bulk backbone extends from Hluhluwe 1 WTP to the north east towards Bartown or Hluhluwe Town passing Sikwakwaneni towards Njiya, branching after Sikwakwaneni to the south towards Nqutsheni and its ø ranges from 90mm to 315mm dia over some sections. The total storage in the Hluhluwe Supply area is 40.4 Mℓ.

[9] Umkhanyakude District Water Services Master Plan, rev 3, 2016

- ✓ Hluhluwe Phase 3: Hluhluwe Phase 3 is currently served from the Hluhluwe 1 WTP under the Hluhluwe Supply Area.

5.2.4.1 Water Resources Problem

In the water resources discussion in Section 4, it is noted that the Hluhluwe Dam has a yield of 13.5 mil m^3/a. The total registered use from the Dam is at a total of 14.8 mil m^3/a(40.5Mℓ/d) of which Domestic use is registered at 3.6 mil m^3/a (9.86 Mℓ/day). With the current high demand being 25.84Mℓ/day, the domestic component of the dam allocation is already exceeded the demand (shortfall of 15 Mℓ/day). Considering that the future domestic consumption is expected to be 33.19Mℓ/d(high) without considering increases in the agricultural demands (which is quite unlikely) the total future demand from the Hluhluwe Dam will be 64.4Mℓ/d (2050) which means the present yield will be exceeded by 24Mℓ/d.

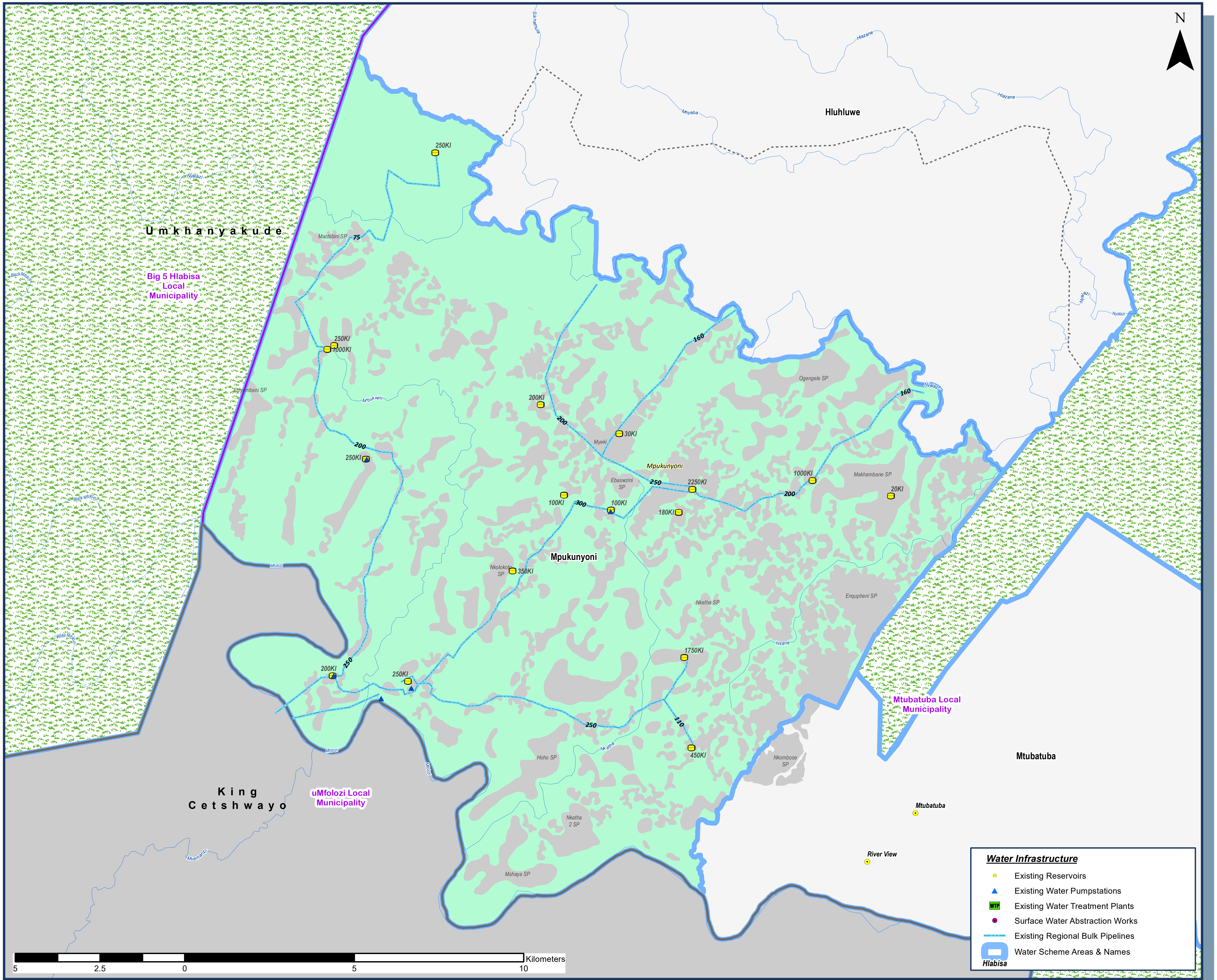
5.2.5 The Mpukunyoni Supply Area

A possible solution for this shortfall could be the increase in dam capacity by increasing the height of the dam resulting in a more adequate yield, however more detailed studies need to be done for this option. Another possibility is a transfer from the Mfolozi River.

Water Resource - This scheme draws raw water from the Mfolozi River with some raw water stored in the Mbukwini off channel storage pond. The yield in the Mfolozi River at the Nkolokoto WTP abstraction point is not known as studies of this area were not available. The Mpukunyoni Scheme shares the Mfolozi River as a water resource with the Mtubatuba Supply area. Due to the low flows in the Mfolozi River a potential long-term water resource solution affecting the Hluhluwe, Mpukunyoni and Mtubatuba Supply Areas should be considered.

Water Treatment - The abstraction point located on (X 32.033: Y -28.396) is currently not functioning under optimal capacity due to the low flow levels on the Mfolozi River. The abstracted raw water is transported from the abstraction point and pumped into a raw water channel and then gravitates into a raw water sump located in the vicinity of the Nkolokoto Water Treatment Plant. The scheme layout is illustrated in Figure 5-7 overleaf.

From the raw water sump, the water then gravitates into the Nkolokotho WTP inlet, any surplus water entering the sump overflows directly into the Mbukweni of channel storage dam which also has an independent gravity connection with the Nkolokotho WTP inlet as a reserve should the primary source be interrupted. There was unfortunately very little information pertaining to the capacity of the Mbukweni off channel storage pond for comments to be made on the storage capacity of the pond.



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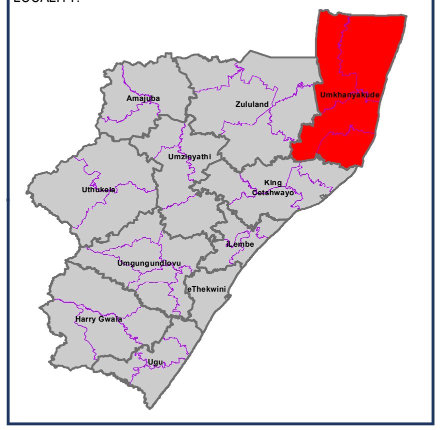
- UKDM Sub Scheme Areas & Names

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

UMKHANYAKUDE DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
Fax: + 27 (0) 12 460 4071
Email: pretoria@mariswe.com

PROJECT TITLE

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

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Mpukunyoni
Umkhanyakude District Municipality

DATE COMPLETED: 30 September 2020

MAP NO.: DC27: Figure 5.7

The Nkolokotho WTP is registered on WARMS for an abstraction of 10 Mℓ/d and is listed in Table 5-6 below.

Table 5-6: Water Treatment Plant in Mpukonyoni

LM	Regional Scheme	Sub-Scheme	Source	Water Treatment Works	Design Capacity	Current Operating Capacity	Works Classification
				Plant Names	(Ml/Day)	(Ml/Day)	
Mtubatuba	Mpukunyoni	Mpukonyoni	Mfolozi	Nkolokoto	5	4.5	C

Source: UKDM Water Services District Master Plan, 2016

This plant is currently being operated and maintained by WSSA and is generally in a good condition as preventative maintenance is being undertaken. No major refurbishment work is however undertaken currently.

The bulk distribution and reticulation of the supply area is summarised in Table 5-7. There is one prominent Water Treatment Plant (Nkolokotho) supplying the entire area, with distinct bulk pipelines and storage reservoirs. Table 5-7 provides a summary of the bulk distribution in the Mpukunyoni Supply Area.

Table 5-7: Summary of Bulk Distribution Mains

Ø	Length	Condition
300mm Rising Main	11 km	Good
250mm Rising Main	18 km	Good
250mm Gravity Main	1.4 km	Good
200mm Rising Main	5.5	Good
200mm Gravity Main	8 km	Good
160mm Gravity Main	11 km	Good
110mm Rising Main	2 km	Good
100mm Gravity Main	1.4 Km	Good
75mm Gravity Main	7 km	Good

Source: UKDM Water Services District Master Plan, 2016

Potable water is pumped from the WTP in three (3) directions:

- ✓ West, to the Nkumbaningi Reservoir and Pump Station. The Nkumbaningi Pump station pumps water South across the Mfolozi Reservoir to the Fuleni in King Cetshwayo and North to Mahaye Reservoir and Pump Station. The Mahaye Reservoir distributes to its supply zone (Esiyembeni SP) and the Pump Station pumps water further North to the Dlokodlo Reservoir which then distributes in and around the Machibini SP.
- ✓ East to the Phaphasi and KwaMshaye Reservoirs which then distribute to the areas of Nkatha SP, Nkombose SP and Nkatha 2 SP.
- ✓ North-East to the Nomatiya Pump Station, from here water is pumped to 1; the Ebaswazini Reservoir which then distributes to its supply zone. 2; the Dolombo Reservoir which in term distributes West to

the Manyoni and Alex RC Reservoirs (distributing to Gunjaneni SP and Myeki SP Respectively), and East to the Mapeleni Reservoir (distributing to the Ogengele SP)

Due to the high demands in the Hluhluwe Supply area which exceed the existing dam yield, as well as the low flows in the Mfolozi River resulting in intermittent supplies for the Mpukunyoni and Mtubatuba Supply Areas, it is important to consider a regional water resources solution that can potentially address the issue for the three supply areas on a regional scale.

Off Channel Storage Dam at Mfolozi River: The potential of this option is quite significant in addressing the water resource need for the areas identified. It has now become important that this option be looked into at a feasibility level such that it caters for the demands of the three supply areas in UKDM as well as the water supply shortfall of The City Of uMhlathuze that are:

- ✓ Hluhluwe Supply Area: 2050 demand 33.19 Mℓ/day less 9.86Mℓ/day (available from Hluhluwe Dam) results in an additional need of 23.94Mℓ/day
- ✓ Mpukunyoni Supply Area: 2050 demand 13.7Mℓ/day
- ✓ Mtubatuba Supply Area: 2050 demand 21.5Mℓ/day
- ✓ The City Of uMhlathuze: Demand 50-60 Mℓ/day

The firm yield of this off channel dam will provide 155 Mℓ/day which is the full demand for all the areas to be served plus an additional provision for future demand increases thereafter. In addition, provision will be made for a ø 600mm bulk pipeline transfer and pump station to supply the Hluhluwe Supply area's shortfall from its local water resource from the dam.

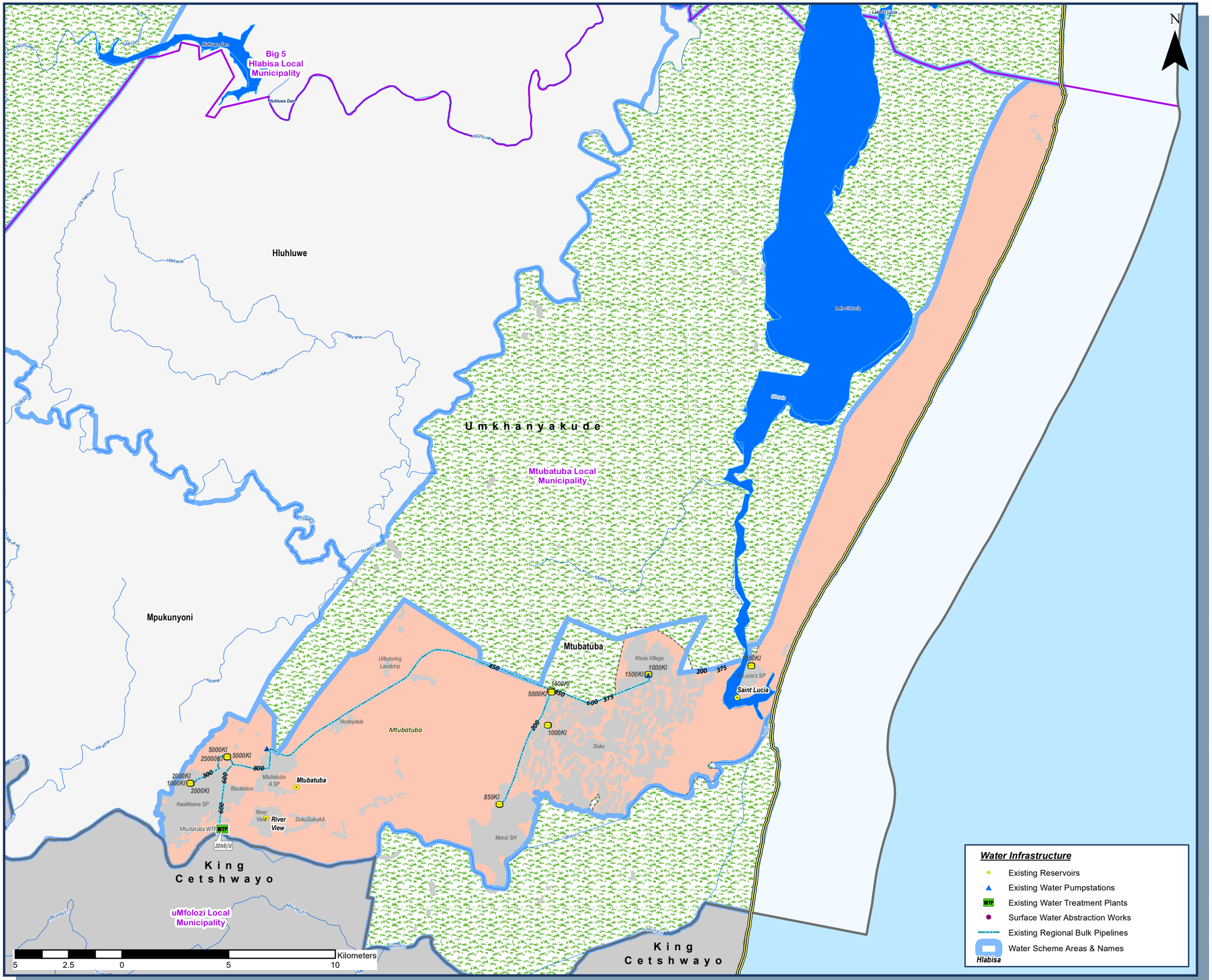
5.2.6 The Mtubatuba Water Supply Scheme

The entire Mtubatuba supply area sources water from the Mfolozi River as well as from production boreholes. The current safe yield for the Mfolozi River according to the 2014 Recon is at 10.1 Mℓ/d.

Water is abstracted from the Mfolozi River to the Mtubatuba WTP. Water is treated at the newly upgraded 20Ml/day Mtubatuba WTP. Potable water is then pumped Northwards through a ø 600mm steel rising main to the 25Mℓ Mtuba Heights Reservoirs and illustrated within Figure 5-8 overleaf.

From the Mtuba Heights Reservoirs, water then gravitates South Westerly to the KwaMsane 2Ml reservoir to supply the KwaMsane Township. Another 600mm dimeter steel gravity main (currently being upgraded to ø 813mm) transports potable water from the Mtuba Heights reservoirs East towards Mtubatuba Town.

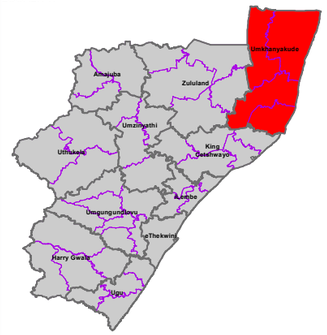
An off take from this gravity main ties into the distribution system in Mtubatuba town and the ø 600mm gravity main continues 16 km East along the R618 main road to the 5Ml Mozi Reservoir. From the Mozi Reservoir, a ø 375mm AC main gravitates 10km East to St. Lucia to tie into the 1.5Ml Reservoir.



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Farm Land & Conservation Areas
- Dams & Dam Names
- Rivers
- Settlements & Settlement Names
- Major Towns
- UKDM Sub Scheme Areas & Names

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

UMKHANYAKUDE DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

MARISWE

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
Fax: + 27 (0) 12 460 4071
Email: pretoria@mariswe.com

PROJECT TITLE

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

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Mtubatuba
Umkhanyakude District Municipality

DATE COMPLETED:

30 September 2020

MAP NO.:

DC27: Figure 5.8

Water Infrastructure

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

Hlabisa

6. EXISTING SANITATION BULK INFRASTRUCTURE

6.1 SANITATION SERVICE LEVEL

16,8% of the households within UKDM do not have access to basic sanitation and illustrated within Table 6-1 below and illustrated within Figure 6-1. The majority of the backlogs are concentrated within the rural areas with the 27% of the households in the Umhlabuyalingana Local Municipality do not have access to basic sanitation.

Table 6-1: Sanitation Service

Local Municipality	No of HH	No of HH			
		Pit Latrines to Waterborne	Pit Latrines to VIP	Total Sanitation Need	% HH with no access to basic sanitation
Umhlabuyalingana Local Municipality	29 311	238	7 773	8 011	27.3%
Jozini Local Municipality	41 567	6	7 439	7 445	17.9%
Mtubatuba Local Municipality	41 669	239	2 733	2 972	7.1%
Big 5 Hlabisa Local Municipality	36 650	184	6 522	6706	18.3%
Umkhanyakude	**149 197**	**667**	**24 467**	**25 134**	**16.8%**

Source: UKDM WSDP 2020

6.2 EXISTING SANITATION BULK INFRASTRUCTURE

There are 11 Wastewater Treatment Plant within the UKDM that serves the major towns but all of them are in need of refurbishment and improved operations and maintenance. None of these works has achieved Green Drop status. Details of the Sanitation Schemes within UKDM is listed within Table 6-2 and illustrated within Figure 6-2.

N

MOZAMBIQUE

SWAZILAND

Ndumo

Kutlange

Umhlabuyalingana Local Municipality

Jozini Local Municipality

Lake Sibayi

Casa Mia

N2

Pongolapoort

uPhongolo Local Municipality

R69

Umkhanyakude

Zululand

Nongoma Local Municipality

R618

Big 5 Hlabisa Local Municipality

Hluhluwe

Lake St Lucia

R618

Mtubatuba Local Municipality

Saint Lucia

Mtubatuba

River View

Mthonjaneni Local Municipality

uMfolozi Local Municipality

King Cetshwayo

N2

Nseleni

City of uMhlathuze Local Municipality

R34

Nzalabantu

Richard's Bay

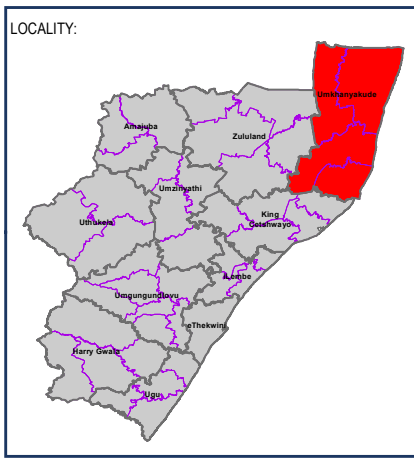
Municipality

10 5 0 10 20 Kilometers

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Farm Land & Conservation Areas
- National Roads (N1)
- Main Roads
- Dams & Dam Names (Dried Dam)
- Rivers
- Settlements
- Major Towns (Eshowe)

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

UMKHANYAKUDE DISTRICT MUNICIPALITY

CONSULTANTS:

Project No.: 27814

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
Fax: + 27 (0) 12 460 4071
Email: pretoria@mariswe.com

PROJECT TITLE

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

MAP TITLE:

Sanitation Reliability Profile

Umkhanyakude District Municipality

DATE COMPLETED:

30 September 2020

MAP NO.:

DC27: Figure 6.1

Sanitation Reliability Profile

- Communities not receiving a reliable service
- Communities receiving a reliable service

N

MOZAMBIQUE

SWAZILAND

Ndumo

MANGUZI HOSPITAL WWTP
MANGUZI HOSPITAL 3
MANGUZI HOSPITAL 1
MANGUZI HOSPITAL 2

INGWAVUMA 2
INGWAVUMA HOSPITAL WWTP

Umhlabuyalingana Local Municipality

MSELENI WWTP
MSELENI 2

Jozini Local Municipality

JOZINI WWTP
JOZINI 1
JOZINI 2
JOZINI 3

Casa Mia

uPhongolo Local Municipality

BETHESDA WWTP
BETHESDA HOSPITAL 2
MKUZE WWTP
MKUZE

Umkhanyakude

Zululand

Nongoma Local Municipality

Big 5 Hlabisa Local Municipality

HLUHLUWE 2
Hluhluwe
HLUHLUWE WWTP

HLABISA HOSPITAL3
HLABISA HOSPITAL1
HLABISA HOSPITAL WWTP

Mtubatuba Local Municipality

ST LUCIA WWTP
DUKUDUKU 3
ST LUCIA 1
DUKUDUKU 4
Saint Lucia
DUKUDUKU 2
MTUBATUBA 2
KWAMSANE 3
KWAMSANE 2
Mtubatuba
MTUBATUBA WWTP
KWAMSANE WWTP
River View

Mthonjaneni Local Municipality

uMfolozi Local Municipality

King Cetshwayo

Nseleni

City of uMhlathuze Local Municipality

Nzalabantu

Richard's Bay

Municipality

10 5 0 10 20 Kilometers

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Farm Land & Conservation Areas
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- Main Roads
- Dams & Dam Names (Driel Dam)
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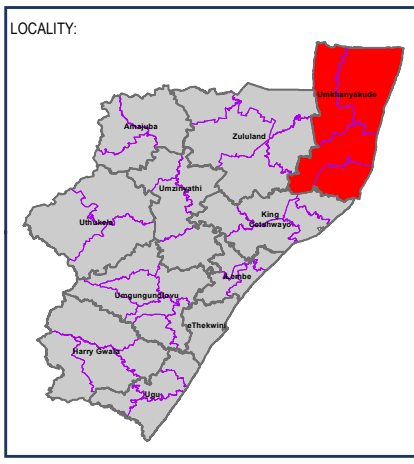


CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

UMKHANYAKUDE DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

MARISWE
JTN CONSULTING

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
Fax: + 27 (0) 12 460 4071
Email: pretoria@mariswe.com

PROJECT TITLE

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

MAP TITLE:

Existing Sanitation Infrastructure

Umkhanyakude District Municipality

DATE COMPLETED:

30 September 2020

MAP NO.:

DC27: Figure 6.2

Sanitation Infrastructure

- Existing Sewer Pumpstations
- Existing Wastewater Treatment Plant
- Sanitation Scheme Areas & Names (Jozini 1)

Table 6-2: Sanitation Schemes per Local Municipality

Local Municipality	Sanitation Scheme Name	Refurbishment required	GD Status	WwTW												WwTW Pump station		
				WwTW Name	Process Type	Capacity Sufficient	WwTW Capacity	Hydraulic Capacity	Solid Waste Disposal	Solid Waste Disposal Site	Operating hours	SwdFreq	SwlFreq	Green Drop Score	Useful Life Reached	Pump station Name	PS Capacity	Useful Life Reached
Big 5 Hlabisa Local Municipality	HLABISA HOSPITAL1	Yes	No	HLABISA HOSPITAL	Activated sludge	Yes	2	2	1	Water course	24	Monthly	Never	24	No			
Big 5 Hlabisa Local Municipality	HLUHLUWE 1	Yes	No	HLUHLUWE	Oxidation ponds	Yes	2	2	1	Other	24	Monthly	Never	24	No			
No of WwTWs	2																	
Jozini Local Municipality	BETHESDA HOSPITAL 1	Yes	No	BETHESDA WWTW	Activated sludge	No	0	0	0	Drying beds	24	Weekly	Never	24	No			
Jozini Local Municipality	INGWAVUMA 1	Yes	No	INGWAVUMA HOSPITAL	Oxidation ponds	No	0	0	0	Water course	24	Monthly	Never	22	No	INGWAVUMA WWT PUMPSTATION	77,2	No
Jozini Local Municipality	JOZINI 1	Yes	No	JOZINI	Oxidation ponds	No	2	2	2	Water course	24	Monthly	Never	23	No			
Jozini Local Municipality	MKUZE	Yes	No	MKUZE	Oxidation ponds	No	1	1	1	Water course	24	Monthly	Never	25	No	MKUZE PONDS	15,3	No
No of WwTWs	4																	
Mtubatuba Local Municipality	KWAMSANE 3	Yes	No	KWAMSANE	Oxidation ponds	No	1	1	1	Water course	24	Monthly	Never	40	No	KWAMSANE PONDS	5,6	No
Mtubatuba Local Municipality	MTUBATUBA 1	Yes	No	MTUBATUBA WWTW	Activated sludge	Yes	1	5	4	Water course	24	Daily	Daily	31	No	INDLOVU VILLAGE SEWER PUMP STATION	7,6	No
Mtubatuba Local Municipality	ST LUCIA	Yes	No	ST LUCIA												ST LUCIA OLD PUMP (LOCKED)	5,6	No
No of WwTWs	3	Oxidation ponds																
																	Yes	0

Local Municipality	Sanitation Scheme Name	Refurbishment required	GD Status	WwTW												WwTW Pump station		
				WwTW Name	Process Type	Capacity Sufficient	WwTW Capacity	Hydraulic Capacity	Solid Waste Disposal	Solid Waste Disposal Site	Operating hours	SwdFreq	SwlFreq	Green Drop Score	Useful Life Reached	Pump station Name	PS Capacity	Useful Life Reached
Umhlabuyalinga Local Municipality	MANGUZI HOSPITAL 1	Yes	No	MANGUZI HOSPITAL	Activated sludge	No	1	1	1	Water course	24	Monthly	Never	22	No			
Umhlabuyalinga Local Municipality	MSELENI 2	Yes	No	MSELENI	Oxidation ponds	Yes	0	1	0	Water course	24	Never	Never	0	No			
No of WwTWs	2																	
Total	11																	

Source: UKDM WSDP 2020

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[10] or sub regional [11]scale (over vast distances[12]), 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.

7.1 REGIONAL BULK WATER PROJECTS IN PLANNING

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 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 for infrastructure development over the next three years are tabled within Table 7-1: Grant Funding Streams overleaf.

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

[11] "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

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

Table 7-1: Grant Funding Streams

Grant Funding Programme	2019/2020	2020/2021	2021/2022	Total Funding over Next 3 Financial Years
	(R '000)	(R '000)	(R '000)	
Municipal Infrastructure Grant (MIG)	214 959	227 631	245 862	R688 452
Water Services Infrastructure Grant (WSIG)	80 000	84 400	90 000	R254 400
Regional Bulk Infrastructure Grant (RBIG)	-	3 600	-	R3 600
Total: Umkhanyakude District Municipality	**R294 959**	**R315 631**	**R335 862**	**R946 452**

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

Table 7-2 indicates the RBIG funding allocated for the next three financial years to for only one bulk project within UKDM that would receive only an allocation in 2021.

Table 7-2: RBIG Funding in terms of DORA for UKDM

Project Code	Local Municipality	Project Name	2019/2020(R '000)	2020/2021(R '000)	2021/2022(R '000)
RM01	Jozini Local Municipality	Pongolapoort Bulk Water Scheme (Jozini)	-	3 600	-
Total Umkhanyakude District Municipality			**R0**	**R3 600**	**R0**

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

The funding allocations per Local Municipality as presented in DORA, is presented in Table 7-3 below.

Table 7-3: Three-Year Medium-Term Expenditure Framework (MTEF) per Local Municipality in UKDM

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)
uMkhanyakude District Municipality	**214 959**	**227 631**	**245 862**	**80 000**	**84 400**	**90 000**

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

The following list of water services projects are presented within the District IDP of 2018/19.

uMhlabuyalingana Municipality

Project Name	Type	Amount
Manguzi Star of the Sea Water Scheme	Water – MIG	R 15 000 000-00
Kwazibi Water Project	Water – MIG	R 5 000 000-00
Project Name	Type	Amount
Mseleni Water Supply Phase 1	WSIG	R 10 000 000-00
Refurbishment and Upgrade of Rudimentary Water and Sanitation within uMhlabuyalingana LM as part of a Tanker Reduction Strategy	WSIG	R 10 000 000-00

Jozini Municipality

Project Name	Type	Amount

Jozini regional CWSS	Water – MIG	R 11 236 231-84
Kwajobe community water scheme	Water – MIG	R 27 000 000-00
Shemula water upgrade	Water – MIG	R 10 498 570-33
Refurbishment of Ubombo water scheme	Water – MIG	R 6 000 000-00
Ingwavuma Drought Relief (boreholes)	Water – MIG	R 5 497 135-00
Total		R60 231 937-17
Project Name	Type	Amount
Refurbishment and Upgrade of Rudimentary Water and Sanitation within Jozini LM as part of a Tanker Reduction Strategy	WSIG	R 10 000 000-00
Ingwavuma Interim Water Supply - Phase 2	WSIG	R 5 000 000-00
Project Name	Type	Amount
Ingwavuma VIP sanitation	Sanitation - MIG	R 26 112 813-12
Jozini Low cost housing sewer upgrade	Sanitation - MIG	R 15 000 000-00
Thembalethu sanitation	Sanitation - MIG	R 5 000 000-00
Total		R 46 112 813-12

Big 5 Hlabisa Municipality

Project Name	**Type**	**Amount**
Hluhluwe Water Phase 1	Water – MIG	R 1 000 000-00
Hluhluwe Phase 2 Upgrade	Water – MIG	R 5 270 005-00
Total		R6 270 005-00
Project Name	Type	Amount
Refurbishment and Upgrade of Rudimentary Water and Sanitation within the Big 5 Hlabisa LM as part of a Tanker Reduction Strategy	WSIG	R 10 000 000-00

Mtubatuba Municipality

Project Name	**Type**	**Amount**
Mpukunyoni water remedial	Water – MIG	R 10 000 000-00
Bulk pipeline from Mtubatuba HeightsReservoirs to KwaMsane Reservoirs	Water – MIG	R 3 912 792-00
Mtubatuba Emergency Water - Well point Installations (Drought)	Water – MIG	R1 132 351- 61
Bhoboza to KwaMsane Gravity Main Project (Drought)	Water – MIG	R 7 000 000-00
Total		R 23 045 143-61
Project Name	Type	Amount
Refurbishment and Upgrade of Rudimentary Water and Sanitation within the Mtubatuba LM as part of a Tanker Reduction Strategy	WSIG	R 10 000 000-00

Project Name	Type	Amount
Mtubatuba VIP sanitation	Sanitation - MIG	R 7 149 863-67

Source: UKDM Integrated Development Plan, 2018/2019

8. SYNOPSIS OF EXISTING AND COMMITTED SCHEMES

A gap analysis has been undertaken for the water schemes in the Umkhanyakude DM. The gap analysis has taken into account current planning interventions by the WSA. In this regard, the entire Umkhanyakude has been demarcated into regional water schemes in line with short- and long-term plans by the WSA. Seven (7) regional schemes have been identified and are as follows:

- ✓ UK001 WSIA: Hlabisa;
- ✓ UK002 WSIA: Shemula;
- ✓ UK003 WSIA: Mpukunyoni;
- ✓ UK004 WSIA: Jozini;
- ✓ UK005 WSIA: Hluhluwe;
- ✓ UK006 WSIA: Mtubatuba; and
- ✓ UK007: Mkuze (part of Shemula)

The gap analysis for the seven (7) regional schemes is discussed under this section.

8.1 UK001 WSIA: HLABISA SCHEME

The overall capacity of the new Mandlakazi WTP was upgraded to 20 Mℓ/d, which would comprise of 10.6 Mℓ/d for the Mandlakazi scheme area and 9.3 Mℓ/d would be reserved to be supplied to the Hlabisa Supply Area. The water is treated at the Mandlakazi WTP that has a current capacity of 20 Mℓ/day. The Hlabisa WTP and the Mphembheni WTP is decommissioned.

UAP Phase II recommended the upgrade of infrastructure and storage capacity to the value of approximately R 78,5 million that included the upgrade of the Mandlakazi WTP to 20 Mℓ/day. However, the water supply to the Hlabisa scheme from the Mandlakazi WTP should be increased to 15 Mℓ /day under UAP Phase III to meet the demand of 2050. Hence it would be required to upgrade the Mandlakazi WTP to 35Mℓ/day to meet both the demands for the Mandlakazi scheme as well as the Hlabisa Scheme.

Two MIG projects were identified to upgrade the existing reticulation distribution network around Hlabisa to the value of approximately R 6,3 million but would leave the remainder of the communities within the Hlabisa scheme to be excluded. The latter should be considered when planning the bulk infrastructure requirements.

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in Table 8-1: Hlabisa Scheme Gap Analysis.

Table 8-1: Hlabisa Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	20	0	20	35	15
Storage (Mℓ)		18.4	18.4	27.4	9.0
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	-	-
Bulk conveyance - Clear Water (Mℓ/d)	63.13	0	63.13	75.83	12.7

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 the existing WTP, the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.2 UK002 WSIA: SHEMULA SCHEME

The Shemula Scheme abstracts water from the Pongola River and is treated at the Shemula WTP with a capacity of 27Mℓ/day. The scheme has 13.5 million m3/a (37 Mℓ/day) registered on WARMS. The scheme is also augmented with five (5) stand-alone schemes that are supplied by boreholes. These schemes are Manyiseni, Manguzi, Thengane, Mshudu and Enkanyezini.

UAP Phase II recommended the upgrade of the Shemula WTP and provide additional storage capacity to the value of approximately R 149,3 million. However, it is proposed under UAP Phase III that the Shemula WTP should supply the entire Shemula scheme area that will have a total demand of close to 50 Mℓ/day in 2050. Hence it would be required to upgrade the current treatment capacity of the Shemula WTP from 27 Mℓ/day to 45Mℓ/day as well as to upgrade / extend / build the associated additional bulk distribution and storage.

There is one (1) MIG project identified to upgrade the Shemula water distribution network to the value of approximately R 10 million. The latter should be considered when planning the bulk infrastructure requirements.

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

Table 8-2: Shemula Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	33	0	33	51	18
Storage (Mℓ)	42.80	0	42.8	109.2	66.41

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	-	-
Bulk conveyance - Clear Water (Mℓ/d)	255.72	0	255.72	316	60.3

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

8.3 UK003 WSIA: Mpukunyoni Scheme

This scheme draws raw water from the Mfolozi River with some raw water stored in the Mbukwini off channel storage pond. The yield in the Mfolozi River at the Nkolokoto WTP abstraction point is 10.10Mℓ/day that supplies the entire area, with distinct bulk pipelines and storage reservoirs. The Mpukunyoni Scheme shares the Mfolozi River as a water resource with the Mtubatuba Supply area. Due to the low flows in the Mfolozi River, a potential long-term water resource solution affecting the Hluhluwe, Mpukunyoni and Mtubatuba Supply Areas is to investigate the feasibility of implementing the Mfolozi Off-Channel Storage Dam.

UAP Phase II recommended that the Off Channel Storage Dam would meet the 2035 demands for Hluhluwe, Mpukunyoni and Mtubatuba Supply Areas in UKDM as well as The City of uMhlathuze to the value of R 276 million as well as the upgrade of the Nkolokotho WTP, provision of additional storage and the construction of a ø 250mm bulk pipe to uThungulu to the value of R 338,1 million.

The Nkolokotho WTP's capacity is inadequate to meet the future demands as well as the bulk distribution and storage: The Mpukunyoni scheme requires an additional 19.6Mℓ storage capacity to cater for the ultimate future demand of 2050. In addition, a cross boarder agreement with King Cetshwayo requires a bulk main of ø 250mm. No MIG projects have been earmarked for this supply area over the next three years.

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

Table 8-3: Mpukunyoni Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	10	0	10	14	4
Storage (Mℓ)	8.63	0	8.63	30.63	22
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	-	-
Bulk conveyance - Clear Water (Mℓ/d)	61.83	0	61.83	85.5	23.64

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 the existing WTP, the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.4 UK004 WSIA: JOZINI SCHEME

The Phongola River is the main water resource for this bulk scheme and flows into the Pongolopoort Dam. The available water in the Phongola River is 1.10 and has a current allocation of 37 Mℓ/day from the abstraction weir at the new Jozini WTP.

UAP Phase II recommended the following for the various sub scheme areas within the Jozini Regional Bulk Scheme to a total value of R 1,128 billion and were as follows:

- ✓ Upgrade the Jozini Bulk Storage and Reticulation and ensure adequate supply;
- ✓ Upgrade the Mkuze WTP and bulk pipeline to the Mkhuze Town;
- ✓ Extend the bulk supply from Mkuze to the Mhlekazi area and surrounds inclusive of bulk storage;
- ✓ Extend the bulk supply from Orthobothini to Mjindi inclusive of bulk storage;
- ✓ Augment the current bulk storage within the Othobothini supply area; and
- ✓ Extend the bulk supply with additional storage to Nondabuya, Mbazwana and Malobeni supply areas from the Orthobothini WTP and only supply the Mseleni area from Lake Sibaya.

The recent upgrades to the Jozini Regional Bulk Water Supply Project would be able to meet the total demand for 2050. The new Othobothini 40Ml/day treatment works have the capacity to supply the ultimate future demand for the scheme area and could also support the proposal to supply Hluhluwe Phase 3. Bulk distribution and storage requirements were also determined irrespective of the lack of obtaining the capacities of the aforementioned. The total demand for the Jozini scheme would be 39.35 Mℓ/day.

One (1) RBIG project is earmarked for implementation in 2020 relevant to the Jozini Scheme, namely the Pongolapoort Bulk Water scheme to the value of R 3,6 million. The latter should be considered when planning the bulk infrastructure requirements.

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

Table 8-4: Jozini Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	57.03	0	57.03	57.03	0
Storage (Mℓ)	17.2	0	17.2	75.8	258.6

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	-	-
Bulk conveyance - Clear Water (Mℓ/d)	378.12	0	378.12	453.75	75.63

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

8.5 UK005 WSIA: HLUHLUWE SCHEME

The Hluhluwe Dam and River are over committed in terms of capacity and allocations. The potential for an Off-Channel Dam on the Mfolozi River and a bulk pipeline to this supply area is a possible solution to the huge shortfall that the local water resource is currently experiencing. Jozini Phase 2 could also be utilised to augment the existing water source.

UAP Phase II recommended to upgrade the Hluhluwe 1 WTP, construct bulk pipe mains ranging between ø 315mm and ø 450mm bulk to also supply Phase 4, upgrade the Hluhluwe 2 WTP inclusive of additional storage at the Command Reservoir to be supplied via a ø 500mm bulk and connect to the Mfolozi Off-Channel storage dam via 49km of ø 600mm bulk pipeline, pump station and command reservoir. The total cost requirement was R 1,412 billion.

However, the treatment capacity is insufficient and the Hluhluwe 1 WTP requires an additional treatment capacity of 8Mℓ/day and Hluhluwe 2 WTP requires an additional 1,5Mℓ/day treatment capacity as well as augmented bulk distribution and storage: Overall additional storage required for the supply area is 53.5Mℓ (38.5Mℓ Hluhluwe 1 and 15Mℓ Hluhluwe 2).

There are two (2) MIG project identified to address the upgrades to Hluhluwe Phases 1 and 2 to the value of approximately R 6,2 million. The development of Hluhluwe Phase 3 has not been addressed but could be supplied from the upgraded Hluhluwe 1 WTP to be supplied from the future Off-Channel Storage Dam.

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

Table 8-5: Hluhluwe Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
***Water Treatment (Mℓ/d)**	11.5	0	11.5	21	9.5
Storage (Mℓ)	40.4	0	40.4	709.9	30.5

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	-	-
Bulk conveyance - Clear Water (Mℓ/d)	121	0	121	149.5	28.4

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 the existing WTP, the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.6 UK006 WSIA: MTUBATUBA SCHEME

The Mtubatuba Scheme abstracts water downstream from the Mpukunyoni's abstraction point. Hence the Mtubatuba Scheme share the same resources problem as the Mpukunyoni Scheme. The water resource proposal of the off-channel dam from the Mfolozi River is a recommendation that should be considered as a potential long-term water resource solution.

UAP Phase 2 also recommended to augment the supply to the Mthubathuba Town and surrounds from the proposed off-channel storage dam from the Mfolozi River to the value of R 276,9 million.

The recently upgraded Mtubatuba WTP needs to be upgraded in future to ultimately meet the future demand of 2050. The Mtubatuba WTP requires an additional 2Mℓ/day treatment capacity to meet that demand. Bulk distribution and storage also need to be increased to accommodate the future demand.

There is one (1) MIG project identified to upgrade the bulk pipeline from Mtubatuba Heights Reservoirs to KwaMsane Reservoirs to the value of approximately R 3,9 million. The latter should be considered when planning the bulk infrastructure requirements.

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

Table 8-6: Mtubtuba Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	20	0	20	22	2
Storage (Mℓ)	26.6	0	26.6	48.3	21.7
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	-	-
Bulk conveyance - Clear Water (Mℓ/d)	62.6	0	62.6	84.06	21.49

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 the existing WTP, the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.7 UK007 WSIA: MKUZE SCHEME

It is proposed to extend a bulk line from Jozini New WTP to Mkhuze to Mhlekazi and augment the supply to Mkhuze and Mhlekazi. Jozini New is a 5 Mℓ/day plant abstracting water from the irrigation canal fed from Pongolapoort Dam. The Mhlathuze Water proposed a bulk pipeline to Mkhuze and Mlekazi. From the demand model, ø 250 mm pipe from the works to Mkhuze is recommended, and also a ø 200 mm pipe from Bethesda Hospital to Mhlekazi.

UAP Phase II recommended to augment the supply to the Mkuze and Mhlekazi areas from the Mkuze WTP that is supplied from the Mkuze River and supplemented from the Pongola river to the value of R 236,9 million.

The total water demand for Mkhuze and Bethesda WTWs is 4.29 Mℓ/day, while the capacity of the four WTWs add up to 4.3 Mℓ/day but would be augment to 9.3Mℓ/day when supplied from the 5Mℓ Jozini WTP. Therefore, the treatment plants are sufficient to supply those three areas. Additional bulk distribution and storage is required.

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

Table 8-7: Mkuze Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	4.3	0	4.3	9.3	5
Storage (Mℓ)	0	0	0	11.4	11.4
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	-	-
Bulk conveyance - Clear Water (Mℓ/d)	9.83	0	9.83	11.79	1.96

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 and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

9. PROPOSED BULK WATER SUPPLY INTERVENTIONS (WSI)

This section details the water supply reconciliation options for bulk water services within the Umkhanyakude DM – considering exiting use and future supplies and water sources, per scheme area. It must be noted that the Water Supply Intervention Areas (WSIAs) 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.

The details of the each WSIA split between existing upgrade and future additional requirements are provided per WSIA within the paragraphs hereafter and illustrated for the entire WSA within Figure 9-1 and per proposed WSIA.

9.1 UK001 WSIA: HLABISA SCHEME

9.1.1 Demand Model Intervention

9.1.1.1 Water Demand

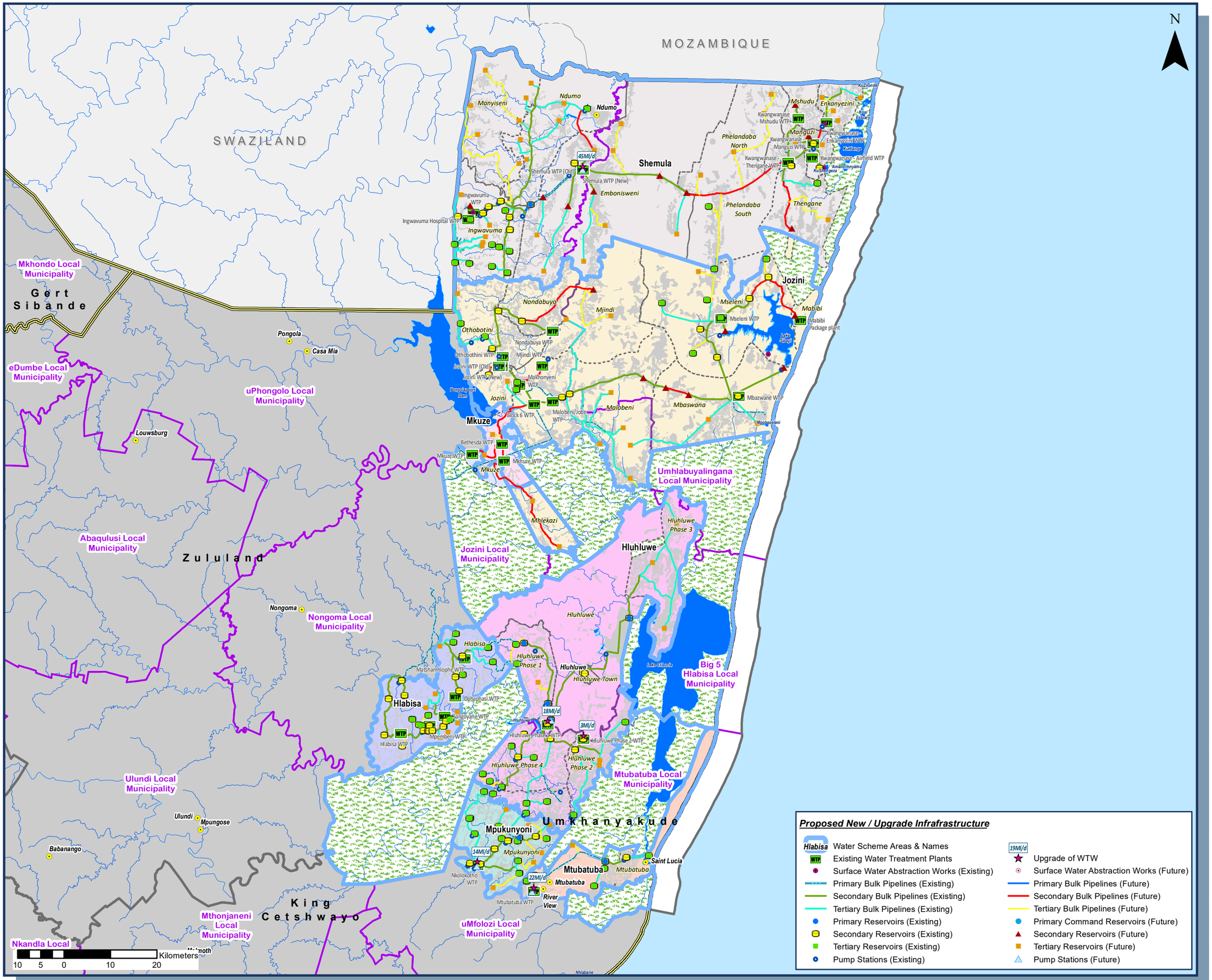
The water demand for the Hlabisa WSI was determined for 2020 and 2050 and included within Table 9-1: Population and Water demand 2020 and 2050. It includes approximately 31 communities of which the majority are rural. The scheme serves the Hlabisa town from where the scheme is extended to the surrounding rural communities.

Table 9-1: Population and Water demand 2020 and 2050 for the Hlabisa WSIA

Population	**Population 2020**	**Population 2050**
	62 370	77 460
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	11.16	14.39

9.1.1.2 Water Resource Consideration

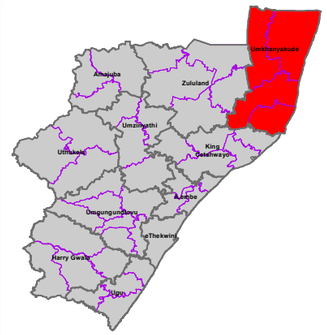
The existing Hlabisa scheme draws water from the Mandlakazi Water Scheme that is duly authorised through a cross-district agreement with Zululand District Municipality. Raw water is sourced from the Senekal Boerdery via a licensed abstraction from the Pongola Poort Dam. The Charl Senekal is noted to have a license for abstraction of 32.6mil m^3/a, of which 2.6 million m3/a (7.1Mℓ/day) is registered for domestic use to share between the Mkuze and Mandlakazi (and therefore Hlabisa) schemes. It is assumed that the available yield for the Pongolopoort dam is 20 Mℓ/day.



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Farm Land & Conservation Areas
- Dams & Dam Names
- Rivers
- Settlements & Settlement Names
- Eshowe — Major Towns
- Mshudu — UKDM Sub Scheme Areas & Names

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

UMKHANYAKUDE DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
Fax: + 27 (0) 12 460 4071
Email: pretoria@mariswe.com

PROJECT TITLE

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

MAP TITLE:

Total Bulk Water Supply Interventions

Umkhanyakude District Municipality

DATE COMPLETED: 30 September 2020

MAP NO.: **DC27: Figure 9.1**

Proposed New / Upgrade Infrafrastructure

- Hlabisa — 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)

The water is treated at the Mandlakazi WTP that has a current capacity of 20 Mℓ/day. Potable water "gravitates" via a 450mm ø pipe into the two (2) Hlabisa Scheme connection nodes H ((Northern Area) and A (Southern Area) which comprise of 245KVA and 55KVA pump stations respectively. Water from each node is pumped via 400 mm ø rising mains into storage reservoirs and then into secondary distribution mains ranging between 140 mm ø and 315 mm ø.

9.1.2 Water Supply Infrastructure

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Hlabisa WSIA and is illustrated within Figure 9-2 overleaf followed by the schematic layout of the WSIA within Figure 9-3 .

- ✓ The existing Mandlakazi WTP needs to be upgraded to 35 Mℓ/day to meet the 2050 demand of 15 Mℓ/day for the Hlabisa scheme;
- ✓ The existing secondary and tertiary bulk mains should be extended to include 7 km of secondary bulk ranging between 90ømm and 250ømm and 12 km of tertiary bulk ranging between ø 63 mm and ø 315mm; and
- ✓ The existing secondary storage should be increased from 7.8 Mℓ to 19.8 Mℓ and the tertiary storage capacity from 4.16 Mℓ to 9.16 Mℓ.

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

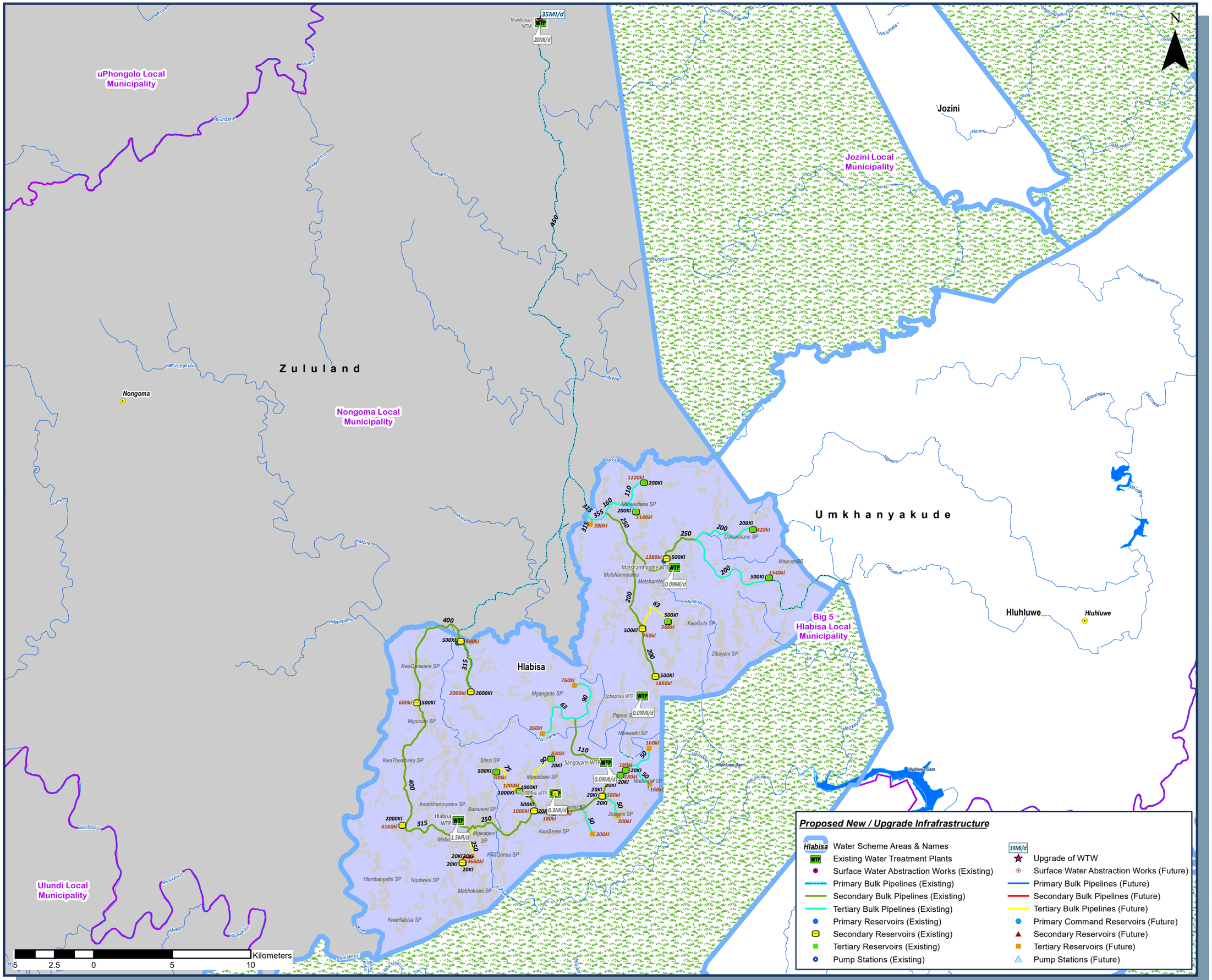
9.1.3 Financial Requirements

The bulk cost requirement for UK001: Hlabisa WSIA is tabled within Table 9-2 below.

Table 9-2: UK001 Hlabisa Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R-	R0	R-
Secondary	R197 121 000	R19 712 100	R216 833 100
Tertiary	R56 520 000	R5 652 000	R62 172 000
Total	**R253 641 000**	**R25 364 100**	**R279 005 100**

The total bulk cost requirement for the Hlabisa Scheme is R 279 005 100 (excl VAT). The scheme development cost per household is approximately R 16 604. Due to the size of the project, it will take close to 15 years to complete.



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- District Municipality Boundaries
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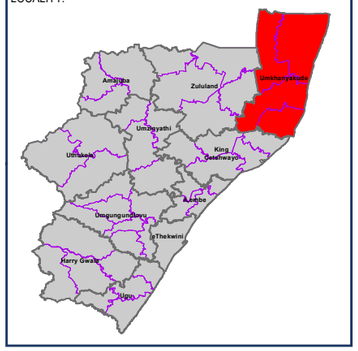


CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

UMKHANYAKUDE DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
Fax: + 27 (0) 12 460 4071
Email: pretoria@mariswe.com

PROJECT TITLE

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

MAP TITLE:

Total Bulk Water Supply Interventions - UK001: Hlabisa Umkhanyakude District Municipality

DATE COMPLETED:

30 September 2020

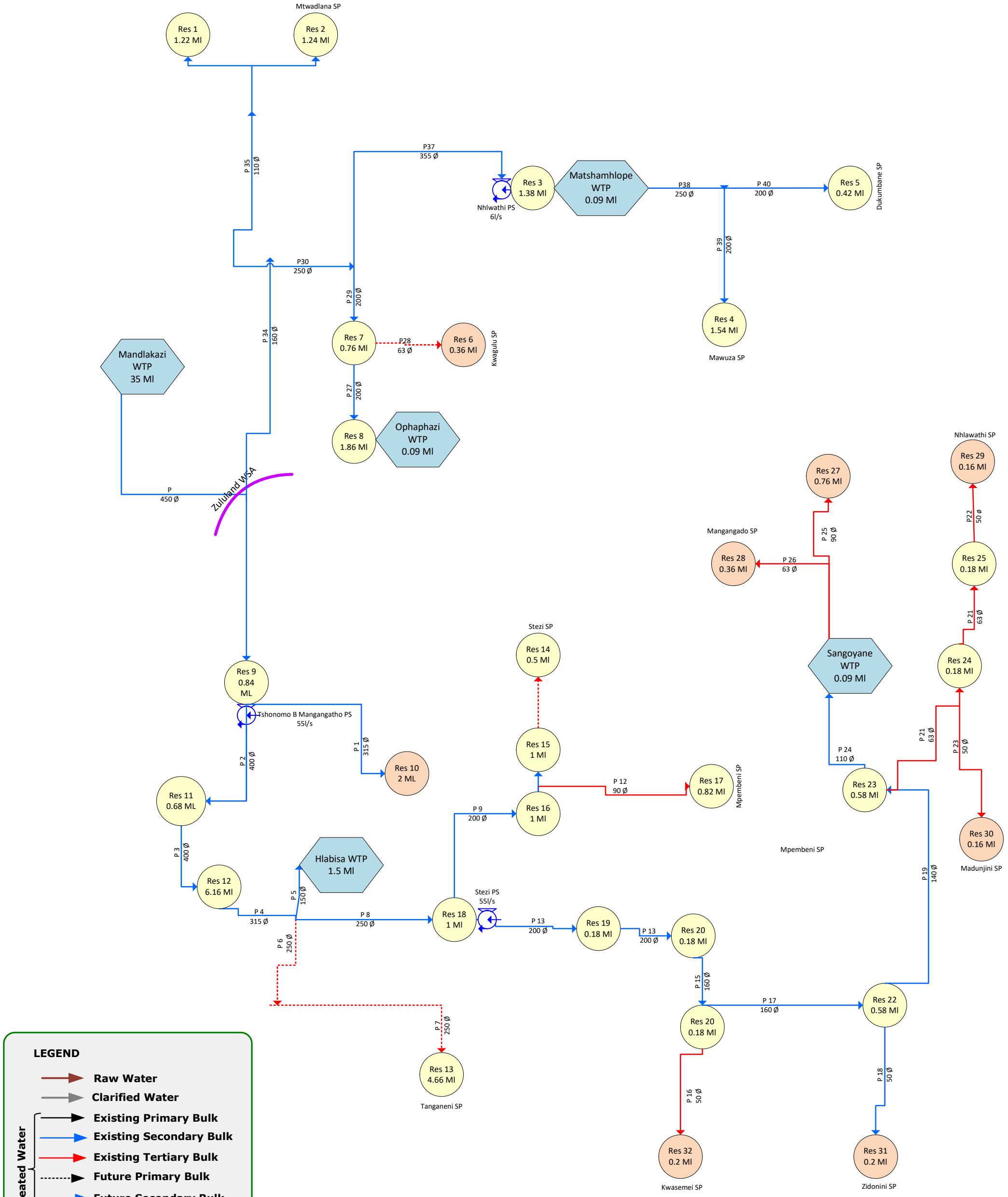
MAP NO.:

DC27: Figure 9.2

Proposed New / Upgrade Infrafrastructure

- Hlabisa — 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 9-3
UK001 WSIA: Hlabisa



9.2 UK002 WSIA: SHEMULA SCHEME

9.2.1 Demand Model Intervention

9.2.1.1 Water Demand

The water demand for the Shemula WSI was determined for 2020 and 2050 and included within Table 9-3. It includes approximately 106 communities of which the majority are rural. The scheme serves the Ingwavuma town to the west and the scheme extends further to the east reaching as far as Manyiseni, Manguzi, Thengane, Mshudu and Enkanyezini.

Table 9-3: Population and Water demand 2020 and 2050 for the Shemula WSIA

Population	**Population 2020**	**Population 2050**
	220 211	273 491
Water Demand	**Demand 2020**	**Demand 2050**
	38.70	49.97

9.2.1.2 Water Resource Consideration

The Shemula Scheme abstracts water from the Pongola River and is treated at the Shemula WTP with a capacity of 27Mℓ/day. The scheme has 13.5 million m3/a (37 Mℓ/day) registered on WARMS but needs to be verified and detailed study is required to determine the extent of the existing users. The scheme is also augmented with five (5) stand-alone schemes that are supplied by boreholes. These schemes are Manyiseni, Manguzi, Thengane, Mshudu and Enkanyezini.

- ✓ Manyiseni is supplied by boreholes with capacity ranging from 0.5l/s to 5l/s. These boreholes are fitted with handpumps.
- ✓ Manguzi - This sub-scheme draws water from Gezisa stream and several boreholes where it is treated at the Airfield WTP (1 Mℓ day) and pumped to a clear water reservoir at the Manguzi WTP. The details of the boreholes are as follows:
    - o Airfield 1 and Airfield 1a boreholes yield 10l/s that amounts to a daily delivery of 633m^3/day;
    - o Airfield 2 and Airfield 2a each yield 12l/s amounting to a daily delivery of 875m^3/day;
    - o Airfield 3 and Airfield 3a each yield 8l/s with a daily delivery amounting to 644m^3/day; and
    - o Manguzi 1 yields 5l/s with a daily delivery of 454 m^3/day.
- ✓ Thengane - This sub-scheme draws water from a wellfield of five boreholes; and is treated at Thengane WTP with a capacity of 1 Mℓ/day. The details of the 5 boreholes are: BOM 12 -12l/s; Libuyile – 5.3l/s; Bom 10A – 3l/s; Thengani- 5.4l/s; Thengani B- 2.1l/s
- ✓ Mshudu draws water from a Mshudu borehole of 3l/s where it is treated at Mshudu WTP (1 Mℓ/day). It is also supplied with treated water from Thengane Reservoir 6 located in Thandizwe. The reservoir is supplied with water drawn from the Thengane well field and treated at the Thengane WTP.

- ✓ Enkanyezini – The sub-scheme gets its water from Kanini Stream and Tshong 4 borehole. The Tshong 4 borehole yields 10.5l/s amounting to a daily delivery of 781.92 m^3/day. The raw water abstracted from the two sources is treated at the Enkanyezini WTP (1 Mℓ/day).

A summary of the various WTWs is 33,5 Mℓ/day and tabled within Table 9-4 below.

Table 9-4: WTP Summary within the Shemula Scheme

WTP capacities	Mℓ/day
Shemula WTP	27
Ingwavuma WTP	1
Thengani WTP	1
Airfield WTP	1
Manguzi WTP	1.5
Mshudu WTP	1
Kwangwanase WTP	1
	33.5

9.2.2 Water Supply Infrastructure

9.2.2.1 Bulk conveyance

- ✓ The existing 27 Mℓ/day Shemula WTP branches to:
  - o The Ingwavuma Town and surrounds with a branch line extending to Machobeni and its ø ranges from ø 150mm to ø 300 mm.
  - o The Ndumo area via ø 400mm and then extends to the west towards eManyiseni via ø 200mm pipelines;
  - o The Embonisweni extends to Sihangwane surrounds with branches south to Lulwane and Mengu via ø 50 mm and ø 250 mm pipelines and will ultimately extends to Phelandaba North and South.
- ✓ Manyiseni - There is no existing bulk supply in Manyiseni, however there is a proposed bulk supply line that is planned to branch from a bulk supply pipeline supplying water to Ingwavuma from the Shemula WTP. This proposed bulk pipeline will extend from Manyiseni and its diameter ranges from ø 200 mm to ø 250 mm
- ✓ Mshudu - The bulk line extends from the Mshudu WTP to a reservoir in Mshudu just north of the plant. There is a bulk line that extends from a Thengani reservoir (Res 6) which feeds the clear water storage reservoir of the Mshudu WTP with treated water from Thengani WTP. The size of the bulk pipeline is ø 160 mm.
- ✓ Manguzi – The ø160mm bulk line extends from Manguzi WTP to the distribution network

- ✓ Thengani - The bulk pipeline extends from Thengani WTP to a command reservoir (Reservoir 4) in Thengani with pipe size of ø 160 mm, extends from command reservoir to four service reservoirs with pipe sizes of ø 160mm, also extends from WTP to Thandizwe with a pipe sizes of ø 160mm.
- ✓ Enkanyezini – The bulk pipeline extends from Enkanyezini WTP to Res 3 via a ø 160mm pipe branching off to Res 1 and branching off to Res 2.

9.2.2.2 Storage

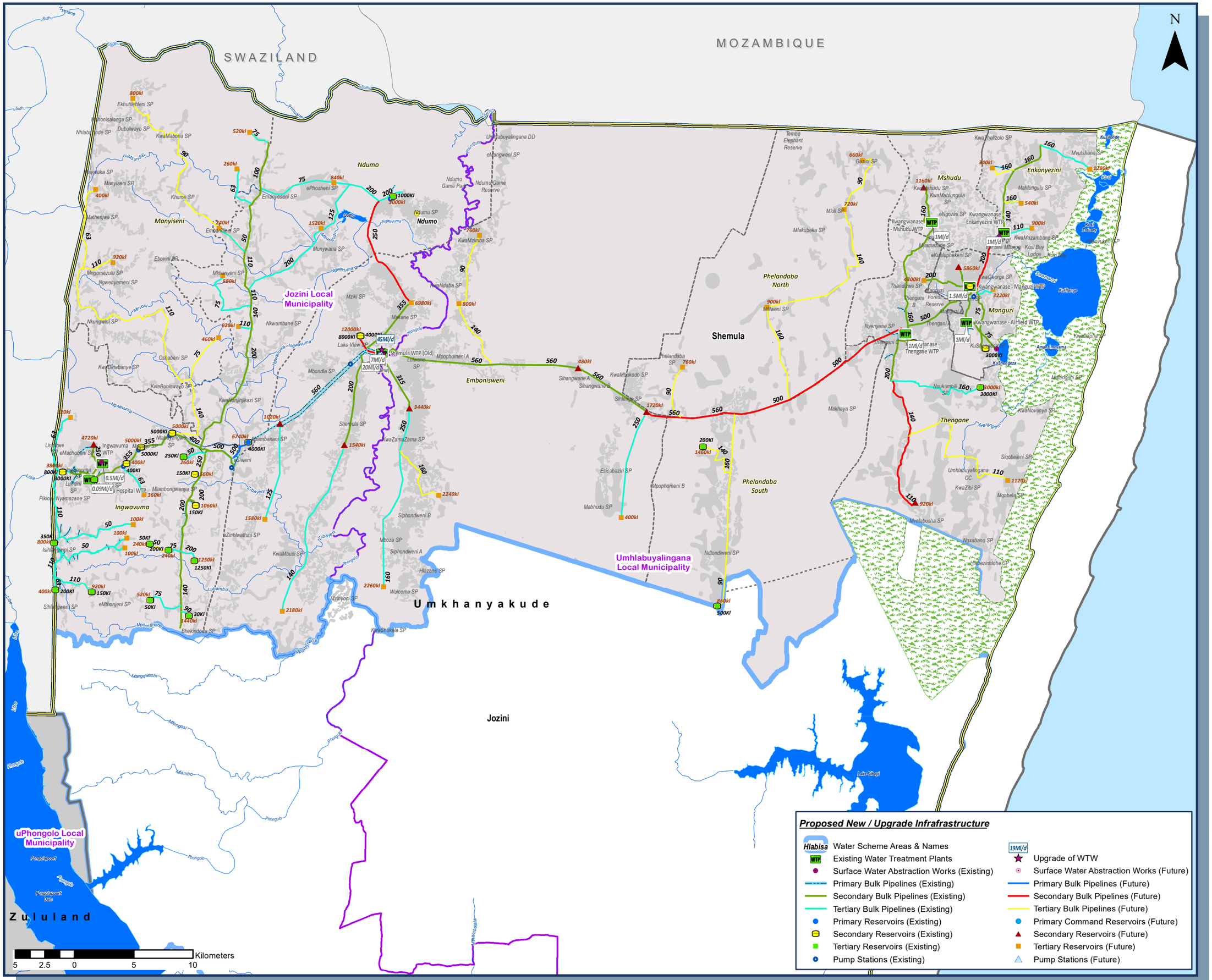
Treated and purified water at the Shemula WTP is pumped to the command reservoir that provides bulk water storage for each of the supply areas of Shemula, Ingwavuma, Emboniseni, Ndumo, Phelandaba and Thengane. The total storage currently is approximately 42.8 Mℓ.

9.2.2.3 Proposed Interventions

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Shemula WSIA and is illustrated within overleaf Figure 9-4 followed by the schematic layout of the WSIA within Figure 9-5Figure 9-3.

- ✓ The existing Shemula WTP needs to be upgraded to 45 Mℓ/day to meet the 2050 demand;
- ✓ The existing primary and secondary bulk mains from the Shemula WTP feeding Ingwavuma, Emboniseni, Ndumo, Phelandaba and Thengane should be upgraded to ø 560 mm;
- ✓ The primary, secondary and tertiary bulk mains should be further extended by adding 136.69km of secondary bulk ranging between ø 90 mm – ø 560 mm and 156.14 km of tertiary bulk ranging between ø 63mm -ø 200 mm;
- ✓ The existing secondary and tertiary storage should be increased from 42.8 Mℓ to 66.9 Mℓ and the tertiary storage capacity from 8.7 Mℓ to 9.16 Mℓ;
- ✓ The additional secondary storage to be added is 40.4 Mℓ and the tertiary storage is 20.8 Mℓ; and
- ✓ The pump station at the Shemula WTP should be upgraded to 195 KW to pump 0.2m^3/s.

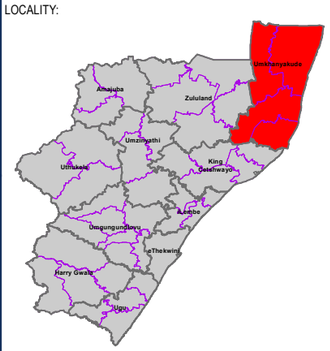
Design details of all the infrastructure components for UK002: Shemula WSIA are provided within Annexure B.



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Farm Land & Conservation Areas
- Dams & Dam Names
- Rivers
- Settlements & Settlement Names
- Major Towns
- UKDM Sub Scheme Areas & Names

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

UMKHANYAKUDE DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
Fax: + 27 (0) 12 460 4071
Email: pretoria@mariswe.com

PROJECT TITLE

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

MAP TITLE:

Total Bulk Water Supply Interventions - UK002: Shemula
Umkhanyakude District Municipality

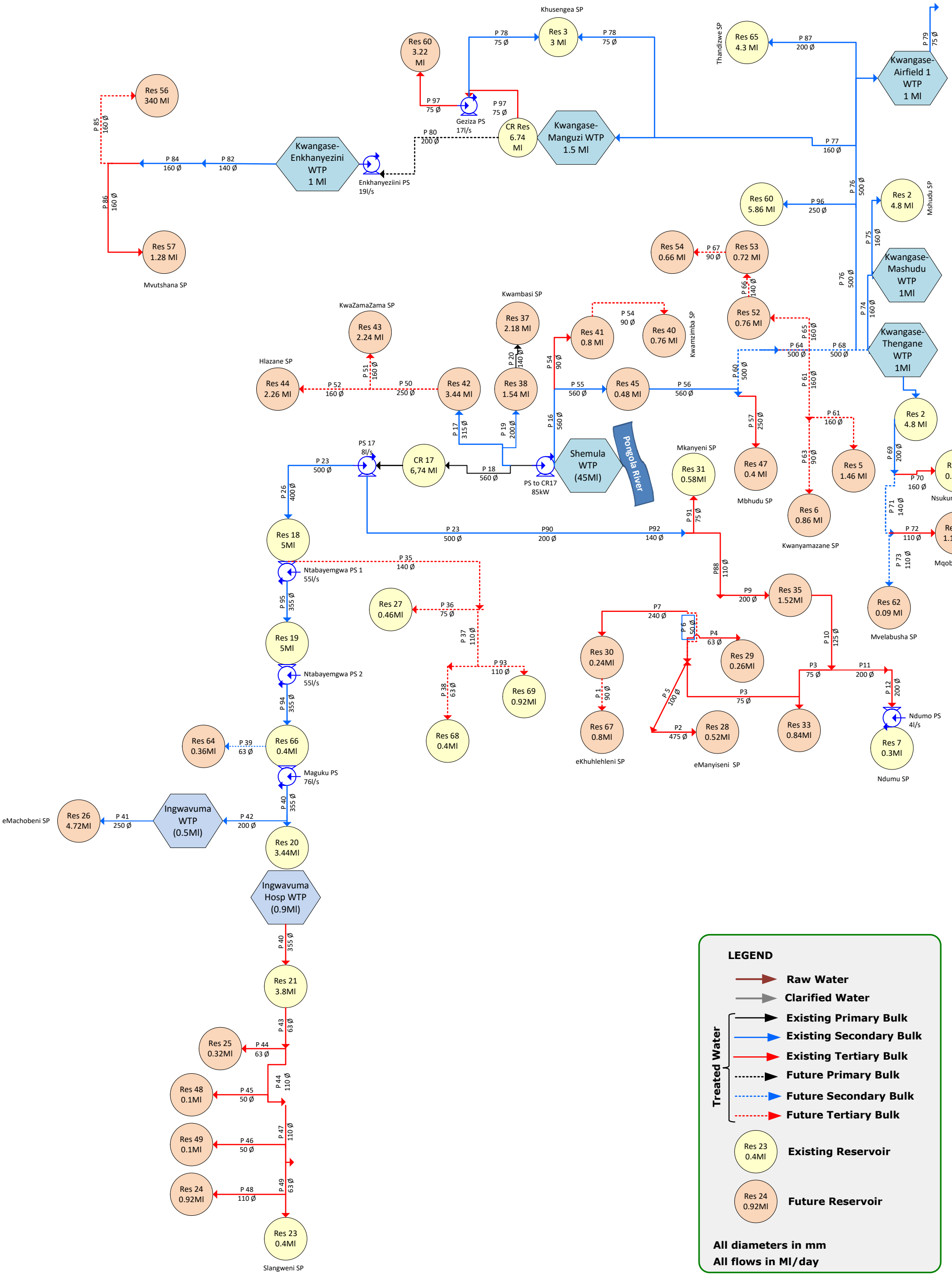
DATE COMPLETED: 30 September 2020

MAP NO.: **DC27: Figure 9.4**

Proposed New / Upgrade Infrafrastructure

- Hlabisa — 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)

Figure 9-5
UK002 WSIA: Shemula



9.2.3 Financial Requirements

The bulk cost requirement for UK002: Shemula WSIA is tabled within Table 9-5 below.

Table 9-5: UK002 Shemula Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R222 052 000	R22 205 200	R244 257 200
Secondary	R732 985 000	R73 298 500	R806 283 500
Tertiary	R353 717 000	R35 371 700	R389 088 700
Total	**R1 308 754 000**	**R130 875 400**	**R1 439 629 400**

The total bulk cost requirement for the Shemula Scheme is R 1,439 billion (excl VAT). The scheme development cost per household is approximately R 25 002. Due to the size of the project, it will take close to 15 years to complete.

9.3 UK003 WSIA: Mpukunyoni Scheme

9.3.1 Demand Model Intervention

9.3.1.1 Water Demand

The water demand for the Mpukunyoni WSI was determined for 2020 and 2050 and included within Table 9-6: Population and Water demand 2020 and 2050 for the Mpukunyoni WSIA. It includes approximately 15 communities of which the majority are rural.

Table 9-6: Population and Water demand 2020 and 2050 for the Mpukunyoni WSIA

Population	**Population 2020**	**Population 2050**
	61 178	75 980
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	10.57	13.66

9.3.1.2 Water Resource Consideration

This scheme draws raw water from the Mfolozi River with some raw water stored in the Mbukwini off channel storage pond. The Mpukunyoni Scheme shares the Mfolozi River as a water resource with the Mtubatuba Supply area. The yield in the Mfolozi River is 10.1Mℓ/d under good conditions and will not meet the future demand for both schemes that would be 35.15Mℓ/day.

The abstracted raw water is transported from the abstraction point and pumped into a raw water channel and then gravitates into a raw water sump located in the vicinity of the Nkolokoto Water Treatment Plant. From the raw water pump, the water then gravitates into the Nkolokotho WTP inlet, any surplus water entering the

sump overflows directly into the Mbukweni off channel storage dam. The capacity of the Mbukweni off channel storage is unknown.

Due to the high demands in the Hluhluwe Supply area that exceed the existing dam yield as well as the low flows in the Mfolozi River resulting in intermittent supplies for the Mpukunyoni and Mtubatuba Supply Areas, it is important to consider a regional water resources solution that can potentially address the issue for the three supply areas on a regional scale.

It is therefore proposed to build an Off-Channel Storage Dam at Mfolozi River: The potential of this option is quite significant in addressing the water resource need for the areas identified. It has now become important that this option be looked into at a feasibility level such that it caters for the demands of the three supply areas in UKDM as well as the water supply shortfall of The City Of uMhlathuze that are:

- ✓ Hluhluwe Supply Area: 2050 demand 33.19 Mℓ/day less 9.86Mℓ/day (available from Hluhluwe Dam) results in an additional need of 23.94Mℓ/day
- ✓ Mpukunyoni Supply Area: 2050 demand 13.7Mℓ/day
- ✓ Mtubatuba Supply Area: 2050 demand 21.5Mℓ/day
- ✓ The City Of uMhlathuze: Demand 50-60 Mℓ/day

The firm yield of this off channel dam will provide 155 Mℓ/day that would meet the entire demand of the supply areas mentioned above until 2050 and beyond.

9.3.2 Water Supply Infrastructure

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Hlabisa WSIA and is illustrated within Figure 9-2 overleaf followed by the schematic layout of the WSIA within Figure 9-3 .

9.3.2.1 Bulk conveyance and Storage

Potable water is pumped from the Nkolokotho WTP (in three (3) directions:

- ✓ West, to the Nkumbaningi Reservoir (250Kl) and Pump Station. The Nkumbaningi Pump station pumps water South across the Mfolozi Res to the Fuleni in King Cetshwayo and North to Mahaye Reservoir and Pump Station via a ø 250 mm bulk pipe. The Mahaye Reservoir (250Kl) distributes to its supply zone (Esiyembeni SP) and the Pump Station pumps water further North to the Dlokodlo (1 250 Kl) Reservoir via bulk distribution ranging from ø 200mm to ø 1 200 mm bulk pipe which then distributes in and around the Machibini SP.
- ✓ East to the Phaphasi (1 750Kl) and KwaMshaye (450Kl) Reservoirs which then distribute to the areas of Nkatha SP, Nkombose SP and Nkatha 2 SP via bulk distribution ranging from ø 200mm to ø 250 mm bulk pipe.

- ✓ North-East to the Nomatiya Pump Station and Reservoir(100Kl), from here water is pumped to the Ebaswazini Reservoir which then distributes to its supply zone. 2; the Dolombo Reservoir which in term distributes West to the Manyoni (200Kl) and Alex RC (30Kl) Reservoirs (distributing to Gunjaneni SP and Myeki SP Respectively) via bulk distribution ranging from ø 75mm to ø 110mm bulk pipe, and East to the Mapeleni Reservoir (1 000 Kl and distributing to the Ogengele SP) via bulk distribution ranging from ø 160mm to ø 200mm bulk pipe.

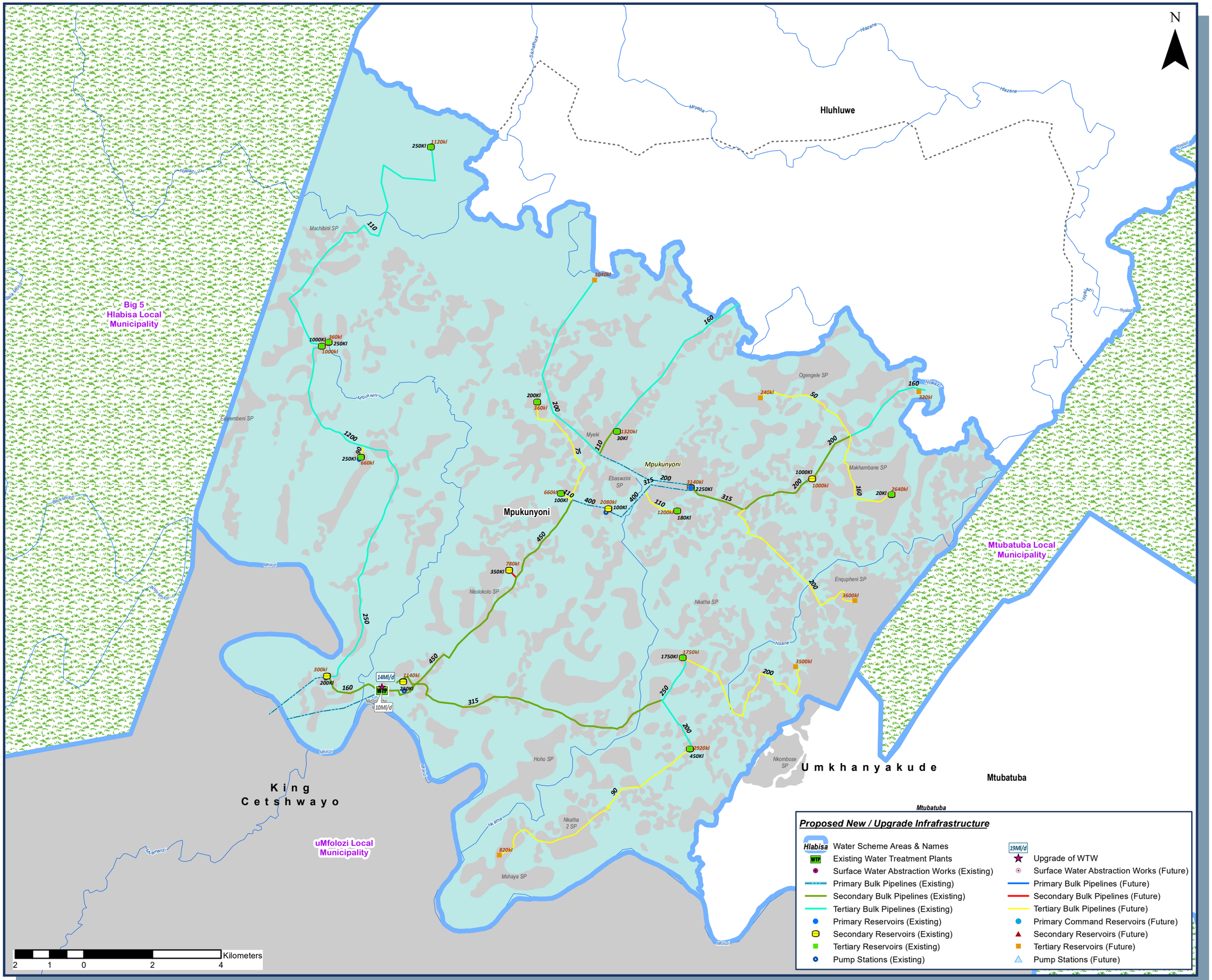
9.3.2.2 Proposed Interventions

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Mpukunyoni WSIA and is illustrated within Figure 9-6 overleaf followed by the schematic layout of the WSIA within Figure 9-7 overleaf.

- ✓ Initiate the feasibility study to investigate the build an Off Channel Storage Dam at Mfolozi River as the potential for an Off-Channel Dam on the Mfolozi River and a bulk pipeline to this supply area is a possible solution to the huge shortfall which the local water resource is currently experiencing. Only then can the following extensions and upgrades be implemented:

    - o The existing Nkolokotho WTP needs to be upgraded to 14 Mℓ/day to meet the 2050 demand;
    - o The existing primary and secondary bulk mains from the Nkolokotho WTP feeding the Esiyembeni SP, Machibini SP, Nkatha SP, Nkombose SP, Nkatha 2 SP; Gunjaneni SP; Myeki SP and the Ogengele SP should be upgraded by adding 6.8km of primary bulk ranging between 200mm - 400mm and 28.9 km of secondary bulk ranging between ø 200mm - ø 450mm and 39.33 km of tertiary bulk ranging between ø 63mm - ø 250 mm;
    - o The secondary and tertiary bulk mains should be further extended to include 300m of 90mm secondary mains and 30.8km of ø 50mm - ø 250 mm tertiary mains;
    - o The existing primary Vulamehlo Reservoir should be increased to 3,1 Mℓ from where the secondary and tertiary storage should be increased from 1.9Mℓ to 5.18 Mℓ and the tertiary storage capacity from 4.5 Mℓ to 12.6 Mℓ; and
    - o The additional tertiary storage to be added is 9.52 Mℓ; and
    - o The pump station at the Nkolokoto WTP should be upgraded to 215 KW to pump 156l//s and the Nkumbanbengi pump station (11.2kW), Mahaye pump station (12.2 kW) and Nomatiya pump station (45.9kW) should remain the same.

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



Legend

- Provinical Boundaries
- District Municipality Boundaries
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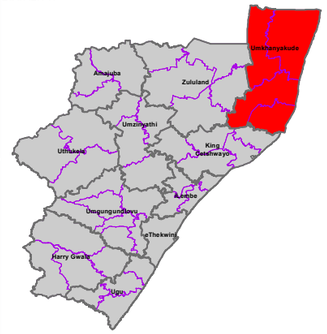
- Farm Land & Conservation Areas
- Dams & Dam Names
- Rivers
- Settlements & Settlement Names
- Major Towns
- UKDM Sub Scheme Areas & Names

Proposed New / Upgrade Infrafrastructure

Hlabisa Water Scheme Areas & Names	19Ml/d Upgrade of WTW
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)	

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

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CONSULTANTS:

Project No.: 27814

MARISWE

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
Fax: + 27 (0) 12 460 4071
Email: pretoria@mariswe.com

PROJECT TITLE

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

MAP TITLE:

Total Bulk Water Supply Interventions - UK003: Mpukunyoni
Umkhanyakude District Municipality

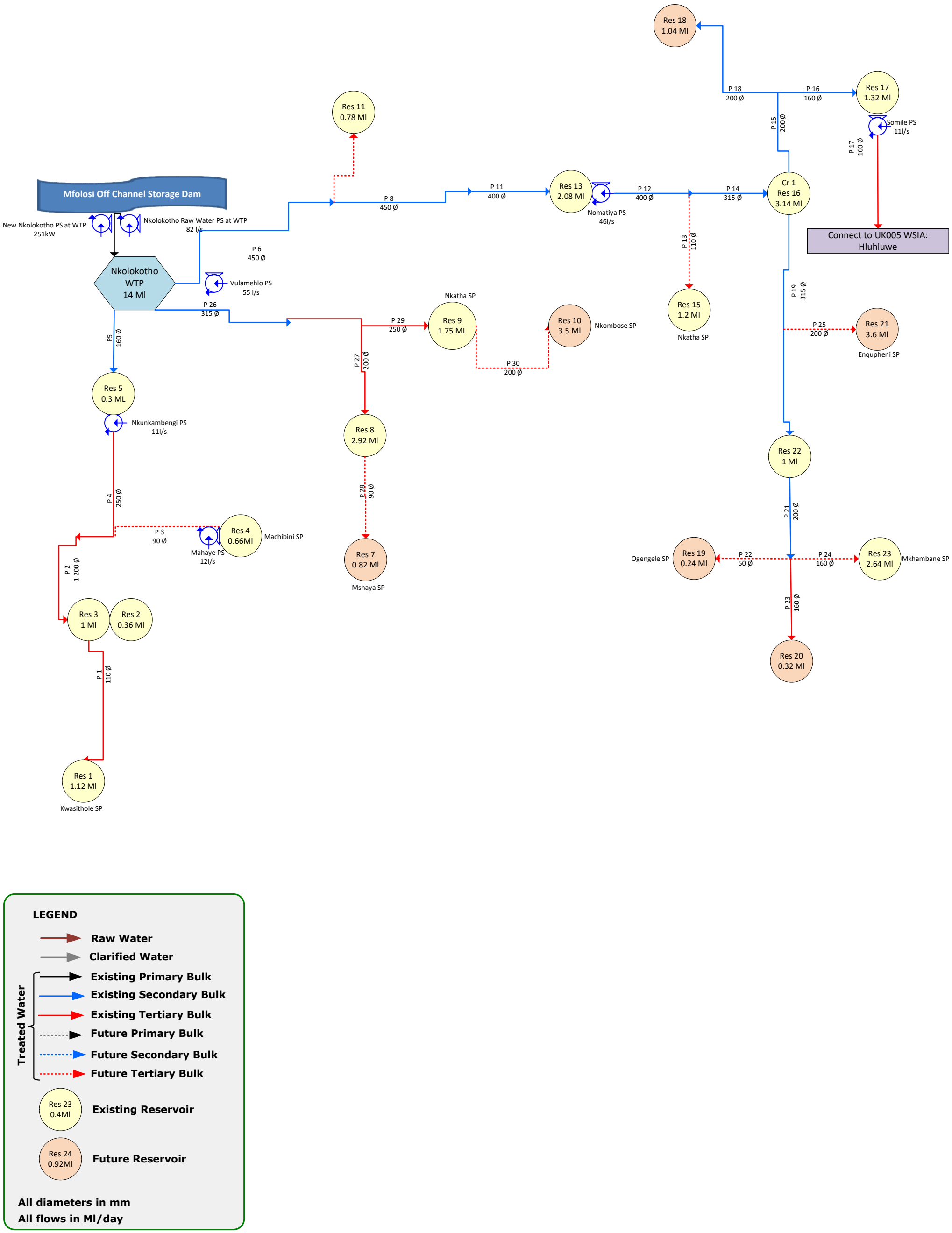
DATE COMPLETED:

30 September 2020

MAP NO.:

DC27: Figure 9.6

Figure 9-7
UK003 WSIA: Mpukunyoni



9.3.3 Financial Requirements

The bulk cost requirement for UK003: Mpukunyoni WSIA is tabled within Table 9-7 below.

Table 9-7: UK003: Mpukunyoni Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R67 227 000	R6 722 700	R73 949 700
Secondary	R106 085 000	R10 608 500	R116 693 500
Tertiary	R121 060 000	R12 106 000	R133 166 000
Total	**R294 372 000**	**R29 437 200**	**R323 809 200**

The total bulk cost requirement for the Mpukunyoni Scheme is R 323,8 million (excl VAT). The scheme development cost per household is approximately R 26 623. Due to the size of the project, it will take close to 15 years to complete.

9.4 UK004 WSIA: JOZINI SCHEME

9.4.1 Demand Model Intervention

9.4.1.1 Water Demand

The water demand for the Jozini WSI was determined for 2020 and 2050 and included within Table 9-8. It includes approximately 87 communities of which the majority are rural. The scheme serves the Jozini town from where the scheme is extended to the surrounding rural communities.

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

Population	**Population 2020**	**Population 2050**
	172 100	213 739
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	30.54	39.35

9.4.1.2 Water Resource Consideration

[13]The main source of supply to the sub schemes of Jozini, Malobeni, Mjindi, Nondabuyo and Othobothini currently is the Phongola River that flows into the Pongolapoort Dam. An allocation of 2.6 million m^3/a is registered on WARMS for the UKDM. The UKDM has registered a water allocation of 13.5 million m^3/a at the weir where the Jozini New WTW abstracts water. This is the equivalent of 37Mℓ/day.

[13] Umkhanyakude District Water Services Master Plan, Version 3, 2016

[14]The Pongolopoort Dam can potentially supply the following schemes:

- ✓ The Jozini North and Nondabuya Schemes that are located on the left bank of Pongolapoort Dam and are supplied by an abstraction works on the left bank of the dam.
- ✓ The Jozini-Makhathini water supply scheme where Jozini town is located on the right bank of Pongolapoort Dam and is supplied directly from the dam. The scheme extends into Makhathini Fats up to a small river called Muzi and the uMkhuze River in the south. Depending on the availability of the water resources of Lake Sibaya and groundwater, the scheme areas of Mbazwana and Mseleni may, in the long term, be supplied from the uPhongolo River.

The 40 Mℓ/day Othobothini WTP will have the capacity to meet the future demand of Nondabuyo, Bhokweni to Matshamhlophe as well as to KwaJobe.

The capacities of the various water treatment plants that supply the aforementioned schemes are tabled within Table 9-9 below and will meet the water demand of the entire Jozini scheme until 2050.

Table 9-9: WTP Capacities within the Jozini WSIA

WTP Name	Capacity (Mℓ/day)
Nondabuya WTP	0.3
Othobothini WTP	40
Jozini Old WTP	2.5
Jozini New WTP	5
Mjindi WTP	0.35
Makhonyeni WTP	0.8
Malobeni WTP	0.8
Jobe WTP	0.5
Bethesda WTP	0.3
Mkhuze WTP	2.5
Mkuze WTP	1.5
Mseleni	0.8
Mabibi WTP	0.18
Mbazwane WTP	1.5
14 WTPs	**57.03**

[14] Umgeni Water Infrastructure Master Plan, 2020

9.4.2 Water Supply Infrastructure

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Jozini WSIA and is illustrated within Figure 9-8 overleaf followed by the schematic layout of the WSIA within Figure 9-9.

9.4.2.1 Bulk conveyance

- ✓ Jozini Old/New – The ø 800 mm primary bulk pipeline from the abstraction weir to both the old and new Jozini WTPs extends ultimately to Mseleni Town and surrounds via secondary bulk gravity mains ranging from ø 315mm - ø 762mm, to the north west towards Thokazi via ø 125 mm tertiary bulk pipe, to the north east towards KwaSonto up to KwaNsukumibili and Mabibi via a ø 50 mm -90 mm tertiary bulk and to the south via a ø 125 mm - ø 250 mm secondary bulk pipe to serve Qondweni and Mbazwana and a tertiary bulk of ø 90 mm to serve Ubombo; and
- ✓ Othobothini- The ø 800 mm bulk backbone from Jozini WTP extends to Othobothini WTP from where it supplies the rural areas towards the northwest of Bhokweni and eMombeni via a ø 160 mm - ø 360 mm tertiary bulk and the north east towards Nondabya and Magovini via a ø 200 mm - ø 315 mm tertiary bulk.

9.4.2.2 Storage

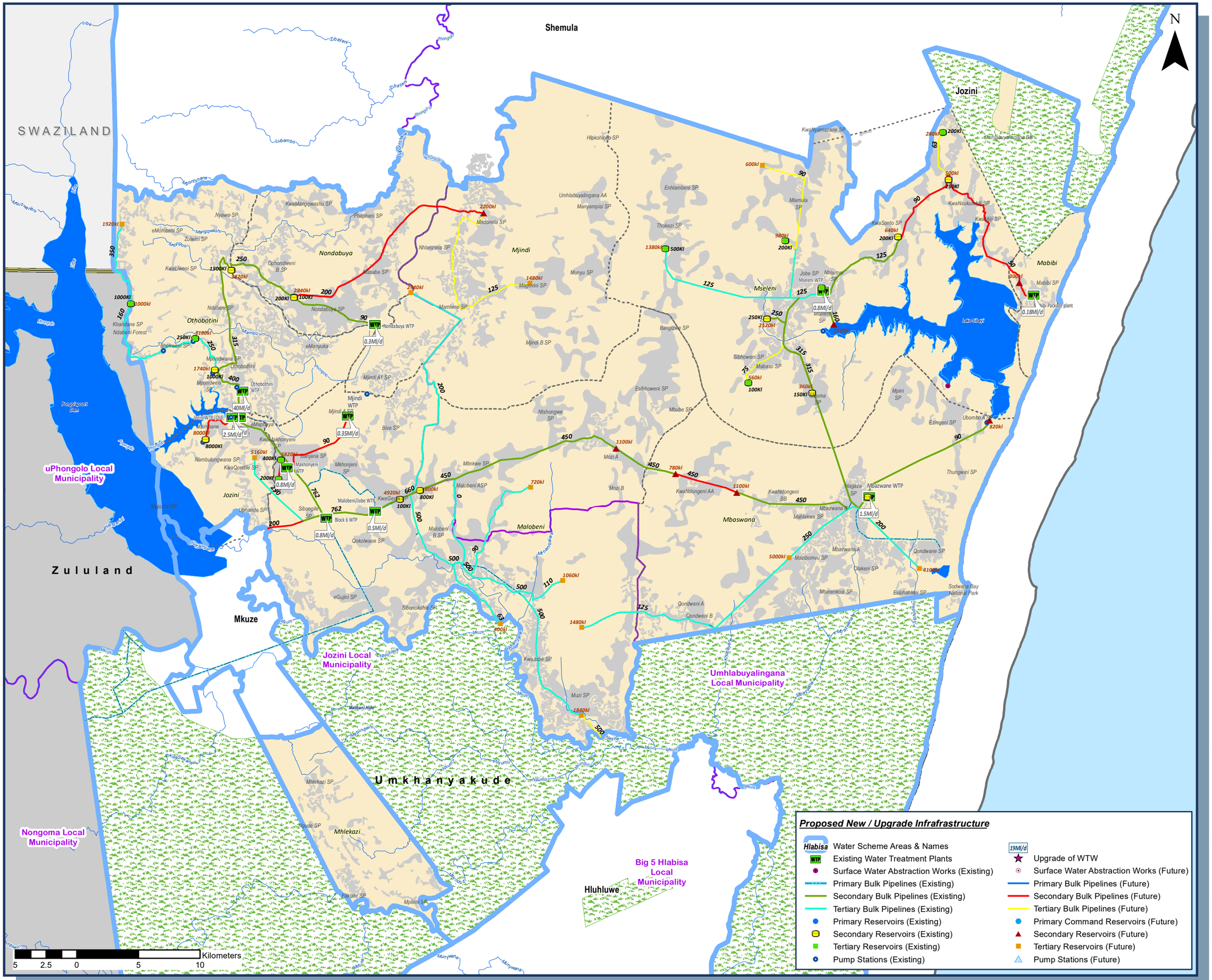
- ✓ The 8 Mℓ Reservoir close to the Jozini WTP will be connected via ø 200 mm secondary pipe; and
- ✓ The existing Jozini Main reservoir close to the Orthobothini WTP will be upgraded to 1 740Kl.

9.4.2.3 Pumpstations

The pumping capacities of the existing pump stations are sufficient and listed within Table 9-10 below;

Table 9-10: Existing pumping capacities within the Jozini WSIA

Pump station Name	Power (kW)
Pump station 150 Njobeni Pump station	5,61
Ridge stage 1 PS	112,13
Jozini Raw Water pump station	55,05
Mbazwana Raw Water Pump station	81,55
Mseleni Raw Water Pump station	22,43
Jozini local PS at Reservoir	42,61
Ridge stage 2 PS	103,52
Jozini Main PS	112,13
Hyalophane Pump station	5,61



Legend

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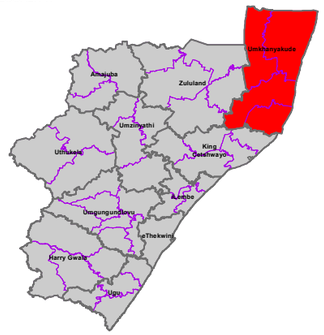
LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

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Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
Fax: + 27 (0) 12 460 4071
Email: pretoria@mariswe.com

PROJECT TITLE

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

MAP TITLE:

Total Bulk Water Supply Interventions - UK004: Jozini Umkhanyakude District Municipality

DATE COMPLETED:

30 September 2020

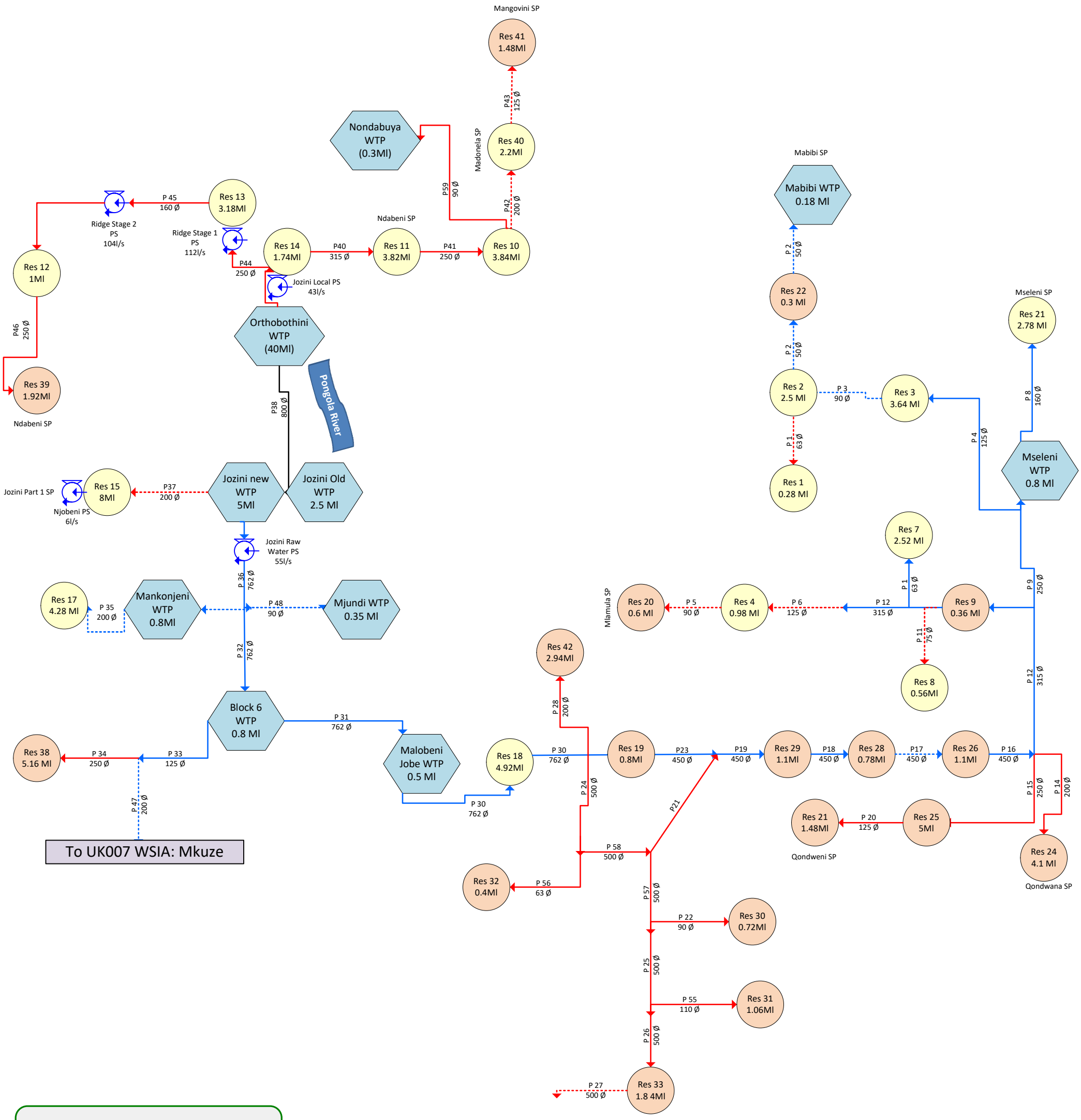
MAP NO.:

DC27: Figure 9.8

Proposed New / Upgrade Infrafrastructure

- 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)
- 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
UK004 WSIA: Jozini



LEGEND

- Raw Water
- Clarified Water

Treated Water

- Existing Primary Bulk
- Existing Secondary Bulk
- Existing Tertiary Bulk
- Future Primary Bulk
- Future Secondary Bulk
- Future Tertiary Bulk

Res 23 0.4Ml — Existing Reservoir

Res 24 0.92Ml — Future Reservoir

All diameters in mm
All flows in Ml/day

9.4.2.4 Proposed Interventions:

- ✓ The existing secondary and tertiary bulk mains from the Jozini WTP supplying Mseleni SP and Mbzawana SP and Orbhothini WTP supplying Bhokweni SP and Nondubya SP should be upgraded by adding 116km of secondary bulk ranging between ø 90mm - ø 762mm and 151,9 km of tertiary bulk ranging between ø 90mm - ø 500mm.
- ✓ The secondary and tertiary bulk mains should be further extended to include 87.4km of secondary bulk ranging between ø 90 mm and ø 450 mm and 44.8km of ø 90mm - ø 500 mm tertiary mains;
- ✓ The existing secondary main Jozini reservoir should be among other be increased to 1.74 Mℓ from where the remainder of the 10 secondary and 19 tertiary storage should be increased between 12.5 Mℓ to 25.9 Mℓ and the tertiary storage capacity from 4.7 Mℓ to 19.3 Mℓ; and
- ✓ The additional secondary storage to be added across the Jozini supply area is 9.1 Mℓ and the tertiary storage to be added is 26.7 Mℓ.

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

9.4.3 Financial Requirements

The bulk cost requirement for UK003: Jozini WSIA is tabled within Table 9-11: UK004 Jozini Cost Requirement below.

Table 9-11: UK004 Jozini Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R-	R0	R-
Secondary	R757 796 000	R75 779 600	R833 575 600
Tertiary	R454 459 000	R45 445 900	R499 904 900
Total	**R1 212 255 000**	**R121 225 500**	**R1 333 480 500**

The total bulk cost requirement for the Jozini Scheme is R 1,33 billion (excl VAT). The scheme development cost per household is approximately R 31 381. Due to the size of the project, it will take close to 15 years to complete.

9.5 UK005 WSIA: Hluhluwe Scheme

9.5.1 Demand Model Intervention

9.5.1.1 Water Demand

The water demand for the Hluhluwe WSI was determined for 2020 and 2050 and included within Table 9-12. It includes approximately 38 communities of which the majority are rural. The scheme serves the Hluhluwe town from where the scheme is extended to the surrounding rural communities.

Table 9-12: Population and Water demand 2020 and 2050 for Hluhluwe WSIA

Population	Population 2020	Population 2050
	145 171	180 295
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	11,16	14,39

9.5.1.2 Water Resource Consideration

The Hluhluwe system can also be supplied by the Mfolozi River. The potential for an Off-Channel Storage Dam on the Mfolozi River and a bulk pipeline to this supply area is a possible solution to the huge shortfall that the local water resource is currently experiencing. Jozini Phase 2 could also be utilised to augment the existing water source.

The existing 10Mℓ/day Hluhluwe 1 WTP requires an additional treatment capacity of 8Mℓ/day and the existing 1.5Mℓ/day Hluhluwe 2 WTP requires an additional 1,5Mℓ/day treatment capacity.

9.5.2 Water Supply Infrastructure

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Hluhluwe WSIA and is illustrated within Figure 9-10 overleaf followed by the schematic layout of the WSIA within Figure 9-11.

9.5.2.1 Bulk Conveyance

- ✓ The existing ø 250 mm rising main should be upgraded to 350 mm to pump potable water to the 5 000Kℓ Command reservoirs located in the Nomkondo SP area. Water is pumped from the Command reservoir and transferred to Hluhluwe town, the St Lucia Marine Reserve SP to reach Hluhluwe Phase 3 via secondary bulk mains that ranges between ø 250mm and ø 315mm and tertiary bulk mains to be upgraded to range between ø 250mm and ø 500mm.
- ✓ Water is also pumped north east from the Command reservoir to the Nompondo pump station and reservoir via secondary and tertiary bulk ranging between ø 160mm and 355mm main to supply the Nkonyamaneni SP, Koqhoqhoqho SP and Mzinene SP;
- ✓ Water is pumped south into Phase 4 to KWaMthole SP via secondary bulk ranging between ø 50mm and ø 250mm to reach KWaSithole SP and Madwaleni SP;
- ✓ The secondary bulk main connecting the Hluhluwe 1 and Hluhluwe 2 WTPs should be upgraded from the existing ø 90mm and ø 250mm to range between ø 250mm and ø 450mm; and
- ✓ The Hluhluwe 2 WTP supplies potable water to rural communities to the south (Ophondweni region) via secondary bulk mains that should be upgraded to ø 160mm and ø 315 mm bulk and tertiary bulk mains ranging from ø 200mm to ø 250mm to reach Dukuduku SP, Mfekayi SP and Phondweni SP.

9.5.2.2 Storage

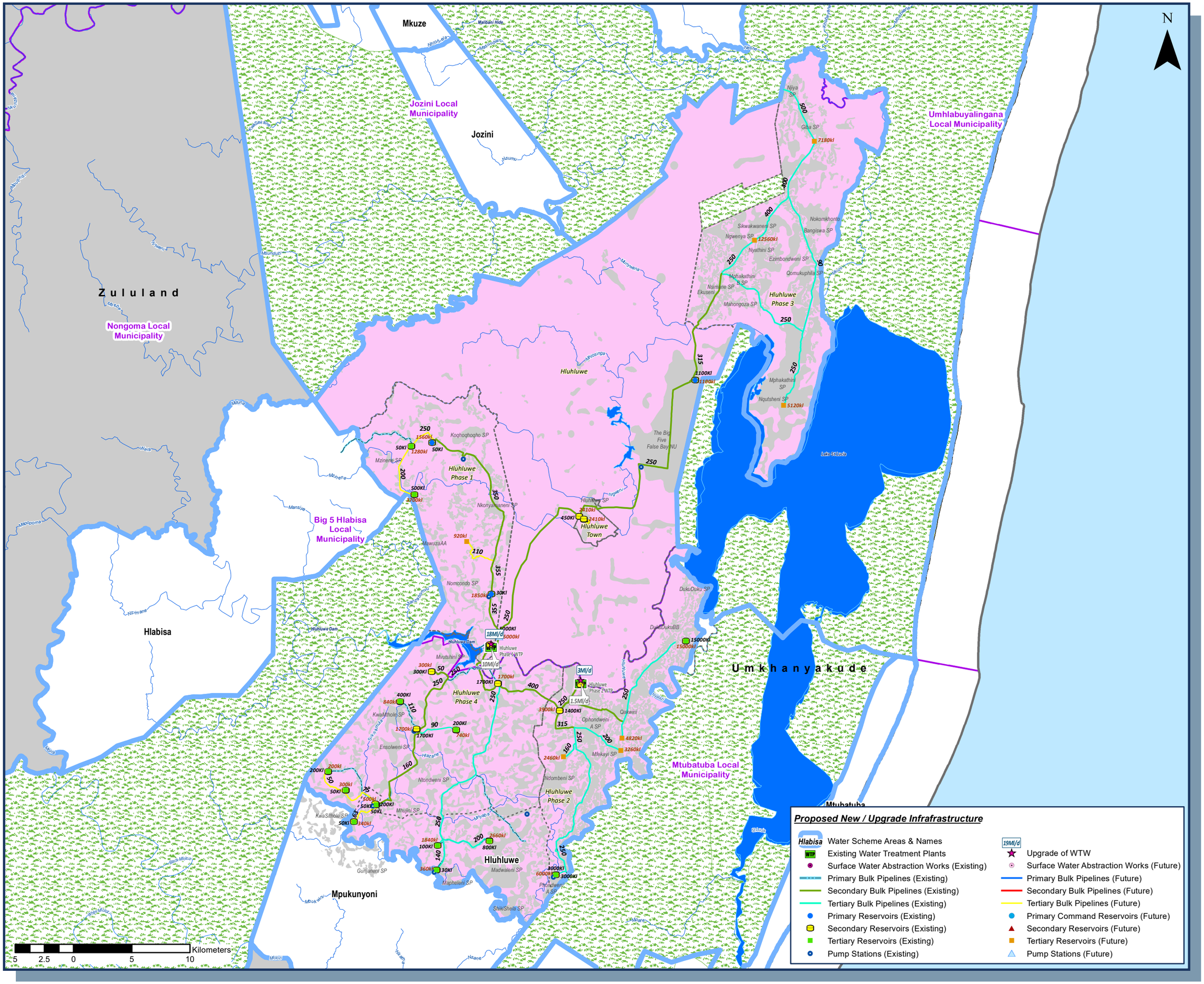
- ✓ The existing 30Kl Nompondo Pump station Reservoir should be upgraded to a Command reservoir and its storage capacity should be increased to 1 850Kl. Water is then pumped further to Hluhluwe Phase 1 and the existing 50Kl Makhowe Reservoir should also be upgraded to a Command reservoir with an increased storage capacity of 1 560Kl.
- ✓ The existing 450 Kl Tower Reservoir at the Hluhluwe Town as well as the 450Kl Balancing Reservoir should both be upgraded to 2 410Kl.
- ✓ The existing capacity of the 5 000Kl Command reservoirs close to the Hluhluwe 1 WTP is sufficient.

9.5.2.3 Proposed Interventions

- ✓ Initiate the feasibility study to investigate the build an Off Channel Storage Dam at Mfolozi River as the potential for an Off-Channel Dam on the Mfolozi River and a bulk pipeline to this supply area is a possible solution to the huge shortfall which the local water resource is currently experiencing. Only then can the following extensions and upgrades be implemented:

    - o The existing Hluhluwe 1 WTP needs to be upgraded to 18Mℓ/day and the existing Hluhluwe 2 WTP needs to be upgraded to 3Mℓ/day inclusive of a pump station of 42 kW to pump the water to the Command reservoir in Hluhluwe Phase 1;
    - o The existing secondary and tertiary bulk mains should be upgraded to include 109.33km of secondary bulk ranging between ø 50mm and ø 450mm and 105 km of tertiary bulk ranging between ø 90mm and ø 500mm;
    - o The existing ø 250mm primary bulk of 3.36km should be extended by 3.14km of ø 110mm bulk main and the tertiary bulk should be extended to include 25.46km of bulk ranging between ø 50mm and ø 250mm;
    - o The capacities of the existing four(4) primary command reservoirs should be upgraded from 6,2 Mℓ to 9.5 Mℓ,
    - o The existing eight (8) secondary storage reservoirs should be increased from 10.4 Mℓ to 16.8 Mℓ and the 13 tertiary storage reservoirs' capacities from 23.8 Mℓ to 33.8 Mℓ;
    - o The tertiary storage capacity should be further increased by an additional seven (7) tertiary reservoirs with a total capacity of 36.3 Mℓ; and
    - o An additional 42 kW pump station that delivers at 0,055 M^3/s should be built to pump water from the 5 000Kl Command Reservoir to the Msushwana Command Reservoir.

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



Legend

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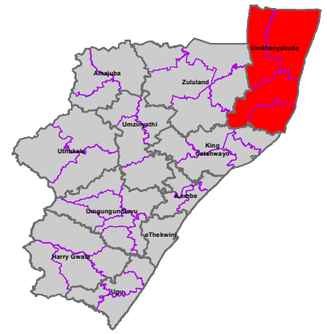


CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

UMKHANYAKUDE DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

MARISWE
JTN CONSULTING

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
Fax: + 27 (0) 12 460 4071
Email: pretoria@mariswe.com

PROJECT TITLE

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

MAP TITLE:

Total Bulk Water Supply Interventions - UK005: Hluhluwe Umkhanyakude District Municipality

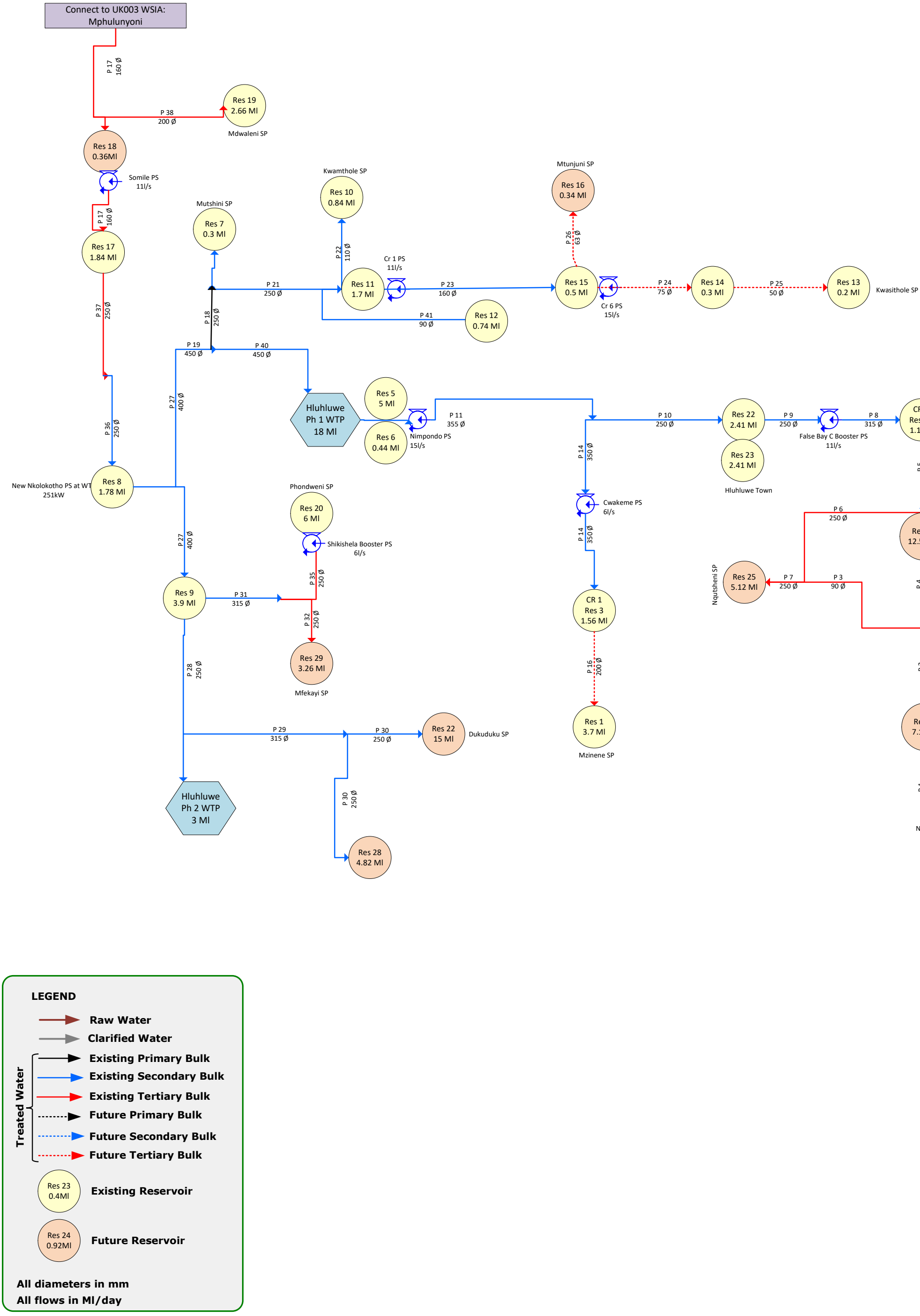
DATE COMPLETED: 30 September 2020

MAP NO.: **DC27: Figure 9.10**

Proposed New / Upgrade Infrafrastructure

- Hlabisa — 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 9-11
UK005 WSIA: Hluhluwe



9.5.3 Financial Requirements

The bulk cost requirement for UK005: Hluhluwe WSIA is tabled within Table 9-13 below.

Table 9-13: UK005 Hluhluwe Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R57 880 500	R5 788 050	R63 668 550
Secondary	R268 711 000	R26 871 100	R295 582 100
Tertiary	R338 996 000	R33 899 600	R372 895 600
Total	**R665 587 500**	**R66 558 750**	**R732 146 250**

The total bulk cost requirement for the Hluhluwe Scheme is R 732,1 million (excl VAT). The scheme development cost per household is approximately R 21 603. Due to the size of the project, it will take close to 15 years to complete.

9.6 UK006 WSIA: MTUBATUBA SCHEME

9.6.1 Demand Model Intervention

9.6.1.1 Water Demand

The water demand for the Mtubatuba WSI was determined for 2020 and 2050 and included within Table 9-14 below. It includes approximately nine (9) communities and the scheme serves the Mtubatuba and St Lucia towns from where the scheme is extended to the surrounding rural communities.

Table 9-14: Population and Water demand 2020 and 2050 for the Mtubatuba WSIA

Population	**Population 2020**	**Population 2050**
	64 142	79 661
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	16.84	21.49

9.6.1.2 Water Resource Consideration

The Mtubatuba Scheme shares the Mfolozi River as a water resource with the Mpukunyoni Scheme. The entire Mtubatuba supply area sources water from the Mfolozi River (current safe yield of 10.1 Mℓ/d) as well as from production boreholes. As stated earlier, the low flows in the Mfolozi River results in intermittent supplies for the Mpukunyoni and Mtubatuba supply areas and it is therefore proposed to build an Off Channel Storage Dam at Mfolozi River to meet the Mtubatuba Supply Area: 2050 demand 21.5 Mℓ/day. The firm yield of this off channel dam will provide 155 Mℓ/day that would meet the entire demand of all the supply areas until 2050 and beyond.

- ✓ Water is abstracted from the Mfolozi River to the Mtubatuba WTP. Water is treated at the newly upgraded 20Ml/day Mtubatuba WTP that should be increased to 22Mℓ/day and a pump station with a pumping capacity of 77kW should be implemented at the Mtubatuba WTP.

9.6.2 Water Supply Infrastructure

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Mtubatuba WSIA and is illustrated within Figure 9-12 overleaf followed by the schematic layout of the WSIA within Figure 9-13.

9.6.2.1 Bulk Conveyance

- ✓ Potable water is pumped northwards through the existing primary ø 600mm steel rising main to the 25Mℓ Mtuba Heights Reservoir that should be increased. The capacity of the rising main should be increased to ø 630mm. and a pump station with pumping capacity of 77kW should be implemented at the Mtubatuba WTP.
- ✓ The existing ø 813mm steel gravity main that transports potable water from the Mtuba Heights reservoirs East towards Mtubatuba Town and continues towards Honeydale and Uitkyktoring Land strip. The aforementioned existing pipe extension from the Mtubatuba Town should be increased from ø 450mm to ø 813mm;
- ✓ The existing gravity main continues east via ø 500mm – ø 600mm bulk pipe to reach St Lucia Town and also branches to reach the Monzi reservoir via ø 250mm and ø 315mm bulk pipe;
- ✓ The pumping capacities of the Khula village Pump Station, the Mtubatuba old booster pump station and the Khula village pump station water tower reservoir are sufficient.

9.6.2.2 Storage

- ✓ The capacities of the following existing reservoirs should be increased:
    - o The 25Mℓ Mtuba Heights reservoir to 35Mℓ;
    - o The 5Mℓ Kwamsane reservoir to 10.2Mℓ;
    - o The 5Mℓ Monzi/Dukuduku reservoir to 5.3Mℓ;
    - o The 1.5Mℓ Monzi Crossings Pressure Break to 4.3Mℓ;
    - o The 1Mℓ Futululu reservoir to 4.3Mℓ;
    - o The 850Kℓ Monzi reservoir to 2.8Mℓ;
    - o The 1Mℓ Khula Village Pump station & reservoirs 1 to 5Mℓ; and
    - o The 1.5Mℓ St Lucia 2 x 600kl reservoirs to 5Mℓ.

Proposed Interventions

- ✓ Initiate the feasibility study to investigate the build an Off Channel Storage Dam at Mfolozi River as the potential for an Off-Channel Dam on the Mfolozi River and a bulk pipeline to this supply area is a

possible solution to the huge shortfall which the local water resource is currently experiencing. The estimated development cost of the storage dam is included under the development cost for Mtubatuba. Only then can the following extensions and upgrades be implemented:

- The existing Mtubatuba WTP needs to be upgraded to 22Mℓ/day inclusive of a pump station of 77kW to pump the water to the Mtuba Heights Reservoir;
- The existing primary, secondary and tertiary bulk mains should be upgraded to include 18.13km of primary bulk ranging between ø 500mm and ø 813mm, 8.64km of secondary bulk ranging between ø 600mm and ø 630mm and 13.57km of tertiary bulk ranging between ø 200mm and ø 375mm;
- The existing secondary bulk should be extended with a 4.68km bulk pipe of ø 315mm of bulk to and the tertiary bulk should be extended to include bulk 2.33km of bulk of ø 140mm;
- The capacities of the existing two(2) primary command reservoirs should be increased from 30 Mℓ to 40.34 Mℓ,
- The existing secondary storage reservoir should be increased from 2.5 Mℓ to 5 Mℓ and the five (5) tertiary storage reservoirs' capacities from 9.85 Mℓ to 26.6 Mℓ;
- The tertiary storage capacity should be further increased by one additional tertiary reservoir with a capacity of 2.1 Mℓ; and
- An additional 77 kW pump station that delivers at 0,22 M^3/s should be built to pump water from to the 35 000Kl Mtuba Heights Command Reservoir.

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

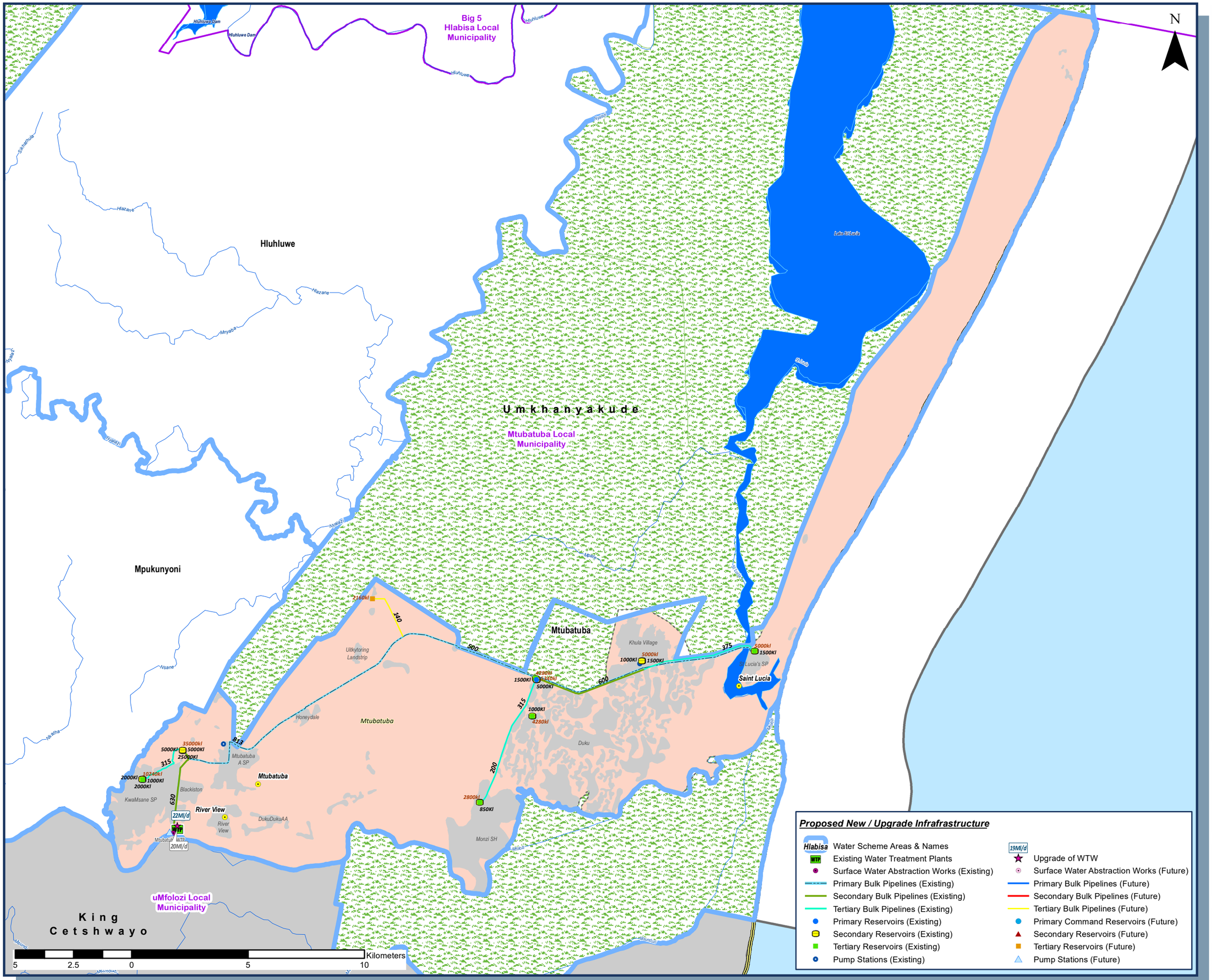
9.6.3 Financial Requirements

The bulk cost requirement for UK006: Mtubatuba WSIA is tabled within Table 9-15 below.

Table 9-15: UK006 Mtubatuba Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R2 350 917 156	R235 091 716	R2 586 008 872
Secondary	R101 328 000	R10 132 800	R111 460 800
Tertiary	R116 587 000	R11 658 700	R128 245 700
Total	**R2 568 832 156**	**R256 883 216**	**R2 825 715 372**

The total bulk cost requirement for the Mtubatuba Scheme is R 2.825 billion (excl VAT). The scheme development cost per household is approximately R 57 751 if the dam development cost is excluded. Due to the size of the project, it will take close to 15 years to complete.



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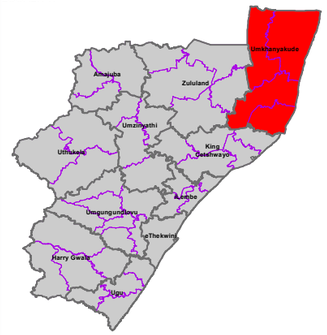

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CONSULTANTS:

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MARISWE

JTN CONSULTING

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
Fax: + 27 (0) 12 460 4071
Email: pretoria@mariswe.com

PROJECT TITLE

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

MAP TITLE:

Total Bulk Water Supply Interventions - UK006: Mtubatuba Umkhanyakude District Municipality

DATE COMPLETED:

30 September 2020

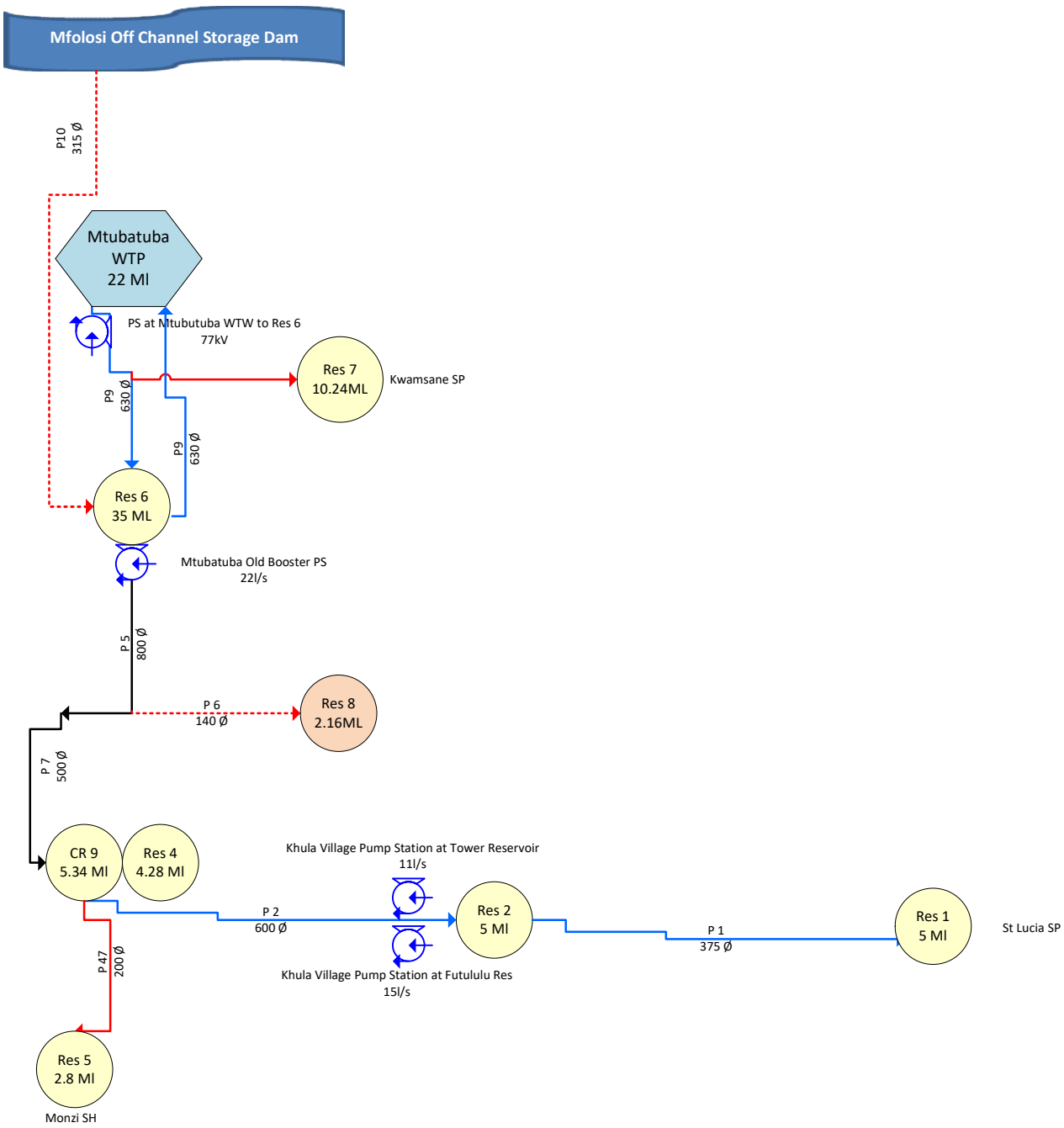
MAP NO.:

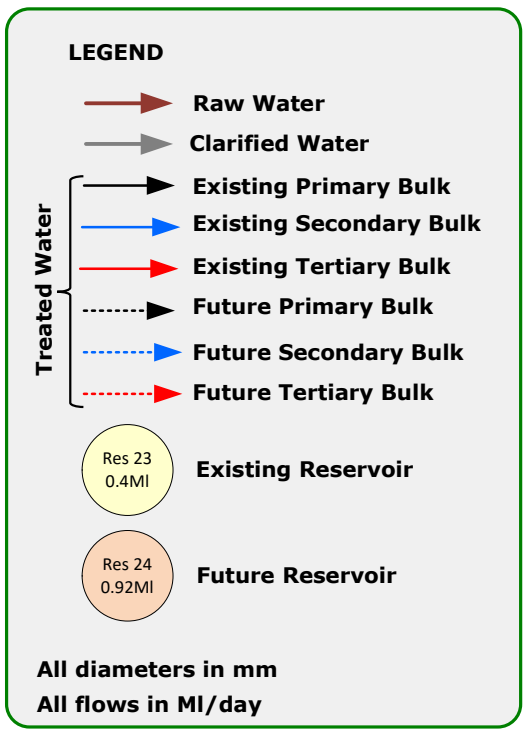
DC27: Figure 9.12

Proposed New / Upgrade Infrafrastructure

- Hlabisa 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 9-13
UK006 WSIA: Mtubatuba





9.7 UK007 WSIA: MKUZE SCHEME

9.7.1 Demand Model Intervention

9.7.1.1 Water Demand

The water demand for the Mkuze WSI was determined for 2020 and 2050 and included within Table 9-16. It includes approximately 11 communities of which the majority are rural. The scheme serves the Mkhuze town from where the scheme is extended to the surrounding rural communities.

Table 9-16: Population and Water demand 2020 and 2050 for the Mkuze WSIA

Population	**Population 2020**	**Population 2050**
	15 020	15 020
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	3.35	4.29

9.7.1.2 Water Resource Consideration

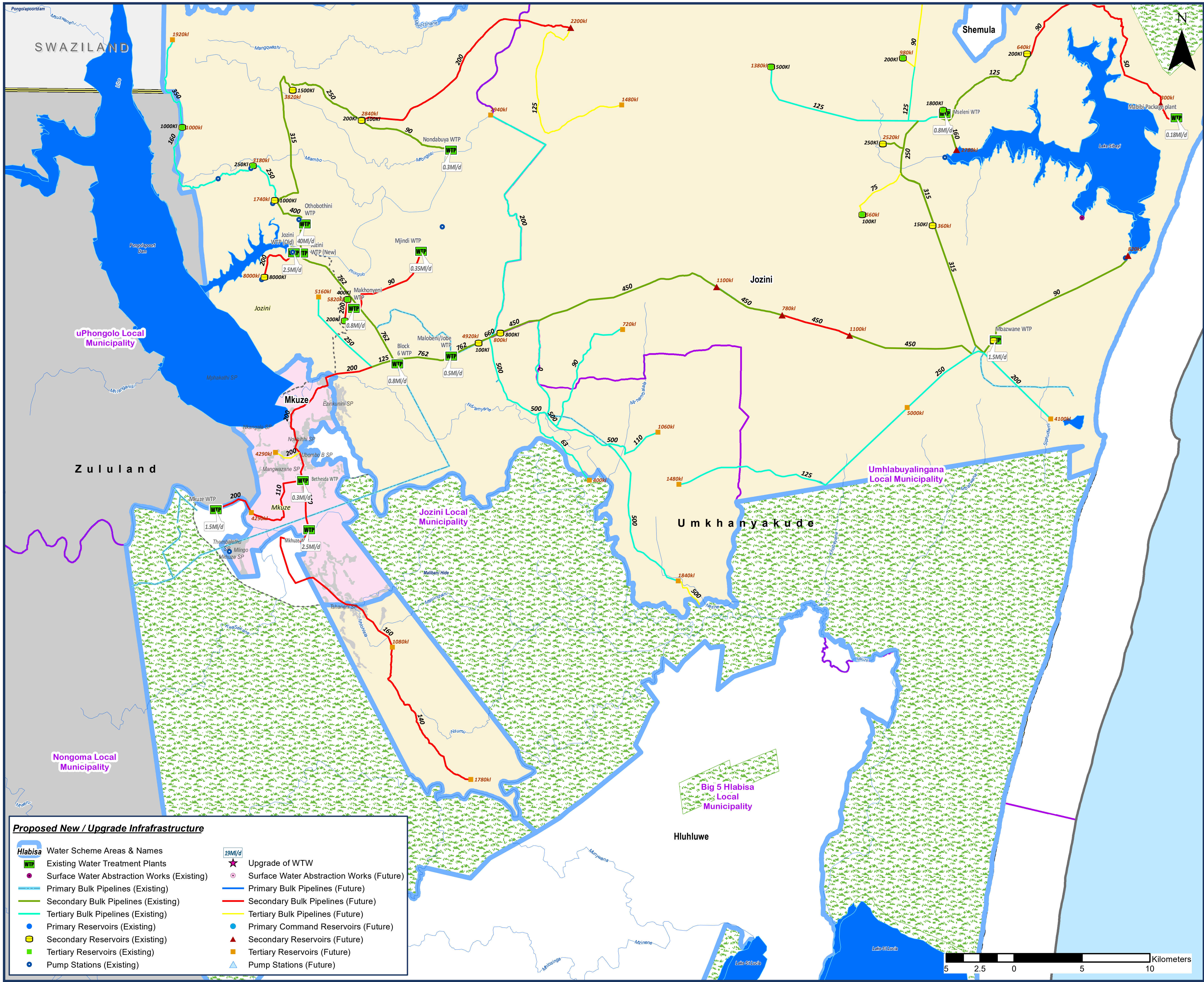
It is proposed to extend a bulk line from Jozini New WTP to augment the Mkhuze and Mhlekazi. Supply areas. Jozini New WTP is a 5 Mℓ/day plant abstracting water from the irrigation canal fed from the Pongolapoort Dam. The Mkuze Scheme is supplied by three (3) WTPs with a total capacity of 4.3 Mℓ/day and the water supply would be sufficient when the additional water supply is augmented from the 5 Mℓ/day Jozini New WTP. The details of the WTPs are tabled below.

Table 9-17: WTP capacities within the Mkuze WSIA

WTP Name	Capacity (Mℓ/day)
Bethesda WTP	0,3
Mkuze River WTP	2,5
Mkuze WTP	1,5
Jozini WTP	5
	9,3

9.7.2 Water Supply Infrastructure

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Mkuze WSIA and is illustrated within overleaf followed by the schematic layout of the WSIA within Figure 9-15.



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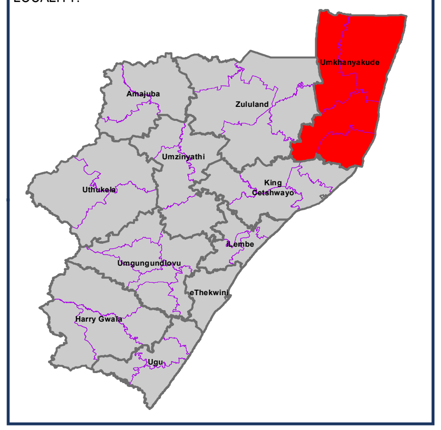

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Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
Fax: + 27 (0) 12 460 4071
Email: pretoria@mariswe.com

PROJECT TITLE

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

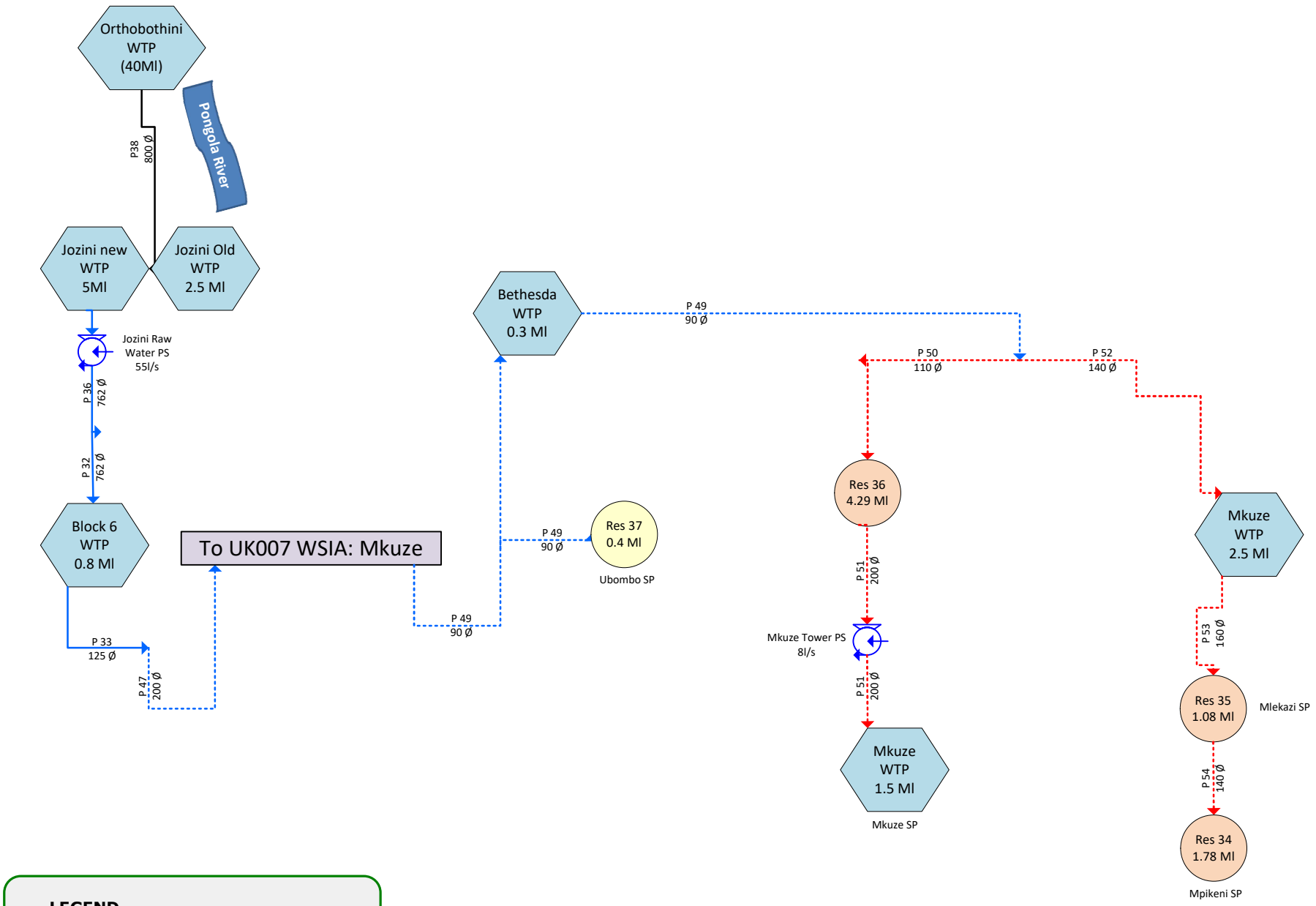
MAP TITLE:

Total Bulk Water Supply Interventions - UK007: Mkuze
Umkhanyakude District Municipality

DATE COMPLETED:
30 September 2020

MAP NO.:
DC27: Figure 9.14

Figure 9-15
UK007 WSIA: Mkuze



9.7.2.1 Bulk Conveyance

- ✓ It is proposed to transfer treated water from the Jozini WTP via the existing ø 200mm that is proposed to be upgraded to ø 762mm under the Jozini scheme until it reaches Block 6 WTP in the Malobeni supply area.

9.7.2.2 Proposed Interventions

- ✓ The existing ø 125mm secondary bulk from the Block 6 WTW should be extended to include 52km of secondary bulk pipes between ø 90mm and ø 200mm bulk main to reach the Mkhuze Town and Mhlekazi and the tertiary bulk should be extended to include 2.03km of bulk pipe of ø 200mm;
- ✓ The additional storage to be provided is 11,4 Mℓ with two (2) 4.3 Mℓ tertiary reservoirs to serve the Mkuze SP and Nkangala SP and two (2) tertiary reservoirs with a total capacity of 2.86 Mℓ to serve the Mhlekazi SP.
- ✓ The existing Mkhuze Tower pump station that delivers at 7.6 M^3/s is sufficient to supply the Mkuze and surrounds.

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

9.7.3 Financial Requirements

The bulk cost requirement for UK007: Mkuze WSIA is tabled within Table 9-18 below.

Table 9-18: UK007 Mkuze Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary		R0	R-
Secondary	R30 410 000	R3 041 000	R33 451 000
Tertiary	R48 979 000	R4 897 900	R53 876 900
Total	**R79 389 000**	**R7 938 900**	**R87 327 900**

The total bulk cost requirement for the Mkuze Scheme is R 87,3 million (excl VAT). The scheme development cost per household is approximately R 23 782. Due to the size of the project, it will take close to 15 years to complete.

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

Water Supply Scheme / WSIA		Population 2020	Water Requirements (Mℓ/d)						
			2020	2025	2030	2035	2040	2045	2050
Con001	Conservation	1 912	0.40	0.42	0.43	0.45	0.47	0.49	0,51
Farm001	Farmland	1 066	0.26	0.27	0.28	0.29	0.30	0.31	0,33
UK001	Hlabisa	62 370	11.16	11.59	12.05	12.59	13.15	13.75	14,39
UK002	Shemula	220 211	38.70	40.19	41.82	43.68	45.65	47.75	49,97
UK003	Mpukunyoni	61 178	10.57	10.98	11.42	11.93	12.48	13.05	13,66
UK004	Jozini	172 100	30.54	31.71	32.98	34.43	35.97	37.61	39,35
UK005	Hluhluwe	145 171	25.84	26.81	27.88	29.09	30.37	31.74	33,19
UK006	Mtubatuba	64 142	16.84	17.47	18.14	18.91	19.73	20.58	21,49
UK007	Mkuze	15 020	3.35	3.48	3.61	3.77	3.93	4.11	4,29
TOTAL		**743 170**	**137,65**	**142.91**	**148.63**	**155.14**	**162.06**	**169.39**	**177.18**

A total of 177.18 Mℓ/d is required for the entire WSA in 2050 with the Shemula WSIA and Jozini WSIA requiring the largest portion at 28% and 22% respectively.

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)
UK001	Hlabisa	77 460	14.4	5.25	7.3	5.48	12.78	7.53
UK002	Shemula	273 491	50.0	18.24	13.5	6.57	20.07	1.83
UK003	Mpukunyoni *	75 980	13.7	4.99	3.65	56.5	60.15	47.32
UK004	Jozini	213 739	39.3	14.36	20.82	0	20.82	6.46
UK005	Hluhluwe *	180 295	33.2	12.11	3.59	56.5	60.09	35.21

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)
UK006	Mtubatuba *	79 661	21.5	7.84	3.65	56.5	60.15	52,31
UK007	Mkuze	18 654	4.3	1.57	1.57	1.83	3.4	1,83
Con001	Conservation Areas and Farm land	3 699	0.8	0.19	-	-	-	-
TOTAL			919 280	176.34	64.36			
*** The current source is the Mfolozi River of which the existing yield is insufficient and should be augmented by the off-channel storage dam on the Mfolozi River that would yield 56,57Mm^3/annum.**								

From the table above, it is noted all the schemes will have adequate raw water resources to meet the 2050 demand requirements. The investigation to augment the water shortage within three WSIAs, Mtubatuba, Mpukunyoni and Hlabisa, by constructing the off-channel storage dam at the Mfolozi River 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 UK001: Hlabisa WSIA

Table 10-3: UK001 Hlabisa WSIA Summary

Hlabisa Scheme						
Item	Description					
1	Infrastructure				Size / No	Capacity (Ml/d or Length or kW)
1.1	Existing	WTW	Mandlakazi WTW	Primary Bulk	1	35
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	-	-
				Secondary Bulk	140 ømm - 400ømm	64.46 km
				Tertiary Bulk	50 ømm - 315 ømm	34.92km
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	14	180 - 6 160 kl
			Supply Reservoirs	Tertiary Bulk	11	180 - 1 540 Kl
		Pump stations	Stezi Pump station F	Primary Bulk	55 l/s	55 l/s
			Tshonono B Magangatho Pump station	Primary Bulk	55 l/s	55 l/s
1.2	Future	Bulk Pipelines		Primary Bulk	1 1060 ømm	3.65km
				Secondary Bulk	110 ømm - 914 ømm	24 km
				Tertiary Bulk	315 ømm - 355 ømm	1.13 km
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	-	-
			Supply Reservoirs	Tertiary Bulk	7	160- 760 Kl
		Pump stations		Primary Bulk	-	-

10.3.2 UK002: Shemula WSIA

Table 10-4: UK002 Shemula WSIA Summary

Shemula Scheme						
Item	Description					
1	Infrastructure				Size / No	Capacity (Ml/d or Length or kW)
1.1	Existing	WTW	Various	Primary Bulk	7	51
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	500 ømm - 560ømm	16.7 km
				Secondary Bulk	50 ømm - 560ømm	166.20 km
				Tertiary Bulk	63 ømm - 250 ømm	161.18 km
		Reservoirs	Command Reservoir	Primary Bulk	1	6 740 Kl
			Command Reservoir	Secondary Bulk	10	400 - 12 000Kl
			Supply Reservoirs	Tertiary Bulk	14	400 - 3 440 Kl
		Pump stations	Various	Primary Bulk	284.91 l/s	-
1.2	Future	Bulk Pipelines		Primary Bulk	-	-
				Secondary Bulk	110 ømm -560 ømm	56.44 km
				Tertiary Bulk	50 ømm - 160 ømm	135.93 km
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	9	480 - 5 860 Kl
			Supply Reservoirs	Tertiary Bulk	35	240 - 6 980 Kl
		Pump stations	PS at Shemula WTW to Res 17	Primary Bulk	0.19963 M^3/s	195 kW

10.3.3 UK003: Mpukunyoni WSIA

Table 10-5: UK003 Mpukunyoni WSIA Summary

Mpukunyoni Scheme						
Item	Description					
1	Infrastructure				Size / No	Capacity (Ml/d or Length or kW)
1.1	Existing	WTW	Nkolokotho WTW	Primary Bulk	10	14
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	200 ømm - 400ømm	6.8 km
				Secondary Bulk	200 ømm - 450ømm	28.9 km
				Tertiary Bulk	63ømm - 250 ømm	39.33 km
		Reservoirs	Command Reservoir	Primary Bulk	1	3 140Kl
			Command Reservoir	Secondary Bulk	5	300 - 2 080 Kl
			Supply Reservoirs	Tertiary Bulk	11	360 - 2 920 Kl
		Pump stations	Various	Primary Bulk	0.14 M ^{3}/s	251 kW
1.2	Future	Bulk Pipelines		Primary Bulk	-	-
				Secondary Bulk	90 ømm	0.3 km
				Tertiary Bulk	50 ømm - 200 ømm	30.81 km
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	-	-
			Supply Reservoirs	Tertiary Bulk	6	240 - 3 600 Kl
		Pump stations		Primary Bulk	-	-

10.3.4 UK004: Jozini WSIA

Table 10-6: UK004 Jozini WSIA Summary

Jozini Scheme						
Item	Description					
1	Infrastructure				Size / No	Capacity (Ml/d or Length or kW)
1.1	Existing	WTW	Various	Primary Bulk	14	57.03
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	-	-
				Secondary Bulk	90 ømm - 800ømm	137.78 km
				Tertiary Bulk	90 ømm - 500 ømm	155.82 km
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	10	360 - 8 000 Kl
			Supply Reservoirs	Tertiary Bulk	9	400 - 5 160 Kl
		Pump stations		Primary Bulk	-	-
1.2	Future	Bulk Pipelines		Primary Bulk	-	-
				Secondary Bulk	90 ømm -450ømm	62.92 km
				Tertiary Bulk	90 ømm - 500 ømm	40.39 km
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	7	300 - 2 780 Kl
			Supply Reservoirs	Tertiary Bulk	12	400 - 5 160 Kl
		Pump stations				

10.3.5 UK005: Hluhluwe WSIA

Table 10-7: UK005 Hluhluwe WSIA Summary

Hluhluwe Scheme						
Item	Description					
1	Infrastructure				Size / No	Capacity (Ml/d or Length or kW)
1.1	Existing	WTW	Hluhluwe Phase 1 WTW	Primary Bulk	10	18
			Hluhluwe Phase 2 WTW	Primary Bulk	1.5	3
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	250ømm	3.36 km
				Secondary Bulk	50 ømm - 450ømm	109.33 km
				Tertiary Bulk	90 ømm - 500 ømm	105 km
		Reservoirs	Command Reservoir	Primary Bulk	4	1 100- 5 000Kl
			Command Reservoir	Secondary Bulk	8	300 - 4 400 Kl
			Supply Reservoirs	Tertiary Bulk	13	200 - 15 000 Kl
		Pump stations		Primary Bulk	-	-
1.2	Future	Bulk Pipelines		Primary Bulk	110 ømm	3.14 km
				Secondary Bulk	-	-
				Tertiary Bulk	50 ømm - 250 ømm	25.46 km
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	-	-
			Supply Reservoirs	Tertiary Bulk	7	160- 760 Kl
		Pump stations	PS at Res 5 to Res3	Primary Bulk	0.05463 M^3/s	42 kW

10.3.6 UK006: Mtubatuba WSIA

Table 10-8: UK006 Mtubatuba WSIA Summary

Mtubatuba Scheme						
Item	Description					
1	Infrastructure				Size / No	Capacity (Ml/d or Length or kW)
1.1	Existing	Source	Mfolozi Off Channel Storage Dam Feasibility Study and Dam development	Primary Bulk	1	155
		WTW	Mtubatuba WTW	Primary Bulk	20	22
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	500 ømm - 813ømm	18.13 km
				Secondary Bulk	600ømm - 630 ømm	13.32 km
				Tertiary Bulk	200 ømm - 375 ømm	13.57 km
		Reservoirs	Command Reservoir	Primary Bulk	2	5 340 Kl - 35 000Kl
			Command Reservoir	Secondary Bulk	1	5 000
			Supply Reservoirs	Tertiary Bulk	5	2 800 - 10 240Kl
		Pump stations	Various	Primary Bulk	48.9 l/s	-
1.2	Future	Bulk Pipelines		Primary Bulk	-	-
				Secondary Bulk	315 ømm	4.68 km
				Tertiary Bulk	140 ømm - 250 ømm	2.33 km
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	-	-
			Supply Reservoirs	Tertiary Bulk	1	2 160 Kl
		Pump stations	PS at Mtubatuba WTW to Res 6	Primary Bulk	0.217778 M^3/s	77 kW

10.3.7 UK007: Mkuze WSIA

Table 10-9: UK007 Mkuze WSIA Summary

Mkuze Scheme						
Item	Description					
1	Infrastructure				Size / No	Capacity (Ml/d or Length or kW)
1.1	Existing	WTW	Jozini WTW	Primary Bulk	5	5
			Bethesda WTW	Primary Bulk	0.3	0.3
			Mkuze River WTW	Primary Bulk	2.5	2.5
			Mkuze WTW	Primary Bulk	1.5	1.5
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	-	-
				Secondary Bulk	-	-
				Tertiary Bulk	-	-
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	-	-
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	Mkhuze Tower Pump station		7.64525994 m^3/s	-
1.2	Future	Bulk Pipelines		Primary Bulk	-	-
				Secondary Bulk	90ømm - 200 ømm	52.26 km
				Tertiary Bulk	200 ømm	2.03 km
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	-	-
			Supply Reservoirs	Tertiary Bulk	4	1 080-4 290 Kl
		Pump stations		Primary Bulk	-	-

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 Table 10-10 below.

Table 10-10: Financial Requirements based on Demand Model Interventions

WSIA	WSIA Name	Total Cost Requirement				
		Primary	Secondary	Tertiary	10% Contingencies	Total Cost (Excl VAT)
UK001	Hlabisa	R0,00	R197 121 000	R56 520 000	R25 364 100	R279 005 100
UK002	Shemula	R222 052 000	R732 895 000	R353 717 000	R130 875 400	R1 439 629 400
UK003	Mpukunyoni	R67 227 000,00	R106 085 000,00	R121 060 000,00	R29 437 200	R323 809 200
UK004	Jozini	R0,00	R757 796 000,00	R454 459 000,00	R121 225 500	R1 333 480 500
UK005	Hluhluwe	R57 880 500	R268 711 000	R338 996 000	R66 558 750	R732 146 250
UK006	Mtubatuba	R2 350 917 156.26	R101 328 000.00	R116 587 000.00	R256 883 216	R2 825 715 372
UK007	Mkuze	R0,00	R30 410 000,00	R48 979 000,00	R7 938 900	R87 327 900
TOTAL		**R2 698 076 656**	**R2 194 346 000**	**R1 490 318 000**	**R638 274 066**	**R7 021 014 722**

A total estimate of approximately R 7.021 billion is required to address the total bulk water supply requirement by 2050.

10.5 Funding Options

The UKDM relies mainly on grant funding programmes to fund their water supply projects. These funding programmes are mainly MIG and RBIG. Based on all the current funding streams available to the District Municipality over the MTEF period, it will take a minimum of 15 years for the WSA to address their water supply requirements. Another funding option that the UKDM 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 seven (7) area interventions would be an implementation priority for the DM, it is proposed to consider the following three (3) priorities detailed within Table 10-11. 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 10-11: Proposed Implementation Order (Phased Approach)

Proposed Priorities (Phased Approach)	WSIA No and Name		Proposed Project Name	Proposed Estimated Project Value
1	UK003	Mpukunyoni	Mfolozi Off Channel Storage Dam Feasibility Study and Dam Development:	
	UK005	Hluhluwe	1. Initiate Feasibility Study	R5 000 000
	UK006	Mtubatuba	2. Off-channel storage dam development	R2 077 643 156
2	UK007	Mkuze	Augment the supply to the Mkuze supply area from the Jozini WTP	R87 327 900
3	UK002	Shemula	Upgrade the existing Shemula WTP to 45 Ml/day inclusive of an 195kW pump station at the WTP as well as increasing the storage capacity of the Command Reservoir to 6.74Mℓ.	R103 927 000

11. RECOMMENDATIONS

11.1 RESPONSIBILITIES

The provision of water services remains the responsibility of the UKDM as the WSA. The UKDM 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 UKDM to take this process further.

11.2 SELECTION OF SOLUTIONS

The seven (7) proposed water supply intervention areas (WSIAs) are the appropriate solutions for bulk water supply development within UKDM and are as follows:

- ✓ UK001 WSIA: Hlabisa;
- ✓ UK002 WSIA: Shemula;
- ✓ UK003 WSIA: Mpukunyoni;
- ✓ UK004 WSIA: Jozini;
- ✓ UK005 WSIA: Hluhluwe;
- ✓ UK006 WSIA: Mtubatuba; and
- ✓ UK007 WSIA: Mkuze (part of Jozini).

The following three WSI are prioritised for consideration:

- ✓ Priority 1 UK003, UK005 and UK006: Mpukunyoni Mfolozi Off Channel Storage Dam Feasibility Study and Dam Development:
  - o 1. Initiate Feasibility Study
  - o 2. Off-channel storage dam development
- ✓ Priority 2 UK007: Mkuze - Augment the supply to the Mkuze supply area from the Jozini WTP
- ✓ Priority 3 UK002: Shemula - Upgrade the existing Shemula WTP to 45 Ml/day inclusive of an 195kW pump station at the WTP as well as increasing the storage capacity of the Command Reservoir to 6.74Mℓ.

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 – REFERENCE

Reference List

DWS (2011)	Support to the Implementation and Maintenance of Reconciliation Strategies for Towns in the Southern Region, 2016
DWS (2018)	Reference Framework Geo database, March 2018
Umgeni Water	UAP Phase II: Towards the Development of a Regional Bulk Water Requirements for the Umkhanyakude District Municipality, June 2015
Statistics SA	Census 2011; Community Survey 2016
WSDP	2020 uMkhanyakude WSDP (Draft)
IDP	Umkhanyakude Municipality 2019/2020 Financial Year, June 2019
WSA	Climate Change Vulnerability Assessment and Response Plan, March 2018, Version 2
WSA	Umkhanyakude District Municipality Bio-Diversity Sector Plan, 2014
IDP	Umkhanyakude District Municipality Integrated Development Plan Review 4th Generation: 2018/2019
DGDP	Umkhanyakude District Growth and Development Plan, 2014
DWS	Continuation of Reconciliation Strategies for All Towns (CRSAF) in the Eastern Region - Summary of the Water Reconciliation Strategy Options for the Schemes in the Umkhanyakude District Municipality for the Period - 2015 To 2045, September 2016
Umgeni Water	Umgeni Water Infrastructure Master Plan, 2020
Bigen	Umkhanyakude Bulk Water Supply Master Plan, 2016

ANNEXURE B – DETAILED PROPOSED WSI INFRASTRUCTURE COMPONENT DETAIL

UK001 WSIA: Hlabisa Scheme

The total bulk cost requirement for the Hlabisa Scheme is R 279 005 100 (excl VAT). The scheme development cost per household is approximately R 16 604. Due to the size of the project, it will take close to 15 years to complete.

Hlabisa Scheme						
Item	Description					
1	Population	Scheme Name	Sub scheme No	Population 2020	Population 2050	
		Hlabisa Scheme	UK001	62 370	77 460	
		Total		62 370	77 460	
2	Demand	Scheme Name	Sub scheme No	Demand 2020 (Ml/day)	Demand 2050 (Ml/day)	
		Hlabisa Scheme	UK001	11.16	14.39	
		Total		11.16	14.39	
3	Water Resource		HFY (Mm3/a)	HFY (Ml/d)	Comments	
		Dams	Mandlakazi WTW	35		
4	Infrastructure			Class	Size / No	Capacity (Ml/d or Length or kW)
4.1	Existing	WTW	Mandlakazi WTW	Primary Bulk	20	35
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	-	-
				Secondary Bulk	140 ømm - 400ømm	64.46km
				Tertiary Bulk	50 ømm - 315 ømm	34.92km
		Reservoirs		Primary Bulk	-	-
			Res 3	Secondary	500	1 380
			Res 7	Secondary	500	760
			Res 8	Secondary	500	1 860
			Res 9	Secondary	500	840
			Res 10	Secondary	2 000	1 200
			Res 11	Secondary	500	680
			Res 12	Secondary	2 000	6 160
			Res 13	Secondary	80	4 660
			Res 18	Secondary	500	1 000
			Res 19	Secondary	40	180
			Res 20	Secondary	20	180
			Res 21	Secondary	20	360
			Res 22	Secondary	580	360
			Res 23	Secondary	40	180
			Res 1	Tertiary	200	1 220

			Res 2	Tertiary	200	1 140
			Res 4	Tertiary	500	1 540
			Res 5	Tertiary	200	420
			Res 6	Tertiary	500	360
			Res 14	Tertiary	500	440
			Res 15	Tertiary	1 000	320
			Res 16	Tertiary	1 000	320
			Res 17	Tertiary	20	820
			Res 24	Tertiary	20	180
			Res 25	Tertiary	20	180
		Pump stations	Stezi Pump station F	Primary Bulk	55 l/s	55 l/s
			Tshonono B Magangatho Pump station	Primary Bulk	55 l/s	55 l/s
4.2	Future	Bulk Pipelines		Primary Bulk	-	-
				Secondary Bulk	90 ømm -250 ømm	1.7 km
				Tertiary Bulk	63 ømm - 315 ømm	12 km
		WTW		Primary Bulk		
				Secondary Bulk	-	-
		Reservoirs	Res 1	Primary Bulk	-	-
			Res 3	Secondary Bulk	-	-
			Res 26	Tertiary Bulk	0	380
			Res 27	Tertiary Bulk	0	760
			Res 28	Tertiary Bulk	0	360
			Res 29	Tertiary Bulk	0	160
			Res 30	Tertiary Bulk	0	160
			Res 31	Tertiary Bulk	0	200
			Res 32	Tertiary Bulk	0	200
		Pump stations		Primary Bulk	-	
5	Cost Requirement		Capital Cost	10% Contingencies	Total Cost (Excl VAT)	
		Primary	R -	R -	R -	
		Secondary	R 197 121 000	R19 712 100	R 216 833 100	
		Tertiary	R 56 520 000	R5 652 000	R 62 172 000	
		Total	R 253 641 000	R 25 364 100	R 279 005 100	

UK002: Shemula Scheme

The total bulk cost requirement for the Shemula Scheme is R 1,439 billion (excl VAT). The scheme development cost per household is approximately R 25 002. Due to the size of the project, it will take close to 15 years to complete.

Shemula Scheme						
Item	Description					
1	Population	Scheme Name	Sub scheme No	Population 2020	Population 2050	
		Shemula Scheme	UK002	220 211	273 491	
		Total		220 211	273 491	
2	Demand	Scheme Name	Sub scheme No	Demand 2020 (Ml/day)	Demand 2050 (Ml/day)	
		Shemula Scheme	UK002	38.70	49.97	
		Total		38.70	49.97	
3	Water Resource		HFY (Mm3/a)	HFY (Ml/d)	Comments	
		Dams				
		River	Pongola River	37.60		
			Gezisa and Kanini Streams			
			Manguzi boreholes	2.61		
			Thengani, Mshudu boreholes			
			Enkanyezini Boreholes	0.78		
4	Infrastructure			Class	Size / No	Capacity (Ml/d or Length or kW)
4.1	Existing	WTW	Shemula WTW	Primary Bulk	27	45
			Ingwavuma WTW	Primary Bulk	1	1
			Kwangwanase - Thengani WTW	Primary Bulk	1	1
			Kwangwanase - Airfield	Primary Bulk	1	1
			Kwangwanase - Manguzi	Primary Bulk	1,5	1,5
			Kwangwanase Mshudu WTW	Primary Bulk	1	1
			Kwangwanase	Primary Bulk	1	1
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	500 ømm - 560ømm	16.17 km
				Secondary Bulk	50 ømm - 560ømm	166.20 km
				Tertiary Bulk	63 ømm - 250 ømm	161.18 km
		Reservoirs	Res 17	Primary Bulk	4 000	6 740
			Res 1	Secondary Bulk	260	6 720
			Res 2	Secondary Bulk	300	4 800
			Res 3	Secondary Bulk	3 000	3 000
			Res 8	Secondary Bulk	12 000	12 000
			Res 14	Secondary Bulk	150	1 060

			Res 15	Secondary Bulk	150	560
			Res 18	Secondary Bulk	5 000	5 000
			Res 19	Secondary Bulk	5 000	5 000
			Res 21	Secondary Bulk	3 800	3 800
			Res 66	Secondary Bulk	400	400
			Res 4	Tertiary Bulk	3 000	3 000
			Res 5	Tertiary Bulk	200	1 460
			Res 6	Tertiary Bulk	500	860
			Res 7	Tertiary Bulk	1 000	3 000
			Res 9	Tertiary Bulk	30	1 440
			Res 10	Tertiary Bulk	50	520
			Res 11	Tertiary Bulk	1 250	1 250
			Res 12	Tertiary Bulk	200	240
			Res 13	Tertiary Bulk	50	240
			Res 16	Tertiary Bulk	250	260
			Res 20	Tertiary Bulk	1 500	3 440
			Res 22	Tertiary Bulk	350	800
			Res 23	Tertiary Bulk	200	400
			Res 24	Tertiary Bulk	150	920
		Pump stations	Gezisa Raw Water Pump station	Primary Bulk	17.32925586 l/s	17.32925586 l/s
			Enkanyezini Pump station	Primary Bulk	19.36799185 l/s	19.36799185 l/s
			Phuntaza TWPS Res	Primary Bulk	49.9490316 l/s	49.9490316 l/s
			Maguku PS	Primary Bulk	76.45259939 l/s	76.45259939 l/s
			Ntabayemwe TWPS Res 2 Ingwavuma Pump station 2	Primary Bulk	55.04587156 l/s	55.04587156 l/s
			Ntabayemwe TWPS Res 1 Ingwavuma Pump station 1	Primary Bulk	55.04587156 l/s	55.04587156 l/s
			Ndumo Booster PS	Primary Bulk	4.07747197 l/s	4.07747197 l/s
			PS17	Primary Bulk	7.64525994 l/s	7.64525994 l/s
4.2	Future	Bulk Pipelines		Primary Bulk	-	-
				Secondary Bulk	110 ømm -560 ømm	56.44 km
				Tertiary Bulk	50 ømm - 160 ømm	135.93 km
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs	Res 1	Primary Bulk	-	-
			Res 26	Secondary Bulk	0	4 720
			Res 35	Secondary Bulk	0	1 020
			Res 38	Secondary Bulk	0	1 540
			Res 42	Secondary Bulk	0	3 440
			Res 45	Secondary Bulk	0	480
			Res 46	Secondary Bulk	0	1 720
			Res 55	Secondary Bulk	0	1 160
			Res 60	Secondary Bulk	0	5 860

			Res 62	Secondary Bulk	0	920
			Res 25	Tertiary Bulk	0	320
			Res 28	Tertiary Bulk	0	520
			Res 29	Tertiary Bulk	0	260
			Res 30	Tertiary Bulk	0	240
			Res 31	Tertiary Bulk	0	580
			Res 27	Tertiary Bulk	0	460
			Res 32	Tertiary Bulk	0	920
			Res 33	Tertiary Bulk	0	840
			Res 34	Tertiary Bulk	0	1 520
			Res 36	Tertiary Bulk	0	1 580
			Res 37	Tertiary Bulk	0	2 180
			Res 39	Tertiary Bulk	0	6 980
			Res 40	Tertiary Bulk	0	760
			Res 41	Tertiary Bulk	0	800
			Res 43	Tertiary Bulk	0	2 240
			Res 44	Tertiary Bulk	0	2 260
			Res 47	Tertiary Bulk	0	400
			Res 48	Tertiary Bulk	0	100
			Res 49	Tertiary Bulk	0	100
			Res 50	Tertiary Bulk	0	100
			Res 51	Tertiary Bulk	0	760
			Res 52	Tertiary Bulk	0	900
			Res 53	Tertiary Bulk	0	720
			Res 54	Tertiary Bulk	0	660
			Res 56	Tertiary Bulk	0	340
			Res 57	Tertiary Bulk	0	1 280
			Res 58	Tertiary Bulk	0	540
			Res 59	Tertiary Bulk	0	900
			Res 61	Tertiary Bulk	0	3 220
			Res 63	Tertiary Bulk	0	1 120
			Res 64	Tertiary Bulk	0	360
			Res 65	Tertiary Bulk	0	4 300
			Res 67	Tertiary Bulk	0	800
			Res 68	Tertiary Bulk	0	400
			Res 69	Tertiary Bulk	0	920
		Pump stations	PS at Shemula WTW to Res 17	Primary Bulk	0.19963 M^3/s	195 kW
5	Cost Requirement		Capital Cost	10% Contingencies	Total Cost (Excl VAT)	
		Primary	R 222 052 000	R22 205 200	R 244 257 200	
		Secondary	R 732 985 000	R73 298 500	R 806 283 500	
		Tertiary	R 353 717 000	R35 371 700	R 389 088 700	
		Total	R1 308 754 000	R130 875 400	R1 439 629 400	

UK003: Mpukunyoni Scheme

The total bulk cost requirement for the Mpukunyoni Scheme is R 323,8 million (excl VAT). The scheme development cost per household is approximately R 26 623. Due to the size of the project, it will take close to 15 years to complete.

Mpukunyoni Scheme						
Item	Description					
1	Population	Scheme Name	Sub scheme No	Population 2020	Population 2050	
		Mpukunyoni Scheme	UK003	61 178	75 980	
		Total		61 178	75 980	
2	Demand	Scheme Name	Sub scheme No	Demand 2020 (Ml/day)	Demand 2050 (Ml/day)	
		Mpukunyoni Scheme	UK003	10.57	13.66	
		Total		10.57	13.66	
3	Water Resource		HFY (Mm3/a)	HFY (Ml/d)	Comments	
		Dams				
		River	Mfolozi River	155,00	After construction of new proposed off-storage dam at Mfolozi River	
4	Infrastructure			Class	Size / No	Capacity (Ml/d or Length or kW)
4.1	Existing	WTW	Nkolokotho WTW	Primary Bulk	10	14
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	200 ømm - 400ømm	6.8 km
				Secondary Bulk	200 ømm - 450ømm	25.8
				Tertiary Bulk	63ømm - 250 ømm	39.33 km
		Reservoirs	CR1 (Res 16)	Primary Bulk	250	3 140
			Res 11	Secondary Bulk	350	780
			Res 13	Secondary Bulk	100	2 080
			Res 22	Secondary Bulk	1 000	880
			Res 5	Secondary Bulk	200	300
			Res 6	Secondary Bulk	250	1 140
			Res 1	Tertiary Bulk	250	1 120
			Res 12	Tertiary Bulk	100	660
			Res 14	Tertiary Bulk	200	360
			Res 15	Tertiary Bulk	180	1 200
			Res 17	Tertiary Bulk	30	1 320
			Res 2	Tertiary Bulk	250	360
			Res 23	Tertiary Bulk	20	2 640
			Res 3	Tertiary Bulk	1 000	360
			Res 4	Tertiary Bulk	250	660
			Res 8	Tertiary Bulk	450	2 920
			Res 9	Tertiary Bulk	1 750	1 020

		Pump stations	PS at Nkolokoto WTW to CR	Primary Bulk	0.14 M^3/s	251 kW
			Nkumbanbengi pump station	Primary Bulk	11.21 l/s	
			Mahaye pump station	Primary Bulk	12.23 l/s	
			Nomatiya pump station	Primary Bulk	45.87 l/s	
4.2	Future	Bulk Pipelines		Primary Bulk	-	-
				Secondary Bulk	90 ømm	0.30 km
				Tertiary Bulk	50 ømm - 200 ømm	30,81 km
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs	Res 1	Primary Bulk	-	-
			Res 26	Secondary Bulk	-	-
			Res 10	Tertiary Bulk	0	3 500
			Res 18	Tertiary Bulk	0	1 040
			Res 19	Tertiary Bulk	0	240
			Res 20	Tertiary Bulk	0	320
			Res 21	Tertiary Bulk	0	3 600
			Res 7	Tertiary Bulk	0	820
		Pump stations		Primary Bulk	-	-
5	Cost Requirement		Capital Cost	10% Contingencies	Total Cost (Excl VAT)	
		Primary	R 67 227 000	R6 722 700	R 73 949 700	
		Secondary	R 106 085 000	R10 608 500	R 116 693 500	
		Tertiary	R 121 060 000	R12 106 000	R 133 166 000	
		Total	R294 372 000	R29 437 200	R 323 809 200	

UK004: Jozini Scheme

The total bulk cost requirement for the Jozini Scheme is R 1,33 billion (excl VAT). The scheme development cost per household is approximately R 31 381. Due to the size of the project, it will take close to 15 years to complete.

Jozini Scheme						
Item	Description					
1	Population	Scheme Name	Sub scheme No	Population 2020	Population 2050	
		Jozini Scheme	UK004	172 100	213 739	
		Total		172 100	213 739	
2	Demand	Scheme Name	Sub scheme No	Demand 2020 (Ml/day)	Demand 2050 (Ml/day)	
		Jozini Scheme	UK004	30.54	39.35	
		Total		30.54	39.35	
3	Water Resource		HFY (Mm3/a)	HFY (Ml/d)	Comments	
		Dams				
		River	Phongola River	1.10	The domestic volume allocation must be adjusted at the weir	
4	Infrastructure			Class	Size / No	Capacity (Ml/d or Length or kW)
4.1	Existing	WTW	Nondabuya WTW	Primary Bulk	0.3	0.3
			Othobothini WTW	Primary Bulk	40	40
			Jozini Old WTW	Primary Bulk	2.5	2.5
			Jozini New WTW	Primary Bulk	5	5
			Mjindi WTW	Primary Bulk	0.35	0.35
			Makhonyeni WTW	Primary Bulk	0.8	0.8
			Malobeni WTW	Primary Bulk	0.8	0.8
			Jobe WTW	Primary Bulk	0.5	0.5
			Bethesda WTW	Primary Bulk	0.3	0.3
			Mkhuze WTW	Primary Bulk	2.5	2.5
			Mkuze WTW	Primary Bulk	1.5	1.5
			Mseleni	Primary Bulk	0.8	0.8
			Mabibi WTW	Primary Bulk	0.18	0.18
			Mbazwane WTW	Primary Bulk	1.5	1.5
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	-	-
				Secondary Bulk	90 ømm - 800ømm	137.78 km
				Tertiary Bulk	90 ømm - 500 ømm	155.82 km
		Reservoirs		Primary Bulk	-	-
			Res 10	Secondary Bulk	300	2 840
			Res 11	Secondary Bulk	1 500	3 820
			Res 14	Secondary Bulk	1 000	1 740

			Res 15	Secondary Bulk	8 000	8 000
			Res 18	Secondary Bulk	100	4 920
			Res 19	Secondary Bulk	800	600
			Res 2	Secondary Bulk	250	500
			Res 3	Secondary Bulk	200	640
			Res 7	Secondary Bulk	250	2 520
			Res 9	Secondary Bulk	150	360
			Res 1	Tertiary Bulk	200	280
			Res 12	Tertiary Bulk	1 000	1 000
			Res 13	Tertiary Bulk	250	3 180
			Res 16	Tertiary Bulk	400	5 820
			Res 17	Tertiary Bulk	200	4 280
			Res 4	Tertiary Bulk	200	980
			Res 5	Tertiary Bulk	1 800	1 800
			Res 6	Tertiary Bulk	500	1 380
			Res 8	Tertiary Bulk	100	560
		Pump stations	Pump station 150 Njobeni Pump station	Primary Bulk	5.60652396 l/s	5.60652396 l/s
			Ridge stage 1 PS	Primary Bulk	112.1304791 l/s	112.1304791 l/s
			Jozini Raw Water pump station	Primary Bulk	55.04587156 l/s	55.04587156 l/s
			Mbazwana Raw Water Pump station	Primary Bulk	81.54943935 l/s	81.54943935 l/s
			Mseleni Raw Water Pump station	Primary Bulk	22.42609582 l/s	22.42609582 l/s
			Jozini local PS at Reservoir	Primary Bulk	42.60958206 l/s	42.60958206 l/s
			Ridge stage 2 PS	Primary Bulk	103.51681957 l/s	103.51681957 l/s
			Jozini Main PS	Primary Bulk	112.1304791 l/s	112.1304791 l/s
			Nyawoshane Pump station	Primary Bulk	5.60652396 l/s	5.60652396 l/s
4.2	Future	Bulk Pipelines		Primary Bulk	-	-
				Secondary Bulk	90 ømm -450ømm	62.92 km
				Tertiary Bulk	90 ømm - 500 ømm	40.39 km
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs	Res 1	Primary Bulk	-	-
			Res 21	Secondary Bulk	0	2 780
			Res 22	Secondary Bulk	0	300
			Res 23	Secondary Bulk	0	820
			Res 26	Secondary Bulk	0	1 100
			Res 28	Secondary Bulk	0	780
			Res 29	Secondary Bulk	0	1 100
			Res 40	Secondary Bulk	0	2 200
			Res 20	Tertiary Bulk	0	600

			Res 24	Tertiary Bulk	0	4 100
			Res 25	Tertiary Bulk	0	5 000
			Res 27	Tertiary Bulk	0	1 480
			Res 30	Tertiary Bulk	0	720
			Res 31	Tertiary Bulk	0	1 060
			Res 32	Tertiary Bulk	0	400
			Res 33	Tertiary Bulk	0	1 840
			Res 38	Tertiary Bulk	0	5 160
			Res 39	Tertiary Bulk	0	1 920
			Res 41	Tertiary Bulk	0	1 480
			Res 42	Tertiary Bulk	0	2 940
		Pump stations		Primary Bulk	-	-
5	Cost Requirement		Capital Cost	10% Contingencies	Total Cost (Excl VAT)	
		Primary	R-	R0	R -	
		Secondary	R 757 796 000	R75 779 600	R 833 575 600	
		Tertiary	R 454 459 000	R45 445 900	R 499 904 900	
		Total	R1 212 255 000	R121 225 500	R1 333 480 500	

UK005: Hluhluwe Scheme

The total bulk cost requirement for the Hluhluwe Scheme is R 732,1 million (excl VAT). The scheme development cost per household is approximately R 21 603. Due to the size of the project, it will take close to 15 years to complete.

Hluhluwe Scheme						
Item	Description					
1	Population	Scheme Name	Sub scheme No	Population 2020	Population 2050	
		Hluhluwe Scheme	UK001	145 171	180 295	
		Total		145 171	180 295	
2	Demand	Scheme Name	Sub scheme No	Demand 2020 (Ml/day)	Demand 2050 (Ml/day)	
		Hluhluwe Scheme	UK001	25.84	33.19	
		Total		25.84	33.19	
3	Water Resource		HFY (Mm3/a)	HFY (Ml/d)	Comments	
		Dams	Hluhluwe Dam	9,86	NOT SUFFICIENT - the domestic volume must be adjusted. The allocation for WTW1 and WTW 2 must also be adjusted. Assume sufficient yield in total, after adjustment, however, this may severely impact on irrigation volumes.	
		River	Hluhluwe River			
4	Infrastructure			Class	Size / No	Capacity (Ml/d or Length or kW)
4.1	Existing	WTW	Hluhluwe Phase 1 WTW	Primary Bulk	10	18
			Hluhluwe Phase 2 WTW	Primary Bulk	1.5	3
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	250ømm	3.36 km
				Secondary Bulk	50 ømm - 450ømm	109.33 km
				Tertiary Bulk	90 ømm - 500 ømm	105 km
		Reservoirs	CR 1 (Res3)	Primary Bulk	50	1 560
			CR 2 (Res4)	Primary Bulk	30	1 850
			CR 3 (Res24)	Primary Bulk	1 100	1 100
			CR 4 (Res 5)	Primary Bulk	5 000	5 000
			Res 6	Secondary Bulk	4 400	4 400
			Res 7	Secondary Bulk	300	300
			Res 8	Secondary Bulk	1 700	1 700
			Res 9	Secondary Bulk	1 400	3 900
			Res 11	Secondary Bulk	1 700	1 700
			Res 22	Secondary Bulk	450	2 410
			Res 23	Secondary Bulk	450	2 410

			Res 1	Tertiary Bulk	500	3 700
			Res 2	Tertiary Bulk	50	1 280
			Res 10	Tertiary Bulk	400	840
			Res 12	Tertiary Bulk	200	740
			Res 13	Tertiary Bulk	200	200
			Res 14	Tertiary Bulk	50	300
			Res 15	Tertiary Bulk	250	500
			Res 16	Tertiary Bulk	250	340
			Res 17	Tertiary Bulk	100	1 840
			Res 18	Tertiary Bulk	30	360
			Res 19	Tertiary Bulk	800	2 660
			Res 20	Tertiary Bulk	6 000	6 000
			Res 21	Tertiary Bulk	15 000	15 000
		Pump stations			-	-
4.2	Future	Bulk Pipelines		Primary Bulk	110 ømm	3.14 km
				Secondary Bulk	-	-
				Tertiary Bulk	50 ømm - 250 ømm	25.46 km
		WTW		Primary Bulk		
				Secondary Bulk	-	-
		Reservoirs	Res 1	Primary Bulk	-	-
			Res 3	Secondary Bulk	-	-
			Res 25	Tertiary Bulk	0	5 120
			Res 26	Tertiary Bulk	0	12 560
			Res 27	Tertiary Bulk	0	7 180
			Res 28	Tertiary Bulk	0	4 820
			Res 29	Tertiary Bulk	0	3 260
			Res 30	Tertiary Bulk	0	2 460
			Res 31	Tertiary Bulk	0	920
		Pump stations	PS at Res5 to Res3	Primary Bulk	0.05463 M^3/s	42 kW
5	Cost Requirement		Capital Cost	10% Contingencies	Total Cost (Excl VAT)	
		Primary	R 57 880 500	R5 788 050	R 63 668 550	
		Secondary	R 268 711 000	R26 871 100	R 295 582 100	
		Tertiary	R 338 996 000	R33 899 600	R 372 895 600	
		Total	R665 587 500	R66 558 750	R732 146 250	

UK006: Mtubatuba Scheme

The total bulk cost requirement for the Mtubatuba Scheme is R 2.825 billion (excl VAT). The scheme development cost per household is approximately R 57 751 if the dam development is excluded. Due to the size of the project, it will take close to 15 years to complete.

Mtubatuba Scheme						
Item	Description					
1	Population	Scheme Name	Sub scheme No	Population 2020	Population 2050	
		Mtubatuba Scheme	UK006	64 142	79 661	
		Total		64 142	79 661	
2	Demand	Scheme Name	Sub scheme No	Demand 2020 (Ml/day)	Demand 2050 (Ml/day)	
		Mtubatuba Scheme	UK006	16.84	21.49	
		Total		16.84	21.49	
3	Water Resource		HFY (Mm3/a)	HFY (Ml/d)	Comments	
		Dams				
		River	Mfolozi River	10.10	Not sufficient, Augment with Mfolozi Off-channel storage dam	
4	Infrastructure			Class	Size / No	Capacity (Ml/d or Length or kW)
4.1	Existing	Source	Mfolozi Off Channel Storage Dam Feasibility Study and Dam Development	Primary Bulk	1	155
		WTW	Mtubatuba WTW	Primary Bulk	20	22
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	500 ømm - 813ømm	18.13 km
				Secondary Bulk	600ømm - 630 ømm	13.32 km
				Tertiary Bulk	200 ømm - 375 ømm	13.57 km
		Reservoirs	CR1 (Res 9)	Primary Bulk	5 000	5 340
			CR2 (Res 6)	Primary Bulk	25 000	35 000
			Res 2	Secondary Bulk	2 500	5 000
			Res 1	Tertiary Bulk	1 500	5 000
			Res 3	Tertiary Bulk	1 500	4 280
			Res 4	Tertiary Bulk	1 000	4 280
			Res 5	Tertiary Bulk	850	2 800
			Res 7	Tertiary Bulk	5 000	10 240
		Pump stations	Khula village Pump Station @ Futhululu Res	Primary Bulk	15.29051988 l/s	15.29051988 l/s
			Mtubatuba old booster pump station	Primary Bulk	22.42609582 l/s	22.42609582 l/s

			Khula village pump station water tower reservoir	Primary Bulk	11.21304791 l/s	11.21304791 l/s
4.2	Future	Bulk Pipelines		Primary Bulk	-	-
				Secondary Bulk	315 ømm	4.68 km
				Tertiary Bulk	140 ømm	2.33 km
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs		Primary Bulk	-	-
				Secondary Bulk	-	-
			Res 8	Tertiary Bulk	0	2 160 kl
		Pump stations	PS at Mtubatuba WTW to Res 6	Primary Bulk	0.217778 M^3/s	77 kW
5	Cost Requirement		Capital Cost	10% Contingencies	Total Cost (Excl VAT)	
		Primary	R2 350 917 156	R235 091 716	R2 586 008 872	
		Secondary	R101 328 000	R10 132 800	R111 460 800	
		Tertiary	R116 587 000	R11 658 700	R128 245 700	
		Total	R2 568 832 156	R256 883 216	R2 825 715 372	

UK007: Mkuze Scheme

The total bulk cost requirement for the Mkuze Scheme is R 87,3 million (excl VAT). The scheme development cost per household is approximately R 23 782. Due to the size of the project, it will take close to 15 years to complete.

Mkuze Scheme						
Item	Description					
1	Population	Scheme Name	Sub scheme No	Population 2020	Population 2050	
		Mkuze Scheme	UK007	15 020	18 654	
		Total		15 020	18 654	
2	Demand	Scheme Name	Sub scheme No	Demand 2020 (Ml/day)	Demand 2050 (Ml/day)	
		Mkuze Scheme	UK007	3.35	4.29	
		Total		3.35	4.29	
3	Water Resource		HFY (Mm3/a)	HFY (Ml/d)	Comments	
		Dams	Jozini WTW	5		
		River				
4	Infrastructure			Class	Size / No	Capacity (Ml/d or Length or kW)
4.1	Existing	WTW	Jozini WTW	Primary Bulk	5	5
			Bethesda WTW	Primary Bulk	0.3	0.3
			Mkuze River WTW	Primary Bulk	2.5	2.5
			Mkuze WTW	Primary Bulk	1.5	1.5
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	-	-
				Secondary Bulk	-	-
				Tertiary Bulk	-	-
		Reservoirs		Primary Bulk	-	-
				Secondary Bulk	-	-
				Tertiary Bulk	-	-
		Pump stations	Mkhuze Tower Pump station		7.64525994 l/s	
4.2	Future	Bulk Pipelines		Primary Bulk	-	-
				Secondary Bulk	90ømm - 200 ømm	52.26 km
				Tertiary Bulk	200 ømm	2.03 km
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs	Res 1	Primary Bulk	-	-
			Res 26	Secondary Bulk	-	-
			Res 34	Tertiary Bulk	0	1 780
			Res 35	Tertiary Bulk	0	1 080
			Res 36	Tertiary Bulk	0	4 290

			Res 37	Tertiary Bulk	0	4 290
		Pump stations		Primary Bulk	-	-
5	Cost Requirement		Capital Cost	10% Contingencies	Total Cost (Excl VAT)	
		Primary		R0	R -	
		Secondary	R 30 410 000	R3 041 000	R 33 451 000	
		Tertiary	R 48 979 000	R4 897 900	R 53 876 900	
		Total	R79 389 000	R7 938 900	R87 327 900	